# CALIFORNIA MINIMUM INSULATION REQUIREMENTS

For Nonresidential and Multifamily Building Roofs (Low-Slope)
2022 Energy Code (effective January 1, 2023)

## Key Provisions

- The insulation requirements for roof alterations apply to all roof replacements and recovers regardless of whether existing insulation is located above or below the roof deck.
- The prescriptive minimum requirements for roof alterations are:
  - **R-17** or **R-23** (depending on climate zone) with the use of continuous insulation (ci) only; or
  - **U-0.042** or **U-0.037** (depending on climate zone) if the insulation is a combination of continuous and cavity insulation. Assemblies insulated with cavity insulation must have a **minimum R-10ci installed above the roof deck**.
- There are two exceptions that include important backstops:
  - **Roof Recovers:** Recovers are not required to meet the full R-17/23 (or U-0.037/0.042) requirements if at least R-10ci of **new** insulation is installed above the roof deck.
  - **Equipment Curbs and Flashing Heights:** The maximum amount of insulation (up to the prescriptive requirement) or R-10ci, whichever is greater, must be installed where flashing heights associated with HVAC equipment curbs present limiting conditions.

## Useful Links

- The California Energy Commission's web-based tool for locating the Climate Zone applicable to a specific project can be accessed here.
- The California 2022 Energy Code, Reference Appendices (including JA4), Climate Zone Maps, and the 2022 Multifamily and Nonresidential Compliance Manual can be accessed here.
- *Energy Code Ace* tools, training, and resources (including fact sheets) can be accessed here.

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## New Buildings – Minimum Roof Insulation Assembly Requirements

U-factors/R-values for Span Deck and Concrete Roof Assemblies (R-values are for above deck ci)

| Building Category | Roof Assembly Category | Climate Zones | U-factors | Prescriptive R-value (JA4) | Table |
|---|---|---|---|---|---|
| Nonresidential | Span Deck & Concrete | 1-5, 9-16 | U-0.034 | R-30ci | 140.3-B |
| Nonresidential | Span Deck & Concrete | 6-8 | U-0.049 | R-20ci | 140.3-B |
| Hotel/Motel, Multifamily (Option D, Non-Attic) | Span Deck & Concrete | 1-2, 4, 8-16 | U-0.028 | R-32ci or 33ci* | 140.3-C 170.2-A |
| Hotel/Motel, Multifamily (Option D, Non-Attic) | Span Deck & Concrete | 3, 5-6 | U-0.034 | R-30ci | 140.3-C 170.2-A |
| Hotel/Motel, Multifamily (Option D, Non-Attic) | Span Deck & Concrete | 7 | U-0.039 | R-25ci | 140.3-C 170.2-A |

* This R-value is an estimate because the Appendix Table 4.2.6 does not list a corresponding R-value for U-factors ≤ U-0.028.

**1. Notes for Nonresidential Buildings, Hotel/Motel Guest Rooms and Multifamily Buildings**

- Roofs are divided into two categories: "metal building" roofs and "wood framed and other" roofs. The information in this fact sheet applies only to the "wood framed and other" category.
- Unlike the ASHRAE 90.1 Standard and the International Energy Conservation Code, California does not have separate requirements for roofs with "Insulation Entirely Above Deck." Instead, Title 24's U-factor requirements account for the insulation that is installed both above the roof deck and in the framing cavities.

**2. Calculating Equivalent R-values**

- To calculate the insulation R-values that are equivalent to the required U-factors for different roof assemblies, the code user can use CEC-approved software or the tables in **Joint Reference Appendix 4 (JA4)**. Appendix JA4 lists the equivalent insulation R-values for a range of common assembly types. As an example, for span deck and concrete roof assemblies, the equivalent insulation R-values for above deck insulation range from R-20ci to R-30ci depending on the building type and climate zone (see table above). However, the R-values found in Appendix JA4 can only be used for the prescriptive approach.

