

As you all know, roofing products are a key factor in meeting the state's efficiency objectives. Your input into the 2013 energy Standards process has been invaluable. Attached is our proposed 15-day draft revision to the portions of the energy standards reflecting low-sloped roofing products for nonresidential buildings. These revisions respond to the concerns raised by your industry in the Commission Hearings on March 12th and 13th.

Staff Comments:

1. **Cost Assumptions:** Concerns were raised regarding the "quick and dirty" cost analysis to support the aged solar reflectance for low-sloped roofs. Staff disagrees. Every effort was made by staff to ensure the data collection was representative of industry costs and while it may have been desirable for the inclusion of more data sources, the data gathered is representative of industry's products and installation costs. The cost analysis includes contractors, distributors and manufacturers who work throughout the state. It is highly unlikely that the additional time and resources expended for identifying other cost sources would lead to different results.
2. **Market Consistency:** It was suggested by the roofing industry that the proposed aged solar reflectance for new buildings should be the same as that proposed for additions and alterations to existing buildings. The concern was that setting two different requirements (0.65 for new buildings versus 0.63 for existing buildings) would cause confusion in the market. Staff agrees with this concern. Staff proposes the same requirement for aged solar reflectance for new buildings and existing buildings—0.63. Lowering the proposed aged solar reflectance for new buildings from 0.65 to 0.63 acknowledges concerns by some segments of the commercial roofing industry to establish the cool roof efficiency value at a level more aligned with product availability.
3. **Insulation and Solar Reflectance Tradeoff:** It was suggested by the roofing industry to allow a tradeoff for insulation when lower values of solar reflectance are used. Industry recommended an insulation tradeoff for both new construction and for additions and alterations to existing buildings. During the hearings, there were also requests to allow insulation either above the roof deck or below the roof deck. Staff agrees with these recommendations.

First, separate insulation tradeoff tables have been developed that apply to new and existing buildings.

Second, because of the difficulty in describing where insulation is to be installed and the specific amount based on roof assembly type (i.e., above the roof deck, below the roof deck, or both above and below the roof deck) tradeoff tables were developed by specifying maximum U-factors. Examples of solar reflectance and R-value combinations meeting the table U-value allowances will be developed for the Nonresidential Compliance Manual.

Third, staff recognizes the usefulness of the Overall Envelope TDV Energy Approach of the current standards in Section 140.3(b). This section has been removed from the proposed 2013 standards but is being relocated into the Nonresidential Alternative Calculation Method, which will be available at a later time. Staff intends to provide a user friendly overall envelope tradeoff methodology on the Energy Commission website for the public to use.

SUBCHAPTER 5 NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL/MOTEL OCCUPANCIES—PERFORMANCE AND PRESCRIPTIVE COMPLIANCE APPROACHES FOR ACHIEVING ENERGY EFFICIENCY

SECTION 140.3 – PRESCRIPTIVE REQUIREMENTS FOR BUILDING ENVELOPES

(a) Envelope Component Approach.

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(i) 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 and a minimum thermal emittance of 0.75; or
 2. A minimum SRI of 75.
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 0.039 or lower.
EXCEPTION 2 TO SECTION 140.3(a)1Aia: Metal building 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 0.048 or lower.
EXCEPTION 3 TO SECTION 140.3(a)1Aia: Roof constructions that have thermal mass with a weight of at least 25 lb/ft² over the roof membrane are exempt from the requirements of Section 140.3(a)1Aia.
 - b. Steep-sloped roofs in climate zones 1 through 16 shall have a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.
 - ii. High-rise residential buildings and hotels and motels:
 - a. Low-sloped roofs in climate zones 2 through 15 shall have a minimum aged solar reflectance of 0.63 and a minimum thermal emittance of 0.75 or a minimum SRI of 75.
EXCEPTION TO SECTION 140.3(a)1Aia: Roof constructions that have thermal mass 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.
EXCEPTION TO SECTION 140.3(a)1Aia and iia: An aged solar reflectance less than 0.63 is allowed provided the maximum roof/ceiling U-factor in TABLE 140.3 is met.

