



## Decorative Division

### White Paper on the Relevance of Decorative Glass Products to the U. S. Green Building Council Leadership in Energy and Environmental Design Green Building Rating System™

#### LEED® – NC – Version 3

(with variations for USGBC LEED®–CI, CaGBC LEED®–NC & CaGBC LEED®–CI)

The intent of this White Paper is to address areas of the U.S. Green Building Council’s Leadership in Energy & Environmental Design (LEED®) Rating System that are relevant to the use of Decorative Glass. This document describes the ways in which decorative glass products are consistent with the intent of the LEED® Rating System. Although individual building products do not in themselves constitute conformance to the LEED® criteria, depending on the amount and type of glass used in a project, this versatile material has great potential to help achieve LEED® credits.

The information contained in this paper has been developed using general or typical information on various decorative glass products. More specific information and performance data can be obtained through individual manufacturers that produce decorative glass products. Please visit the Glass Association of North America website at [www.glasswebsite.com](http://www.glasswebsite.com) for a list of member companies and a description of the types of products that are produced by each.

Although decorative glass can be used on a project in many forms, it is critical that products conform to recognized standards to ensure the integrity of the building or space.

**Applicable Standards:** The standards listed below are the most applicable to the various decorative glass products contained in this document; however, this is not an exhaustive list. For the complete directory of ASTM Standards, visit [www.astm.org](http://www.astm.org).

- Flat glass products to comply with ASTM C 1036 *Standard Specification for Flat Glass*
- Heat treated glass products to comply with:
  - ASTM C 1048 *Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT, Coated and Uncoated Glass*
  - ASTM C 1652 *Standard Test Method for Measuring Optical Distortion in Flat Glass Products Using Digital Photography of Grids*

- ANSI Z97.1-2004 *American National Standards Institute (ANSI) American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test*
- CAN/CGSB -12.1-M90 Canadian General Standards Board (CGSB) *Tempered or Laminated Safety Glass*
- 16CFR1201, Category II U.S. Government Code of Federal Regulations Part 1201 - *Safety Standard for Architectural Glazing Materials*
- Laminated glass products to comply with:
  - ASTM C 1172 *Standard Specification for Laminated Architectural Flat Glass*
  - ANSI Z97.1-2004 *American National Standards Institute (ANSI) American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test*
  - CAN/CGSB -12.1-M90 Canadian General Standards Board (CGSB) *Tempered or Laminated Safety Glass*
  - 16CFR1201, Category II U.S. Government Code of Federal Regulations Part 1201 - *Safety Standard for Architectural Glazing Materials*
- Glass coated with ceramic (inorganic) coatings to comply with:
  - ASTM C 346 *Standard Test Method for 45-deg Specular Gloss of Ceramic Materials*
  - ASTM C 724 *Standard Test Method for Acid Resistance of Ceramic Decorations on Architectural-Type Glass*
  - ASTM C 1649 *Standard Practice for Instrumental Transmittance Measurement of Color for Flat Glass, Coated and Uncoated*
  - ASTM C 1650 *Standard Practice for Instrumental Reflectance Measurement of Color for Flat Glass, Coated and Uncoated*
  - ASTM D 523 *Standard Test Method for Specular Gloss*
- Glass coated with organic coatings to comply with:
  - ASTM D3359 *Standard Test Methods for Measuring Adhesion by Tape Test*
- Bent glass to comply with ASTM C 1464 *Standard Specification for Bent Glass*
- Mirror products to comply with ASTM C 1503 *Standard Specification for Silvered Flat Glass Mirror*
- Insulating glass units to comply with:
  - ASTM E 2188 *Standard Test Method for Insulating Glass Unit Performance*
  - ASTM E 2190 *Standard Test Method for Insulating Glass Unit Performance and Evaluation*

This document is intended to provide general information only. The Glass Association of North America does not make any warranty, either expressly or implied, as to the suitability or completeness of the information contained herein.

LEED® Category: *Energy and Atmosphere*

**Credit: EA Credit 1: Optimize Energy Performance**

LEED® Credit Range: 1–19 points (NC & Schools), 3 – 21 points (CS)

**Intent:** To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

**Requirements:** Select one of the three compliance path options described below. Project teams documenting achievement using any of the three options are assumed to be in compliance with EA Prerequisite 2: Minimum Energy Performance.

**Option 1 – Whole Energy Building Simulation (1–19 points for NC & Schools, 3 – 21 points for CS)**

Demonstrate a percentage improvement in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to Appendix G of ANSI/ ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) using a computer simulation model for the whole building project. Points are awarded for New Buildings, Existing Building Renovations, NC & Schools and Core & Shell as outlined in the table in the Reference Guide. All other credit criteria and compliance measures for this credit are described in detail in the LEED® Reference Guide for Green Building Design and Construction, 2009 Edition.

