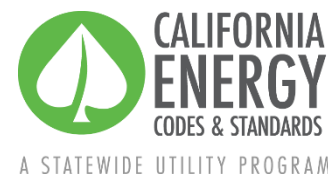


Proposal Submeasure Summary



2022 California Energy Code (Title 24, Part 6)

Nonresidential Envelope – Cool Roofs

Updated: May 20, 2020

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Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on April 23rd, 2020. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. Please share comments by email to info@title24stakeholders.com.

Measure Description

The cool roof measure proposes updates to the existing prescriptive cool roof requirements for nonresidential buildings. This initiative would evaluate requirements for both low-slope roofs (ratio of rise to run of less than 2:12; 9.5 degrees from horizontal) and steep-slope roofs (ratio of rise to run of greater than or equal to 2:12; 9.5 degrees from horizontal) for new construction, additions, and alterations.

For low-slope roofs, the Statewide CASE Team is proposing raising the minimum aged solar reflectance from 0.63 to 0.70, raising the aged Solar Reflectance Index (SRI) from 75 to 85 and keeping the thermal emittance level at 0.75. For steep-slope roofs, the Statewide CASE team is proposing raising the minimum aged solar reflectance from 0.20 to 0.25, aged SRI from 16 to 23, and the minimum thermal emittance from 0.75 to 0.80.

The Statewide CASE Team has determined that these more stringent requirements are appropriate and cost-effective given updated product availability and product costs. Stricter reflectance, emittance, and/or SRI standards will reduce the energy needed to heat and cool non-residential buildings which in turn will allow building proprietors and occupants to save money and reduce their carbon emission footprint.

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in **yellow**.

Standards:



Section 140.3 – Prescriptive Requirements for Building Envelopes

A building complies with this section by being designed with and having constructed to meet all prescriptive requirements in Subsection (a) and the requirements of Subsection (c) and (d) where they apply.

(a) Envelope Component Requirements.

1. **Exterior roofs and ceilings.** Exterior roofs and ceilings shall comply with each of the applicable requirements in this subsection:

A. **Roofing Products.** Shall meet the requirements of Section 110.8 and the applicable requirements of Subsections i through ii:

i. Nonresidential buildings:

a. Low-sloped roofs in Climate Zones 1 through 16 shall have:

1. A minimum aged solar reflectance of ~~0.63~~ 0.70 and a minimum thermal emittance of 0.75; or
2. A minimum Solar Reflectance Index (SRI) of ~~75~~ 85.

EXCEPTION 1 to Section 140.3(a)1Aia: Wood-framed roofs in Climate Zones 3 and 5 are exempt from the requirements of Section 140.3(a)1Aia if the roof assembly has a U-factor of ~~0.034~~ XX or lower.

EXCEPTION 2 to Section 140.3(a)1Aia: Roof constructions with a weight of at least 25 lb/ft² over the roof membrane are exempt from the requirements of Section 140.3(a)1Aia.

EXCEPTION 3 to SECTION 140.3(a)1Aia: An aged solar reflectance less than ~~0.63~~ 0.70 is allowed provided the maximum roof/ceiling U-factor in TABLE 140.3 is not exceeded.

EXCEPTION 4 to Section 140.3(a)1Aia: Roofs in Climate Zone 1, 3, 5, and 16 having a minimum aged solar reflectance of 0.63 and thermal emittance of 0.75 or a minimum Solar Reflectance Index of 75.

b. Steep-sloped roofs in Climate Zones 1 through 16 shall have a minimum aged solar reflectance of ~~0.20~~ 0.25 and a minimum thermal emittance of ~~0.75~~ 0.80, or a minimum SRI of ~~16~~ 23.

ii. High-rise residential buildings and hotels and motels:

a. Low-sloped roofs in Climate Zones 9, 10, 11, 13, 14 and 15 shall have a minimum aged solar reflectance of 0.55 and a minimum thermal emittance of 0.75 or a minimum SRI of 64.

EXCEPTION to Section 140.3(a)1Aia: Roof constructions with a weight of at least 25 lb/ft² over the roof membrane.

b. Steep-sloped roofs in Climate Zones 2 through 15 shall have a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.

TABLE 140.3 Roof/Ceiling Insulation Tradeoff for Aged Solar Reflectance

Nonresidential			
Aged Solar Reflectance	Metal Building Climate Zone 1-16 U-factor	Wood framed and Other Climate Zone 6 & 7 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

EXCEPTION to Section 140.3(a)1A: Roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

TABLE 140.3-B – Prescriptive Envelope Criteria for Nonresidential Buildings (Including Relocatable Public School Buildings Where Manufacturer Certifies Use Only in Specific Climate Zone; Not Including High-Rise Residential Buildings and Guest Rooms of Hotel/Motel Buildings)

