



### Average Expected Useful Life of Roofing Systems

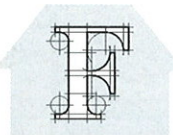
Roofing System	Surface Type	EUL (min. 1/4in/ft)
Built Up (3- or 4-ply)	Gravel	25-30 years
Modified Bitumen (2-ply)	Granules	20-25 years
Single Ply (TPO, Heat Weld PVC)	Unsurfaced/Exposed Membrane	15-20 years
Single Ply (EPDM, adhered)	Unsurfaced/Exposed Membrane	10-15 years
Metal (standing seam)	Fluoropolymer paint	40 years

Source: "Roof Management Program for Multiple Roof Systems", Interface, Nov. 2008.

# White Reflective Roof Coatings

## *Improving the Sustainability of Existing Roofs*

by Jason Smith, chemist, Research and Development, The Garland Co.



For more than a decade, buzzwords such as "cool roof" and "sustainable roofing" have dominated nearly every publication dealing with industrial roofing. However, it is sometimes mistakenly assumed that cool or sustainable roofing applies exclusively to new construction. What does it mean to have a sustainable roof? A sustainable roof is one that is, "designed, constructed, maintained, and rehabilitated with an emphasis throughout its life cycle on using natural resources effi-

ciently and preserving the global environment."

There are several ways to convert an existing commercial roof to a sustainable one. They include: the application of a reflective white (cool roof) coating, the addition of photovoltaic panels, and the application of metal or vegetative roofs. This article will focus on the rehabilitation aspect of sustainability, specifically, on the effects and benefits of the applying reflective coatings on the performance and life-cycle costing of the roof.

### Extending the Expected Useful Life

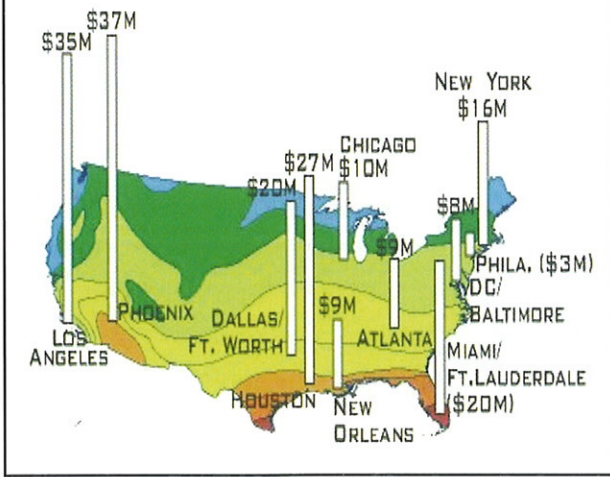
The average expected useful life (EUL) of various roof systems is shown in the chart above.

As a roof comes to the end of its theoretical useful life, a roofing professional can determine if a roof is a candidate for enhanced sustainability through the use of a reflective coating. The typical approach for this determination would include an infrared scan to search for leaks or wet insulation. All identified wet areas must be cut

(Continued on Page 30)

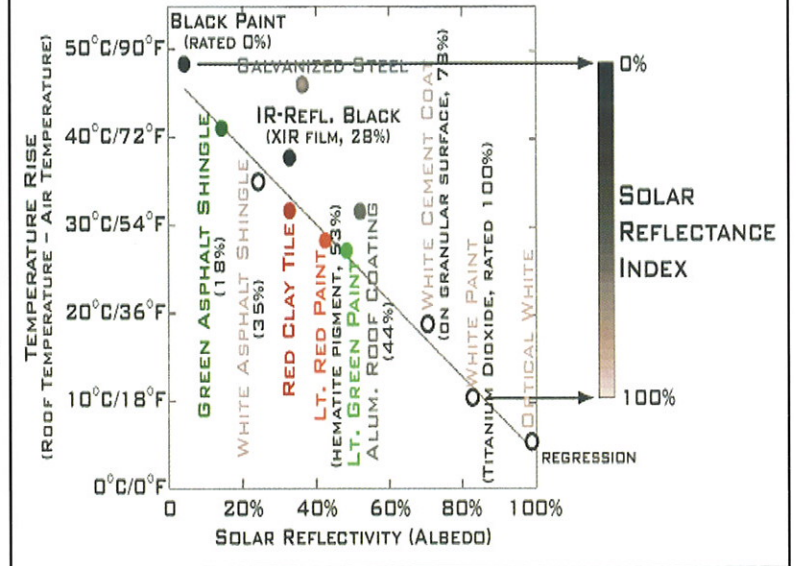


## Cool Roof Energy Savings Map



Source: [www.garland.com/energy-star-cold-roofs.html](http://www.garland.com/energy-star-cold-roofs.html)

## Solar Reflectance Index



# White Reflective Roof Coatings

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out and replaced. In all cases, flashings, surrounding scuppers, drains, penetrations, and HVAC units need to be sealed, re-flashed, and replaced if damaged. All ridging, blisters, splits, and fishmouths must be repaired. Any ponding areas must have either new drains or crickets installed. Crickets are tapered triangles that help direct the flow of water to a drain. Once these issues are addressed, the roof can be coated.