**Option 2 – Prescriptive Compliance Path: ASHRAE Advanced Energy Design Guide (1 point)**

Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide appropriate to the project scope, outlined in the LEED® Reference Guide for Green Building Design and Construction, 2009 Edition. Project teams must comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located.

PATH 1. ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004

The building must meet the following requirements:

- Less than 20,000 sq ft
- Office occupancy

PATH 2. ASHRAE Advanced Energy Design Guide for Small Retail Buildings 2006

The building must meet the following requirements:

- Less than 20,000 sq ft
- Retail occupancy

### PATH 3. ASHRAE Advanced Energy Design Guide for Small Warehouses and Self Storage Buildings 2008

The building must meet the following requirements:

- Less than 50,000 sq ft
- Warehouse or self-storage occupancy

Schools. Option 2. Prescriptive Compliance Path: Advanced Energy Design Guide for K–12 School Buildings (1 point)

Comply with all the prescriptive measures identified in the Advanced Energy Design Guide for K–12 School buildings.

- Projects using Option 2 must be less than 200,000 square feet.

### **Option 3 – Prescriptive Compliance Path: Advanced Buildings™ Core Performance™ Guide (1–3 points)**

Comply with the prescriptive measures identified in the Advanced Buildings™ Core Performance™ Guide developed by the New Buildings Institute. The building must meet the following requirements:

- Less than 100,000 sq ft
- Comply with Section 1: Design Process Strategies, and Section 2: Core Performance Requirements
- Health care, warehouse or laboratory projects are ineligible for the path (for NC & CS Projects)

Points achieved under Option 3 (1 point):

- 1 point is available for all projects (office, school, public assembly and retail projects) less than 100,000 sq ft that comply with Sections 1 and 2 of the Core Performance Guide
- Up to 2 additional points are available to projects that implement performance strategies listed in Section 3: Enhanced Performance. For every 3 strategies implemented from this section, 1 point is available
- The following strategies are addressed by other aspects of LEED® and are not eligible for additional points under EA Credit 1:
  - 3.1 – Cool Roofs
  - 3.8 – Night Venting
  - 3.13 – Additional Commissioning

**Exemplary Performance:** Option 1. Projects that use Option 1 and demonstrate a percentage improvement in the proposed building performance rating compared with the baseline building performance rating per ASHRAE 90.1-2007 by the following minimum energy cost savings percentages will be considered for 1 additional point under the Innovation in Design category:

- New buildings: 50%
- Existing Building Renovation: 46%

Options 2 & 3 – Not available under the Innovation in Design category.

**USGBC LEED®–CI Variation: EQ Credit 1 is split into categories as follows:**

**EQ Credit 1.1: Optimize Energy Performance: Lighting Power (1–5 points)**

**EQ Credit 1.2: Optimize Energy Performance: Lighting Controls (1–3 points)**

**EQ Credit 1.3: Optimize Energy Performance: HVAC (5–10 points)**

**EQ Credit 1.4: Optimize Energy Performance: Equipment & Appliances (1–4 points)**

**CaGBC LEED®–NC Variation: (1–10 points)**

**CaGBC LEED®–CI Variation: EQ Credit 1 is split into categories as follows:**

**EQ Credit 1.1: Optimize Energy Performance: Lighting Power (1–3 points)**

**EQ Credit 1.2: Optimize Energy Performance: Lighting Controls (1 point)**

**EQ Credit 1.3: Optimize Energy Performance: HVAC (1–2 points)**

**EQ Credit 1.4: Optimize Energy Performance: Equipment & Appliances (1–2 points)**

### **Decorative 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, Low E and other solar control types of glass 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.

Furthermore, when performing energy modeling calculations manually operated shading devices such as blinds or window shades are ineligible under this credit. The permanent application of decorative techniques allow for this type of solar control to be included in the calculations.

