



Black or White?

Weighing New Roofing Decisions

[by Jack Carr, P.E., RS, LEED-AP]



Some board members may think deciding about a new roof surface is over their head (forgive the pun). Condominium board members and property managers of urban mid- and high-rise buildings often face flat roof maintenance issues. And now a new wrinkle in the roofing decision process has arisen: black or white.

In the recent past, most flat roofs were made with a rubber-like elastomeric membrane called EPDM. Though black EPDM still accounts for the majority of flat membrane roofs for condo, commercial, and industrial buildings in the northern states, you will see things are changing just by looking out an airplane window as you approach a major airport to see the roof landscape below turning white.

Cool roofs are designed to reduce energy consumption and reduce what is commonly called the urban heat island effect. Cool roofs are categorized into three types: white, reflective coated, or green (vegetated) roofs. White roofs are the most common with TPO (thermoplastic polyolefin) and PVC (polyvinyl chloride) being the typical choices. Though PVC and TPO roofs have the same wear and cost factors, PVC materials have some negative characteristics, such as high toxicity and un-recyclability, so for ease of comparing black to white, we will only

consider EPDM vs. TPO in our comparison discussions.

COMPARING OPTIONS

To start with, TPO roof membranes are recognized to have longer lives, lasting an average of 25 years, compared to EPDM lasting 20 years. This is in some part due to TPO's resistance to UV and thermal expansion damage. Some TPO products developed bad reputations in the past due to their inability to handle severe cold, which, in some cases, caused the membrane to shatter. These problems are reported to have been eliminated with today's TPO roofing materials.

Secondly, the initial cost favors EPDM roofs. However, when life cycle and energy cost issues are considered the black and white roofs become competitive. Installation methods differ in that EPDM seams are taped or adhesively sealed while TPO seams are welded by a thermal process.

There are strong forces pushing the general acceptance of white roofs in the future. States such as California passed laws in 2005 requiring the use of reflective roofing materials, as well as individual cities such as

Chicago establishing building codes to favor its use. There is a body of evidence developing that shows the heat island effect of black surfaces, which include not just roofs but also parking lots, paved roads, and building facades can have an impact on local weather characteristics.

RATING SYSTEMS

The nation's largest green building advocates are influencing architects and building owners by favorably rating buildings with cool roofs. Under the joint program of the US Environmental Protection Agency (EPA) and Department of Energy (DOE), for a roofing product to receive an Energy Star label under its Roof Product Program, it must have a solar reflectivity of at least 0.65 and weathered reflectance of at least 0.50 in accordance with EPA testing procedures.

The Cool Roof Rating Council (CRRC) created a rating system for measuring and reporting the solar reflectance and thermal emittance of 850 roofing products and provides this to energy service providers, building code bodies, architects and specifiers, property owners, and community planners.

The Green Building Initiative instituted its Green Globe system in the U.S. and Canada to develop benchmark criteria for a building's likely energy consumption as a result of the roofing material's solar reflectance and thermal emittance.

The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system is now widely used for most publicly funded building projects and many high-profile, non-government buildings as a result of legislation, executive orders, resolutions, ordinances, policies and tax incentives. Architects seeking a LEED certification for their project will receive credit for white, cool roofing meeting LEED solar reflective index guidelines.

With all of this horsepower pushing for cool roofs, it seems like an easy black or white decision for the condo board facing a roof replacement project. Maybe not. For northern condos, the problem is a little complicated. CRRC admits to a "winter penalty" when cool roofs are installed in northern climates. DOE building modeling data reveal that in the north, heating is a much more significant factor in energy use than cooling. In fact, heating accounts for 29% of energy used, compared to only 6% for cooling.

It turns out that insulation is a more important element for energy efficiency than cool roofs here in New England. It has to do with the amount of Heating Degree Days (HDD) and Cooling Degree Days (CDD). As an example, Boston has 5,841 HDD and 646 CDD as compared to Albuquerque's 4,361 HDD and 1,211 CDD.

Therefore using DOE's cool roof calculator, Boston's high number of HDDs and positive winter heat gain results in lower energy usage and fewer carbon emissions with an EPDM roof. So talk with your roof consultant and remain cool.



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