

## LEED Building Design and Construction

### Activity #4 – Sustainable Sites (SS)

Before completing this Activity Read: Reference Guide for Building Design and Construction v4 – Pages 136-255

Note the following abbreviations are used in this activity:

NC	LEED BD+C: New Construction and Major Renovation
CS	LEED BD+C: Core and Shell Development
S	LEED BD+C: Schools
R	LEED BD+C: Retail
DC	LEED BD+C: Data Centers
WDC	LEED BD+C: Warehouses and Distribution Centers
HOS	LEED BD+C: Hospitality
HC	LEED BD+C: Healthcare

Although the LEED BD+C reference guide does not number the LEED prerequisites and credits, for this exercise they have been numbered in the order presented in the credit category.

#### Fill-In, Multiple Choice, Matching

1. Test your knowledge of how well you know the names of the credits for the Sustainable Sites (SS) credit category:

LEED BD+C: NC, CS, S, R, DC, WDC, HOS, HC	
Credit	Name
P1	Construction Activity Pollution Prevention
C1	Site Assessment
C2	Site Development - Protect or Restore Habitat
C3	Open Space
C4	Rainwater Management
C5	Heat Island Reduction
C6	Light Pollution Reduction
LEED BD+C: Core and Shell Development	
C7	Tenant Design and Construction Guidelines
LEED BD+C: Schools	
P2	Environmental Site Assessment
C7	Site Master Plan
C8	Joint Use of Facilities
LEED BD+C: Healthcare	
P2	Environmental Site Assessment
C7	Places of Respite
C8	Direct Exterior Access

2. Match the intent shown below to the prerequisite or credit:

**LEED BD+C: NC, CS, S, R, DC, WDC, HOS, HC**

Credit	ANS
SS – P1	K
SS – C1	A
SS – C2	H
SS – C3	L
SS – C4	E
SS – C5	D
SS – C6	G
<b>LEED BD+C: CS</b>	
SS – C7	I
<b>LEED BD+C: S</b>	
SS – P2	B
SS – C7	M
SS – C8	F
<b>LEED BD+C: HC</b>	
SS – P2	B
SS – C7	J
SS – C8	C

	INTENT
A	To assess site conditions before design to evaluate sustainable options and inform related decisions about site design.
B	To protect the health of vulnerable populations by ensuring that the site is assessed for environmental contamination and that any environmental contamination has been remediated.
C	To provide patients and staff with the health benefits associated with direct access to the natural environment.
D	To minimize effects on microclimates and human and wildlife habitats by reducing heat islands.
E	To reduce runoff volume and improve water quality by replicating the natural hydrology and water balance of the site, based on historical conditions and undeveloped ecosystems in the region.
F	To integrate the school with the community by sharing the building and its playing fields for nonschool events and functions.
G	To increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people.
H	To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.
I	To educate tenants in implementing sustainable design and construction features in their tenant improvement build-outs.
J	To provide patients, staff, and visitors with the health benefits of the natural environment by creating outdoor places of respite on the healthcare campus.
K	To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust.
L	To create exterior open space that encourages interaction with the environment, social interaction, passive recreation, and physical activities.
M	To ensure that the sustainable site benefits achieved by the project continue, regardless of future changes in programs or demographics.

