Reflective insulation and radiant barriers can be LEED compliant

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In the past decade, there has been a great deal written about sustainable building and the need for a better understanding of the science required for a properly designed building envelope. There has also been a significant movement for greater sensitivity of the environment, both during and after construction, as well as energy efficiency (Green standards) in construction.

As reported in *The Future of Green Developments in the A/E/C Industry,* by Manar Shami and Thomas R. Dunn, Green buildings have been defined as systems that exist in harmony with the environment. Sustainability, in their report, is defined as the relationship between the dynamic human economic systems with the slower-changing ecological systems.

The U.S. Department of Energy Insulation Fact Sheet, developed by Building Envelope Research, Oak Ridge National Laboratory, reports that heating and cooling account for 50 to 70% of the energy used in the average American home. Inadequate insulation and air leakage are leading causes of energy waste in most homes.

In general, insulation is rated in terms of thermal resistance, called R-Value, which indicates resistance to heat flow. The higher the R-Value, the greater the insulating effectiveness. Traditional thinking, which focused more on helping the homeowner save money and less on environmental impact, used to include only bulk insulation treatment, such as blown-in cellulose or wool, fiberglass or polyester batts, or foam boards. But Green standards have now placed more focus on the additional need for reflective insulation and radiant barriers to achieve a higher degree of efficiency.

There has been much published about the benefits of increased insulation, for both cost and energy efficiency, but there must also be an understanding of the dynamics of the total efficiency of the building envelope and related systems. This holds true, in concept, for the entire building project and its relationship to the environment. Reflective foil insulation and radiant barriers not only increase thermal efficiency of the building envelope without taking up additional space, but also meet current green standards as well as cost justification criteria.

Reflective insulation differs from other insulating materials in the primary manner in which it retards heat transfer. Reflective insulation blocks radiant heat transfer between a heat-radiating surface and a heat-absorbing surface through the use of low emittance materials like foils, foil coated papers and plastics. The thermal performance, or the reduction of radiant heat transfer, is directly proportional to the surface emittance of the radiant barrier material. Emittance measurements of all materials range between zero (0) -- no radiant heat transfer -- and one (1) -- complete radiant heat transfer.

Common building materials, such as wood or masonry, have surface emittances of approximately 0.85 and therefore have high radiant heat transfer rates. Products defined as reflective insulation and radiant barriers have surface emittances less than or equal to 0.1 or low radiant heat transfer rates. Reflective insulation materials include paper, plastics with metallic deposits, and aluminum foil or aluminum substrates. In addition to reducing radiant heat transfer, reflective insulation functions by reducing convective heat

transfer by trapping air or other gasses with multiple layers of these materials. This is the same principle that is used in high performance windows (for example a double paned low-e glazing).

Effective examples of reflective insulation include: expandable multi-layer with one or more aluminum layers, such as Fi-Foil's VR Plus Shield, for vertical wall applications; aluminum faced plastic bubble, such as Fi-Foil's RBI Shield, for broad applications where a vapor barrier is also desirable; double-sided foil, such as Fi-Foil's Radiant Shield NT, for general wall and ceiling applications; and multi-layer aluminum faced flexible foam, and a multi-layer high performance aluminum radiant heat barrier, such as Fi-Foil's Silver Shield, for use under roof rafters.

The U.S. Green Building Council (USGBC), a nonprofit organization that is spearheading the effort to standardize the Green building industry, was founded in 1993 to provide clear definition of "Green". One of the programs developed by the USGBC is the LEED (Leadership in Energy and Environmental Design) Rating System which is gaining national and international attention as a baseline for developing "Green"/"Sustainable" building projects.

Specifically, LEED was created to define Green building by establishing a common standard of measurement; promote integrated, whole-building design practices; recognize environmental leadership in the building industry; stimulate green competition; raise consumer awareness of Green building benefits; and help transform the building market to Green compliance.

The LEED Rating System includes several key areas of opportunity for reflective foil insulation. It is first important to understand that there are a number of project-specific LEED Rating Systems: New construction and major renovation, LEED 2.1; Existing Building Operations, LEED-EB; Commercial, LEED-CL; and most recent is LEED for Retail. Additionally, there is a draft for a proposed LEED Residential rating system.

Within each LEED Rating System there are "Categories of Concern" and each typically has Prerequisites as well as Credits. The five major categories include Sustainable Site, Water Efficiency, Energy and Atmosphere, Materials and resources and Indoor Environmental Quality. Each rating system also offers available credits that are specific to that category.

Depending on the application, reflective insulation and radiant barriers could qualify for LEED credits in several areas. The strongest factor is that the thermal efficiency of reflective insulation saves energy, which in turn contributes to a reduction in electrical load requirements. Reduced load requirements, in turn, have the potential for specifying smaller mechanical units, which can result in less energy demand.

From a LEED perspective, energy savings over the sustainable life of a building can be significant through the use of reflective thermal insulation in all appropriate wall, ceiling, floor and roof applications. This product is a very cost effective solution for increasing insulation efficiency and reducing the energy load on mechanical equipment.

Also, a significant amount of the primary materials used in the production of Fi-Foil reflective insulation and radiant barrier components, specifically aluminum foil, kraft paper and plastic, can be derived from post-consumer recycled materials, thus conserving several natural resources. The products are much lighter in weight that most construction materials, which saves energy and other environmentally related costs involved in shipping and handling. Throughout their sustainable life, these products will not emit fumes, particles or other toxins that could degenerate the air quality or otherwise harm the environment within the structure where they have been installed.

The LEED criteria for certification continues to evolve as ongoing testing and evaluations produce new and more consistent results. Environmental responsibility will remain a major issue in the construction industry well into the foreseeable future. Products within the LEED framework that can produce a measurable positive impact on the environment along with cost justification, such as the Fi-Foil Company's line of reflective insulation, will continue to grow in popularity as more and more of their benefits are realized.