

COOL ROOF REGULATIONS IN CALIFORNIA’S 2005 BUILDING ENERGY EFFICIENCY STANDARDS (original took effect October 1, 2005; amendments for roof coatings took effect September 11, 2006)

TITLE 24, California Code of Regulations, PART 1 (Administrative Regulations)

SECTION 10-113 – Certification and Labeling of Roofing Product Reflectance and Emittance

This section establishes rules for implementing labeling and certification requirements relating to reflectance and emittance for roofing products for showing compliance with Sections 141, 142, and 151 (b) of Title 24, California Code of Regulations, Part 6. This section also provides for designation of the Cool Roof Rating Council (CRRC) as the supervisory entity responsible for administering the state's certification program for roofing products, provided CRRC meets specified criteria.

(a) Labeling Requirements.

Every roofing product installed in construction to take compliance credit for reflectance and emittance under Sections 141, 142, and 151 (b) shall have a clearly visible packaging label that lists the reflectance and emittance tested in accordance with CRRC-1.

Packaging for liquid applied roof coatings shall state the product meets the requirements specified in Section 118 (i) 3.

(b) Certification Requirements.

Every roofing product installed in construction to take compliance credit for reflectance and emittance under Sections 141, 142, and 151 (b) shall be certified by CRRC or another supervisory entity approved by the Commission pursuant to Section 10-113 (c).

(c) Designation of Supervisory Entity. The Cool Roof Rating Council shall be the supervisory entity to administer the certification program relating to reflectance and emittance ratings for roofing products, provided the Commission determines that the CRRC meets the criteria in paragraph (d).

1. The Commission may consider designating a supervisory entity other than CRRC only if the Commission determines that the CRRC cannot meet the criteria in paragraph (d). Such other supervisory entity shall meet the criteria in paragraph (d) prior to being designated.
2. The Commission shall periodically review, at least annually, the structure and operations of the supervisory entity to ensure continuing compliance with the criteria in paragraph (d).

(d) Criteria for Supervisory Entity.

1. Membership in the entity shall be open on a nondiscriminatory basis to any person or organization that has an interest in uniform performance ratings for roofing products, including, but not limited to, members of the roofing industry, building industry, design professionals, specifiers, utilities, government agencies, and public interest organizations. The membership shall be composed of a broad cross section of those interested in uniform thermal performance ratings for roofing products.
2. The governing body of the entity shall reflect a reasonable cross-section of the interests represented by the membership.
3. The entity shall maintain a program of oversight of product manufacturers, laboratories, and independent certifying organizations that ensures uniform application of the CRRC testing and rating procedures, labeling and certification, and such other rating procedures for other factors affecting energy performance as the CRRC and the Commission may adopt.
4. The entity shall require manufacturers and independent certifying organizations within its program to use only laboratories accredited by the supervisory entity to perform tests under the CRRC rating procedure.
5. The entity shall maintain appropriate guidelines for testing laboratories and manufacturers, including requirements for adequate:

- A. Possession and calibration of equipment;
 - B. Education, competence, and training of personnel;
 - C. Quality control;
 - D. Record keeping and reporting;
 - E. Periodic review (including but not limited to, blind testing by laboratories; inspections of products; inspections of laboratories, and manufacturing facilities);
 - F. Challenges to certified ratings; and
 - G. Guidelines to maintain the integrity of the program, including, but not limited to, provisions to avoid conflicts of interest within the rating and certification process.
6. The entity shall be a nonprofit organization and shall maintain reasonable, nondiscriminatory fee schedules for the services it provides, and shall make its fee schedules, the financial information on which fees are based, and financial statements available to its members for inspection.
 7. The entity shall provide hearing processes that give laboratories, manufacturers and certifying agencies a fair review of decisions that adversely affect them.
 8. The entity shall maintain a certification policy committee whose procedures are designed to avoid conflicts of interest in deciding appeals, resolving disputes and setting policy for the certifying organizations in its program.
 9. The entity shall publish at least annually a directory of products certified and decertified within its program.
 10. The entity itself shall be free from conflict-of-interest ties or to undue influence from any particular roofing product manufacturing interest(s), testing or independent certifying organization(s).
 11. The entity shall provide or authorize the use of labels that can be used to meet the requirements for showing compliance with the requirements of Sections 141, 142, and 151 (b), and this section.
 12. The entity's certification program shall allow for multiple participants in each aspect of the program to provide for competition between manufacturers and between testing labs.

TITLE 24, PART 6 (Building Energy Efficiency Standards)

SECTION 118 – Mandatory Requirements for Insulation and Cool Roofs

- (i) **Mandatory Requirements for Cool Roofs.** In order to qualify for compliance credit as a cool roof or meet the requirements of Section 143 (a) 1 or 149 (b) 1 B, a cool roof shall be certified and labeled according to the requirements of Section 10-113 and meet conditions 1 or 2 and, for liquid applied roofing products, 3 below.
1. Any roofing product with an initial thermal emittance greater than or equal to 0.75 when tested in accordance with CRRC-1 shall have a minimum initial solar reflectance of 0.70 when tested in accordance with CRRC-1.