			Climate Zone																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Envelope	Maximum U-factor	Roofs/ Ceilings	Metal Building	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	
		Wood Framed and Other	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	0.034	
		Walls	Metal Building	0.113	0.061	0.113	0.061	0.061	0.113	0.113	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.061
			Metal-framed	0.069	0.062	0.082	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
			Mass Light ¹	0.196	0.170	0.278	0.227	0.440	0.440	0.440	0.440	0.440	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass Heavy ¹	0.253	0.650	0.650	0.650	0.650	0.690	0.690	0.690	0.690	0.650	0.184	0.253	0.211	0.184	0.184	0.160
			Wood-framed and Other	0.095	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.045	0.059	0.059	0.059	0.042	0.059
		Floors/ Soffits	Raised Mass	0.092	0.092	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.269	0.092	0.092	0.092	0.092	0.092	0.058
		Other	0.048	0.039	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.039	0.071	0.071	0.039	0.039	0.039	
		Roofing Products	Low-sloped	Aged Solar Reflectance	0.63	0.63 <u>0.70</u>	0.63	0.63 <u>0.70</u>	0.63	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	0.63 <u>0.70</u>	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	
Steep-Sloped	Aged Solar Reflectance		0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	0.20 <u>0.25</u>	
	Thermal Emittance		0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	0.75 <u>0.80</u>	
Air Barrier	Air Barrier		NR	NR	NR	NR	NR	NR	NR	NR	NR	REQ	REQ	REQ	REQ	REQ	REQ		
	Exterior Doors, Maximum U-factor	Non-Swinging	0.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	0.50		
		Swinging	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	

TABLE 140.3-D Prescriptive Envelope Criteria for Relocatable Public School Buildings for Use in All Climate Zones

Roofs/ Ceilings	Metal Buildings	Maximum U-factor		0.041	
	Non-Metal Buildings			0.034	
Walls	Wood frame buildings			0.042	
	Metal frame buildings			0.057	
	Metal buildings			0.057	
	Density ≤ 95			0.170	
	All Other Walls			0.059	
Floors and Soffits	Floors and Soffits			0.048	
Roofing Products	Low-Sloped	Aged Solar Reflectance		0.63 <u>0.70</u>	
		Thermal Emittance		0.75	
	Steep-Sloped	Aged Solar Reflectance		0.20 <u>0.25</u>	
		Thermal Emittance		0.75 <u>0.80</u>	
Fenestration	Windows	Maximum U-factor		0.47	
		Maximum SHGC		0.26	
	Glazed Doors (Site-Built and Factory Assembled)	Maximum U-factor		0.45	
		Maximum SHGC		0.23	
	Skylights	Glass with Curb		Maximum U-factor	0.99
		Glass without Curb			0.57
		Plastic with Curb			0.87
		Glass Type	0-2% SRR	Maximum SHGC	0.46
			2.1-5% SRR		0.36
		Plastic Type	0-2% SRR		0.69
2.1-5% SRR	0.57				
Exterior Doors	Non-Swinging doors	Maximum U-factor		0.50	
	Swinging doors			0.70	

Section 141.0 – Additions, Alterations, And Repairs to Existing Nonresidential, High-Rise Residential, And Hotel/Motel Buildings, To Existing Outdoor Lighting, And to Internally and Externally Illuminated Signs

- B. Existing roofs being replaced, recovered or recoated, of a nonresidential, high-rise residential and hotels/motels shall meet the requirements of Section 110.8(i). Roofs with more than 50 percent of the roof area or more than 2,000 square feet of roof, whichever is less, is being altered the requirements of i through iii below apply:
 - i. Roofing Products. Nonresidential buildings:

- a. Low-sloped roofs in Climate Zones 1 through 16 shall have a minimum aged solar reflectance of ~~0.63~~ 0.70 and a minimum thermal emittance of 0.75, or a minimum SRI of ~~75~~ 85.
- b. Steep-sloped roofs in Climate Zones 1 through 16 shall meet the requirements in 140.3 (a)1Aib ~~have a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.~~

EXCEPTION 1 to Section 141.0(b)2Bia: An aged solar reflectance less than ~~0.63~~ 0.70 is allowed provided the maximum roof/ceiling U-factor in TABLE 141.0-B is not exceeded.

EXCEPTION 2 to Section 141.0(b)2Bia: Roofs in Climate Zone 1, 3, 5, and 16 having a minimum aged solar reflectance of 0.63 and thermal emittance of 0.75 or a minimum Solar Reflectance Index of 75.

ii. Roofing Products. High-rise residential buildings and hotels and motels:

- a. Low-sloped roofs in Climate Zones 10, 11, 13, 14 and 15 shall have a minimum aged solar reflectance of 0.55 and a minimum thermal emittance of 0.75, or a minimum SRI of 64.
- b. Steep-sloped roofs Climate Zones 2 through 15 shall meet the requirements in 140.3 (a)1Aib ~~have a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.~~

EXCEPTION 1 to Section 141.0(b)2Bi and ii: Roof area covered by building integrated photovoltaic panels and building integrated solar thermal panels are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

EXCEPTION 2 to Section 141.0(b)2Bi and ii: Roof constructions with a weight of at least 25 lb/ft² are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

Table 141.0-B Roof/Ceiling Insulation Tradeoff for Aged Solar Reflectance

Aged Solar Reflectance	Climate Zone 1, 3-9 U-factor	Climate Zone 2, 10-16 U-factor
<u>0.62-0.60</u>	<u>0.075</u>	<u>0.052</u>
<u>0.59-0.55</u>	<u>0.066</u>	<u>0.048</u>
<u>0.54-0.50</u>	<u>0.060</u>	<u>0.044</u>
<u>0.49-0.45</u>	<u>0.055</u>	<u>0.041</u>
<u>0.44-0.40</u>	<u>0.051</u>	<u>0.039</u>
<u>0.39-0.35</u>	<u>0.047</u>	<u>0.037</u>
<u>0.34-0.30</u>	<u>0.044</u>	<u>0.035</u>
<u>0.29-0.25</u>	<u>0.042</u>	<u>0.034</u>