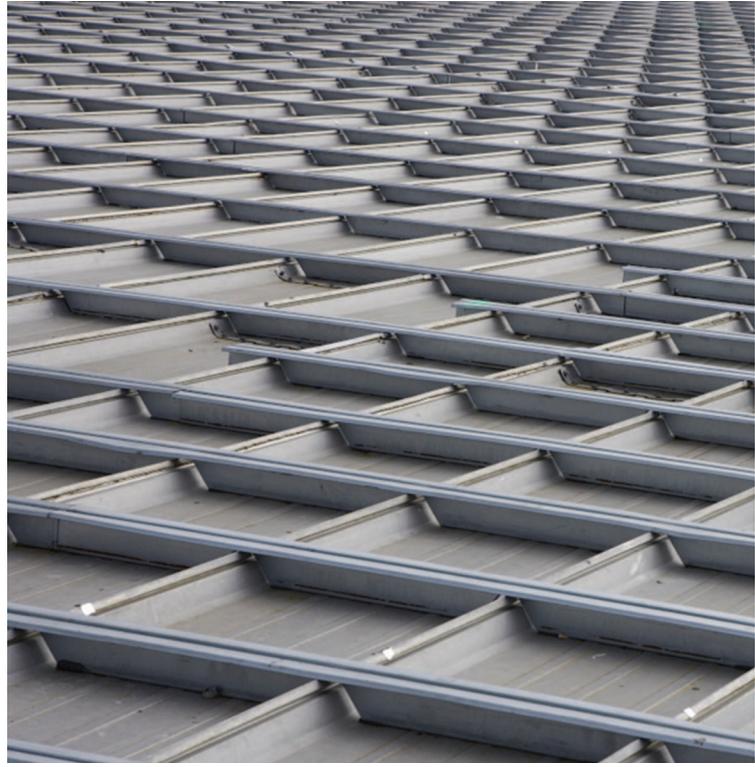


# Retrofit your Metal Roof

## Retrofitting Can Increase Strength and Energy Efficiency



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In the current economy, building owners and architects are looking for ways to save money or get the most value out of their renovation projects. Retrofit roofing projects provide a lot more benefits than just upgrading the look of your building. Often, these additional benefits are available at little to no additional cost.



### Metal Overlay Systems vs. Demolition

Metal roofs have very long life spans. A study in 2007 by Ducker Worldwide reveals the average life cycle of a metal roof is 41.6 years. However, the time will come when a metal roof will need to be replaced. Replacement will be necessary sooner if subpar installation or design causes roof leaks or poor energy efficiency. Many building owners, roofing consultants and architects will be faced with the need to replace an existing metal roof. The first question that often comes to mind is “How should I replace this roof?”. ¶ Two of the most common methods to replace an existing metal roof are demolition of the old roof or patented sub-frame overlay systems. Demolition entails removing all existing roofing materials, sometimes including the deck, and replacing them with new. ¶ Sub-frame overlay systems are punched to the existing roof profile and placed on top of the existing metal roof. The new roof system is then attached to these sub-frame members. These overlay systems have numerous “free” benefits that often are overlooked. Consider the following:



**LEFT** // Sub-frame installation at edge zone **RIGHT** // Sub-frame overlay retrofit method **BELOW** // Additional insulation



- ▶ Eliminate demolition costs by not requiring removal of the existing roof
- ▶ No interruption to building operations during construction
- ▶ Improve safety by working over a solid structure
- ▶ Provide fast and efficient construction techniques
- ▶ Increase strength of the existing roof structure
- ▶ Allow for additional insulation and other energy-efficiency improvements
- ▶ Support the installation of photovoltaics

Let's look at some of these benefits in more detail.

## Structural Upgrades

Recent revisions to the International Build-

ing Code now treat wind loads the same as gravity and snow loads with no reductions allowed. Previously, the code allowed a 1/3 stress reduction for wind. Thus, millions of square feet of metal buildings that were built in the past 30 years would not meet the new building code. Simply removing the existing roof and replacing it with a new roof is not sufficient because it requires the existing structure to be reinforced or additional framing installed. This is very costly and requires access from the inside of the building.