TABLE 140.3 Roof/Ceiling U-Factor Insulation Tradeoff For Aged Solar Reflectance

Nonresidential					
Aged Solar Reflectance	Metal Building Climate Zone 1-16 Roof/Ceiling U-factor	Wood framed and Other Climate Zone 1 & 5 Roof/Ceiling U-factor	Wood Framed and Other Climate Zone 2-4, 9-16 Roof/Ceiling U-factor	Wood Framed and Other, Climate Zone 6 Roof/Ceiling U-factor	Wood Framed and Other, Climate Zone 7 & 8 Roof/Ceiling U-factor
0.62-0.60	0.061	0.045	0.036	0.065	0.059
0.59-0.55	0.054	0.041	0.034	0.058	0.053
0.54-0.50	0.049	0.038	0.032	0.052	0.048
0.49-0.45	0.047	0.035	0.030	0.047	0.044
0.44-0.40	0.043	0.033	0.028	0.043	0.040
0.39-0.35	0.039	0.031	0.027	0.039	0.037
0.34-0.30	0.035	0.029	0.025	0.037	0.035
0.29-0.25	0.033	0.027	0.024	0.034	0.032
High-Rise Residential Buildings					
Aged Solar Reflectance	Metal Building Climate Zone 1-16 Roof/Ceiling U-factor	Wood Framed and Other Climate Zone 1 Roof/Ceiling U-factor	Wood Framed and Other Climate Zone 3, 5-7 Roof/Ceiling U-factor	Wood Framed and Other Climate Zone 2, 8-16 Roof/Ceiling U-factor	
0.62-0.60	0.062	0.034	0.037	0.027	
0.59-0.55	0.058	0.033	0.035	0.026	
0.54-0.50	0.055	0.032	0.033	0.025	
0.49-0.45	0.052	0.032	0.032	0.024	
0.44-0.40	0.050	0.031	0.030	0.024	
0.39-0.35	0.047	0.031	0.029	0.023	
0.34-0.30	0.046	0.031	0.028	0.022	
0.29-0.25	0.045	0.030	0.027	0.021	

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.

- B. **Roof Insulation.** Roofs shall have an overall assembly U-factor no greater than the applicable value in TABLE 140.3-B, TABLE 140.3-C, or TABLE 140.3-D, and shall be, where required by Section 110.8(e), placed in direct contact with a continuous roof or drywall ceiling.

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SECTION 141.0(b)2B

Addition and Alterations for Nonresidential and High-rise Residential and Hotels/Motels.

- 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), and where roofs with more than 50 percent of the roof or more than 2,000 square feet of roof, whichever is less, is being altered the requirements of through iii apply:.
- i. Nonresidential buildings:
 - a. Low-sloped roofs in climate zones 1 through 16 shall have a minimum aged solar reflectance of 0.63 and a minimum thermal emittance of 0.75, or a minimum SRI of 75.
 - b. Steep-sloped roofs in climate zones 1 through 16 shall have a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or a minimum SRI of 16.
 - ii. High-rise residential buildings and hotels and motels:
 - a. Low-sloped roofs in climate zones 2 through 15 shall have a minimum aged solar reflectance of 0.63 and a minimum thermal emittance of 0.75, or a minimum SRI of 75.
 - b. Steep-sloped roofs 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.

EXCEPTIONS 1 TO SECTION 141.0(b)(2)(B)ii and iii: 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.

EXCEPTIONS 2 TO SECTION 141.0(b)(2)(B)ii and iii: Roof constructions that have thermal mass over the roof membrane with a weight of at least 25 lb/ft² are not required to meet the minimum requirements for solar reflectance, thermal emittance, or SRI.

EXCEPTION 3 TO SECTION 141.0(b)(2)(B)(i)a and (ii)a: An aged solar reflectance less than 0.63 is allowed provided the maximum roof/ceiling U-factor in TABLE 141.0-B is met.

