

Cool Roofs Are Heating Up

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There's a lot of buzz lately on "cool roofs": roofing materials that reflect rather than absorb the sun's energy. The buzz makes a lot of sense, since these cool roofs save energy, extend the life of the roof, reduce the 'heat island' effect, require little or no increase in cost during construction, and could actually reduce equipment costs.

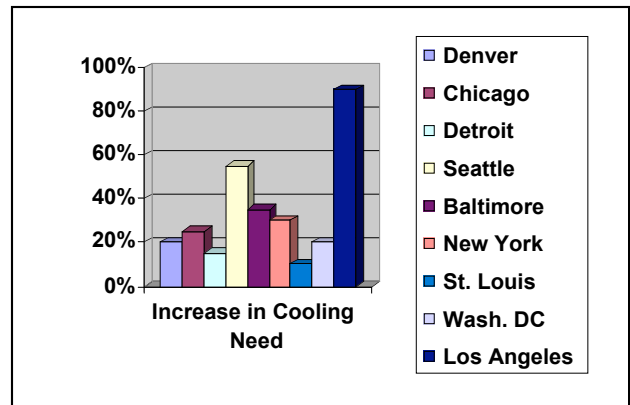
Defining a cool roof can become complicated, since there are different requirements for reflecting light and reflecting heat, as well as performance over time. However, there are two critical gauges on which we can rely. The first is Energy Star. Most of us know Energy Star when buying a new appliance or light bulb, but they certify cool roofs also. Backed by the EPA, Energy Star has done the research to determine acceptable standards and certification, so we can look for the Energy Star label.



The second standard is Title 24, California's energy code. As of October 2005, Title 24 requires a cool roof on any commercial space larger than 5,000 SF. Title 24 reflectance requirements are greater than Energy Star, but most roofers and manufacturers have been planning for the change for a while and are up-to-date on the requirements. Energy Star is reviewing their standards and may be making adjustments.

Four Good Reasons to Use a Cool Roof

1. *Energy:* In a commercial building in most of California, dispelling heat generated by occupants and equipment is the primary goal almost all year. By reflecting heat, cool roofs can reduce the peak air conditioning use by 15%, and overall use as much as 50%. Such a reduction could reduce the size of mechanical equipment in the first place, providing an initial cost savings. Even if you are using natural ventilation for a home or smaller building, keeping the heat out in summer provides greater ability to keep your building cool.
2. *Pollution:* Energy savings not only means money in your pocket, but it reduces pollution and emissions by decreasing the total power generated. According to the EPA, the Energy Star program (not only roofing) has "prevented greenhouse gas emissions equivalent to those from \$18 million automobiles."
3. *Resources:* A standard roof absorbs solar energy, which accelerates the break down of the roofing material. With a cool roof, the life of the roof is extended.
4. *Heat Island:* When a dark surface, such as a street or roof absorbs heat, it retains the heat and radiates it back into the air, increasing the surrounding temperature. In cities, this combined affect can be quite dramatic, increasing the city temperature by 10° F or more, which is known as a heat island (see table at right). The 'inflated' temperature increases



Heat Island Effects for Select Cities, courtesy USGBC

the cooling demand even more, as well as the subsequent energy use. Cool roofs can reduce the surface temperature of the roof by 100° F, keeping down the heat island.

A Wide Variety of Choices

In its most basic form, a cool roof takes a typical black or dark-colored roof and makes it white, or light colored. If you have stepped barefoot from concrete to asphalt, you know what a difference a color change can make. But manufacturers are meeting demand, and there are lots of choices for materials and colors.

Single-ply (membrane) Roofing: For flat roofs, these systems come in various materials, such as EPDM or PVC, and usually have an integral top coating that is highly reflective, usually white.

Roof Coatings: Applied over traditional systems such as built-up roofing, a coating is simply a polymer or similar material, colored white, and applied on top of the roof. These systems can also be applied over existing roofs, including built-up, metal or tile, which eliminates the demolition waste of tearing off the old roof. (GAF spray-on application in photo at right).



Metal Roof: Metal roofs have caught on the earliest as far as color choices, having figured out coatings that will reflect light but appear colored to the eye, even with dark colors such as red or green. Metal roofs are available in standing seam styles, but also shingle or shake styles.



Shingles: In composition shingles, a couple of manufacturer's have white shingles, but at this time, only Elk has colored shingles, in three earth-toned colors (photo at left). Since 3M has come up with a reflective granule, more manufacturers should be jumping in soon with colors.

Tile: Even clay tile has a cool roof option, through Maruhachi Ceramics of America, in a variety of colors.



Green Roofs: In its own category, but still a cool roof are the vegetated or green roofs. Green roofs not only have all the benefits of a cool roof (energy savings, heat island, long life), they also manage storm water, are great insulators, provide outdoor usable space and actually clean the air.



Green roof on Chicago's City Hall

Although used centuries ago throughout the world, the last 20 years have seen a boom across Europe and Asia and many places in North America. The increase in use is attributed to recognition of the many benefits combined with improved technology and modular systems. Traditional green roofs had layers of waterproofing material topped with aggregate and soil. Newer modular systems are basically well-engineered plastic tubs that contain plant material but are still removable if needed to access the roof system.

A Few Other Considerations

If you are pursuing Leadership in Energy and Environmental Design (LEED) certification, cool roofs are a relatively easy point with a great pay-back. The green roof, however, provides even more point possibilities since it also addresses water and open space issues.

A couple of cautions: Small buildings in very cold areas will want to check that the reflectivity of the roof is not so high that it hurts the roof's performance in winter when heat gain is desired. Also, insulation is still critical in just about any project, and most roof applications will demand a minimum R-30 insulation value.

In Summary...

The impact of a cool roof will vary for any project, but there is almost no risk in applying a cool roof to any new roof or re-roofing project. Commercial projects with large roof areas in hot, dry climates will see the most dramatic improvements in performance, but almost any application will benefit.

With State energy requirements, cost savings, environmental benefits and improved options for the buyer, cool roofs are definitely a hot item.

Resources

Energy Star: www.energystar.gov.

Cool Roof Rating Council (CRRC): www.coolroofs.org

Green Roofs: www.greenroofs.org

LEED, US Green Building Council: www.usgbc.org