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Reduce solar heat gain through exterior glazing parameters and reduce energy use.	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Digital ceramic images</li> <li>• Decorative laminated glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Exterior glazing insulating units in conjunction with low-e or reflective glass</li> <li>• Exterior vision glazing with patterns</li> <li>• Exterior fins/sunshades</li> <li>• Operable louvers</li> </ul>
Maximize daylight harvesting to reduce the requirement for electric light	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• U-channel</li> <li>• Bent glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Atria</li> <li>• Skylights</li> <li>• Clerestory glazing</li> <li>• Courtyards</li> <li>• Energy efficient exterior glazing</li> </ul>
Provide glare control to increase lighting quality	<ul style="list-style-type: none"> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Translucent coatings</li> <li>• Decorative film applications</li> <li>• Silkscreened designs in ceramic enamels or organic coatings</li> </ul>	<ul style="list-style-type: none"> <li>• Interior sun shading</li> <li>• Interior glazing / partitions</li> <li>• Light shelves</li> <li>• Light redirecting glazing</li> <li>• Glass furniture components</li> </ul>
Reduce energy required for ventilation by providing demand control natural ventilation	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Translucent coatings</li> <li>• Decorative film applications</li> </ul>	<ul style="list-style-type: none"> <li>• Operable windows</li> </ul>
Provide interior components to increase the daylight penetration deeper into the space	<ul style="list-style-type: none"> <li>• Fused, slumped or cast glass</li> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Stained glass</li> <li>• Textured / pattern glass</li> <li>• Bent glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Glass stairways and flooring</li> <li>• Glass railings and balustrades</li> <li>• Interior glazing / partitions</li> <li>• Furniture components</li> <li>• Demountable partitions or sliding walls</li> </ul>

LEED® Category: Materials and Resources

**Credit: MR Credit 4.1: Recycled Content – 10% (post-consumer + ½ pre-consumer)**

LEED® Credit Range: 1 point

**Credit: MR Credit 4.2: Recycled Content – 20% (post-consumer + ½ pre-consumer)**

LEED® Credit Range: 1 additional point

**Intent:** Increase demand for building products that incorporate recycled content materials, thereby reducing impacts resulting from extraction and processing of virgin materials.

**Requirements:** Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (or 20%) (based on cost) of the total value of the materials in the project.

**Exemplary Performance:** Project teams may earn an Innovation in Design credit for exemplary performance by achieving a total recycled-content value of 30% or more.

**USGBC LEED®–CI Variation: None**

**CaGBC LEED®–NC Variation:**

**MR Credit 4.1: Recycled Content: 7.5% (post-consumer + ½ post-industrial)**

**MR Credit 4.2: Recycled Content: 15% (post-consumer + ½ post-industrial)**

**Intent:** Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and greenhouse gas-intensive industrial and manufacturing processes.

**CaGBC LEED®–CI Variation:**

**MR Credit 4.1: Recycled Content: 7.5% (post-consumer + ½ post-industrial)**

**MR Credit 4.2: Recycled Content: 15% (post-consumer + ½ post-industrial)**

**Intent:** Increase demand for building products that incorporate recycled content materials, therefore reducing impacts resulting from extraction and processing of new virgin materials and by-passing energy and greenhouse gas-intensive industrial and manufacturing processes.

**Decorative Glass Contribution** – Although float glass manufacturers typically use 20% 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 specifically excluded for credit. Some decorative glass manufacturers and glass artists, however, use recycled glass in their own product offerings. Consult with your decorative glass supplier to determine if this credit is applicable to their products.

Although LEED® Credits do not apply, some types of decorative glass are completely recyclable at the end of their useful life if not previously contaminated with glazing materials. Examples of this are clear and cast glass, satin etch and glass silkscreened with ceramic enamels or with digital ceramic images

applied. Laminated glass, mirror and some other types of coatings are not recyclable. Interested parties are encouraged to contact their local recycling facilities for information on the recyclability of specific products.

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Provide interior finishings made from recycled glass	<ul style="list-style-type: none"> <li>• Fused or slumped glass</li> <li>• Cast glass</li> <li>• Decorative glass tiles</li> </ul>	<ul style="list-style-type: none"> <li>• Feature walls</li> <li>• Glass counter tops / desk tops</li> <li>• Glass art installations</li> <li>• Furniture components</li> <li>• Doors and windows</li> <li>• Demountable partition systems</li> </ul>



LEED® Category: *Indoor Environmental Quality*

**Credit: IEQ Credit 6.1: Controllability of Systems: Lighting (not available for CS)**

LEED® Credit Range: 1 point

**Intent:** 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.

**Requirements:** Provide individual lighting controls for 90% (minimum) of the building occupants to enable adjustments to suit individual task needs and preferences.

AND

Provide light system controllability for all shared multi-occupant spaces to enable adjustments that meets group needs and preferences.

**Exemplary Performance:** This credit is not eligible for exemplary performance under the Innovation in Design section.

**USGBC LEED®–CI Variation: None**

**CaGBC LEED®–NC Variation:**

**EQ Credit 6.1: Controllability of Systems: Perimeter Spaces**

**EQ Credit 6.2: Controllability of Systems: Non-Perimeter Spaces**

**Intent:** Provide a high level of thermal, ventilation and lighting system control by individual occupants or specific groups in multi-occupant spaces (i.e. classrooms or conference areas) to promote the productivity, comfort and well-being of building occupants.

**Requirements: EQ Credit 6.1:** Provide at least an average of one operable window and one lighting control zone per 18.5m<sup>2</sup> (200 ft<sup>2</sup>) for all regularly occupied areas within 5m (15 ft) of the perimeter wall.

