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Making sense of LEED

Glass considerations under the Leadership in Energy and Environmental Design program

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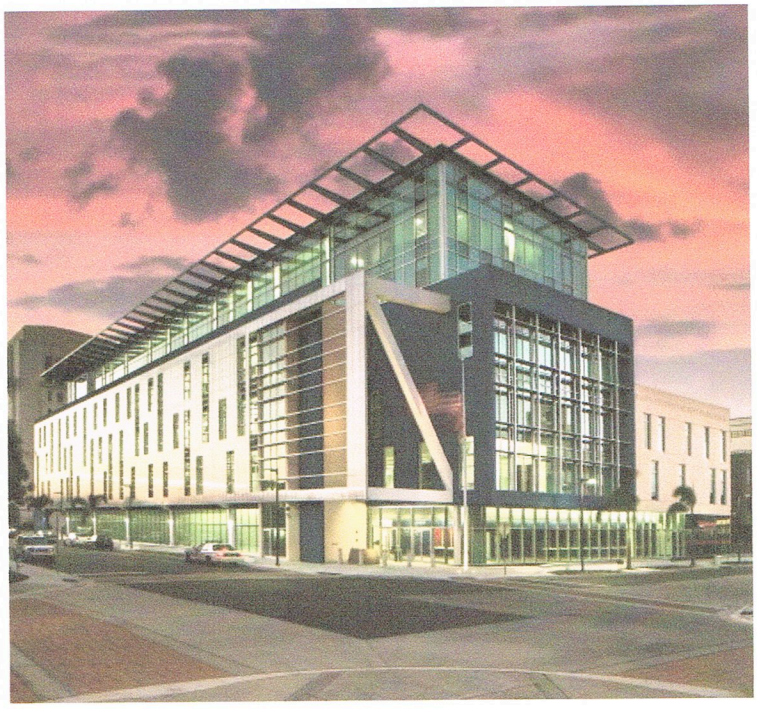
FABRICATION : GREEN



Photos by Greg Wilson Group, Sarasota. The Sarasota Police Headquarters is designed to achieve Silver certification from the U.S. Green Building Council's Leadership in Energy and Environmental Design program. Final certification is pending.

There has been a significant increase in the number of LEED-registered construction projects in North America in the last few years, more than doubling between 2006 and 2009. Green building now accounts for nearly one-third of new construction in the United States, up from 2 percent in 2005, according to McGraw-Hill Construction, New York.

No matter where you sit on the spectrum regarding the relevance of LEED, there is no question that it has impacted our industry in a big way. From product development, to marketing and sales, to managing documentation, LEED affects virtually every company within our industry.

We have seen some innovative products and installation methods over the past five years that have helped the industry move forward towards more sustainable construction. However, what individual companies can do to affect a LEED project is quite limited, as the majority of credits available through glass and glazing are related to the overall building design.

Nonetheless, the one thing that each of us can do is understand the requirements and how our companies or products actually fit within the LEED rating system. If we want to be considered a reliable source of information in our industry, we must first educate ourselves.

Overview of the LEED rating system

The LEED certification program is a system of credits that acts as an incentive for the construction industry to build in a greener, more sustainable way. The U.S. Green Building Council launched the rating system in 1998. The Canada Green Building Council developed an adaptation of this system in 2004, tailored specifically to Canadian climates, construction

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practices and regulations.

The rating system is organized into five environmental categories and two bonus categories for innovative design and regional differences. It offers credits and points for items such as protecting the natural habitat on a construction site, reducing energy and water use, and using materials that have less of a negative impact on the earth.

In the more than 100 points available within the system, there are only about 12 (excluding Optimizing Energy Performance and Innovation credits) that could be applicable to the commercial glass and glazing industry. While we all want to show how our products are green, in many cases, LEED might not be the proper framework to use. To help understand how glass can contribute to achieving some of these points, this article provides an explanation of the main credits applicable to glazing products, in the order in which they are most asked about.

Materials & Resources: Credit 4: Recycled Content (maximum 2 points)

Intent of the credit: To increase demand for products with recycled content and reduce the impacts related to extraction and production of new materials.