3. Rainwater runoff carries such pollutants as oil, sediment, chemicals, and lawn fertilizers directly to streams and rivers, where they contribute to eutrophication and harm aquatic ecosystems and species.
4. Abbreviation      Name  
BUG                      backlight-uplight-glare
5. SS Prerequisite Construction Activity Pollution Prevention requirements:  
Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2012 U.S. Environmental Protection Agency (EPA) Construction General Permit or local equivalent, whichever is more stringent. Projects must apply the CGP regardless of size. The plan must describe the measures implemented.
6. Abbreviation      Name  
ESC                      Erosion Sedimentation Control
7. List the three objectives that the Erosion and Sedimentation (ESC) plan must accomplish:
1. control Soil Erosion
  2. Sedimentation
  3. airborne dust
8. To ensure that all projects implement erosion and sedimentation control (ESC) measures during construction, LEED applies a U.S.-based national standard, the U.S. Environmental Protection Agency (EPA) Construction general permit (CGP).
9. Local jurisdictions typically look to this standard when writing their own code requirements and adopt ESC measures that are applicable to local soils, weather, natural waterway, and municipal rainwater systems.
10. The Civil engineer is typically responsible for developing an erosion and sedimentation control (ESC) plan, but in some cases, the landscape architect, project hydrologist, geologist, earthwork contractor, or general contractor will undertake the plan's development.
11. Projects within the U.S. should determine whether the local jurisdiction requires an official Construction General Permit (CGP) based on the National Pollutant Discharge Elimination System (NPDES) program criteria.
12. Projects already using the CGP thus have a Streamline path to compliance.
13. The establishment and maintenance of ESC measures are generally the responsibility of the general contractor or builder.
14. Inspections must be recorded regularly via date-stamped photographs, inspection reports, or other recording processes.
15. Whether they follow the CGP or a local equivalent, all projects must meet the requirements outlined in the CGP, Section 2:  
Section 2.1, erosion and sedimentation control  
Providing natural buffers  
Installing perimeter controls

Minimizing sediment track-out  
Controlling discharges from stockpiled sediment or soil  
Minimizing dust  
Minimizing the disturbance of steep slopes  
Preserving topsoil  
Minimizing soil compaction  
Protecting storm drain inlets  
Maintaining control measures

Section 2.2, stabilization

Deadlines for initiating and completing stabilization  
Criteria for stabilization

Section 2.3, pollution prevention

Prohibited discharges  
General maintenance requirements  
Pollution prevention standards  
Emergency spill notification  
Fertilizer discharge restrictions

16. Track implementation of the ESC plan by keeping written records or date-stamped photographs. A narrative description of ESC plan implementation should include the following:  
Timing of the implementation of the plan  
Specific control measures applied on site  
Maintenance protocols used to ensure the proper function of control measures
17. SS Prerequisite Environmental Site Assessment applies to Schools and Healthcare.
18. SS Prerequisite Environmental Site Assessment requires:  
Conduct a Phase I Environmental Site Assessment as described in ASTM E1529-05 (or a local equivalent) to determine whether environmental contamination exists at the site. If contamination is suspected, conduct a Phase II Environmental Site Assessment as described in ASTM E1903-11 (or a local equivalent).  
  
If a site is contaminated, remediate the site to meet local, state, or national environmental protection agency region residential (unrestricted) standards, whichever are most stringent.
19. Abbreviation      Name  
ESA                      Environmental Site Assessment
20. ASTM Standard E1529-05, Section 4.8, considers a Phase I ESA valid for 180 days.
21. If a Phase I ESA is more than one year old, a new assessment is required.
22. EPA's residential (unrestricted) use standards represent the most rigorous level of cleanup; local equivalent standards must have a similar level of rigor. After remediation, land use must be suitable for residential, school, or hospital use.
23. A Phase I environmental site assessment (ASTM E1527-05) is a nonintrusive survey that identifies potential or existing site contamination.

