



Energy efficiency: It is more than a simple black and white issue

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The days when heating and cooling costs were a relatively insignificant line item on a building owner's budget are long gone. Oil, natural gas and coal price increases and instability have led to higher heating and cooling costs, and property owners are doing all they can to minimize them by using energy-efficient building materials.

It is probable that the focus on energy efficiency has impacted the roofing industry more than most. Codes have been developed, organizations formed and regulations established - all in the interest of addressing energy-efficient roofing. Over the past decade, energy efficiency within the roofing market has been focused on cool roofing, utilizing light-colored materials such as thermoplastic polyolefin (TPO) and polyvinyl chloride (PVC) to reflect sunlight and solar energy away from a building.

In 2001, TPO accounted for just 10% of the commercial roofing market, but by 2007 its share had reached 29%. At the same time, EPDM and asphalt-based roofing had seen their share within the market drop by 7% and 11% respectively. These numbers highlight the increased emphasis that has been placed on reflectivity.

Numerous studies have proven that, under some circumstances, a building's air conditioning-related energy consumption can be reduced through the use of reflective roofing materials. These studies, along with irresponsible marketing efforts, have created a perception that reflectivity is the best option for reducing energy consumption.

But caution must be used when specifying cool-roof systems. The energy savings that buildings experience due to reflective roofing materials are most often realized in warm, southern climates where Cooling Degree Days (CDD) outnumber Heating Degree Days (HDD) and air conditioning is more prevalent than heating.

To help reduce heating-related energy demands, which are greater than air conditioning demands in northern regions, dark-colored materials such as EPDM membranes are most often beneficial because they absorb heat and transfer exterior solar energy into a building, alleviating the demands placed on heating systems.

Table 7.4 of the 2007 Buildings Energy Data Book, published by The Building Technologies Program within the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy, outlines energy use intensity in various commercial building types, comparing heating and cooling as a percentage of total energy consumed. The average results show that heating accounts for 29% of the energy consumed within a building, while cooling totals a mere 6%.

These numbers indicate that the move toward reflective roofing in many parts of the country may be unwarranted and counterproductive in minimizing energy consumption and that there should be more focus on cutting heating costs, not cooling costs, making dark-colored membranes an

important asset in the push for energy efficiency.

The U.S. Department of Energy (DOE), in conjunction with the Oak Ridge National Laboratory (ORNL), has developed a Cool Roof Calculator to help determine the most efficient, cost-effective roof system for any given project by simulating building energy consumption based on a building's location and the type of roofing membrane and amount of insulation installed.

"Research shows that from an energy perspective, insulation often negates membrane color," said Andres Desjarlais, group leader for building envelope research at the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tenn., the research wing of the DOE. "Reflective roofing should not take the place of quality design, of which insulation is a key factor."

A superior option for any low-sloped roofing, white or black, is to utilize two layers of fully adhered insulation, minimizing the effect of thermal escapes at fasteners and joints, resulting in a more airtight, efficient assembly.

"White membranes, throughout the northern U.S., may be a tool by which heat island concerns could be addressed, but they do not deliver energy savings or contribute to lower carbon emissions," stated Carlisle SynTec's Director of Design Services Samir Ibrahim. "The key factor should always be the amount of insulation utilized in the assembly, as insulation is the most influential component by which sustainability can be achieved."

Even as more evidence surfaces refuting the benefits of reflective roofing in many instances, there is a large, influential movement that continues to push the agenda. Independent organizations and government agencies such as the Cool Roof Rating Council (CRRC), the Environmental Protection Agency's ENERGY STAR program and LEED are all recognizable organizations within the roofing industry that promote reflective roofing without consideration of insulation or climate zone.

"The design community has always emphasized sustainability and energy efficiency; however, the reflective roofing movement seems to have blurred many people's vision as to how to reach those goals," said Ibrahim. "EPDM has been an effective roofing solution for decades, and we always knew that it was more beneficial in cold, northern regions. The energy analysis tools available today are helping us counteract some of the misconceptions that are out there."

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