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

	Nonresidential				High-Rise Residential and Hotel/Motel Buildings
Aged Solar Reflectance	Metal Building Climate Zone 1, 3-9 Roof/Ceiling U-factor	Metal Building Climate Zone 2, 10-16 Roof/Ceiling U-factor	Wood Framed and Other Climate Zone 1, 3-9 Roof/Ceiling U-factor	Wood Framed and Other Climate Zone 2, 10-16 Roof/Ceiling U-factor	All Buildings Climate Zone 1-16 Roof/Ceiling U-factor
0.62-0.60	0.075	0.052	0.069	0.052	0.053
0.59-0.55	0.066	0.048	0.062	0.048	0.049
0.54-0.50	0.060	0.044	0.056	0.044	0.046
0.49-0.45	0.055	0.041	0.051	0.041	0.044
0.44-0.40	0.051	0.039	0.048	0.039	0.042
0.39-0.35	0.047	0.037	0.044	0.037	0.040
0.34-0.30	0.044	0.035	0.042	0.035	0.039
0.29-0.25	0.042	0.034	0.039	0.034	0.037

- iii. For nonresidential buildings, high-rise residential buildings and hotels and motels, when roofs are exposed to the roof deck, or to the roof recover boards and meets Section 141.0(b)(2)(B)i and ii the exposed area shall be insulated to the levels specified in TABLE 141.0-C.

EXCEPTION 1 to Section 141.0(b)(1)(B)iii: Existing roofs that are insulated with at least R-7 insulation or it has a U-factor lower than 0.089 are not required to meet the R-value requirement of TABLE 141.0-C.

EXCEPTION 2 to Section 141.0(b)(2)(B)iii

1. If mechanical equipment is located on the roof and will not be disconnected and lifted as part of the roof replacement, insulation added may be limited to the maximum insulation thickness that will allow a height of 8 inches (203 mm) from the roof membrane surface to the top of the base flashing.
2. If adding the required insulation will reduce the base flashing height to less than 8 inches (203 mm) at penthouse or parapet walls, the insulation added may be limited to the maximum insulation thickness that will allow a height of 8 inches (203 mm) from the roof membrane surface to the top of the base flashing, provided that the conditions in subsections i through iv apply:
 - i. The penthouse or parapet walls are finished with an exterior cladding material other than the roofing covering membrane material; and

- ii. The penthouse or parapet walls have exterior cladding material that must be removed to install the new roof covering membrane to maintain a base flashing height of 8 inches (203 mm); and
 - iii. For nonresidential buildings, the ratio of the replaced roof area to the linear dimension of affected penthouse or parapet walls shall be less than 25 square feet per linear foot for climate zones 2, and 10 through 16, and less than 100 square feet per linear foot for climate zones 1, and 3 through 9; and
 - iv. For high-rise residential buildings, hotels or motels, the ratio of the replaced roof area to the linear dimension of affected penthouse or parapet walls shall be less than 25 square feet per linear foot for all climate zones.
3. Tapered insulation may be used which has a thermal resistance less than that prescribed in TABLE 141.0-C at the drains and other low points, provided that the thickness of insulation is increased at the high points of the roof so that the average thermal resistance equals or exceeds the value that is specified in TABLE 141.0-C.

TABLE 141.0-C INSULATION REQUIREMENTS FOR ROOF ALTERATIONS

Climate Zone	Nonresidential		High-Rise Residential and Guest Rooms of Hotel/Motel Buildings	
	Continuous Insulation R-value	U-factor	Continuous Insulation R-value	U-factor
1	R-8	0.081	R-14	0.055
2	R-14	0.055	R-14	0.055
3-9	R-8	0.081	R-14	0.055
10-16	R-14	0.055	R-14	0.055

EXCEPTION 1 to Section 141.0(b)(2)B: The Overall Envelope Energy Approach of Section 140.3(b) may be used and the standard building shall be based on the higher roof/ceiling insulation value of the following;

- i. The existing installed insulation; or
- ii. For low-sloped roofs, the insulation values specified in TABLE 141.0-B; or
- iii. For steep-sloped roofs, the insulation values specified in Section 140.3(a).