24. A Phase II ESA (ASTM E1903-11) involves collection and testing soil, soil vapor, groundwater, and building material samples to determine whether and how much contamination exists on the site.
25. SS Credit Site Assessment requires:  
Complete and document a site survey or assessment that includes the following information:
- Topography. Contour mapping, unique topographic features, slope stability risks.
  - Hydrology. Flood hazard areas, delineated wetlands, lakes, streams, shorelines, rainwater collection and reuse opportunities, TR-55 initial water storage capacity of the site (or local equivalent for projects outside the U.S.).
  - Climate. Solar exposure, heat island effect potential, seasonal sun angles, prevailing winds, monthly precipitation and temperature ranges.
  - Vegetation. Primary vegetation types, greenfield area, significant tree mapping, threatened or endangered species, unique habitat, invasive plant species.
  - Soils. Natural Resources Conservation Service soils delineation, U.S. Department of Agriculture prime farmland, healthy soils, previous development, disturbed soils (local equivalent standards may be used for projects outside the U.S.).
  - Human Use. Views, adjacent transportation infrastructure, adjacent properties, construction materials with existing recycle or reuse potential.
  - Human Health effects. Proximity of vulnerable populations, adjacent physical activity opportunities, proximity to major sources of air pollution.
26. The survey or assessment should demonstrate the relationships between the site features and topics listed above and how these features influenced the project design; give the reasons for not addressing any of those topics.
27. Performing a site assessment is part of an integrative design process that incorporates a site's ecological and historical contexts.
28. List the information that the assessment team should collect:
1. climate data
  2. topographical maps
  3. nearby building types
  4. soil survey data
29. Plan to complete the assessment before conceptual design starts because the findings will inform the location and orientation of major program elements.
30. List the information that should be documented for the project site's trees:
1. Size
  2. Species
  3. health
  4. root structure
  5. shade potential
31. The site inventory should include such man-made features as buildings, roads, pathways, and existing infrastructure.

32. List the high, low, and average monthly climate indicators:

1. Temperature
2. Relative Humidity

33. List examples of unique or significant topographical features that could be found on a site:

1. rock outcroppings
2. irregular topography
3. direction of overland water flows

34. A sustainable approach to rainwater management involves finding ways to harvest it on site for irrigation and other water uses, create beneficial water features, prevent rainwater overflows, and recharge the groundwater and aquifers.

35. List the environmental services of site vegetation:

1. rainwater management
2. filtration
3. groundwater recharge
4. soil structure
5. soil organic matter
6. erosion prevention
7. carbon storage
8. oxygen production

36. List the site vegetation whose location and type must be inventoried:

1. significant trees
2. invasive plants
3. threatened or endangered species

37. Healthy soils allow natural rainwater infiltration, which helps prevent runoff, sedimentation, erosion, and flooding. Soils also aid in cleaning, storing, and recharging groundwater.

38. Document the previous, current, and future known uses surrounding the site to establish a context for human use. Include the location and condition of on-site buildings and infrastructure.

39. Research indicates that the natural environment plays a very important role in human health and well-being.

40. Identify opportunities for physical activity on or adjacent to the site, such as trails, playgrounds, athletic fields, and gyms.

41. View corridors, transportation infrastructure, and adjacent properties, for example, may indicate the best orientation of buildings.

42. Technical Release (TR) 55 an approach to hydrology in which watersheds are modeled to calculate storm runoff volume, peak rate of discharge, hydrographs, and storage volumes, developed by the former USDA Soil Conservation Service

43. SS Credit Site Development – Protect or Restore Habitat requirements:

Preserve and protect from all development and construction activity 40% of the greenfield area on the site (if such areas exist).

AND

Option 1. On-Site Restoration (2 points except Healthcare, 1 point Healthcare)

Using native or adapted vegetation, restore 30% (including the building footprint) of all portions of the site identified as previously developed. Projects that achieve a density of 1.5 floor-area ratio may include vegetated roof surfaces in this calculation if the plants are native or adapted, provide habitat, and promote biodiversity.

Restore all disturbed or compacted soils that will be revegetated within the project's development footprint to meet the following requirements:

- Soils (imported and in-situ) must be reused for functions comparable to their original function.
- Imported topsoils or soil blends designed to serve as topsoil may not include the following: soils defined regionally by the Natural Resources Conservation Service web soil survey (or local equivalent for projects outside the U.S.) as prime farmland, unique farmland, or farmland of statewide or local importance; or soils from other greenfield sites, unless those soils are a byproduct of a construction process.
- Restored soil must meet the criteria of reference soils in categories 1–3 and meet the criteria of either category 4 or 5:
  1. organic matter;
  2. compaction;
  3. infiltration rates;
  4. soil biological function; and
  5. soil chemical characteristics.

Project teams may exclude vegetated landscape areas that are constructed to accommodate rainwater infiltration from the vegetation and soils requirements, provided all such rainwater infiltration areas are treated consistently with SS Credit Rainwater Management.

