

LEED® V4 Impact Analysis



LEED® v4 Impact Analysis™

Section I	PRODUCT IDENTIFICATION
Product Name	Solatube Daylighting Systems
Manufacturer	Solatube International Inc 2110 Oak Ridge Way Vista, CA 92081
Section II	PRODUCT DESCRIPTION
	<p>Solatube Daylighting Systems utilize proprietary breakthrough technology, design and materials to capture the most daylight throughout the day to naturally illuminate any interior space. Product lines include:</p> <ul style="list-style-type: none"> > Brighten Up® Series (Solatube 160 DS and 290 DS Daylighting Systems) ideal for smaller spaces in both residential and commercial applications > Solamaster® Series (Solatube 330 DS-C and DS-O Daylighting Systems and 750 DS-C and DS-O Systems) designed specifically for commercial buildings > SkyVault Series® (SkyVault M74 DS) designed for large volume spaces with high, open ceilings and the > Solatube SmartLED Daylighting System (160 SL) designed mostly for small and residential applications.
Section III	LEED CONTRIBUTION STATEMENT
	<p>While products are not awarded points by the LEED rating system, they can contribute to achievement of LEED credits. This LEED Analysis summarizes the impacts of Solatube Daylighting Systems and the Solatube Daylight Dimmer to the following LEED Rating Systems:</p> <ul style="list-style-type: none"> > LEED for Building Design and Construction (BD+C) > LEED for Operations and Maintenance (O+M) > LEED for Interior Design and Construction (ID+C)
Section IV	MARKET SECTOR ADAPTATIONS
	<p>LEED v4 represents five major rating system, supporting 21 different building types (or market sector adaptations) expanding the LEED rating systems to more diverse project applications. With the 2009 rating system, LEED began to address the unique needs of specific building types. LEED v4 expands upon previous work to address the specific and unique needs of particular space types. These needs might be driven by occupants a facility serves, regulatory requirements or unique resource needs. By recognizing the unique need of specific space types, LEED removes barriers, moving us closer to market transformation.</p> <p>LEED v4 provides solutions for new and existing data centers, new and existing warehouses and distribution centers, hospitality, existing schools, existing retail, and midrise residential buildings.</p> <ul style="list-style-type: none"> > LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers > LEED O+M: Existing Buildings, Data Centers, Warehouses and Distribution Centers, Hospitality, Schools, Retail > LEED ID+C: Commercial Interiors, Retail, Hospitality

Integrative Process

<p>Integrative Process</p>	<p>Intent To support high-performance, cost-effective project outcomes through an early analysis of the interrelationships among systems.</p>
	<p>Product Impact Statement The inclusion of Solatube Daylighting Systems in a project's early Discovery and Schematic Design phases can contribute to the integrated planning and design in order to optimize the performance and interrelatedness of a building's systems.</p>
<p>Rating Systems: BD+C v4 ID+C v4 Not applicable for v2009 rating systems except as a Pilot credit under Innovation</p>	<p>Contribution Calculation There are no calculations associated with documenting the Integrative Process credit.</p>
	<p>Requirements See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.</p> <p><u>LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers</u> 1 POINT - Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses described below to inform the owner's project requirements (OPR), basis of design (BOD), design documents, and construction documents as they pertain to Energy-Related and Water-Related Systems.</p> <p>For Energy-Related Systems, requirements are described below:</p> <p>DISCOVERY: Perform a preliminary "simple box" energy modeling analysis before the completion of schematic design that explores how to reduce energy loads in the building and accomplish related sustainability goals by questioning default assumptions. Assess at least two potential strategies associated with the following:</p> <ul style="list-style-type: none"> > Site conditions > Massing and orientation > Basic envelope attributes > Lighting levels > Thermal comfort ranges > Plug and process load needs > Programmatic and operational parameters <p>IMPLEMENTATION: Document how the above analysis informed design and building form decisions in the project's OPR and BOD and the eventual design of the project, including the following, as applicable: building and site program, building form and geometry, building envelope and façade treatments on different orientations, elimination and/or significant downsizing of building systems (e.g., HVAC, lighting, controls, Exterior materials, interior finishes, and functional program elements); and other systems.</p>
<p>Available Points: 1-2</p>	<p><u>LEED ID+C: Commercial Interiors, Retail, Hospitality</u> Site Selection and Energy-Related Systems (1 point) Starting in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses described below to inform the owner's project requirements (OPR), basis of design (BOD), design documents, and construction documents. Conduct analyses in site selection and energy-related systems (1 point). An additional point is available for including water-related systems in early planning. For Energy-Related Systems, requirements are described below:</p>