**Requirements: EQ Credit 6.2:** Provide controls for each individual for airflow, temperature and lighting for at least 50% of the occupants in non-perimeter, regularly occupied areas.

**CaGBC LEED®–CI Variation: None**

**Decorative Glass Contribution:** This credit refers to adjustable lighting for individual tasks or in common areas. Integration of surface materials selection (i.e. high reflectance surfaces) and lighting design may create opportunities to reduce the number of installed lighting fixtures. Daylighting can be integrated within the ambient 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.

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Provide high reflectance surfaces to coordinate with lighting design	<ul style="list-style-type: none"> <li>• Laminated glass with decorative interlayers</li> <li>• Glass coated with ceramic enamels or organic coatings</li> <li>• Back painted glass</li> <li>• Decorative mirror</li> <li>• Acid etched mirror</li> </ul>	<ul style="list-style-type: none"> <li>• Laminated glass ceiling tiles with diffused or light colored interlayers (90% or greater reflectivity)</li> <li>• Light colored glass wall cladding</li> <li>• Interior light shelves</li> </ul>
Provide glare control as a component of daylighting strategy	<ul style="list-style-type: none"> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Translucent coatings</li> <li>• Decorative film applications</li> <li>• Silkscreened designs in ceramic enamels or organic coatings</li> </ul>	<ul style="list-style-type: none"> <li>• Interior sun shading</li> <li>• Interior partitions</li> <li>• Light shelves</li> <li>• Light redirecting glazing</li> <li>• Exterior fins / canopies / sun shading</li> <li>• Acid etched rear projection screens</li> <li>• Doors and windows</li> <li>• Demountable partition systems</li> </ul>
Provide interior components to increase the daylight penetration deeper into the space	<ul style="list-style-type: none"> <li>• Fused, slumped or cast glass</li> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• Bent glass</li> <li>• Stained glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Glass stairways and flooring</li> <li>• Glass railings and balustrades</li> <li>• Interior glazing / partitions</li> <li>• Furniture components</li> <li>• Interior doors</li> </ul>

LEED® Category: *Indoor Environmental Quality*

**Credit: IEQ Credit 8.1: Daylight & Views: Daylight 75% of Spaces**

LEED® Credit Range: 1–2 points (NC & CS), 1–3 points (Schools)

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

**Requirements:**

**Option 1: Simulation–** Demonstrate through computer simulations that 75% or more of all regularly occupied spaces achieve daylight illuminance levels of a minimum of 25 footcandles (fc) and a maximum of 500 fc in a clear sky condition on September 21 at 9 a.m. and 3 p.m.; areas with illuminance levels below or above the range do not comply. However, design that incorporate view-preserving automated shades for glare control may demonstrate compliance for only the minimum 25 fc illuminance level.

**Option 2: Prescriptive–**

For the Side-lighting daylight zone:

- Achieve a value, calculated as the product of the visible light transmittance (VLT) and window-to-floor area ratio (WFR) of daylight zone 0.150 and 0.180. The window area included in the calculation must be at least 30 inches above the floor.
- The ceiling must not obstruct a line in section that joins the window-head to a line on the floor that is parallel to the plane of the window; is twice the height of the window-head above the floor in, distance from the plane of the glass as measured perpendicular to the plane of the glass.
- Provide sunlight redirection and/or glare control devices to ensure daylight effectiveness.

For Top-lighting Daylight Zone:

- The daylight zone under a skylight is the outline of the opening beneath the skylight, plus in each direction the lesser of:
  - 70% of the ceiling height, OR
  - ½ the distance to the edge of the nearest skylight, OR
  - The distance to any permanent opaque partition (if transparent show VLT) that is farther than 70% of the distance between the top of the partition and the ceiling.
- Achieve skylight roof coverage between 3% and 6% of the roof area with a minimum 0.5 VLT.
- The distance between the skylights must not be more than 1.4 times the ceiling height.
- A skylight diffuser, if used, must have a measured haze value of greater than 90% when tested according to STM D1003. Avoid direct line of sight to the skylight diffuser.

**Option 3: Measurement–** Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and shall be recorded on building floor plans.

Only the square footage associated with the portions of rooms or spaces meeting the minimum illumination requirements may be counted in the calculations.

For all projects pursuing this option, provide daylight redirection and/or glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by daylight will be considered on their merits.

**Option 4: Combination**– Any of the above calculation methods may be combined to document the minimum daylight illumination in at least 75% of all regularly occupied spaces. The different methods used in each space must be clearly recorded on all building plans.

In all cases, only the square footage associated with the portions of rooms or spaces meeting the requirements can be applied toward the total area calculation required to qualify for this credit.