## Roof Alterations – Minimum Roof Insulation Assembly Requirements

**When do the Title 24 requirements for minimum roof insulation levels apply to roof alterations?**

- Roof alterations that affect more than 50 percent of the roof area or more than 2,000 square feet of roof, whichever is less, must comply with the minimum insulation requirements.
- Insulation requirements for alterations apply to both roof replacements **and** roof recovers.
- Note: Hospitals and other healthcare facilities are exempt from the alteration requirements (see Title 24 Section 141.0, exception).

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## Insulation Requirements for Roof Alterations

| Climate Zones | R-value | U-factor | Table |
|---|---|---|---|
| 1-5, 9-16 | R-23ci | U-0.037 with at least R-10ci above deck | 141.0-C |
| 6-8 | R-17ci | U-0.047 with at least R-10ci above deck | 141.0-C |

### 1. Nonresidential and Hotel/Motel Buildings (Section 141.0(b)2Bii)

- **Minimum Insulation Requirements:** Roof alterations (both replacements and recovers) must comply with the minimum R-values or U-factors in Table 141.0-C as follows:
- **Exceptions and Backstops:**
  - Recovers are not required to meet the levels specified in Table 141.0-C if at least R-10ci of new insulation is installed above the roof deck.
  - When existing mechanical equipment located on the roof will not be disconnected and lifted as part of the roof alteration, insulation added shall be the greater of R-10ci 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 installation instructions. Note: Compliance with Table 141.0-C without exception is required if adding R-10ci necessitates lifting the equipment in order to comply with the manufacturer's recommendations for flashing heights.
  - Tapered insulation with a thermal resistance less than that prescribed in Table 141.0-C may be used at the drains and other low points, if insulation thickness is increased at the high points of the roof so that the "average thermal resistance" equals or exceeds the value specified in Table 141.0-C.
  - The area of the existing roof that is "recoated" (i.e., liquid applied roof coating) is not required to be insulated.

### 2. Multifamily Buildings (Section 180.2(b)1Aiii)

- **Minimum Insulation Requirements:** Roof alterations shall be insulated to R-14 continuous insulation or a U-factor of U-0.039 in Climate Zones 1, 2, 4, and 8 through 16. Note: There are no insulation requirements for multifamily building roof alterations in the other climate zones.
- **Exceptions and Backstops:**
  - Roof recovers with new R-10ci of insulation added above the roof deck are not required to meet the minimum requirements for other roof alterations.
  - When existing mechanical equipment located on the roof will not be disconnected and lifted, the insulation added may be limited to the greater of R-10ci 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 installation instructions.
  - Tapered insulation with a thermal resistance less than R-14 may be used at the drains and other low points if insulation thickness is increased at the high points of the roof so that the "average thermal resistance" equals or exceeds R-14.
  - The area of the existing roof that is "recoated" (i.e., liquid applied roof coating) is not required to be insulated.

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## Notes on Cool Roofs and Insulation Trade-Off for Low-Slope Roofs

California Title 24's cool roof requirements for each building category apply to both new construction and roof alterations. These requirements are found in Section 140.3(a)1Ai (non-residential), Section 170.2(a)1A (multifamily) and 140.3(a)1Aii (hotel/motel).

Where a nonresidential or multifamily building roof covering does not meet the reflectivity requirements, additional insulation is required under Tables 140.3 (new non-residential), 141.0-B (existing non-residential), and 180.2-A (existing multifamily). The additional insulation required by the insulation-reflectivity tradeoff is not permitted to be reduced under the exceptions for roof alterations in Sections 141.0(b)2Bii or 180.2(b)1Aiii. Note: There is no insulation-reflectivity tradeoff for new multifamily construction or for new and existing hotel/motel buildings.

## Information provided by PIMA

For more than 30 years, the Polyisocyanurate Insulation Manufacturers Association (PIMA) has served as the voice of the rigid polyiso industry, proactively advocating for safe, cost-effective, sustainable, and energy-efficient construction. Organized in 1987, PIMA is an association of polyiso manufacturers and industry suppliers. Polyiso is one of North America's most widely-used and cost-effective insulation products.

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