DISCOVERY: Perform a preliminary energy analysis before the completion of schematic design that explores how to reduce energy loads for the interior design project and accomplish related sustainability goals by questioning default assumptions and testing options. Assess at least two potential options associated with each of the following in terms of project and human performance:

- > Basic envelope attributes
- > Programmatic and operational parameters
- > Lighting levels
- > Thermal comfort ranges
- > Plug and process load needs

IMPLEMENTATION: Document how the above analysis informed interior design decisions in the project's OPR and BOD and the interior design of the project, including the following, as applicable: building envelope and façade conditions, elimination and/or significant downsizing of building systems (e.g., HVAC, lighting, controls, exterior materials, interior finishes, functional program elements), methods planned to gather feedback on energy performance and occupants' satisfaction during operations.

Sustainable Sites

Heat Island Reduction

Rating Systems:

BD+C v4

O+M v4

ID+C v4

BD+C v2009

O+M v2009

ID+C v2009

Possible 2 points, 1 point
for Roof Heat Island
Reduction

Intent

To minimize effects on microclimates and human and wildlife habitats by reducing heat islands.

Product Impact Statement

Solatube Daylighting Systems are installed with penetrations on the roof surface. When calculating the total square footage of the roof area for the purposes of calculating heat island reduction, mechanical systems roof penetrations, as well as area for accessing equipment, are exempt from the total area.

Contribution Calculation

Heat Island reduction for roof areas is calculated as a percentage of roof surface that is adequately reflective - $\text{SF reflective roof} / \text{total roof SF}$. When calculating total roof area, use the following equation: $\text{Roof area} - \text{mechanical equipment} - \text{area of solatubes on roof} - \text{access area} = \text{total roof SF}$.

Requirements

See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.

LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Healthcare, Hospitality, Warehouse and Distribution Centers, Data Centers

LEED O+M: Existing Buildings, Data Centers, Warehouses and Distribution Centers, Hospitality, Schools, Retail

LEED ID+C: Commercial Interiors, Retail, Hospitality

LEEDv2009 Rating Systems

For all rating systems, heat island reduction is calculated the same.

For LEEDv4 rating systems, the following criteria are assessed:

- Use roofing materials that have an SRI equal to or greater than the values in Table 1. Meet the three-year aged SRI value. If three-year aged value information is not available, use materials that meet the initial SRI value
- Use Initial SRI of 82 or 3-year aged SRI of 64 or higher, for low-sloped roof surfaces $\leq 2:12$ slope
- Use initial SRI of 39 or 3-year aged SRI of 32 or higher, for steep-sloped roof surfaces $\geq 2:12$ slope

For LEEDv2009 rating systems, the following criteria are assessed:

- Use Initial SRI of 78 or higher, for low-sloped roof surfaces $< 2:12$ slope
- Use initial SRI of 29 or higher, for steep-sloped roof surfaces $> 2:12$ slope