Application of a reflective coating is one of the simplest ways a roof can become sustainable. Many of the roof coatings on the market can be applied with a regular paint roller. Multiple component reflective coatings (i.e., two-component polyurethanes and polyureas) require a metered dispenser system and a higher degree of operational sophistication. Reflective coatings come in a variety of chemistries, including acrylic, polyurethane, urea, silicone, and polyurethane-urea hybrids. In addition, new advances in soy-based technology have allowed formulators to incorporate "greener" bio-based raw materials into their sustainable coatings.

Applying a reflective coating to a roof

will add five to ten years to the life of a properly designed roof. By implementing routine preventive maintenance (i.e., regular evaluations, cleaning drains, thermal scans to check for leaks, etc), the working life of the roof can be extended even further. By extending the working life of the roof, the owner also realizes a significant cost savings. For example, a modified bitumen roof consisting of two plies and a mineral cap sheet, with an estimated useful life of about 20 years, when painted with a reflective coating around year 20, can reduce the overall life-cycle cost of the roof by about 15%.

## Energy Savings

A good-quality, reflective roof coating system will also save energy costs for the building owner. According to the EPA, the United States spends over \$40 billion per year to air-condition its buildings; that accounts for about one sixth of the country's generated electricity. When compared to dark roofs, roofs with a restorative white reflective coating require up to 40% less energy to cool the interior, and reduce peak cooling demands by up to 15%.

Online calculators such as [roofcalc.com](http://roofcalc.com), found on the EPA's website, provide user-friendly calculating tools to determine approximate energy savings. The decrease in cost is directly related to the reflectivity and emissivity of the coating chosen.

The temperature differential (the difference between the roof temperature and the air temperature) is indirectly proportional to the solar reflectance. Therefore, the more a coating reflects sunlight, the lower the temperature observed on the roof surface. Coatings using titanium dioxide (white) come closest to optical whiteness (100% reflectance). This is because titanium dioxide is one of the best solar reflectors available to formulators. Reflectivity is the primary criterion for obtaining roof coating Energy Star® qualification, which uses the following reflectance guidelines:

For roofs with slopes of 2:12 or less:

Initial Solar Reflectance . . . . . ≥ 0.65,  
Reflectance After Three Years . . . . . ≥ 0.50.

For roofs with slopes greater than 2:12:

Initial Solar Reflectance . . . . . ≥ 0.25,  
Reflectance After Three Years . . . . . ≥ 0.15.



Coatings that continue to show high reflectance beyond the three-year mark translate to continued energy savings for the building owner. Emissivity, a measure of the ability of the coating to release absorbed heat, is not a requirement for Energy Star; however, emissivity values have been listed with reflectance values of coatings since 2007. Currently, 220 manufacturers have joined the Energy Star program. It should be noted that the simple addition of a reflective white coating can also add to the value of a roof by contributing valuable LEED® points.

### LEED Points

In 1993, building industry leaders formed the US Green Building Council (USGBC). In 1998, the USGBC founded LEED, the Leadership in Energy and Environmental Design, green building rating system in order to reduce the heat-island effect, the phenomenon whereby heat is absorbed and reradiated by clusters of buildings in densely built areas. LEED provides a point-rating system establishing maintenance standards not only for new construction, but also for building rehabilitation.

In roof rehabilitation, coatings, which are used to improve reflectance and provide an additional water barrier, can also help a facility earn valuable LEED points. Points (or credits) are earned based on a set of prerequisites in these six major categories:

- ☛ Sustainable sites: 14 possible points
- ☛ Energy and atmosphere: 5 possible points
- ☛ Water efficiency: 17 possible points
- ☛ Materials and resources: 13 possible points
- ☛ Indoor environmental quality: 15 possible points
- ☛ Innovation and design process: 5 possible points


The points required to obtain different LEED certifications range from 26 to 32 points (for the most basic certification) to 52 to 69 points (for the highest platinum certification). Regardless of whether a roof coating is used as part of a restoration plan or new construction plan, LEED points are typ-

ically applied in the Materials and Resources category. A local architect, roofing consultant, or manufacturer's represen-

*...using a reflective coating may be the simplest way for a building owner to reduce energy...*

tative can typically help analyze and compare the LEED contribution potential of various roofing solutions.

### Conclusion

With all the buzz in the roofing industry regarding sustainability, using a reflective coating may be the simplest way for a building owner to reduce energy while extending the working life of his roofs. When used in conjunction with a responsible, eco-friendly restoration or rehabilitation plan, the use of a reflective coating can help save energy and contribute to LEED certification, transforming an existing roof into a sustainable one. 

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