In all cases, provide glare control devices to avoid high-contrast situations that could impede visual tasks. Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

A well-designed daylight building is estimated to reduce lighting energy use by 50 to 80%. (Sustainable Building Technical Manual, chapter IV.7, page 90).

**Exemplary Performance:** (NC & CS) This credit may be eligible for exemplary performance under the Innovation in Design section if the project achieves 95% daylighting based on the credit requirements and guidelines. (Schools) This credit may be eligible for exemplary performance under the Innovation in Design section if the project achieves daylighting for 90% of all classrooms and 95% daylighting in all other regularly occupied non-classroom spaces based on the credit requirements and guidelines.

**USGBC LEED® Variation – Schools:**

Classroom Spaces	Points
75%	1
90%	2

OR

75% of all other regularly occupied spaces (1 additional point). Project teams can achieve a point for these other spaces only if they have also achieved at least 1 point for classroom spaces.

**USGBC LEED®–CI Variation – Schools:**

Classroom Spaces	Points
75%	1
90%	2

CaGBC LEED®–NC Variation: None

CaGBC LEED®–CI Variation: None

**Decorative Glass Contribution:** This credit addresses the availability of daylight 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.

Decorative glass can be used in a variety of applications and help achieve LEED® credits by increasing the daylight factor within a building. By using glass to provide the connection between indoor occupants and the outdoors, building designers can also offer the added benefits of a low maintenance product and superior sound control. Many decorative techniques can also be used as glare control or to vary the degree of light transmission, making decorative glass a versatile material for use in floors, walls, ceilings, and furniture, as well as in the more traditional doors and windows.

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Maximize daylight harvesting to provide the connection between indoor spaces and the outdoors	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• Channel glass</li> <li>• Bent glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Atria</li> <li>• Skylights</li> <li>• Clerestory glazing</li> <li>• Courtyards</li> <li>• Energy efficient exterior glazing</li> <li>• Interior glazing / partitions</li> <li>• Doors and windows</li> </ul>
Reduce heat gain/loss through exterior glazing parameters and reduce energy use	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> </ul>	<ul style="list-style-type: none"> <li>• Low E or reflective exterior glazing</li> <li>• Exterior vision glazing with silkscreened patterns</li> <li>• Exterior fins / sunshades</li> <li>• Operable louvers</li> <li>• Exterior light shelves</li> </ul>
Provide interior components to increase daylight factor	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Textured / pattern glass</li> <li>• Bent glass</li> </ul>	<ul style="list-style-type: none"> <li>• Interior light shelves</li> <li>• Light redirecting glazing</li> <li>• High reflectance ceiling or wall tiles</li> <li>• Interior glazing / partitions</li> <li>• Conference room and office walls with privacy decoration that still allows light penetration</li> <li>• Interiors doors</li> <li>• Demountable partitions or sliding walls</li> </ul>
Provide interior components to increase the daylight penetration	<ul style="list-style-type: none"> <li>• Fused, slumped or cast glass</li> <li>• Silkscreened designs in ceramic</li> </ul>	<ul style="list-style-type: none"> <li>• Glass stairways and flooring</li> <li>• Glass railings and balustrades</li> </ul>

deeper into the space	<p>enamels or organic coatings</p> <ul style="list-style-type: none"> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Stained glass</li> <li>• Textured / pattern glass</li> <li>• Bent glass</li> </ul> <p>Acid etched glass</p>	<ul style="list-style-type: none"> <li>• Interior glazing / partitions</li> <li>• Furniture components</li> <li>• Interior doors</li> <li>• Demountable partitions or sliding walls</li> </ul>
Provide glare control to increase lighting quality	<ul style="list-style-type: none"> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Translucent coatings</li> <li>• Decorative film applications</li> <li>• Silkscreened designs in ceramic enamels or organic coatings</li> </ul>	<ul style="list-style-type: none"> <li>• Interior sun shading</li> <li>• Interior glazing / partitions</li> <li>• Light shelves</li> <li>• Louvers</li> <li>• Light redirecting glazing</li> <li>• Glass furniture components</li> <li>• Exterior sun shading / fins</li> <li>• Acid etched rear projection screens</li> <li>• Demountable partitions or sliding walls</li> <li>• Doors and windows</li> </ul>
Reduce the incidents of bird collisions with exterior glazing	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic coatings</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Decorative film applications</li> <li>• Sandblasted/carved glass</li> <li>• Textured / pattern glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Exterior sun shading / fins</li> <li>• Exterior vision glazing with silkscreened patterns</li> <li>• Exterior glazing with reduced apparent transparency and reflectivity through decorative techniques</li> </ul>

LEED® Category: Indoor Environmental Quality

**Credit: IEQ 8.2: Daylight & Views: Views for 90% of Spaces**

LEED® Credit Range: 1 point

**Intent:** Provide building occupants a connection to the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

**Requirements:** Achieve a direct line of sight to the outdoor environment via vision glazing between 30 inches and 90 inches above the finish floor for building occupants in 90% of all regularly occupied areas. Determine the area with direct line of sight by totaling the regularly occupied square footage that meets the following criteria:

- In plain view, the area is within sight lines drawn from perimeter vision glazing.
- In section view, a direct sight line can be drawn from the area to perimeter vision glazing.

