



Cool Metal Roofing's Many Sustainable Attributes Generate Savings

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Introduction

“Metal roofing is represented by a variety of metal-based roof coverings designed to provide buildings with protection from the elements, allow for positive drainage of water from the roof surface and to keep contents and occupants dry and comfortable,” according to “Cool Metal Roofing,”¹ a paper written by the Cool Metal Roofing Coalition (CMRC), Pittsburgh, whose mission is to educate architects, building owners, specifiers, code and standards officials and other stakeholders about the sustainable, energy-related benefits of cool metal roofing. Metal roofing materials include aluminum, steel, copper, zinc, stainless steel and titanium.

Getting more specific, “cool metal roofing is a family of sustainable, energy-efficient roofing products comprised of unpainted metal, prepainted metal and granular-coated metal,” notes CMRC². “It is available in a wide variety of finishes, colors, textures and profiles for steep-slope and low-slope applications.”

Why should education facility managers take note of cool metal roofs? Because both energy consumption and energy costs are going to increase, but budgets are not likely to keep pace, requiring administrators to continue to seek ways to make their facilities more energy efficient. Cool metal roofs can do that, because the roof is the one facility product that can have the greatest impact on a building's energy use. In addition to energy efficiency, they have many other sustainable attributes, all of which are addressed here.



Aesthetic Options

“Metal roofing is available in a wide range of finishes, colors and profiles, giving architects extensive design flexibility,” notes CMRC². Scott Kriner³, LEED AP, president of Green Metal Consulting, Inc., Macungie, Pa., expands this thought: “The metal roof family offers a key feature compared to other products in that there’s a variety of colors. New pigments introduced in recent years allow for higher solar reflectance for lower surface temperatures but don’t affect color. That alone differentiates cool metal roofing from other roofing products, which are typically white, gray or black. In terms of profile, whether the surface is smooth or embossed, architects can dial in the level of solar reflectance by changing color, paint formulation, or going from painted to unpainted. I often say the diversity that metal roofing offers is good but it’s also a challenge because there are so many options.”

BENEFIT: In addition to welcoming learners, school designs are often intended to draw attention to the facilities as community or campus focal points. Cool metal roofing enhances education facilities’ exterior aesthetics.

Design Flexibility

In terms of design flexibility, it’s important to remember that metal roofing is a family of products, not just a rusty galvanized roof. That family includes aluminum, copper, zinc, titanium and steel. “I believe cool metal roofs can be used in both a traditional style and a more sleek, modern style with a good designer,” indicates Katie Pedersen⁴, AIA, CDT, LEED BD&C, associate and senior project manager with Atlanta-based Perkins + Will, who worked on Milton High School in Alpharetta, Ga., which boasts an aluminum roof. “So they can be used in multiple ways and not limited to a particular style.”

BENEFIT: Cool metal roofing’s design flexibility is a great value-added consideration to a product intended to shed water and keep building occupants dry and comfortable.

High Strength-to-Weight Ratio

According to the CMRC⁵, “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 fact, for re-roofing projects, metal roofing can often be applied over the original roof, saving removal and disposal costs.

BENEFIT: Because cool metal roofing is light weight, it produces less static and dynamic loading on education facilities — a consideration for any region and more so in regions that experience seismic activity.

Class 'A' Fire Rating

“A class 'A' fire rating specifically means the product has the highest classification for fire resistance,” Kriner³ explains. “That’s easy to understand because we know metal is noncombustible.” Where it gets a little more complicated is that, when products are tested for fire rating, they’re tested as a complete assembly. Burning embers are placed on the surface, and the classification is for how long it takes the burning sample to penetrate and start a fire underneath. A class 'A' fire rating means the product takes the most amount of time for this to occur.

In Southern California, many structures are built with wood shake shingles, which are highly combustible and obviously more combustible than metal roofs. Kriner often sees that, after a wildfire in that region, local executives ban wood shake and require metal for its additional safety and protection.

BENEFIT: Because cool metal roofing’s non-combustibility can reduce the spread of fire in and among education facilities, it is a safe product for the academic market. It may even lower facility insurance rates.

Hail Resistance

Metal is very resistant to hail damage, meaning a roof's integrity won't be jeopardized in the event of a hail storm. "A metal roof will endure a hail storm without the seams opening, the metal being perforated or the ability to shed water being lost," Kriner³ notes. He adds that there may be aesthetic damage that's visible to the naked eye, and that insurance companies won't typically replace a roof because of aesthetic damage.

BENEFIT: Because cool metal roofing performs well in hail, it reduces insurance claims, as well as the time and expense involved in replacing a damaged roof.

