

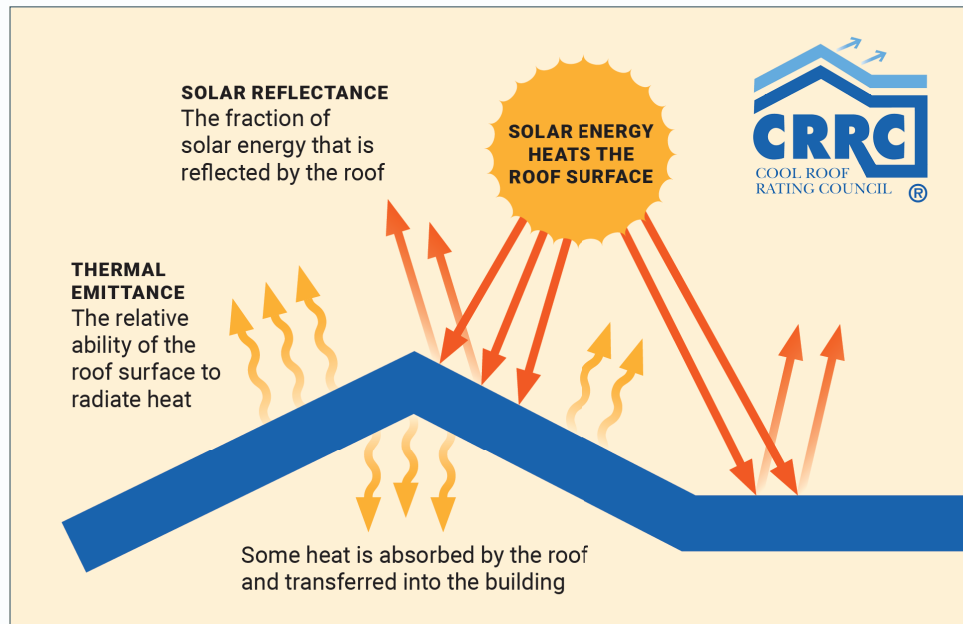
HOW DOES A COOL ROOF SAVE ENERGY?

A COOL ROOF IS...

...a roof that reflects more solar energy away from its surface and more efficiently radiates absorbed heat away from the building than other roofs. This helps air-conditioned buildings use less energy.

You may want to install a cool roof to reduce building energy use, lower utility bills, improve the comfort inside the building, help reduce peak energy demand, and/or help combat local urban heat islands.

VISIT COOLROOFS.ORG TO LEARN MORE.



This illustration describes the flow of radiant energy as heat between the sun, roof and wall surfaces, building interior, and surroundings. The higher the solar reflectance, the more solar energy is reflected away from the surface. Some of the solar energy is absorbed by the surface as heat. The higher the thermal emittance, the more absorbed heat is radiated away from the surface.

CALCULATORS

There are several resources that can provide an estimate of the energy savings associated with installing a cool roof.

Please note that the values provided by any of these tools should be considered an estimate and not a guarantee of actual results.

ORNL COOL ROOF CALCULATOR

- Online tool for low-slope (e.g., commercial) roofs
- Intended for or small and medium-sized facilities that purchase electricity without a demand charge based on peak monthly load
- A version of the calculator is available for large facilities that purchase electricity with a demand charge based on peak monthly load here.

DOE STEEP SLOPE CALCULATOR

- Online tool for steep-slope (e.g., residential) roofs

LAWRENCE BERKELEY NATIONAL LABORATORY'S COOL SURFACE SAVINGS EXPLORER

- Excel tool that reports energy, energy cost, emission, and peak power demand savings estimates drawn from simulation database
- Limited to certain building categories, locations, and vintages

For buildings without air-conditioning, a cool roof may help the inside of the building feel cooler during hot months.



CALCULATING COOL ROOF ENERGY SAVINGS

There are many factors to consider when calculating the energy and cost savings of a cool roof.

SOME KEY FACTORS INCLUDE:

SOLAR REFLECTANCE —

The greater the solar reflectance, the more of the sun's energy will be reflected away from the building. A larger increase in solar reflectance between the existing and new roof coverings will yield greater savings.

