



Benefits of Cool Metal Roofing:

Delivering Sustainable, Cost-Effective Solutions to the Marketplace

Mark A. Thimons, Posted 06/01/2012

In the construction market, a product's sustainable benefits have become a driver in materials selection decisions. Fortunately, this emphasis on sustainability translates positively to "cool metal roofs," which are energy-efficient, durable and cost-effective.

What's "Cool" About Metal Roofs?

Buildings consume one-third of all energy and two-thirds of all electricity generated in the United States, and a roof can have a significant impact on the energy use of a building. A metal roof qualifies as a recognized "cool roof" product if it has certain coatings and finishes. It is available unpainted, with oven-baked paint finishes or with granular-coated surfaces.

What are the advantages of cool metal roofs?



- **Energy Efficiency.** In North America, about half of the population lives in urban areas. Dark pavements, dark building materials and a decreased amount of plant life create a microclimate where ambient temperatures are higher than they are in surrounding areas. This Urban Heat Island Effect can increase the temperatures in urban areas by as much as 12 F (7 C).

Cool metal roofing is one way to mitigate this effect. Cool metal roofs reflect the sun's energy better than other products, allowing the roof surface to remain cooler so less heat is transferred into the building and to the surrounding atmosphere. In fact, lightly colored, more reflective roofs can save up to 40 percent in cooling energy, as reported by the Heat Island Group of Lawrence Berkeley National Laboratory. This high reflectance factor also allows the roof to cool faster at night.

Some of the sun's energy will naturally be absorbed into the roof and re-emitted from the roof surface to the sky. The emittance of metal roofing varies with the surface finish; for example, the emittance of painted or granular-coated metal roofing can be as high as 90 percent. Highly emissive roofs help to lower urban air temperatures, with the added benefit of reducing smog formation. Many metal roofs are included in the U.S. Environmental Protection Agency's Energy Star Roof Products Program.

In 2004, the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL) Buildings Technology Center conducted a three-year comparison study to evaluate the energy efficiency and service life of metal roofing systems. The study include tests for solar reflectance and emittance for various metal roofing materials in steep-slope and low-slope applications in Tennessee, Florida, Pennsylvania and Nova Scotia that simulated exposure of 30 years or more. Among other results, the study showed that painted and unpainted metal panels maintained their energy efficiency better over time than any of the other roofing systems studied (see www.coolmetalroofing.org for details).

So, how does one determine which metal roof to choose? In climates where annual cooling loads dominate, such as the southern U.S., a highly reflective and highly emissive painted or granular-coated metal roof is optimal for reducing energy consumption. Alternately, where annual heating loads dominate, such as the northern U.S. and Canada, an unpainted metal roof may be more desirable because of its low infrared emittance.

When choosing a roofing material, some will argue that cooling and heating costs can be more effectively reduced by adding insulation under the roof surface. However, cool metal roofing can provide a more economical approach to improved energy efficiency because it is an integral part of the total system design. Often, a combined approach using a cool metal roof with additional insulation provides an optimal solution.



- **Cost Effectiveness.** Cool metal roofing may cost more initially, but it can pay for itself over time with its energy efficiency and durability benefits. In some applications, energy savings from a painted metal roof allow it to pay for itself in as little as nine years.
- **Durability.** Metallic-coated and pre-painted metal roofing have service lives in excess of 40 years. Metal roofing is known for its resistance to weather, including wind, hail, ice and snow. It is less affected by hot-cold and wet-dry cycles that tend to destroy other materials. Additionally, metal roofing's non-combustibility can reduce the spread of fire in and around buildings.
- **Low Maintenance.** Cool metal roofing demonstrates durability in weather extremes by maintaining its surface properties and by resisting soiling. As demonstrated by research at the Oak Ridge National Laboratory, metal roofing retains its solar reflectance over time better than other roofing products because it resists the growth of organic matter and sheds dirt more readily than other materials.
- **Environmental Benefits.** Subject to local building codes, metal roofs can be installed directly onto an existing asphalt roof, saving removal and disposal costs and reducing landfill waste. This is because

depending on the specific product chosen, the weight of metal roofing is one-third to as little as one-eighth that of conventional roofing shingles. In addition, metal roofs are 100 percent recyclable when removed as part of a building renovation or demolition.

Ongoing research and emerging technologies focused on energy, cost, durability and environmental solutions continue to demonstrate the many benefits of cool metal roofing. Because of these benefits, it is anticipated that this market sector will grow significantly in the years to come.

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