Radiant Barriers

Improved insulation for metal buildings

By Kelly Myers

With the need for energy efficiency buildings more important than ever, more building owners are learning about the thermal value of radiant barriers, and incorporating them into their insulating systems. That the use of radiant barriers in construction is growing rapidly and more and more building professionals specifying these products in their building projects.

Radiant barrier insulation products have been available for decades. However, the general awareness, understanding and acceptance of these materials have increased dramatically in the past 10 years. This growth has been even greater in hotter regions, where the controlling building heat gain is more difficult with conventional mass/fiber insulation. The ability of radiant barriers to reduce heat transfer through the building envelope, combined with rising energy costs, has made radiant barrier insulation an integral part of building insulating systems everywhere.

Studies have shown that a radiant barrier combined with mass insulation is a very effective way to reduce building heat gain/loss, improve the overall comfort, and to reduce the cost of air conditioning and heating. Radiant barriers have emerged as one of the most effective ways to reduce building heat gain and loss.

In metal building systems, the value of incorporating an effective radiant barrier is even greater. Due to the high thermal conductivity of exterior metal panels, these materials tend to provide less thermal resistance, and allow for easier transfer of the sun's heat energy. Metal roofing temperatures can exceed 165 degrees in the summer, and these hot surfaces then radiate this heat energy inward, placing a higher demand on the thermal insulation in metal buildings. A properly installed radiant barrier will reflect up to 97 percent of the heat radiating from the metal roofing to the aluminized radiant barrier surface.

Radiation is just one of the three modes of heat transfer, but as much as 93 percent of the total heat gain from the roof decking to the insulation is via radiation. Since most of the heat gain is in the form of radiation, the need for radiant barriers in metal buildings even greater, combined with the fact that mass insulation alone has very little effect on this type of heat transfer. Mass insulation is more effective against the two other forms of heat transfer-conduction and convection-which are much of a factor in metal building systems than radiation.

To understand how radiant barriers work, it is important to know that heat always moves toward cold, and heat has three methods which it can travel-conduction, convection and radiation. It can travel by either method, or in a combination of all three, depending on its environment and conditions. Whenever a surface is warmer than it surrounding air, heat radiates from that surface into the airspace. The greater the temperature differential between the surface and the airspace, the greater the amount of radiant energy is cast, or emitted, from the surface into the air.

Building heat gain occurs when the outside air is warmer than inside, and especially when sun strikes the outside surfaces. As the surface temperature increases, that heat is transferred into the building by radiating from the hot surface to the air inside. The process is much like that of a wood-burning stove. The heat inside the stove travels into the room by radiating off the surface into the cooler air.

Heat radiates through the air until it strikes another surface. At that point, the heat is either reflected or absorbed by the new surface, or some degree of both. Radiant barriers reflect up to 97 percent of this energy, sending it back to the source. Mass insulation products absorb, or slow down, the flow of heat. When an insulation material absorbs heat energy, but the flow continues from the source, that heat will eventually travel through, and re-radiate from the insulation into the building.

Rather than absorb heat, radiant barriers work by reflecting, or redirecting heat energy radiates to its surface. A highly reflective surface also has a very low emissivity. This means that heat has less ability to radiate outward from the surface, and into the surrounding airspace. A low-E window uses the same principle, reducing heat transfer by not emitting from one side to the opposite airspace. Depending on its placement and location, a radiant barrier can prevent heat transfer by either reflecting heat, or limiting emittance.

Most radiant barriers are composed of an aluminum (or aluminized) surface material. Aluminum reflects up to 97 percent of radiant heat flow, this only emitting up to 5 percent of radiant energy from its surface. These products are usually manufactured in sheet form, often reinforced with a polymer or scrim, or laminated to another building material substrate. Laminating to another substrate can provide the added value of material rigidity, condensation control, sound attenuation or aesthetics.

Kelly Myers is the national sales manager-USA for Covertech Fabricating Inc./rFOIL Insulation Products, Etobicoke, Ontario, Canada. To learn more, visit www.rfoil.com.