EXCEPTION to Section 118 (i) 1: For low-rise residential buildings, concrete tile (as defined in ASTM C55) and clay tile (as defined in ASTM C1167) roofing products shall have a minimum initial thermal emittance of 0.75 and a minimum initial solar reflectance of 0.40 when tested in accordance with CRRC-1.
 2. Any roofing product with a minimum initial thermal emittance $\epsilon_{\text{initial}}$ less than 0.75 when tested in accordance with CRRC-1, including but not limited to roof products with metallic surfaces, shall have a minimum initial solar reflectance of $0.70 + 0.34 * (0.75 - \epsilon_{\text{initial}})$ when tested in accordance with CRRC-1.
 3. Liquid applied roof coatings applied to low-sloped roofs in the field as the top surface of a roof covering shall
 - a. be applied across the entire roof surface to meet the dry mil thickness or coverage recommended by the coating manufacturer, taking into consideration the substrate on which the coating is applied, and
 - b. meet the minimum performance requirements listed in TABLE 118-C or the minimum performance requirements of ASTM C836, D3468, D6083, or D6694, whichever are appropriate to the coating material.

EXCEPTION 1 to Section 118 (i) 3 B: Aluminum-pigmented asphalt roof coatings shall meet the requirements of ASTM D2824 or ASTM D6848 and be installed as specified by ASTM D3805.

EXCEPTION 2 to Section 118 (i) 3 B: Cement-based roof coatings shall contain a minimum of 20% cement and shall meet the requirements of ASTM C1583, ASTM D822, and ASTM D5870.

TABLE 118-C MINIMUM PERFORMANCE REQUIREMENTS FOR LIQUID APPLIED ROOF COATINGS FOR LOW-SLOPED ROOFS

Physical Property	ASTM Test Procedure	Requirement
Initial percent elongation (break)	D 2370	Minimum 200% 73 °F (23 °C)
Initial percent elongation (break) OR Initial flexibility	D2370 D522, Test B	Minimum 60% 0°F (-18°C) Minimum pass 1” mandrel 0°F (-18°C)
Initial tensile strength (maximum stress)	D 2370	Minimum 100 psi (1.38 Mpa) 73 °F (23 °C)
Initial tensile strength (maximum stress) OR Initial flexibility	D2370 D522, Test B	Minimum 200 psi (2.76 Mpa) 0°F (-18°C) Minimum pass 1” mandrel 0°F (-18°C)
Final percent elongation (break) after accelerated weathering 1000 h	D 2370	Minimum 100% 73 °F (23 °C)
Final percent elongation (break) after accelerated weathering 1000 h OR Flexibility after accelerated weathering 1000 h	D2370 D522, Test B	Minimum 40% 0°F (-18°C) Minimum pass 1” mandrel 0°F (-18°C)
Permeance	D 1653	Maximum 50 perms
Accelerated weathering 1000 h	D 4798	No cracking or checking ¹
¹ Any cracking or checking visible to the eye fails the test procedure.		

SECTION 143 – Prescriptive Requirements for Building Envelopes

(a) Envelope Component Approach.

1. Exterior roofs and ceilings. Exterior roofs and ceilings shall:

- A. For nonresidential buildings with low-sloped roofs, meet the requirements of either 118(i)1 or 118(i)2 and for liquid applied roof coatings, Section 118(i)3; and

EXCEPTION to Section 143(a)1A: Any roofing product with a minimum initial thermal emittance $\epsilon_{initial}$ less than 0.75 when tested in accordance with CRRC-1, including but not limited to roof products with metallic surfaces, if that roofing product has a minimum initial solar reflectance of $0.70 + 0.34 * (0.75 - \epsilon_{initial})$ when tested in accordance with CRRC-1.

[B., C. pertain to insulation, R-values, U-factors]

(b) Overall Envelope Approach [contains Overall Heat Loss and Overall Heat Gain equations.] Heat Gain equations contain

$\rho_{Ri_{std}}$ = Initial solar reflectance of the roofing product for the corresponding A_{Ri} (exterior roof area). The standard building has an initial solar reflectance of 0.70 for nonresidential buildings with low-sloped roofs and an initial solar reflectance of 0.30 for nonresidential buildings with high-sloped roofs, for high-rise residential buildings, and for guest rooms of hotel/motel buildings.

and

$\rho_{Ri_{prop}}$ = The initial solar reflectance of the proposed design roofing product for the corresponding A_{Ri} , as certified and labeled according to the requirements of §10-113. If the roofing product has an emittance less than 0.75 the value shall be calculated by the following equation:

$$\rho_{Ri_{prop}} = -0.448 + 1.121 * R + 0.524 * E$$

Where R = reflectance of the roofing product and E = emittance of the roofing product

The calculated value of $\rho_{Ri_{prop}}$ from the above equation shall not be larger than R or less than 0.10.