Wind Resistance

When compared to other types of roofing, cool metal roofing is a strong product to begin with, made more so by attaching to framing with screws. Still, it holds its own when tested against resistance to expected wind uplift. According to CMRC¹, "The interlocking or active fastening of most metal roofing panels allows them to pass very severe wind and uplift tests, including ASTM E1592, UL 580 and UL 1897." Moreover, resistance can be engineered to the panels themselves to achieve a region's required resistance.

BENEFIT: With cool metal roofing, "You can dial in whatever you need to meet wind uplift requirements in both high- and low-wind zone areas," says Kriner³.



Durability

Metal roofing is incredibly durable in terms of recycled content, recyclability and life span. CMRC⁴ indicates that metal roofing contains a minimum of 25-percent recycled content. As a result, it contributes to a point in the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program of certification of green buildings. Next, metal roofing is 100-percent recyclable, which minimizes the solid waste stream going to landfills. In addition, says Kriner³, "It can be remade into the same product it started out as for a closed loop system."

Finally, metal roofing lasts much longer than most non-metal roofing products. "The paint formulation used to create pre-painted cool metal roofing is what makes for a cool surface," says Kriner³, "and that paint is no good if it flakes away." In conducting research with Oak Ridge National Laboratories, paint samples were put on exposure sites in South Florida because it's the real world and is accelerated in terms of high UV, high temperatures and high humidity, which are the three things that break down any paint system exposed outdoors. Tests determined that degrading occurs within the first three years, if at all. Metal roofing showed only about a five-percent drop in solar reflectance in the first three years, where other roofing products showed more than 40 percent in the first three years.

"The oven-cured paint systems used on pre-painted metal roofing are scientifically formulated for long-term resistance to chalk and fade," Kriner³ explains. "We learned that the solar reflectance hadn't changed more than five percent in 30 years, so what you see at the beginning is what you get for decades." In addition, it sheds dirt, does not support the growth of algae or fungi and doesn't dampen reflectance. "So the paint system is keeping the surface temperature lower, which extends the roof's life because natural elements aren't breaking it down," he sums.

When it came time to choose a roof for the Science & Technology building at the University of South Carolina's River Campus in Bluffton, experts chose aluminum for its durability. "We considered aluminum vs. zinc or vs. steel or vs. asphalt shingles," describes Eugene Bell⁶, AIA, LEED AP BD+C, a senior associate with Watson Tate Savory, which has offices in the Carolinas. "We felt aluminum offered better durability. Plus, the roof had to meet hurricane wind loading, and we knew we could get that with aluminum."

BENEFIT: Cool metal roofing's durability means low life cycle costs.

Energy Efficiency

Cool metal roofing's performance makes it an energy-efficient option. According to The Metal Initiative (TMI)⁷, the Metal Construction Association's (MCA) market development program, which educates decision makers in the building and design communities about the benefits and applications of metal, "the performance of a cool metal 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 three ways — 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," says TMI⁷, which has offices in Chicago and Baltimore.

Further, TMI⁷ indicates, "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."

The fact that solar reflectance and infrared emittance of a metal roof can be engineered to meet the climate requirements of the building, "means reducing energy consumption by lowering cooling loads," says Kriner³.

As an added bonus, Thomas Kikta⁸, AIA, LEED AP BD+C, a member of the Building Envelope Services Team with Illinois-based Legat Architects points out that, with a reflective roof, the microclimate around the air intake doesn't heat up quite as much as it does with a less-reflective roof, meaning cooler air enters the building to begin with.

BENEFIT: TMI⁷ quotes Oak Ridge National Laboratory in saying that cool metal 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.

Platform for Rooftop

Metal roofing makes an excellent platform for any kind of renewable energy technology mounted to the rooftop. Metal allows you to mount technology without penetrating the roof surface itself, via mechanical fasteners that clamp directly to standing seams. “That’s a huge advantage compared to other roof types that typically require mounting by penetrating the surface through to the structural support system below,” says Kriner³.

In addition, referring specifically to mounting photovoltaics (PVs), there’s another advantage. PVs carry a 25-year warranty; on metal roofing, you simply unfasten the failing PVs and replace them with the new. “In contrast to other commercial roofing systems,” Kriner³ says, “during the 25-year life of the PVs, the roof needs to be replaced, requiring the PVs to be removed, the roof replaced, and the PVs reinstalled. It is much more labor intensive, creates more sources of potential leaks and may require electricity to be offline during the replacement period.”

BENEFIT: Cool metal roof life times match those of PVs, so there’s no prematurely replacing the roof before the PVs.

In a time of growing energy consumption and cost, coupled with shrinking energy budgets, cool metal roofing’s many sustainable attributes make it an ideal choice for education facilities.

RESOURCES

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For more information on cool metal roofing or to learn how **Petersen Aluminum Corporation** can help you with your roofing system, please call **1-800-PAC-CLAD**, email us at bbatkoff@petersenmail.com, or visit our website at www.PAC-CLAD.com.