TYPE OF ROOFING COVERING —

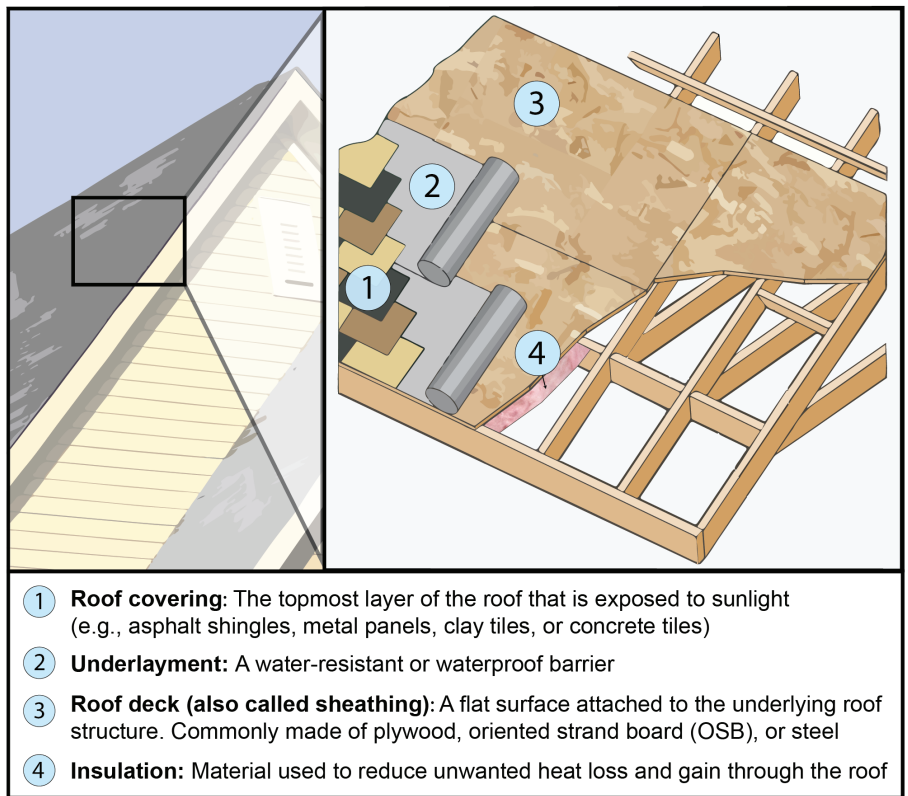
The capacity to store heat (thermal mass) varies by roof covering type and roof assembly. For example, concrete roof tiles have a high thermal mass, which means they absorb and release heat slowly. This can reduce air-conditioning demand in climates with warm days and cool nights.

CLIMATE — Temperature and the amount of sunlight where the cool roof is installed will affect the potential energy savings. Cool roofs will yield greater energy savings when replacing non-reflective roof coverings in hot climates more than in temperate climates. For conditioned buildings in colder climates where more energy is needed for heating, the "heating penalty" is usually small compared to the annual cooling savings because roofs in winter tend to receive much less sunlight. The long-term performance of the roofing product can also be affected by local environmental conditions. The solar reflectance of most

products decreases over time, and this can be sped up in areas with high pollution, moss, or algae.

INSULATION — Cool roof products and insulation work together to prevent heat transfer into a building. Like insulation, a cool roof reduces the amount of cooling needed by

decreasing the heat transferred into the building and surrounding environment. However, it works in a very different way. Generally, the same cool roof product will yield greater energy savings in older buildings with little roof insulation than in newer buildings with highly insulated roofs.



- 1 **Roof covering:** The topmost layer of the roof that is exposed to sunlight (e.g., asphalt shingles, metal panels, clay tiles, or concrete tiles)
- 2 **Underlayment:** A water-resistant or waterproof barrier
- 3 **Roof deck (also called sheathing):** A flat surface attached to the underlying roof structure. Commonly made of plywood, oriented strand board (OSB), or steel
- 4 **Insulation:** Material used to reduce unwanted heat loss and gain through the roof

Graphic adapted from APA's "Proper Installation of APA Rated Sheathing for Roof Applications." This figure represents one configuration of a residential steep-slope roof. There are many other residential and commercial roof configurations that contain similar components.

ENERGY COST SAVINGS

- A cool roof can help lower energy bills. Cost savings depend on several factors, such as the energy efficiency of the HVAC system and energy prices.
- Some cities and utilities offer incentives for the installation of a cool roof and/or reduced energy use.

VISIT COOLROOFS.ORG FOR:

- ✓ A list of cool roof code requirements, ordinances, and incentive programs by city, county, and state
- ✓ A database of over 3,000 roofing products with solar reflectance and thermal emittance values