The line of sight may be drawn through interior glazing. For private offices, the entire square footage of the office may be counted if 75% or more of the area has direct line of sight to perimeter vision glazing. For classrooms and other multi-occupant spaces, the actual square footage with a direct line of sight to perimeter vision glazing is counted.

Additional requirement for Core & Shell: The core and shell design must incorporate a feasible tenant layout(s) per the default occupancy counts (or some other justifiable occupancy count) that can be used in the analysis of this credit.

**Exemplary Performance:** Exemplary performance may be demonstrated for this credit by meeting 2 of the following 4 measures:

1. 90% or more of regularly occupied spaces have multiple lines of sight to vision glazing in different directions at least 90 degrees apart.
2. 90% or more of regularly occupied spaces have views that include views of at least 2 of the following 3 options: 1) vegetation, 2) human activity, or 3) objects at least 70 feet from the exterior of the glazing.
3. 90% or more of regularly occupied spaces have access to unobstructed views located within the distance of 3 times the head height of the vision glazing.
4. 90% or more of regularly occupied spaces have access to views with a view factor of 3 or greater.

**USGBC LEED®-CI Variation: IEQ Credit 8.2: Daylight & Views: Views for Seated Spaces.**

**Section View Requirement: In section view, a direct sight line can be drawn from a point 42 inches above the floor (typical seated eye height) to perimeter vision glazing.**

**CaGBC LEED®–NC Variation: Additional requirements:**

- Areas directly connected to perimeter windows must have a glazing-to-floor area ratio of at least 0.07.
- For multi-occupant spaces, if the view area of any applicable room exceeds 90%, the entire square footage of the room can be counted.
- Parts of the floor area with horizontal view angles of less than 10° at 1.27m (50”) above the floor cannot be included in this calculation.
- Areas not directly connected to perimeter windows must have a horizontal view angle of at least 10° at 1.27m (50”) above the floor involving 50% or more of the floor area. If a room meets these requirements then the entire room area is considered to meet the view requirement.

**CaGBC LEED®–CI Variation:**

**EQ Credit 8.2: Daylight & Views: Daylight for 90% of Spaces:** Follow the requirements for EQ Credit 8.1 for a minimum of 90% of regularly occupied spaces.



Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Use glass to provide the connection between indoor occupants and the outdoors.	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• U-channel</li> <li>• Bent glass</li> </ul>	<ul style="list-style-type: none"> <li>• Atria</li> <li>• Skylights</li> <li>• Clerestory glazing</li> <li>• Courtyards</li> <li>• Energy efficient exterior glazing</li> <li>• Doors and windows</li> </ul>
Develop indoor green spaces and incorporate glass components to increase viewing area.	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• Bent glass</li> </ul>	<ul style="list-style-type: none"> <li>• Atria</li> <li>• Skylights</li> <li>• Clerestory glazing</li> <li>• Courtyards</li> <li>• Energy efficient exterior glazing</li> <li>• Interior doors</li> </ul>
Utilize interior glazing to increase areas with a direct line of sight to the outdoors, adding decorative components to reduce glare and add a measure of privacy.	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• Bent glass</li> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Translucent coatings</li> <li>• Decorative film applications</li> <li>• Stained glass</li> </ul>	<ul style="list-style-type: none"> <li>• Glass stairways and flooring</li> <li>• Glass railings and balustrades</li> <li>• Interior glazing / partitions</li> <li>• Furniture components</li> <li>• Glass signage</li> <li>• Interior doors</li> <li>• Demountable partitions or sliding walls</li> </ul>
Provide colors, textures and patterns applied to glass to bring the effect of nature into the building's interior increasing overall satisfaction of occupants with their work environment.	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Textured / pattern glass</li> <li>• Back painted glass</li> <li>• Fused, slumped and cast glass</li> <li>• Stained glass</li> <li>• Acid etched mirror</li> </ul>	<ul style="list-style-type: none"> <li>• Atria</li> <li>• Skylights</li> <li>• Clerestory glazing</li> <li>• Courtyards</li> <li>• Glass stairways and flooring</li> <li>• Glass railings and balustrades</li> <li>• Interior glazing / partitions</li> <li>• Furniture components</li> <li>• Glass wall cladding</li> <li>• Demountable partitions or sliding walls</li> <li>• Interior doors and door inserts</li> </ul>

LEED® Category: Indoor Environmental Quality

**Credit: IEQ 9: Enhanced Acoustical Performance (for Schools only)**

LEED® Credit Range: 1 point

**Intent:** To provide classrooms that facilitates better teacher-to-student and student-to-student communications through effective acoustical design.