Schools only

Dedicated athletic fields that are solely for athletic uses are exempted from the soil restoration criteria. These areas may not count toward the minimum required area.

OR

Option 2. Financial Support (1 point)

Provide financial support equivalent to at least \$0.40 per square foot (US\$4 per square meter) for the total site area (including the building footprint).

Financial support must be provided to a nationally or locally recognized land trust or conservation organization within the same EPA Level III ecoregion or the project's state (or within 100 miles of the project [160 kilometers] for projects outside the U.S.). For U.S. projects, the land trust must be accredited by the Land Trust Alliance.

44. Greenfields are areas that have not been previously developed, graded, or disturbed and that support (or could support) open space, habitat, or natural hydrology.
45. Building vertically can significantly reduce a building footprint while increasing site density.
46. If the project meets the floor-area ratio (FAR) density minimum, vegetated roofs may be considered part of the restored area (see Further Explanation, Vegetated Roofs).
47. Restoration must use native or adapted vegetation.
48. List examples of uses that disturb soil:
1. Heavy wheeled traffic
  2. previous grading
  3. compacted dirt roads
  4. equipment storage areas
  5. parking
49. Lawns (turf grasses) qualify as adapted vegetation only if they are able to survive without mowing, fertilization, pesticides, and irrigation.
50. Any Wetland damaged or destroyed as a result of construction must be rebuilt or remediated.
51. If the density of the project and the roof vegetation meet the credit requirements, the vegetated roof may be counted toward the overall restored area calculation.
52. List the characteristics of compost that could be used to enhance the site soil's ability to support vegetation:
1. A carbon to nitrogen ratio below 25:1
  2. Low pollutant concentrations
  3. NO weed seeds
53. Samples must be taken from soils that are disturbed or compacted and will be revegetated. (Soils that will not be revegetated can be excluded from the test.)
54. List examples of documentation narratives:
1. Removal and Storage of Topsoil and Duff
  2. Grading and Slope Shaping
  3. Soil loosening
  4. Soil amendments and Fertilizer
  5. Soil Stabilization
  6. Soil Reuse
55. Exemplary Performance
- Option 1. Double the 30% restoration requirement (restore at least 60%).
- Option 2. Double the financial donation requirement (provide at least \$0.80 per square foot or \$8.00 per square meter).



56. SS Credit Open Space requirements:

Provide outdoor space greater than or equal to 30% of the total site area (including building footprint). A minimum of 25% of that outdoor space must be vegetated (turf grass does not count as vegetation) or have overhead vegetated canopy.

The outdoor space must be physically accessible and be one or more of the following:

a pedestrian -oriented paving or turf area with physical site elements that accommodate outdoor social activities;

a recreation -oriented paving or turf area with physical site elements that encourage physical activity;

a garden -space with a diversity of vegetation types and species that provide opportunities for year-round visual interest;

a garden -space dedicated to community -gardens or urban food production;

preserved or created habitat that meets the criteria of SS Credit Site Development—Protect or Restore Habitat and also includes elements of human interaction.

For projects that achieve a density of 1.5 floor-area ratio (FAR), and are physically accessible, extensive or intensive vegetated roofs can be used toward the minimum 25% vegetation requirement, and qualifying roof-based physically accessible paving areas can be used toward credit compliance.

Wetlands or naturally designed ponds may count as open space if the side slope gradients average 1:4 (vertical : horizontal) or less and are vegetated.

For projects that are part of a multitenant complex only

Open space can be either adjacent to the building or at another location in the site master plan. The open space may be at another master plan development site as long as it is

protected from development. If the open space is not adjacent to the building, provide documentation showing that the requirements have been met and the land is in a natural state or has been returned to a natural state and conserved for the life of the building.

57. List the environmental benefits of open spaces:

1. habitat creation
2. linked habitat corridors in urban areas
3. increased rainwater infiltration
4. reduced heat island effect

58. List examples of open spaces with qualities that support the environmental goals of SS Credit Open Space:

1. community gardens
2. vegetated roofs
3. preserved habitats with learning opportunities
4. gardens that provide visual interest all year long

59. Turf areas, including areas of turf grass under overhead tree canopies, can be counted in total open space but do not qualify as vegetated open space.

