

CALBO Cool Roofs Cool Roof Installation Methods

Cool Roof Installation Methods

Cool Roofs are designed to reduce the cooling load on a building by reflecting the sun's energy away from the roof surface. This reduces the amount of solar heat gain that the building's cooling system must overcome, lowering energy costs and improving building comfort.

Cool Roof surfaces usually use bright colored (typically white) materials with high reflectivity, giving them the ability to reflect solar energy. Materials also have high emissivity, which allows them to emit infrared heat energy. Cool Roof technologies can lower the roof surface temperature by as much as 60° F, reducing air conditioning costs by 10 to 20%.

Title 24 Requirements

Title 24, Part 6 of the California Code of Regulations governs the state's Energy Efficiency Standards for Residential and Nonresidential Buildings. At this time, Cool Roofs are included as a performance option in Title 24; they are not required under California's Energy Efficiency Code.

Energy credits may be available to those using commercial and residential Cool Roof products that meet the following specifications:

| | ASTM | Tiles | Multi-Ply or Liquid |
|---------------------------|---------------|--------------|----------------------------|
| Solar Reflectivity | E903 or E1918 | 0.40+ | 0.70+ |
| Emittance Factor | E408 | 0.75+ | 0.75+ |

Therefore, a Cool Roof product must have a surface reflectivity of 70% or more and an emissivity of at least 75% to qualify for energy credits. This means that at least 70% of the solar energy on a Cool Roof must be reflected, and that a minimum of 75% of the solar energy must be radiated away from the roof surface before it is absorbed.

Sections 10-113 of the Energy Code contain information on certification and labeling requirements for Cool Roof products. Every Cool Roof product designed to comply with the requirements of Title 24 must display a packaging label that lists the product's reflectivity and emissivity numbers. For the prescriptive compliance approach, refer to section 118 of Title 24. Sections 141, 142, and 151(b) detail the performance approach.

Types of Cool Roof Products

Four general types of products meet Title 24 criteria for Cool Roof technology on low-slope commercial roofs.

A roofer may apply a *fluid coating over the top of a conventional built-up roof*. Contractors apply these coatings using rollers, brushes or sprays. One common option starts with a conventional built-up or modified bitumen roofing system; the roofer then adds a field-applied Cool Roof coating meeting the Title 24 reflectivity and emissivity requirements.

Single-ply roof membranes, which come in a roll, are rolled out like a carpet on the roof and then installed with adhesives, mechanical fasteners or seams which are heat welded. One example is a cap sheet, coated in the factory to meet the reflectivity requirements and then applied on the roof.

A third option is *spray polyurethane foam*. Two liquid components are mixed and then applied as a layer of closed cell foam insulation (90 to 93% closed cell) on the roof. The roofer then applies a protective, reflective coating over the top of the foam. One of the advantages of a spray polyurethane foam Cool Roof system is that it improves the building's R-value in addition to providing the reflective properties of the Cool Roof.

Spray foams are quite durable. The compressive strength for most types of foam used in Cool Roofs is approximately 45 to 50 pounds per square inch. This means that maintenance crews can walk on these roofs without causing damage.

Another product option is a *fluid-applied membrane or coating*. One example is an asphalt emulsion reinforced with polyester, which has a Cool Roof product installed over the top.

Other materials may also be used as Cool Roof products, including reflective tiles, metal roofing products and others.

Selection Criteria

When considering a Cool Roof system, smart building owners make their decision based on a lifecycle cost analysis rather than on initial costs.

For example, with initial installation, most Cool Roof systems are cost competitive or slightly more expensive than traditional roofing systems. Over time, however, when the life-cycle costs are compared, Cool Roofs are often shown to be less expensive because of their resulting energy savings over time. A number of software programs are available to help building owners understand the costs and benefits of installing a Cool Roof system.

Warranty is another consideration. For example, building owners who plan to hold a building for just three to five years may not feel the need to install a spray polyurethane foam Cool Roof system with an extended warranty. A less expensive system, based primarily on coatings, may make more sense for this type of building owner. However,

because a Cool Roof system with closed cell spray polyurethane foam provides improved longevity and better energy performance over time, a building with these systems may have better resale value.

If a building owner intends to keep a building for more than a few years, it may be cost beneficial to choose a product like a high performance single ply Cool Roof product or a spray polyurethane foam roof system which comes with a 20-year warranty. In addition, the additional R-value provided by high performance Cool Roof roofing systems such as the closed cell spray polyurethane foam could make the most sense for building owners who typically pay their own energy bills, such as hospitals, grocery stores, schools and universities.

Hurricane performance may also be a consideration. A recent NIST report showed that spray polyurethane roofs performed very well under recent high wind events including Hurricanes Katrina and Rita.

Application

Weather has a definite impact on the types of Cool Roof systems that can be applied to a low-slope commercial roof. Single-ply Cool Roof membranes are weather-friendly systems which can be installed even with moisture in the air.

Fluid coatings are more restricted in terms of application, however. If a contractor uses a Cool Roof product with a water-based technology or uses spray polyurethane foam, neither can be installed when rain is imminent, creating constraints on the contractor.

In addition, some coatings use solvent carriers. Individual California Air Quality Management Districts may have constraints on the coatings which can or cannot be used based on the volatile organic compound (VOC) content.

Durability and Longevity

Many Cool Roof systems are renewable. Asphalt products by themselves undergo a degradation process which is caused by high temperature and ultraviolet degradation. Cool Roof products tend to protect a conventional built-up roof better because they have UV inhibitors built into their formulation.

Once a Cool Roof system using a fluid-applied coating has been in service for 10 to 15 years, it can easily be pressure washed for maintenance and repair. The surface can then be recoated and typically, a new warranty is issued to the building owner, making this type of Cool Roof system both durable and affordable.

Links:

- California Energy Commission: www.consumerenergycenter.org
- Cool Roof Rating Council, www.coolroofs.org

- DOE Cool Roof Calculator: www.ornl.gov
- U.S. Environmental Protection Agency: www.epa.gov