**Requirements:**

Sound Transmission

Design the building shell, classroom partitions and other core learning space partitions to meet the Sound Transmission Class (STC) requirements of ANSI Standard S12.60-2002, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools, except windows, which must meet an STC rating of at least 35.

AND

Background Noise

Reduce background noise level to 40 dBA or less from heating, ventilating and air conditioning (HVAC) systems in classrooms and other core learning spaces.

Exemplary Performance: This credit may be eligible for exemplary performance under the Innovation in Design section if the project achieves an outdoor background noise level of 55 dBA for playgrounds and 60 dBA for athletic fields and all other schools grounds, or an indoor noise level of 35 dBA.

**USGBC LEED®—CI Variation: N/A**

**CaGBC LEED®—NC Variation: N/A**

**CaGBC LEED®—CI Variation: N/A**

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

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Increase the STC rating of exterior glass to mask exterior background noise.	Double glazed, insulating or laminated glass containing: <ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative interlayers</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• Acid etched glass</li> </ul>	<ul style="list-style-type: none"> <li>• Skylights</li> <li>• Clerestory glazing</li> <li>• Energy efficient exterior glazing</li> <li>• Doors and windows</li> </ul>
Increase the STC rating of interior glass to mask both interior and exterior background noise.	Double glazed, insulating or laminated glass containing: <ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative interlayers</li> <li>• Digital ceramic images</li> <li>• Textured / pattern glass</li> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Translucent coatings</li> <li>• Decorative film applications</li> </ul>	<ul style="list-style-type: none"> <li>• Clerestory glazing</li> <li>• Courtyards</li> <li>• Interior glazing / partitions</li> <li>• Furniture components</li> <li>• Glass wall cladding</li> <li>• Interior doors and door inserts</li> <li>• Demountable partitions or sliding walls to separate instructional areas</li> </ul>

## POTENTIAL ID CREDITS

LEED® Category: *Innovation in Design*

### **Credit: ID 1: Innovation in Design**

LEED® Credit Range: 1–5 points (1–4 points for Schools)

**Intent:** To provide design teams and projects the opportunity to achieve exceptional performance above the requirements set by the LEED® Green Building Rating System and/or innovative performance in Green Building categories not specifically addressed by the LEED® Green Building Rating System.

**Requirements:** Credit can be achieved through any combination of the paths below:

PATH 1. Innovation in Design (1–5 points for NC & CS, 1–4 points for Schools) in the LEED® 2009 for New Construction and Major Renovations, LEED® 2009 for Core and Shell Development, or LEED® 2009 for Schools Rating System.

One point is awarded for each innovation achieved. No more than 5 points (for NC & CS) and 4 points (for Schools) under IDc1 may be earned through PATH 1 – Innovation in Design.

Identify the following in writing:

- The intent of the proposed innovation credit.
- The proposed requirement of compliance.
- The proposed submittals to demonstrate compliance.
- The design approach (strategies) used to meet the requirements.

PATH 2. Exemplary Performance (1–3 points)

Achieve exemplary performance in an existing LEED® 2009 for Schools prerequisite or credit that allows exemplary performance as specified in the LEED® Reference Guide for Green Building Design & Construction, 2009 Edition. An exemplary performance point may be earned for achieving double the credit requirements and/or achieving the next incremental percentage threshold of an existing credit in LEED®.

One point is awarded for each exemplary performance achieved. No more than 3 points under IDc1 may be earned through PATH 2 – Exemplary Performance.

**USGBC LEED®–CI Variation: None**

**CaGBC LEED®–NC Variation: 1 – 4 points available**

**CaGBC LEED®–CI Variation: 1 – 4 points available**

**Potential ID Credit #1:**

LEED® Category: *Indoor Environmental Quality*

**Credit: ID 1: Innovation in Design**

LEED® Credit Range: 1 point

**Intent:** Reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants.

**Requirement:** Develop a comprehensive strategy to reduce VOC levels by selecting items such as materials, furniture, maintenance coatings and others that introduce low- or no-VOC's and that meet or exceed the South Coast Air Management District Rule 1113. Demonstrate extensive use of these products and verify that their use is not a code requirement or industry standard practice.

