

Questions and Answers for Building Owners Title 24 2005 Building Energy Efficiency Standards

Q. What buildings and roofing projects are subject to the cool roof requirements of the Title 24 2005 Building Energy Efficiency Standards?

A. The 2005 Standards' cool roof requirements apply to roofs on conditioned (heated or cooled) nonresidential buildings that have low-sloped roofs (2:12 or less). The requirements apply to roofs on newly constructed buildings and to most reroofs on existing buildings. A list of building types to which the cool roof requirements apply and a list of exempt building types are included at the end of these questions and answers on page 9 and 10. NOTE that the 2005 Title 24 Energy Standards are not making building owners replace or recover existing roofs that are not in need of reroofing.

Q. I am a building owner and am not very familiar with the Energy Standards. How do the Energy Standards work?

A. In general terms, the Energy Standards set an energy budget for newly constructed buildings, and additions and alterations to existing buildings for how much energy they can use. The budget is given in energy (kBtu, or thousand Btu) per square foot per year. The Standards address a number of energy efficiency measures that impact energy used for lighting, water heating and heating, and air conditioning, including the energy impact of the building envelope (windows, doors, skylights, wall/ floor/ceiling assemblies, attics, and roofs). A building owner or roofer must submit specific documents to the building permitting agency to show how they are complying with the energy budget, and they must build accordingly.

While the Energy Commission has designated some energy measures as mandatory for newly constructed buildings, additions, or alterations, building owners or

roofers also have several options for complying with the budget, using prescriptive approaches or the performance approach.

For nonresidential buildings, there are two ways to comply with the prescriptive cool roof requirements. The first is the building envelope component approach, in which the cool roof requirements, must be met with no variation. This approach is the simplest, but allows no flexibility. The second prescriptive approach is the overall building envelope approach, which provides equations that allow partial credit for roofing products that have CRRC ratings but don't meet the minimum 0.70 and 0.75 reflectance and emittance levels. This approach allows trade-offs among components of the building envelope and applies to newly constructed buildings, additions or reroofing projects that also involve insulation, window replacement, or other envelope upgrades (under the same building permit). Not putting on a cool roof has to be compensated by increases in other building envelope components that make up for the increased solar heat gain resulting from not having a cool roof. This approach is somewhat more complicated than the building envelope component approach but allows some flexibility.

The other way to comply with the Standards is to use the performance approach. Under this approach, all of the characteristics that impact the energy consumption of the building, addition, or alteration are modeled by computer using Energy Commission-approved compliance software. The energy budget for a proposed building is determined by modeling the building, but assuming that all the mandatory and prescriptive measures for the proposed building type and its climate zone are installed. The modeled budget-setting version of the building is referred to as the "standard design." Then the proposed building is modeled using its energy-impacting measures; this version is referred to as the "proposed design." If the energy use of the proposed design is less than or equal to the energy use of the standard design (that is, the energy budget), the proposed building complies; if not, it's back to the drawing board to add more efficiency measures to the proposed building. Many variations of energy efficiency measures can be designed into the proposed building, as long as

the computer modeling shows that the building will use no more energy than the energy budget. The energy budget (standard design) for nonresidential buildings with low-sloped roofs assumes that the building has a cool roof. When modeling the proposed design, the actual CRRC ratings for the planned roofing product are used to help show compliance with the energy budget. “Partial” energy credit is allowed for CRRC-rated roof products that don’t fully meet the minimum 0.70 reflectance and 0.75 emittance levels.

The performance approach is the most complicated compliance approach but allows the most flexibility. If you need assistance with the performance approach, energy consultants are available who have expertise in running the software. Many of them belong to the California Association of Building Energy Consultants (CABEC), www.cabec.org, which lists its members with contact information.

Q What are the cool roof requirements for reroofing projects?

A. For reroofing of nonresidential, low-sloped roofs over conditioned space, if more than 50 percent of the roof or more than 20 squares (2,000 square feet) — whichever is less — is being replaced, recovered, or recoated, you must install a qualifying cool roof OR you must provide calculations that show that the heat gain into the building through the new roof will be less than or equal to the heat gain through a cool roof. Through these calculations, you can get credit for lowering the heat gain by installing extra insulation.

When considering a garden roof in reroofing, these calculations could also account for the extra insulative value of soil or for other energy-saving characteristics or components of the roof assembly. Note: If you make other changes that affect the building’s energy use under the same permit as the reroofing, you could consider those changes together in complying with the prescriptive overall envelope approach or the performance approach.