60. Extensive or intensive Vegetated roofs can be used toward the minimum 25% vegetation requirement. Vegetated roof area can also be counted as open space if it is accessible to the building occupants and the project has a density of 1.5 FAR or greater. Roofs can be either extensive or intensive systems.

61. Design open spaces for the specific project location. For example, a xeriscape area might be appropriate in arid locations.

62. Artificial turf does not count as vegetation or hardscape.

63. SS Credit Rainwater Management requirements:

Option 1. Percentile of Rainfall Events

Path 1. 95 th Percentile (2 points except Healthcare, 1 point Healthcare)

In a manner best replicating natural site hydrology processes, manage on site the runoff from the developed site for the 95 th percentile of regional or local rainfall events using low-impact development (LID) and green infrastructure.

Use daily rainfall data and the methodology in the U.S. Environmental Protection Agency (EPA) Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act to determine the 95 th percentile amount.

Or

Path 2. 98 th Percentile (3 points except Healthcare, 2 points Healthcare)

Achieve Path 1 but for the 98 th percentile of regional or local rainfall events, using LID and green infrastructure.

Or

Path 3. Zero Lot Line projects only—85th Percentile (3 points except Healthcare, 2 points Healthcare)

The following requirement applies to zero lot line projects in urban areas with a minimum density of 1.5 FAR. In a manner best replicating natural site hydrology processes, manage on site the runoff from the developed site for the 85 th percentile of regional or local rainfall events, using LID and green infrastructure.

OR

Option 2. Natural Land Cover Conditions (3 points except Healthcare, 2 points Healthcare)

Manage on site the annual increase in runoff volume from the natural land cover condition to the postdeveloped condition.

Projects that are part of a multitenant complex only

The credit requirements may be met using a coordinated approach affecting the defined project site that is within the master plan boundary. Distributed techniques based on a watershed approach are then required.

64. Conventional site development disrupts natural hydrological systems and watersheds through impervious drainage surfaces, soil compaction, loss of vegetation, and loss of natural patterns.

65. Abbreviation

Name

GI

Green Infrastructure

LID

low-impact Development

66. Rainwater is treated as a resource rather than a waste product.

67. Collect at least 10 years of historical rainfall data, or as much historical data as possible from all seasons to account for seasonal variability.
68. Calculate the total volume of runoff (in cubic feet or cubic meters) corresponding to the 95 th percentile of rainfall events for the site in its postdeveloped condition.
69. Runoff volume depends on the specific postdeveloped site conditions of the project, such as amount of paving, permeability of different surfaces, roof area, and vegetated areas.
70. List methods for managing the total runoff volume:
1. infiltration
  2. evapotranspiration
  3. capture and reuse
71. The typical zero lot line project is an urban site for which the building footprint aligns with the site limits and the LEED project boundary.
72. Calculate the average density of the area within a 1/4-mile (400-meter) radius of the project building. If the density, expressed in terms of floor-area ratio (FAR) is less than 1.5, the project is ineligible for the zero lot line path.
73. Exemplary Performance, Manage 100% of rainwater that falls within the project boundary.
74. SS Credit Heat Island Reduction requirements:  
Choose one of the following options:

Option 1. Nonroof and Roof (2 points except Healthcare, 1 point Healthcare)

Meet the following criterion:

Complete the Equation:

Area of Nonroof Measures	+	Area of High- Reflectance Roof	+	Area of Vegetated Roof	+ ≥	Total Site Paving Area	+	Total Roof Area
<u>0.5</u>		<u>0.75</u>		<u>0.75</u>				

Alternatively, an SRI and SR weighted average approach may be used to calculate compliance.

Use any combination of the following strategies.

#### Nonroof Measures

Use the existing plant material or install plants that provide shade over paving areas (including playgrounds) on the site within 10 years of planting. Install vegetated planters. Plants must be in place at the time of occupancy permit and cannot include artificial turf.

