Commercial skylights: how to “curb” energy loss

We live in an increasingly energy-conscious world and the commercial building industry has followed suit, focusing on energy efficiency as a major design goal. Over the last several years, daylighting has risen to prominence as a strategy to reduce energy costs. However, the energy interactions that occur with roof and wall systems are more complicated with skylights because of limitations on glazings, which must achieve high R-values while still transmitting visible light. Improvements in skylight curbs are emerging as an effective way to capitalize on daylighting while retaining higher R-values.

Typically, skylights have lower effective R-values than windows due to their orientation. Warm air escapes more quickly from horizontal glazings because of the shorter distance that convective air currents must cross to affect heat transfer. As a result, plastic glazed skylight manufacturers have employed a number of strategies to enhance their product’s thermal efficiency. These strategies include triple-dome assemblies and polycarbonate panels filled with silica aerogel, a low-density solid that provides excellent insulation value. Such modifications enhance a skylight’s R-value, but result in reduced light transmission and added expense.

However, one component of a skylight system that could improve energy performance has been overlooked, and that is the skylight curb. Skylight curbs can either be field-fabricated or prefabricated by the manufacturer. R-values are lower for field-fabricated curbs because there are no guidelines in place that address energy loss. While most roofing and insulation manufacturers mandate a multitude of requirements for other aspects of the building envelope, skylights are overlooked. The current ASHRAE standard [1] merely states that “skylight curbs are insulated to level of roofs with insulation entirely above deck or R-5, whichever is less.”

Fortunately, manufacturers are developing prefabricated solutions that address the problem of lower R-values. Curb systems are now being manufactured with an R-value of 15, which is 300 percent higher than a metal curb system. This significant performance improvement is beneficial for a daylit space that must be heated during winter months and cooled in the summer months.

The technology used in the manufacture of these new curbs is identical to that used to manufacture Structural Insulated Panels (SIPs). The curbs are manufactured from composite sandwich panels with 3.50” of high-density expanded polystyrene foamlaminated to an outside wall of 0.4375” oriented strand board, and a 0.125” inner wall of hardboard with a white melamine facer. This configuration provides these new curbs with their high R-value.
interior melamine curb wall surface negates the need for painting or finishing and provides a moisture-resistant, cleanable white surface.

Other advantages to these new curbs are that they are shipped knocked down, removing most of the danger of in-transit damage, and that they can be used by Tubular Daylighting Devices. While typical round housing does not allow ample space for insulation, the square SIP curb system insulates the tube section that extends up through the roof assembly, greatly reducing the possibility of condensation forming in the light transfer tube.

Skylights remain an excellent strategy for building owners to save on energy costs. However, using energy-efficient glazing to address thermal issues is only one part of the strategy. As much as the glazing contributes to energy savings or loss, so does the curb upon which the skylight is affixed. Making a better choice can only result in increased energy performance.

[1] ANSI/ASHRAE Standard 90.1-2007, section 5.5.3.1, p. 21