Sustainable Sites

<p>Tenant Design and Construction Guidelines:</p>	<p>Intent To educate tenants in implementing sustainable design and construction features in their tenant improvement build-outs.</p>
<p>Rating Systems: BD+C v4 BD+C v2009</p>	<p>Product Impact Statement Solatube Daylighting Systems reduce energy demand by enabling buildings to harvest free light: through daylight harvesting the electricity demand and electricity cost for interior lighting are reduced. Additionally, Solatube Daylighting Systems effectively control solar heat gain, allowing occupants to benefit from natural lighting without sacrificing thermal comfort or increasing the buildings cooling load. When generating Tenant Construction and Design Guidelines, consider suggesting or providing daylighting for all future tenant fit-outs.</p>
<p>Possible 1 point</p>	<p>Contribution Calculation The use of Solatubes can contribute to many of the credits and prerequisites required for the tenant guidelines, including Minimum Energy Performance and Daylight.</p> <hr/> <p>Requirements See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.</p> <hr/> <p><u>LEED BD+C: Core and Shell (v4 and v2009)</u> Publish for tenants an illustrated document with the following content, as applicable:</p> <p>Provide a description of the sustainable design and construction features incorporated in the core and shell project and the project’s sustainability goals and objectives, including those for tenant spaces.</p> <p>Provide recommendations, including examples, for sustainable strategies, products, materials, and services.</p> <p>And provide information that enables a tenant to coordinate space design and construction with the building systems when pursuing the following LEED v4 for Commercial Interiors prerequisites and credits:</p> <ul style="list-style-type: none"> - WE Prerequisite: Indoor Water-Use Reduction - WE Credit: Indoor Water-Use Reduction - EA Prerequisite: Minimum Energy Performance - EA Prerequisite: Fundamental Refrigerant Management - EA Credit: Optimize Energy Performance - EA Credit: Advanced Energy Metering - EA Credit: Renewable Energy Production - EA Credit: Enhanced Refrigerant Management - EQ Prerequisite: Minimum Indoor Air Quality Performance - EQ Credit: Construction Indoor Air Quality Management Plan - EQ Credit: Indoor Air Quality Assessment - EQ Credit: Enhanced Indoor Air Quality Strategies - EQ Credit: Interior Lighting - EQ Credit: Thermal Comfort - EQ Credit: Daylight - EQ Credit: Quality Views - EQ Prerequisite: Environmental Tobacco Smoke Control - EQ Credit: Low-Emitting Interiors - EQ Credit: Acoustic Performance - MR Prerequisite: Storage and Collection of Recyclables <p>Provide the guidelines to all tenants before signing the lease.</p>

Energy and Atmosphere

<p>Fundamental Commissioning and Verification</p>	<p>Intent To support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.</p>
<p>Rating Systems: BD+C v4 ID+C v4</p>	<p>Product Contribution Statement Commissioning in LEED v4 requires envelope commissioning as per NIBS Guideline 3-2012 for Exterior Enclosures, which includes any installations of Solatube Daylighting Systems.</p>
<p>Prerequisite</p>	<p>Contribution Calculation There are no calculations associated with all steps involved in fundamental commissioning. Consider infiltration and solar heat gain as early as development of owners project requirements (OPR) and basis of design (BOD). The envelope must be covered in the OPR and BOD, but full envelope commissioning is not required unless the project team pursues EA Credit Enhanced Commissioning, Option 2.</p> <hr/> <p><u>LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers</u></p> <p>Complete the following commissioning (Cx) process activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies, in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R Systems, as they relate to energy, water, indoor environmental quality, and durability.</p> <p>Requirements for exterior enclosures are limited to inclusion in the owner's project requirements (OPR) and basis of design (BOD), as well as the review of the OPR, BOD and project design. NIBS Guideline 3-2012 for Exterior Enclosures provides additional guidance. Project teams must also prepare and maintain a current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently.</p> <hr/> <p><u>LEED ID+C: Commercial Interiors, Retail, Hospitality</u></p> <p>Complete the following commissioning (Cx) process activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies, in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R Systems, as they relate to energy, water, indoor environmental quality, and durability.</p> <p>Requirements for exterior enclosures are limited to inclusion in the owner's project requirements (OPR) and basis of design (BOD), as well as the review of the OPR, BOD and project design. NIBS Guideline 3-2012 for Exterior Enclosures provides additional guidance. Project teams must also prepare and maintain a current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently.</p>

Energy and Atmosphere

Enhanced Commissioning

Rating Systems:

BD+C v4

ID+C v4

Available Points: 1-6

Intent

To further support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.

Product Contribution Statement

Commissioning in LEED v4 requires envelope commissioning as per NIBS Guideline 3-2012 for Exterior Enclosures, which includes any installations of Solatube Daylighting Systems as part of the building envelope.

Contribution Calculation

There are no calculations associated with all steps involved in enhanced commissioning. Commissioning authority must complete commissioning process activities for the building's thermal envelope in accordance with NIBS 3-2012 and ASHRAE Guideline 0-2005 as they relate to energy, water, indoor environmental quality, and durability.

Requirements

See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.

LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers

Implement, or have in place a contract to implement, the following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification.

