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# Getting more mileage from the metal roof

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**Restoration with reflective coatings serves multiple objectives, including enhanced energy efficiency, sustainability, and economy**

*By Bob Brenk, Aldo Products Company Inc.*

*Editor's note: This is the first in a series of articles on the use of field-applied reflective roof coatings on different types of roof surfaces. The articles are being developed and published in cooperation with the Reflective Roof Coatings Institute (RRCI). More information on the institute is available on the website located at www.reflectivecoatings.org. The RRCI is located at 400 Admiral Blvd., Kansas City, MO 64106; phone: 816/221.1297.*

For decades, the construction of pre-engineered metal buildings has offered building owners and facility operators a quality building that meets existing budget and time constraints. Whether the building use is manufacturing, warehousing, professional office space, or some combination of functions, metal buildings have proven to be cost-effective from both the design and construction perspectives.

Metal roofing also finds use in other commercial building types, where it has earned a reputation for performance, durability, and aesthetic appeal.

Metal roofing comes in a variety of styles, each with its own identifying profile. In commercial applications, the most common metal roof styles are either concealed-fastener systems (batten seam, double-lock standing seam, and T-panels) or exposed fastener systems (R-panel and corrugated). Metal roof panels are treated at the factory with coatings products, including acrylic-polymer and fluorocarbon-based paints. These coatings serve as the first defense against the effects of weathering, which can include severe ultraviolet radiation in southern U.S. and tropical regions. These products also deliver aesthetic qualities and contribute to the durable nature of the metal roofing available in the current marketplace.

Metal roof systems can offer advantages in terms of aesthetics, performance, and cost—advantages that include low maintenance and long lifecycle. Metal roof systems can last as much as two to four times longer than asphalt-based roof systems.

As with all roof systems, however, metal roofs don't last forever; service life is affected by a number of factors, including climate and geographic location of the building, the building function, the possible presence of airborne emissions and contaminants, and the quality of roof maintenance on the part of the owner. Not to be overlooked in the discussion of metal roof lifecycle is the role of proper original installation of the system.

A constant with all metal roof systems is "thermal shock" or "thermal cycling." Simply put, this phenomenon is defined as movement of the metal panels and other stress points in the system as the temperature of the metal fluctuates. This phenomenon sometimes becomes evident in the form of creaking sounds that can occur inside a metal building or warehouse. Thermal cycling or shock



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can occur seasonally during the year or as a diurnal (day/night) event, and can result in premature metal fatigue, degradation of fasteners and neoprene washers, and failure of seams. All of these factors can lead to unwanted water entry into the building.

*A roof-restoration coating system that includes a solar-reflective finish coat was applied to the metal roofs of the Mayfair Tennis & Racquet Clubs, Markham, Ontario. Top photo shows the coating application under way; the job is complete in. Right: The coating system—the ASTEC Metal Roof System—includes metal primer, acrylic waterproof membrane for seams and fasteners, and a white, solar-reflective, acrylic finish coat. Photos courtesy of ASTEC Re-Ply Roof Systems.*

At some point during its service life, any metal system will be in need of maintenance, restoration or, at the end of its service life, complete replacement. For an owner or facility manager, the most obvious symptom of the damaged or degraded roof in need of attention is repeated roof leakage during or shortly after rainfall. In many cases, application of an elastomeric coating serves as an excellent choice to restore the metal roof system to a leak-free state.

At the same time, the use of a white, reflective coating can slash the roof-surface temperature from a summer daytime high of 160 F to 175 F to no more than approximately 110 F, a 30% reduction. The building owner also can extend the service life of the roof, and ultimately reduce the energy costs within the building during peak cooling-demand hours. Many elastomeric-coating manufacturers can document these kinds of results with case studies and corresponding data.

**Coatings choices**

The owner, roofing professional, or specifier can evaluate a great number of high-quality products from manufacturers of elastomeric roof coatings for metal-roofing restoration projects. As limits on volatile organic compounds (VOCs) are lowered by federal and state government agencies, water-based acrylic coatings, primers, and sealants are being specified for many of these metal-roof restoration projects. Given the positive slope and limited ponding-water potential associated with most metal roofs, an acrylic coating in many cases represents an acceptable choice of coating materials. Field-applied reflective roof coatings are also offered in a number of other chemistries, some of which are designed to provide specific performance proper-tries, but the discussion here will be restricted to acrylics. These other coatings chemistries include asphaltic/bituminous, epoxy, fluoropolymer, polyurea, polyurethane, silicone, hybrid (combinations), and soy-based products. Acrylics account for the largest share of the field-applied roof-coatings market.

Acrylic elastomeric roof coatings are tested for specific performance and physical-property characteristics in accordance with ASTM D6083, Standard Specification for Liquid Applied Acrylic Coating Used in Roofing. In addition, the EPA Energy Star Program (www.energystar.gov) and the Cool Roof Rating Council (www.coolroofs.org) have established specific solar-reflectance and thermal-emittance criteria that products must meet for program acceptance.

The Cool Roof Rating Council maintains a “Rated Products Directory” that lists initial reflectance and emittance levels for hundreds of roof-coatings products. The directory can be accessed on the council’s website.