Q. Are there any types of nonresidential reroofs that are not required to comply with the cool roof requirements?

A. Yes. Any roof over unconditioned space is exempt. (A cool roof will, however, increase the comfort level of persons working in unconditioned warehouses in many of California's climate zones.) Also, any reroof under 20 squares (2,000 square feet) or 50 percent of the roof — whichever is less — does not have to comply with the cool roof requirements. For reroofs that are larger than this, there is one special case. Rock or gravel roofs that meet specific conditions, don't have to comply. Rock and gravel roof recoverings are allowed by the CBC do not have to meet the cool roof requirements if all of the following conditions are true:

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.

Q. What about roofs with a deck or patio meant for foot traffic, where non-cool surfaces, such as concrete pavers, are the roof surface over some percentage of the total roof area?

A. For newly constructed buildings, use the performance (computer modeling) method to show that the proposed building with a patio or deck roof will meet the allowed energy budget. For reroofing, provide heat gain calculations that show that the roof will allow no more heat gain than a prescriptive cool roof would allow. Again, meeting these heat gain requirements is likely to require an added measure such as roof insulation.



Q. What about solar photovoltaic (PV) panels installed on roofs?

A. Consider the different configurations of solar panels. Often solar panels, for either heating water or generating electricity, are mounted on racks above the roof surface or occasionally resting on the roof surface. The panels could be removed and the roof would still be there. In these cases, the cool roof regulations apply to the roof surface under the solar system. On the other hand, there are some solar electric photovoltaic (PV) systems on the market that are embedded in or integrated into the roof, becoming the roof surface. With the dark color of solar cells and their function of absorbing solar energy to create electricity, they are not a cool roof material. In this case when reroofing with roof-integrated solar, you must take some measures, such as adding insulation, to insure that heat gain into the conditioned building is no greater with the solar roof than it would be with a cool roof.

Q. In evaluating the energy savings and cost effectiveness of cool roofs, did the Energy Commission consider the degradation in reflectance over time?

A. Yes. The Energy Commission assumed the reflectance declined to 0.55.

**California
Building Code
Uses and
Occupancies that
apply to cool
roofs
(CBC, Title 24, Part 2,
Chapter 3):**

*Note:
Qualifying
historic buildings
are exempt from
any cool roof
regulations.*

Types of buildings subject to cool roof requirements:

Group A – Assembly

Building or structure, or portion thereof, for the gathering of 50 or more persons for purposes such as civic, social or religious functions, recreation, instruction, food or drink consumption, or awaiting transportation. Examples: restaurants, arenas, churches, theaters.

Group B – Business

Building or structure, or portion thereof, for office, professional or service-type transactions; includes storage of records and accounts and restaurants with occupant load less than 50. Examples: animal hospitals, kennels, automobile showrooms, banks, barber shops, outpatient clinic and medical offices, educational occupancies above the 12th grade, fire stations, florists and nurseries, testing and research labs, print shops, radio and TV stations

Group E – Educational (through 12th grade)

Building or structure, or portion thereof, for educational purposes through 12th grade for more than 12 hours per week or 4 hours in any one day. Examples: schools, nonresidential buildings used for daycare for more than six children, residential buildings used as daycare for more than 14 persons.

Group F – Factory (low- and moderate-hazard)

Building or structure, or portion thereof, for fabricating, manufacturing, packaging, processing, etc. Examples: furniture manufacturing, bakeries, food processing plants, paper mills, printing or publishing facilities, refuse incineration, shoe factories, dry cleaning facilities.

Group H – Hazardous facilities

Building or structure, or portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a high fire, explosion, or health hazard. Examples: manufacturing plants for explosives, blasting agents, fireworks, flammable gases; storage facilities for such products.

Group M – Mercantile (sale of merchandise)

Building or structure, or portion thereof, for the display and sale of merchandise. Examples: department stores, shopping centers, wholesale and retail stores, markets.

Group S – Storage facilities

Building or structure, or portion thereof, for storage not classified as a hazardous occupancy. Examples: storage of beer or wine in metal, glass, or ceramic containers, of cement in bags, of foods in noncombustible containers, of gypsum board, of stoves, washers, and dryers.

Group U – Utility facilities

Private garages, carports, sheds, agricultural buildings, and towers.

Types of buildings which are exempt from cool roof requirements:

Group I – Institutions

Hospitals, sanitoriums, nursing homes with nonambulatory patients with more than 5 patients; nursing homes for ambulatory patients; mental hospitals, jails, prisons; nurseries for the full-time care of at least 5 children under the age of 6.

Cool roofs are optional — not prescriptive — for the following:

- Unconditioned warehouses and other buildings
- “Process spaces” – not meant for human occupancy, held at temperatures less than 55°F or greater than 90°F
- Buildings cooled by swamp coolers/evaporative coolers
- High-rise residential buildings (4 stories and more)
- Hotels and motels
- Any roof with slope greater than 2:12