Glass contribution: Float glass produced by the major glass manufacturers has no allowable recycled content under the LEED system. Some specialty glass manufacturers and glass artists use recycled glass in making their products. Also, there may be recycled content used in manufacturing the interlayers in laminated glass, spacer in insulating glass, or the metal used to install glass products. The level of recycled content will vary, so you will need to contact the manufacturer for this information.

→ "FLOAT GLASS HAS NO ALLOWABLE Recycled CONTENT UNDER the LEED SYSTEM."

Although currently LEED credits do not apply, some types of glass are completely recyclable at the end of their useful life if not previously contaminated with glazing materials. Contact your local recycling facilities for information on the recyclability of specific products. Some facilities are now able to recycle laminated and insulated glass products that previously were destined for the landfill.

Information you might be asked for: The pre-consumer and post-consumer recycled content of glass, aluminum and other materials. To achieve LEED credits, the allowable content is based on the weight of the entire assembly being installed into the building. Post-consumer recycled content is given greater value in the calculations as it is perceived to offer an increased environmental benefit.

Common misconceptions: Although float glass manufacturers usually use up to 20 percent pre-consumer recycled materials in their manufacturing process, for the purpose of this LEED credit, this is considered reused rather than recycled material and is not allowable under this credit.

→ LEED conciders glass cullet re-used & NOT Recycled.

Post-consumer recycled content is defined as consumer or industrial waste that has served a useful purpose in the consumer market before being used again as a component in another material. This material must have reached its end-user and then have been discarded. Examples would be materials that came from curbside recycling programs or construction debris that is recycled.

Pre-consumer (or post-industrial) recycled content comes from process waste that one industry has sold or traded with another through the marketplace that would otherwise be disposed of as waste. An example would be a composite board manufacturer that purchases sawdust from a lumber mill that would otherwise be incinerated. Reusing materials in the same process in which they were generated (i.e. glass culls) does not contribute towards the recycled content of a material.

Materials & Resources: Credit 5: Regional Materials (maximum 2 points)

Intent of the credit: To increase demand for materials and products that are extracted and manufactured within the region, and reduce the environmental impacts of transportation.

Glass contribution: Glazing products are eligible for this credit if the raw materials used in their manufacture were extracted within 500 miles of the project site, and final manufacture of the glazing product also took place within 500 miles of the project site. The distance varies in Canadian projects, depending on the method of transportation.

→ MATERIALS PARAGON IS SUPPLYING come FROM OVER 500 miles AWAY.

If only a fraction of the product meets the criteria, then that percentage, by weight, can contribute to the credit. The product is not eligible for the credit if only one of the two criteria is met.

Information you might be asked for: Whether your company manufactures, fabricates or installs glass products, you will be asked for the distance from the project site to the raw material extraction site and final manufacturing location.

Common misconceptions: The materials must be extracted and go through the final

manufacturing stage within 500 miles of the project site to be eligible for this credit. A product will not count towards this credit if only one of the two criteria is met.

One of the flaws in the LEED rating system is that this credit does not take into account where the materials go between these two points. For example, the raw material for glass may be extracted in New Jersey, shipped to Texas to be made into raw glass, shipped to the west coast of North America to be fabricated and then to New York to be insulated. If the building is in New York and the first and last points are within 500 miles of the project site, this would comply with the regulations, but clearly a situation like this would not be consistent with the original intent of the credit.

Indoor Environmental Quality: Credit 8.1: Daylight & Views: Daylight 75 percent of spaces (maximum 1 point for commercial projects, up to 3 points for schools)

Intent of the credit: To provide building occupants a connection between indoor spaces and the outdoors through the introduction of daylight into the regularly occupied areas of the building.

Glass contribution: This credit, along with IEQ 8.2, is the most pertinent credit to the glazing industry as it addresses the amount of daylight available to a building's occupants. When designing for maximum daylight, designers must evaluate and balance a number of environmental factors, such as heat gain and loss, glare control, visual quality and variations in daylight availability.

Information you might be asked for: The calculations are performed by the architect as part of modeling the daylighting strategy for the building. Manufacturers and fabricators may be asked to provide glazing properties such as visible light transmittance, solar heat gain, shading coefficient and R or U values to assist with the modeling calculations.

Common misconceptions: Glare control is the most common failure in daylighting strategies. If not managed properly, uncontrolled daylight can produce unwanted glare and affect interior lighting quality, as well as occupant comfort and productivity.