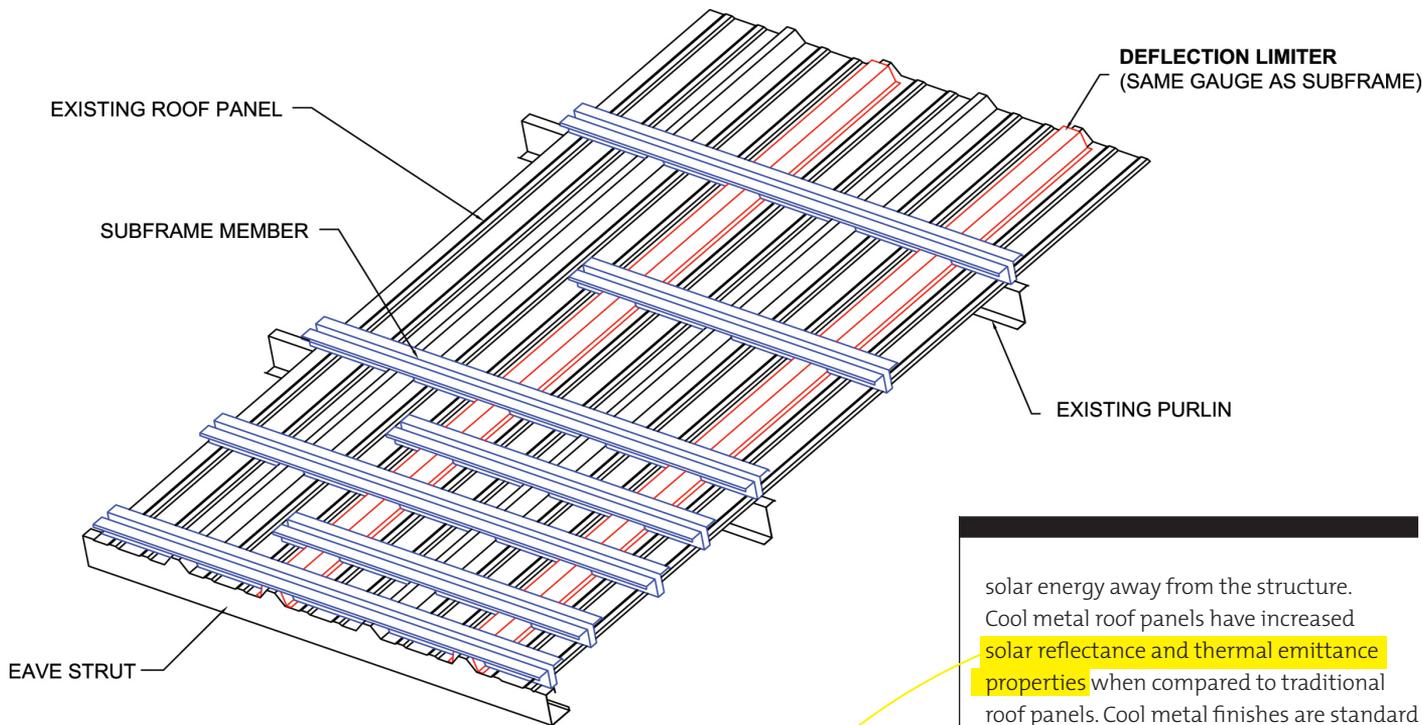
Certain sub-frame-overlay retrofit systems can increase the strength of the existing roof structure. Attaching a sub-frame to the existing framing creates a "composite purlin" that essentially increases the depth of the existing roof purlin. Numerous engineering tests confirm this increases the uplift and

dead-load capacity of the existing structure. (Visit manufacturer Web sites for information performed by independent engineering and testing facilities.) The increased dead-load capacity supports the weight of the new roof system and allows for the installation of additional rooftop equipment, such as fire sprinkler systems or PV.

In addition, hurricane-prone coastal areas require stringent engineering design. Higher wind-uplift areas located in the critical edge and corner zones can require clips to be located as close as 1 foot to 6 inches on center. A majority of existing metal buildings have purlins spaced at 5 foot on center. Previously, the only way to meet these tough clip-spacing requirements was to install new framing from the inside of the building. This is very costly and interrupts building operations. However, contractors now have the ability to install a deflection limiter in combination with the sub-frame overlay system. The deflection limiter is installed vertically over the existing metal-roof ribs and is fastened to the existing framing. This provides a direct structural attachment of subframe members between existing purlins. Standing-seam clips or fasteners now can be installed at various intervals to meet the design requirements of virtually any new metal roof system.

## Energy-efficiency Improvements

The overlay retrofit method includes space for additional insulation or above-sheathing ventilation, installation of reflective cool metal roofing, and the option to install crystalline panels or thin-film building-integrated PV. →



In an overlay retrofit, the insulation under the existing roof remains in place, resulting in energy savings. If the existing insulation is 6-inch fiberglass (R-19), you can achieve an R-Value of R-30 at a minimal cost by installing a layer of 3 1/2-inch layer of fiberglass insulation between the existing and new roof systems. For extreme energy efficiency, the architect or building owner can request spray foam or polyisocyanurate rigid insulation under the new roof system. The addition of 3 1/2- inches of closed-cell spray polyurethane foam insulation in combination with existing 6-inch fiberglass insulation can result in an R-Value of up to R-40.

The gap between the existing and new metal roof systems allows for the design of above-sheathing ventilation, or ASV, systems. Recent research by the U.S. Department of Energy's Oak Ridge National Laboratory has proven that the combination of ASV and reflective cool metal roofing can reduce the heat transmission between the attic of the building and outside environment by up to 45 percent. (Visit [www.oml.gov](http://www.oml.gov) for more information.) The process of venting the eave and ridge of the roof system causes natural convection to force the hot air

through the air gap and outside the building. This simple concept achieves energy savings with minimal additional costs to the new roof system.

Building owners and architects should consider specifying a new cool metal roof as part of the overlay system because it will boost energy savings, as well. Cool metal roofing is a new paint system that creates energy savings by reflecting and transferring

solar energy away from the structure. Cool metal roof panels have increased solar reflectance and thermal emittance properties when compared to traditional roof panels. Cool metal finishes are standard for a majority of metal panel manufacturers and available to the end user at no additional cost.

Architects also have the option to specify BIPV solar panels on top of a new overlay retrofit roof system. Thin-film PV is laminated directly to the flat surface of the new metal roof panels for a single-source installation by the roofing contractor. When considering renewable-energy sources, architects and building owners must evaluate the return on investment of the system. The electricity savings, along with federal and state tax incentives and grants, can create payback on thin-film solar in as little as four years.

Patented overlay retrofit systems, which have numerous benefits at little to no additional cost to the building owner, are intended to be installed as an engineered system. Always consult with a registered engineer with experience in retrofitting when replacing an existing metal roof. 

## / definitions /

( ▶ ) **SOLAR REFLECTANCE** is the fraction of solar energy that is reflected by the roof.

( ▶ ) **THERMAL EMITTANCE** is the ability of the roof surface to release absorbed heat.

Traditionally only white colors had high reflectance and emittance, but new cool coating technology allows a wide range of roofing colors to be energy efficient.