The commissioning authority (CxA) must have documented commissioning process experience on at least two building projects with a similar scope of work. The experience must extend from early design phase through at least 10 months of occupancy; The CxA may be a qualified employee of the owner, an independent consultant, or a disinterested subcontractor of the design team.

Option 1. Enhanced systems commissioning (3-4 points)

Path 1: Enhanced commissioning (3 points)

Complete the following commissioning process (CxP) activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability.

The commissioning authority must complete the following steps: review contractor submittals, verify inclusion of systems manual requirements in construction documents, verify inclusion of operator and occupant training requirements in construction documents, verify systems manual updates and delivery, verify operator and occupant training delivery and effectiveness, verify seasonal testing, review building operations 10 months after substantial completion, develop an on-going commissioning plan, include all enhanced commissioning tasks in the OPR and BOD.

OR

Path 2: Enhanced and monitoring-based commissioning (4 points)

Achieve Path 1 and develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems. Include the procedures and measurement points in the commissioning plan. Update the systems manual with any modifications or new settings, and give the reason for any modifications from the original design.

AND/OR

Option 2. Envelope commissioning (2 points)

Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's thermal envelope in addition to mechanical and electrical systems and assemblies.

Complete the following commissioning process (CxP) activities for the building's thermal envelope in accordance with ASHRAE Guideline 0–2005 and the National Institute of Building Sciences (NIBS) Guideline 3–2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.

Commissioning authority must complete the following:

- > Review contractor submittals.
- > Verify inclusion of systems manual requirements in construction documents.
- > Verify inclusion of operator and occupant training requirements in construction documents.
- > Verify systems manual updates and delivery.
- > Verify operator and occupant training delivery and effectiveness.
- > Verify seasonal testing.
- > Review building operations 10 months after substantial completion.
- > Develop an on-going commissioning plan.

LEED ID+C: Commercial Interiors, Retail, Hospitality

Option 1. Enhanced Commissioning (4 points)

Projects must complete the following commissioning process (CxP) activities for mechanical, electrical, domestic hot water, and renewable energy systems and assemblies in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability.

- > Review contractor submittals.
- > Include systems manual requirements in construction documents.
- > Include operator and occupant training requirements in construction documents.
- > Verify systems manual updates and delivery.
- > Verify operator and occupant training delivery and effectiveness.
- > Verify seasonal testing.
- > Review building operations 10 months after substantial completion.
- > Develop an on-going commissioning plan

Option 2 - Monitoring-Based Commissioning (5 points)

Achieve Option 1 in addition to the development of monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems.

Materials and Resources

Construction and Demolition Waste Management Planning	Intent To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.
Rating Systems: BD+C v4 ID+C v4 Not applicable for v2009 rating systems	Product Impact Statement The inclusion of Solatube Daylighting Systems in a project's early phases can help in planning for waste management throughout the construction process. An understanding of Solatube Daylighting System components and installation can assist with management of any waste generated, and its diversion from the landfill or incineration facility.
Prerequisite	Contribution Calculation There are no calculations associated with documenting this prerequisite.
	Requirements See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.
	<u>LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers</u>
	<u>LEED ID+C: Commercial Interiors, Retail, Hospitality</u> Develop and implement a construction and demolition waste management plan: <ul style="list-style-type: none"> - Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. approximate a percentage of the overall project waste that these materials represent. - Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the materials will be taken and how the recycling facility will process the material. Provide a final report detailing all major waste streams generated, including disposal and diversion rates.

Materials and Resources

Construction and Demolition Waste Management	Intent To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.
Rating Systems: BD+C v4 ID+C v4 BD+Cv2009 ID+Cv2009	Product Impact Statement The inclusion of Solatube Daylighting Systems in a project's early phases can help in planning for waste management throughout the construction process. An understanding of Solatube Daylighting System components and installation can assist with management of any waste generated, and its diversion from the landfill or incineration facility.
Possible 2 points	Contribution Calculation The volume of waste generated from the installation of a Solatube Daylighting System should be included in the total volume of waste, when calculating diversion rates.
	Requirements See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.
	<u>LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers</u>
	<u>LEED ID+C: Commercial Interiors, Retail, Hospitality</u> Recycle and/or salvage nonhazardous construction and demolition materials. Calculations can be by weight or volume but must be consistent throughout.
	OPTION 1. diversion (1-2 points) - Path 1. divert 50% and three material streams (1 point) Divert at least 50% of the total construction and demolition material; diverted materials must include at least three material streams. - Path 2. divert 75% and four material streams (2 points) Divert at least 75% of the total construction and demolition material; diverted materials must include at least four material streams.
	OPTION 2. reduction of total waste material (2 points) Do not generate more than 2.5 pounds of construction waste per square foot (12.2 kilograms of waste per square meter) of the building's floor area.