Some of the strategies that have been used to counteract the undesirable effects of natural daylight include the use of etched , fritted or light diffusing glazing, exterior or interior light shelves, fins, louvers, shades, and electronic or electrochromic glazing.

Indoor Environmental Quality: Credit 8.2: Daylight & Views: Views for 90% of Spaces (maximum 1 point)

Intent of the credit: To provide building occupants a connection to the outdoors through the introduction of views into the regularly occupied areas of the building.

Glass contribution: As in the previous credit, IEQ 8.1, this credit is the most applicable to the glazing industry. By using the many different types of glazing products available, architects can provide views to the outdoors not only at the perimeter of the building, but also into the interior through the use of open office designs and interior glazing.

Information you might be asked for: As in the previous credit, the overall daylighting strategy is performed by the architect when designing the building.

Common misconceptions: Despite the known benefits of using natural daylight in buildings, one clear downside is the likelihood of birds flying into the windows. It is estimated that up to 1 billion birds each year die in this way. To reduce the chance of these collisions, architects are incorporating exterior shading devices, etched or fritted patterns, or other visual markers to reduce the apparent overall transparency and reflectivity of exterior glazing.

Energy & Atmosphere: Credit 1: Optimize Energy Performance (up to 19 points for overall building performance, 21 points for commercial interiors)

Intent of the credit: To reduce impacts associated with increased energy use; reduce energy consumption in the building.

Glass contribution: This credit refers to strategies to optimize energy usage and performance. Four fundamental strategies are used to increase energy performance: reduce demand, harvest free energy, increase efficiency and recover waste energy. The use of glass in both the building envelope and interior components aids in harvesting site energy by increasing daylighting properties throughout the space and reducing the requirement for electric lighting.

Skylight and curtain-wall performance can be enhanced through the right combination of glass construction, tints and coatings. Adding decorative components to the glass surface also provides a measure of control to the light being introduced into each area. In addition, high performance glazing on the exterior of a building will increase the natural lighting while limiting the thermal effects of infrared energy and solar heat gain. This has the potential to generate

savings from lower energy use, smaller equipment requirements, as well as reduced space needs for mechanical and electrical equipment.

In addition, when performing energy modeling calculations, manually operated shading devices such as blinds or window shades are ineligible under this credit. The permanent application of coatings or the use of electronic or electrochromic glass allow for this type of solar control to be included in the calculations.

Information you might be asked for: The calculations are performed by the architect as part of modeling the energy strategy for the building. Manufacturers and fabricators may be asked to provide glazing properties such as visible light transmittance, solar heat gain, shading coefficient and R or U values to assist with the modeling calculations.

Indoor Environmental Quality: Credit 4.1: Low-Emitting Materials – Adhesives and Sealants (maximum 1 point)

Intent of the credit: To reduce the quantity of indoor air contaminants that affects the comfort and well-being of installers and occupants.

Glass contribution: All materials under the low-emitting credits refer to materials used inside the weatherproofing system and applied on-site. Glazing adhesives that are used in on-site installations must have a VOC content of 100 grams/liter (less water) to comply with the requirements of this credit.

Information you might be asked for: If this credit is being pursued, glazing contractors will be asked to provide the VOC content of any adhesives or sealants used in on-site installations.

Common misconceptions: Low- or no-VOC adhesives, paints, coatings or other materials that are factory applied, although more environmentally responsible, do not apply to this credit.

Also, Credit 4.2: Low-Emitting Materials – Paints and Coatings is not applicable for factory applied coatings.

Indoor Environmental Quality: Credit 9: Enhanced Acoustical Performance (for Schools only, not available in Canada, maximum 1 point)

Intent of the credit: To provide classrooms that facilitate better teacher-to-student and student-to-student communications through effective acoustical design.

Glass contribution: Many types of glass products are available in laminated, insulated, laminated insulated or double glazed form. The use of these types of glass products or systems allows for the combination of enhanced acoustical control with energy reduction, daylight harvesting, glare control and the introduction of views.

Information you might be asked for: Manufacturers, fabricators and glazing contractors might be asked to provide the STC (Sound Transmission Class) rating for specific glass make ups. The higher the rating, the more sound control the product offers.