**The restoration process**

The first step in the metal-roof restoration process is typically a site visit by a roofing professional or coatings-manufacturer representative. This visual inspection will include an evaluation of:

- the integrity of metal panels with respect to oxidation (from rooftop and interior if possible);
- the condition of fasteners and panel overlap areas;
- the base of rooftop mechanical units and penetrations (vent pipes, etc.); and
- skylights, for breaches around their perimeters.

Additionally, it is essential to identify the type and composition of the factory finish originally applied to the roof to assure compatibility with the restoration coating system. For example, a Kynar® fluoropolymer factory finish may require a coating or primer of similar chemistry to achieve proper adhesion. Also important in this evaluation process is taking note of the slope of the roof.

These issues related to the condition of the roof, along with the time of year and project geographic

location, will play a role in determining which elastomeric, reflective coating products are appropriate for application on any given project. For example, the relatively dry climate of the Southwest is not conducive to the use of a moisture-cure polyurethane sealers for fasteners, seams and penetrations. Additionally, a waterborne coating used in a project scheduled for completion in the later months of the year in northern regions may be compromised during the curing process due to cold weather. In such a situation, it may be wise to identify and seal obvious leak areas and complete the entire project in the spring when weather permits.

**Cleaning and preparation**

The next step in the restoration process is surface cleaning and preparation. This part of the process is critical to project success, in that cleaning will yield the best surface possible for optimal coating adhesion and ultimately, performance as intended. Without proper adhesion, coating failure is simply a matter of time.

If the roof is of the exposed-fastener type, all fasteners must be checked for integrity; if replacement is required, oversized fasteners are recommended. On many older roofs of this type, the neoprene washers have decayed over time, permitting the fasteners to back out, and making fastener replacement the only option.

Cleaning begins with a pressure wash, although the coating crew must exercise caution and not unnecessarily force water through any openings and into the building during this phase of the project.

Once the roof is cleaned, a primer is applied to all oxidized areas and a mastic material is used to seal all fasteners, panel gaps, any rooftop penetrations, and around the base of rooftop mechanical units. The primer may act as both a rust inhibitor and a bonding agent for the elastomeric coating. It is important not to leave a primer exposed for extended periods of time, as the surface “tack” that many primers exhibit as a bonding mechanism will pick up dirt if exposed for more than 24 hours. This excessive dirt and dust can also compromise the adhesion of an elastomeric coating.

The cleaning, priming, and sealing is critical in sealing all possible water-entry points in the roof system. Once these steps are completed, the roof is ready for application of two coats of an elastomeric coating. Actual coverage rates will vary by product, so all manufacturer requirements should be carefully reviewed by the project foreman.

**Coating application**

Some manufacturers supply the elastomeric coating in a light gray color for the basecoat and white for the topcoat. The gray basecoat will “film over” and set up quicker than white, allowing a film or skin to form slightly faster for protection purposes. In addition, the difference in color facilitates adequate coverage with the topcoat. This also helps ensure that the owner acquires the amount of product for which he has contracted, that the contractor uses all of the material specified, and that the coatings manufacturer’s recommendation on the needed dry film thickness (DFT, measured in mils) is achieved to fulfill warranty requirements. Typically, a cross-directional spray pattern is suggested by the coatings manufacturer to ensure uniform coverage rates.

Ideally, the topcoat is applied the day after the basecoat. Cure times for each coat are dependent on ambient temperature, relative humidity, and exposure to sunlight. Dry, sunny days offer the perfect scenario for any acrylic elastomeric to cure properly, maximizing the product’s adhesive and cohesive properties. Imminent rainfall and surface moisture are the chief enemies of a coating crew. These conditions will seriously affect the cure of the product. Rainfall prior to coating cure may also result in erosion of the newly applied coating and runoff into the gutter system.

Once the application process is completed, a visit by the manufacturer’s representative is usually required as part of the warranty procedure. A thorough inspection, including electronic metering of the DFT, is conducted. Any remedial work to meet the manufacturer’s requirements is done at this point, prior to closing of the job file.

**A restored roof, and much more**

The resulting restored metal roof has given the building owner or facility manager more than just a repaired, leak-free roof. The surface temperature is greatly reduced during warm or hot weather, lessening the effect of thermal shock and stress to the roof and reducing the energy requirements of the facility. The roof also has been given a restored surface that is renewable and sustainable over time, and environmental impacts are reduced thanks to the avoidance of landfill disposal of roof tear-off waste.

An added bonus achieved with this restoration approach is that little or no interruption to normal business functions is experienced, in contrast to a complete roof tear-off and replacement project.—**JAC**

Tagged categories: **Acrylic**; **Aldo Products Company Inc.**; **Asphaltic/bituminous**; **ASTM**; **ASTM D6083**; **Cool Roof Rating Council (CRRC)**; **Elastomeric coatings**; **Epoxy**; **Fluoropolymer**; **Green building**; **Lifecycle analysis**; **Paint application**; **Polyurea**; **Polyurethane**; **Reflective roof coatings**; **Restoration**; **Roof coatings**; **Silicone**; **Solar reflectance**; **Soy**; **Sustainability**; **Thermal emittance**

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