If the proposed design roofing product used has not been certified and labeled according to the requirements of §10-113 and/or does not meet the requirements of §118(i)3, the proposed design initial solar reflectance shall be 0.10 for nonresidential buildings with low-sloped roofs, or 0.30 for nonresidential buildings with high-sloped roofs, high-rise residential buildings, and guest rooms in hotel/motel buildings.

SECTION 149 – Additions, Alterations, and Repairs to Existing Buildings That Will Be Nonresidential, High-Rise Residential, and Hotel/Motels ...

(a) **Additions.** Additions shall meet either Item 1 or 2 below.

1. **Prescriptive approach.** The envelope and lighting of the addition, any newly installed space-conditioning or water-heating system serving the addition, any addition to an outdoor lighting system, and any new sign installed in conjunction with an indoor or outdoor addition shall meet the applicable requirements of Sections 110 through 139 and Sections 142 through 148.
2. **Performance approach.**
 - A. The envelope and indoor lighting in the conditioned space of the addition, and any newly installed space-conditioning or water-heating system serving the addition, shall meet the applicable requirements of Sections 110 through 139; and
 - B. Either:
 - i. The addition alone shall comply with Section 141; or
 - ii. The energy efficiency of the existing building shall be improved so that the entire building meets the energy budget in Section 141 that would apply to the entire building, if the alterations to the existing building met the requirements of 149(b)2B, and the addition alone complied with Item 1.

[EXCEPTIONS 1 and 2: Pertain to heating, cooling, and water heating]

- (b) **Alterations.** Alterations to existing nonresidential, high-rise residential, or hotel/motel buildings or alterations in conjunction with a change in building occupancy to a nonresidential, high-rise residential, or hotel/motel occupancy not subject to Subsection (a) shall meet either Item 1 or 2 below.
1. **Prescriptive approach.** The altered envelope, space conditioning, lighting and water heating components, and any newly installed equipment serving the alteration, shall meet the applicable requirements of Sections 110 through 139; and
 -[items to do with lighting, fenestration]
 - ii. Neither increase the overall heat gain nor increase the overall heat loss of the building envelope.
 - B. Replacements, recovering or recoating of the exterior surface of existing nonresidential low-sloped roofs shall meet Subsection i or ii where more than fifty percent of the roof or more than 2,000 square feet of roof, whichever is less, is being replaced, recovered or recoated.
 - i. The roof shall meet the requirements of either 118(i)1 or 118(i)2; and for liquid applied roof coatings, Section 118(i)3, or
 - ii. The building envelope, which has a roof replacement subject to this requirement, shall comply with Section 143(b) [overall heat loss and overall heat gain], where
 - a. the standard building has a solar reflectance which meets the requirements of Section 143(a)1 and the other terms in Equation 143-D correspond to the existing building at the time of the application of the permit, and
 - b. the proposed building has either:

- (1.) the solar reflectance of the replacement roof product, as certified and labeled according to the requirements of Section 10-113 and the roof product meets the requirements of Section 118(i)3, or
- (2.) a solar reflectance of 0.10 if the product has not been certified and labeled and/or does not meet the requirements of Section 118(i)3, and
- (3.) has the other improvements to the building envelope necessary to comply.

EXCEPTION to Section 149(b)1B: Roof recoverings allowed by the CBC are not required to meet Section 149(b)1B when all of the following occur:

1. The existing roof has a rock or gravel surface, and
2. The new roof has a rock or gravel surface, and
3. There is no removal of existing layers of roof coverings of more than fifty percent of the roof or more than 2,000 square feet of roof, whichever is less; and
4. There is no recoating with a liquid applied coating; and
5. There is no installation of a recover board, rigid insulation or other rigid, smooth substrate to separate and protect the new roof recovering from the existing roof.

...[items regarding space conditioning and lighting]

2. Performance approach.

- A. The altered envelope, space conditioning, lighting and water heating components, and any newly installed equipment serving the alteration, shall meet the applicable requirements of Sections 110 through 139; and
- B. The energy efficiency of either the building or permitted space shall be improved so that the building or permitted space meets the energy budget in Section 141 that would apply to the building or permitted space, if the building envelope was unchanged, except for roofs alterations subject to Section 149(b)1B, the roof alteration met the requirements of 149(b)1; and for any mechanical system alterations subject to Section 149(b)1C, D, and E, the mechanical system alterations met the requirements of Section 149(b)1, and for any lighting system alterations subject to Section 149(b)1F, the lighting system alteration met the requirements of Section 149 (b) 1; and for any service water-heating system alteration subject to Section 149(b)1K, the service water-heating system met the requirements of Section 149(b)1.

EXCEPTION 1 to Section 149(b): When heating, cooling or service water heating ...