Common misconceptions: Designers need to consider two areas of performance to meet the requirements of this credit: low background noise inside the learning space and sound isolation from noise sources outside the learning space. Both interior and exterior glazing products can be used to help meet these requirements.

Indoor Environmental Quality: Credit 6.1: Controllability of Systems - Lighting (maximum 1 point, not available for Core & Shell)

Intent of the credit: To provide a high level of lighting-system control by individual occupants or groups in multi-occupant spaces (i.e. classrooms or conference areas) and promote their productivity, comfort and well-being.

Glass contribution: This credit refers to adjustable lighting for individual tasks or in common areas. Glazing products can be used when integrating high reflectance surfaces and lighting design to create opportunities to reduce the number of installed lighting fixtures. Daylighting can be used within the interior lighting scheme to compensate for the reduced footcandle levels. When daylighting is used as a component of the lighting design, glare control is also necessary.

Information you might be asked for: Manufacturers and fabricators might be asked to provide glazing properties such as visible light transmittance, solar heat gain, shading coefficient, and R or U values to assist with the daylighting calculations.

Common misconceptions: The addition of individual controls may increase the initial costs of a project, but are expected to be offset by the energy savings from lower requirements for general lighting, a reduced heat load, as well as the number of installed fixtures. On the other hand, the abuse of personal controls, such as leaving task lights on, increase energy costs. It

is important to educate occupants on the design and function of the individual control system.

Indoor Environmental Quality: Credit 6.2: Controllability of Systems – Thermal Comfort (maximum 1 point)

Intent of the credit: To provide a high level of thermal-comfort system control by individual occupants or groups in multi-occupant spaces (i.e. classrooms or conference areas) and promote their productivity, comfort and well-being.

Glass contribution: This credit refers to adjustable comfort controls for building occupants to meet individual needs and preferences. Operable windows or louvers allow individual control over ventilation or temperature. Some temperature and lighting control can also be achieved by using electronic glazing products with individual manual controls.

Information you might be asked for: If electronic glazing is specified, manufacturers, fabricators and glazing contractors might be asked to provide the performance characteristics of the specified or alternate products.

Common misconceptions: The addition of individual controls might increase the initial costs of a building, but are expected to be offset by the energy savings from lower requirements for air-conditioning, natural ventilation and shading devices. As in Credit 6.1, the abuse of personal controls, such as setting thermostats too high or leaving windows open during non-working hours increase energy costs. It is important to educate occupants on the design and function of the individual control system.

Innovation in Design: Credit 1: Innovation in Design (maximum 5 points)

Intent of the credit: To allow design teams to achieve credits for exceptional performance above the LEED requirements and/or for innovative performance in areas not currently covered by the LEED system.

The idea behind this credit is that sustainable design comes from innovative strategies and thinking, and that recognition of the exceptional will spur further innovation.

Glass contribution: Innovative strategies must demonstrate a comprehensive approach and have significant, measurable environmental benefits. Innovative glass and glazing products or applications have the potential to be a part of an innovative strategy.

Information you might be asked for: The information required will depend on the glazing products being considered, but will likely be related to the performance characteristics of those products.

Common misconceptions: The guide states that "the level of effort involved in achieving an ID credit should be extraordinary. Installing a single green product or addressing a single aspect of a sustainability issue is not a sufficient level of effort."

To achieve ID credits, the project must achieve three basic criteria:

Demonstrate measurable performance improvements for environmental benefitBe a comprehensive strategy employed throughout the projectBe applicable to other projects.

The designer must also verify that the innovation is not a code requirement or industry standard practice.

In conclusion

There is more to the LEED rating system than the pursuit of recycled content and regional materials, although for most of us, that is what we see. The design and development stage of a building is where most of the planning, engineering and modeling happen that allow architects to combine existing building science with new technology and create more sustainable architecture.

As players in the glazing industry, we are going to be called upon to provide our expertise at one time or another. It's important that if we are going to be in this game, we understand the rules. Upgrading our skills and knowledge on this topic is critical to the future success of our companies. Also, reviewing our company's published LEED information to ensure we are not greenwashing our products will help the credibility of the whole industry.

No system that affects as many people, companies and industries will be without its flaws and controversial points. What the LEED Rating System does is provide a framework that gives us the opportunity to help construct buildings that can become truly sustainable, use less resources, create less waste and be places in which we want to live and work.

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