**Decorative Glass Contribution:** The intent of this credit is to limit VOC's in the building through the selection of materials, furniture, maintenance coatings and other items that are not covered by IEQ Credit 4.1–4.4. Decorative glass offers many products that have factory applied coatings with no VOC's. The use of decorative glass in place of walls, doors, floors, ceilings and furniture provides a wide range of design options with no VOC's being introduced into the site. Unlike drywall or millwork, decorative glass products need no repainting, refinishing or similar maintenance which eliminates VOC's and irritating fumes from periodic maintenance. Glass coatings contain no hazardous content and do not generate hazardous waste during construction unlike solvent-based paints and adhesives. They also require no hazardous materials to clean up after installation or during maintenance.

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Replacement of traditional building materials	<ul style="list-style-type: none"><li>• Silkscreened designs in ceramic enamels or organic inks</li><li>• Decorative laminated glass</li><li>• Digital ceramic images</li><li>• Acid etched glass</li><li>• Sandblasted/carved glass</li><li>• Textured / pattern glass</li><li>• Back painted glass</li><li>• Fused, slumped and cast glass</li><li>• Stained glass</li><li>• Decorative mirror</li><li>• Acid etched mirror</li></ul>	<ul style="list-style-type: none"><li>• Glass stairways and flooring</li><li>• Glass railings and balustrades</li><li>• Interior glazing / partitions</li><li>• Furniture components</li><li>• Glass wall cladding</li><li>• Glass signage</li><li>• Elevator cab interiors</li><li>• Glass canopies</li><li>• Feature walls</li><li>• Demountable partitions or sliding walls</li><li>• Glass counter tops / desk tops</li><li>• Doors and door inserts</li><li>• Ceiling tiles</li><li>• Operable windows &amp; louvers</li></ul>

**Potential ID Credit #2:**

**Intent:** To build a comprehensive, interactive educational program within the LEED® certified building to demonstrate and promote the use of sustainable building features and practices.

**Decorative Glass Contribution:** An educational outreach program could include features such as a visitor’s center, interactive display or video, comprehensive signage program or built-in windows to view the energy saving components of the building. The durability, design flexibility and low maintenance properties of decorative glass make this a valuable material to use for protecting or enhancing the features of the space or to impart information through signage and exhibits.

Potential Strategies Involving Decorative Glass	Types of Decorative Glass	Possible Applications
Use decorative glass signage to illustrate the sustainable design features within the building	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Acid etched glass</li> <li>• Sandblasted/carved glass</li> <li>• Decorative film applications</li> <li>• Back painted glass</li> <li>• Fused, slumped and cast glass</li> </ul>	<ul style="list-style-type: none"> <li>• Decorative glass signage</li> <li>• Wayfinding components</li> </ul>
Use decorative glass screens mounted in the walls or floors to impart information as well as protect interactive displays, televisions or computer screens.	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Decorative film applications</li> <li>• Back painted glass</li> </ul>	<ul style="list-style-type: none"> <li>• Decorative glass signage</li> <li>• Wayfinding components</li> <li>• Glass screens mounted in the floors or walls</li> <li>• Exhibit features</li> </ul>
Incorporate built-in windows to view the energy saving mechanical equipment or other “green” components of the building	<ul style="list-style-type: none"> <li>• Silkscreened designs in ceramic enamels or organic inks</li> <li>• Decorative laminated glass</li> <li>• Digital ceramic images</li> <li>• Sandblasted/carved glass</li> <li>• Decorative film applications</li> </ul>	<ul style="list-style-type: none"> <li>• Viewing windows that contain information/ instruction on the components being viewed</li> </ul>

LEED® Category: *Regional Priority*

**Credit: RP 1: Regional Priority**

LEED® Credit Range: 1–4 points

**Intent:** To provide an incentive for the achievement of credits that address geographically specific environmental priorities.

**Requirements:** Earn 1–4 of the 6 Regional Priority credits identified by the USGBC regional councils and chapters as having environmental importance for a project’s region. A database of Regional Priority credits and their geographic applicability is available on the USGBC website; <http://www.usgbc.org>.

One point is awarded for each Regional Priority credit achieved; no more than 4 credits identified as Regional Priority credits may be earned. Projects outside of the U.S. are not eligible for Regional Priority credits.

**Understanding Regional Priority Credits:** RPCs are not new LEED® credits, but instead are existing credits that USGBC chapters and regional councils have identified as being particularly important for their areas. The incentive to achieve the credits is in the form of a bonus point. If an RPC is earned, then a bonus point is awarded to the project’s total points.

Project teams do not need to attempt these credits in addition to the existing LEED® credits they are attempting. Upon project registration, LEED® Online automatically determines a project’s RPCs based on its ZIP code. If a project earns an RPC, it will also earn the associated bonus point.

For more information and a complete list of RPCs available by ZIP code, visit the USGBC website at <http://www.usgbc.org>.