Provide shade with structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.

Provide shade with architectural devices or structures that have a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation.

Provide shade with vegetated structures.

Use paving materials with a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation.

Use an open-grid pavement system (at least 50% unbound).

#### High-Reflectance Roof

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.

Complete Table 1. Minimum solar reflectance index value, by roof slope

	Slope	Initial SRI	3-year aged SRI
Low-sloped roof	≤ 2:12	82	64
Steep-slope roof	> 2:12	39	32

#### Vegetated Roof

Install a vegetated roof.

OR

#### Option 2. Parking under Cover (1 point)

Place a minimum of 75% of parking spaces under cover. Any roof used to shade or cover parking must (1) have a three-year aged SRI of at least 32 (if three-year aged value information is not available, use materials with an initial SRI of at least 39 at installation), (2) be a vegetated roof, or (3) be covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.

75. List examples of a project site's hardscape:

1. parking
2. roads
3. roofs
4. walkways

76. Urban areas can have temperatures 1.8° to 5.4°F (1° to 3°C) warmer than surrounding suburban and undeveloped areas, and as much as 22°F (12°C) warmer in evenings.

77. Additionally, heat islands increase cooling loads in the summer, necessitating larger, more powerful air-conditioners that use more electricity, in turn increasing cooling costs, producing more greenhouse gases, and generating pollution.

78. The most effective measure of a roofing material's ability to reject solar heat is the solar reflectance index (SRI). However, to measure the solar heat rejection of components that are not roofing materials, or "nonroof"—for example, vegetation, shading devices, and other less reflective components—solar reflectance (SR) is used in this credit instead. SR is a more appropriate way to measure nonroof materials, which have more thermal mass.

79. Hardscape area includes all paved roads, sidewalks, courtyards, and parking lots.
80. Applicable roof area excludes roof area covered by mechanical equipment, solar energy panels, skylights, and any other appurtenances.
81. Read about extensive and intensive green roofs here, <http://www.greenrooftechnology.com/green-roof-types>
82. SS Credit Light Pollution Reduction requirements:

Meet uplight and light trespass requirements, using either the backlight-uplight-glare (BUG) method (Option 1) or the calculation method (Option 2). Projects may use different options for uplight and light trespass.

Meet these requirements for all exterior luminaires located inside the project boundary (except those listed under "Exemptions"), based on the following:  
 the photometric characteristics of each luminaire when mounted in the same orientation and tilt as specified in the project design; and  
 the lighting zone of the project property (at the time construction begins). Classify the project under one lighting zone using the lighting zones definitions provided in the Illuminating Engineering Society and International Dark Sky Association (IES/IDA) Model Lighting Ordinance (MLO) User Guide.

Additionally, meet the internally illuminated signage requirement.

Abbreviation	Name
BUG	<u>backlight-uplight-glare</u>
MLO	<u>Model Lighting Ordinance</u>

#### Uplight

##### OPTION 1. BUG Rating Method

Do not exceed the following luminaire uplight ratings, based on the specific light source installed in the luminaire, as defined in IES-15-11, Addendum A.

Complete Table 1. Maximum uplight ratings for luminaires

MLO lighting zone	Luminaire uplight rating
<u>L20</u>	<u>U0</u>
<u>L21</u>	<u>U1</u>
<u>L22</u>	<u>U2</u>
<u>L23</u>	<u>U3</u>
<u>L24</u>	<u>U4</u>

OR

##### OPTION 2. Calculation Method

Do not exceed the following percentages of total lumens emitted above horizontal.

Complete Table 2. Maximum percentage of total lumens emitted above horizontal, by lighting zones

MLO lighting zone	Maximum allowed percentage of total luminaire lumens emitted above horizontal
LZ0	0%
LZ1	0%
LZ2	1.5%
LZ3	3%
LZ4	6%

AND

Light Trespass

OPTION 1. BUG Rating Method

Do not exceed the following luminaire backlight and glare ratings (based on the specific light source installed in the luminaire), as defined in IES TM-15-11, Addendum A, based on the mounting location and distance from the lighting boundary.