Indoor Environmental Quality

<p>Construction Indoor Air Quality Management</p>	<p>Intent To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.</p>
	<p>Product Impact Statement The inclusion of Solatube Daylighting Systems in a project is part of the total construction process. As with all installations, care should be taken to prevent trapping contaminants and dust in the newly created indoor environments. When installing Solatube Daylighting Systems, all criteria for Indoor Air Quality Management should be followed.</p>
<p>Rating Systems: BD+C v4 ID+C v4 BD+Cv2009 ID+Cv2009</p> <p>Facilities Renovation and O+Mv2009</p> <p>Possible 1 point</p>	<p>Contribution Calculation There are no calculations associated with documenting this credit.</p>
	<p>Requirements See usgbc.org/credits for more credit or prerequisite details and any addenda as applicable.</p>
	<p><u>LEED BD+C: New Construction and Major Renovations, Core and Shell, Schools, Retail, Healthcare, Data Centers, Hospitality, Warehouse and Distribution Centers</u></p> <p><u>LEED ID+C: Commercial Interiors, Retail, Hospitality</u></p> <p>Develop and implement an indoor air quality (IAQ) management plan for the construction and preoccupancy phases of the building. The plan must address all of the following.</p> <p>During construction, meet or exceed all applicable recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.</p> <p>Protect absorptive materials stored on-site and installed from moisture damage.</p> <p>Do not operate permanently installed air-handling equipment during construction unless filtration media with a minimum efficiency reporting value (MERV) of 8, as determined by ASHRAE 52.2–2007, with errata (or equivalent filtration media class of F5 or higher, as defined by CEN Standard EN 779–2002, Particulate Air Filters for General Ventilation, Determination of the Filtration Performance, [East Asia ACP: Construction IAQ Equivalent]), are installed at each return air grille and return or transfer duct inlet opening such that there is no bypass around the filtration media. Immediately before occupancy, replace all filtration media with the final design filtration media, installed in accordance with the manufacturer’s recommendations.</p> <p>Prohibit the use of tobacco products inside the building and within 25 feet (8 meters) of the building entrance during construction.</p>

LEED O+M: Existing Buildings v2009

Develop and implement an IAQ management plan for the construction and occupancy phases:

- During construction, meet or exceed the recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

- If the building undergoes a tenant improvement, develop and implement an IAQ management plan for the preoccupancy phases. Perform a flush-out procedure as follows:

After construction ends and all interior finishes have been installed, install new filtration media and flush out the affected space. The flush out must be done by supplying a total outdoor air volume of 14,000 cubic feet per square foot of floor area while maintaining an internal temperature of at least 60° F and maintaining a relative humidity no higher than 60% where cooling mechanisms are operated. The affected space may be occupied only after the delivery of at least 3,500 cubic feet of outdoor air per square foot of floor area and the space has been ventilated at a minimum rate of 0.30 cfm per square foot of outdoor air or the design minimum outside air rate (whichever is greater) for at least 3 hours prior to occupancy until the total of 14,000 cubic feet per square foot of outdoor air has been delivered to the space. The flush-out may continue during occupancy.

- Protect stored on-site or installed absorptive materials from moisture damage.

- If permanently installed air-handlers must be used during construction, filtration media must be used at each return air grille, and must meet one of the following criteria below. Replace all filtration media immediately prior to occupancy.

1. Filtration media has a minimum efficiency reporting value (MERV) of 8, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda).
2. Equivalent filtration media Class F5 or higher, as defined by CEN Standard EN 779-2002, Particulate air filters for general ventilation, Determination of the filtration performance.
3. Equivalent filtration media with a minimum dust spot efficiency of 30% and greater than 90% arrestance on a particle size of 3–10 µg.