Cool Metal Roofs Help Put Lid on Rising Energy Costs

A roof has a significant impact on the energy use of a building. As a result, building owners and their architects have discovered that it pays to specify building products such as “cool metal roofs” to help avoid unwanted heat build-up inside the building and to help ensure maximum energy conservation. Buildings consume one-third of all energy and two-thirds of all electricity generated in the U.S. But, commercial metal roofs with heat-deflecting coatings and finishes can drastically lower the energy consumption rate by reducing cooling loads. In the process, these roofs can save building owners up to 40 percent in heating and cooling energy costs, perhaps more if used in conjunction with insulation under the roof surface, according to the Oak Ridge National Laboratory.

At the same time, highly emissive roofs benefit the environment by lowering urban air temperatures, thereby helping to reduce smog. They also offer a solution for communities searching for ways to control the demand for electricity.

Cool Roof Performance Depends on Reflectance, Emittance

The performance of a cool roof depends on two properties: solar reflectance and infrared emittance. Solar reflectance indicates the percent of sunlight reflected off the roof. Emittance indicates the percent of the sun’s heat re-radiated from the roof to its surroundings.

Available unpainted, with baked-on paint finishes, or with granular-coated surfaces, cool metal roofing can reflect up to 70 percent of the sun’s rays, resulting in less heat transfer to the interior of the building. The emittance of painted or granular-coated metal roofing can be as high as 90 percent.

The proper choice of a cool metal roof depends on the geographic region of the country. In hot weather climates, a highly reflective and highly emissive painted or granular coated metal roof is optimal for reducing energy consumption. In cooler climates, an unpainted metal roof is more desirable because of its low emittance.

Studies conducted by Oak Ridge National Laboratory indicate that metal roofing reflects solar heat better than other roofing products, even in the harshest environments such as those found in south Florida. A sloped design allows metal roofs to self-clean. Water run-off removes debris and prevents the build-up of mold and mildew growth. Metal also minimizes staining from acid rain or UV degradation. This is critical, because the dirtier a roof, the more its reflective and emittance performance are compromised and the hotter the roof surface becomes.

Metal Roofs Retain Reflectance Values Over Time

Another study recently completed by Oak Ridge on aged reflectance values of metal roofing indicates that painted metal roofing maintains 95% of its solar reflectance and thermal emittance values.

This finding is important because many codes currently assume that the reflective or emissive performance of all roofing products degrades at the same rate. Other roofing materials may be listed with initial values higher than metal roofing, but when their aged values are compared after three years, metal roofing shows itself to be equal or superior in “cool” properties.

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Unlike other roofing materials, metal has a low thermal mass with a propensity to radiate heat away from a building rather than store it. Consequently, metal roofs allow buildings to cool down significantly at night and to experience less temperature differential during the day, resulting in less stress from thermal expansion and contraction.

Building owners looking for long-term, low-maintenance protection and energy savings are best advised to consider a complete cool metal roof system instead of applying a temporary reflective surface coating to their existing roof. Not only will a new system generate tangible energy cost savings and increased occupant comfort, but it can also contribute to a LEED credit in the “Heat Island” section of the criteria.

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