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## **Energy Star's new glass performance standards recognize superior energy saving alternative**

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Proposed revisions to the Department of Energy's Energy Star glass performance standards scheduled to debut as early as 2009 should make clear that generic low-e glass no longer represents a level of energy efficiency required to "transform the market," a key charter of the agency's Energy Star program.

Commercial developers interested in maximum energy efficiency and in achieving LEED Green Building Rating System certification need to know that not all glass is equally effective as a green construction and renovation product. They will benefit from increased awareness of alternative glass technologies that are superior to generic low-e insulating glass and available now.

Because generic low-e glass provides maximum insulating performance of about R-4 in a world in which R-19 insulated walls are the norm, there's a dramatic performance gap between what low-e glass provides and what green building practices promise in saving energy and reducing carbon emissions.

Despite heavily insulated walls and ceilings and the popularity of low-e glass, 25-35% of the energy used in buildings is wasted due to inefficient glass. So, it should come as no surprise that glass is responsible for more than 10% of the total carbon emissions in the US annually and is a major contributor to global warming.

The truth is that low-e glass thermal performance has reached practical limits. A low-e coating reflects heat, reducing heat transfer between panes of glass and thereby improving insulation performance. The "e" in low-e, which stands for "emissivity", is the ability of a surface to radiate energy. Low-e coatings are rated for the amount of heat they radiate, the lower the number, the less heat is radiated and the better the insulation performance of the glass.

Coated glass is commonly available today with emissivity ratings below .03, and lowering emissivity from .03 to .00 will have a negligible incremental improvement on window performance. Clearly, further improvements in glass thermal performance will not come from improvements in low-e coatings. Additionally, low-e coated glass has become a minimum performance baseline and no longer represents a path to "improved" energy performance. The incremental performance benefit of using low-e glass is ZERO, because it is already assumed as a required product.

Generic low-e insulating glass, consisting of two pieces of coated glass separated by a sealed, gas-filled air space (or cavity), achieves a maximum thermal insulation value of R-4. With further advances in glass coating technology expected to provide minimal performance improvement, the focus has now shifted from coatings to cavities. Just as the introduction of single-cavity insulated glass provided a breakthrough in performance beyond monolithic glass, the introduction of

multi-cavity constructions, consisting of two or even three insulating cavities, is providing the next performance breakthrough for insulating glass.

Two alternatives to generic low-e insulating glass are currently available that can meet the new Energy Star glass performance standards. One is triple pane glass, consisting of three panes of glass and two low-e coatings. The good news is that by using a third pane of glass to create a second insulating cavity, triple pane low-e glass improves generic low-e insulating glass performance by about 50% from R-4 to R-6. The bad news is that triple pane glass is 33% heavier than standard insulating glass, requiring stronger window framing and increasing cost accordingly. The additional coated glass can also reduce visible light transmission by 20% or more, reducing the comfort and productivity benefits of natural day lighting.

A superior alternative consists of suspending a low emissivity and solar reflective film inside of an insulating glass unit. Without the weight disadvantages of a third pane of glass, film can create two, three or even four insulating cavities that maximize light transmission and provide conservation performance ranging from R-6 to an amazing R-20 to meet the unique requirements of both commercial and residential new construction and renovation projects.

Such internally-mounted film does not replace low-e glass. Rather, it leverages the benefits of film-based and glass-based technologies to create a lightweight, multi-cavity insulating glass that offers a new level of performance. Most units fabricated today utilize low-e coated glass to minimize solar heat gain, while using lightweight film to maximize insulation performance, block UV radiation, reduce noise, and increase occupant comfort more effectively than low-e glass alone.

Clearly, film-based, multi-cavity insulating glass is tomorrow's state-of-the-art window glass available today. It has been saving energy in such landmark buildings as the National Gallery of Art, the Rotch Library at MIT and in the Audubon Society headquarters in New York.

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