Complete Table 3. Maximum backlight and glare ratings

Luminaire mounting	MLO lighting zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
	<b>Allowed backlight ratings</b>				
> <u>2</u> mounting heights from lighting boundary	B1	B3	B4	B5	B5
<u>1</u> to <u>2</u> mounting heights from lighting boundary and properly oriented	B1	B2	B3	B4	B4
<u>0.5</u> to <u>1</u> mounting height to lighting boundary and properly oriented	B0	B1	B2	B3	B3
< <u>0.5</u> mounting height to lighting boundary and properly oriented	B0	B0	B0	B1	B2
	<b>Allowed glare ratings</b>				
Building-mounted > <u>2</u> mounting heights from any lighting boundary	G0	G1	G2	G3	G4
Building-mounted <u>1</u> - <u>2</u> mounting heights from any lighting boundary	G0	G0	G1	G1	G2
Building-mounted <u>0.5</u> to <u>1</u> mounting heights from any lighting boundary	G0	G0	G0	G1	G1
Building-mounted < <u>0.5</u> mounting heights from any lighting boundary	G0	G0	G0	G0	G1
<u>All</u> other luminaires	G0	G1	G2	G3	G4

The lighting boundary is located at the property lines of the property, or properties, that the LEED project occupies.

The lighting boundary can be modified under the following conditions:

When the property line is adjacent to a public area that is a walkway, bikeway, plaza, or parking lot, the lighting boundary may be moved to 5 feet (1.5 meters) beyond the property line.

When the property line is adjacent to a public street, alley, or transit corridor, the lighting boundary may be moved to the center line of that street, alley, or corridor.

When there are additional properties owned by the same entity that are contiguous to the property, or properties, that the LEED project is within and have the same or higher MLO lighting zone designation as the LEED project, the lighting boundary may be expanded to include those properties.

Orient all luminaires less than two mounting heights from the lighting boundary such that the backlight points toward the nearest lighting boundary line. Building-mounted luminaires with the backlight oriented toward the building are exempt from the backlight rating requirement.

OR

#### OPTION 2. Calculation Method

Do not exceed the following vertical illuminances at the lighting boundary (use the definition of lighting boundary in Option 1). Calculation points may be no more than 5 feet (1.5 meters) apart. Vertical illuminances must be calculated on vertical planes running parallel to the lighting boundary, with the normal to each plane oriented toward the property and perpendicular to the lighting boundary, extending from grade level to 33 feet (10 meters) above the height of the highest luminaire.

Complete Table 4. Maximum vertical illuminance at lighting boundary, by lighting zone

MLO lighting zone	Vertical illuminance
L20	0.05 FC (0.5 LUX)
L21	0.05 FC (0.5 LUX)
L22	0.10 FC (1 LUX)
L23	0.20 FC (2 LUX)
L24	0.60 FC (6 LUX)

FC = footcandle

AND

#### Internally Illuminated Exterior Signage

Do not exceed a luminance of 200 cd/m<sup>2</sup> (nits) during nighttime hours and 2000 cd/m<sup>2</sup> (nits) during daytime hours.

#### Exemptions from Uplight and Light Trespass Requirements

The following exterior lighting is exempt from the requirements, provided it is controlled separately from the nonexempt lighting:  
specialized signal, directional, and marker lighting for transportation;

lighting that is used solely for facade and landscape lighting in MLO lighting zones 3 and 4, and is automatically turned off from midnight until 6 a.m.; lighting for theatrical purposes for stage, film, and video performances; government-mandated roadway lighting; hospital emergency departments, including associated helipads; lighting for the national flag in MLO lighting zones 2, 3, or 4; and internally illuminated signage.

83. List the three forms of light pollution that good lighting design reduces:

1. uplight
2. glare
3. light trespass

84. List examples of lighting controls:

1. motion sensors
2. photocells
3. time clocks
4. other devices

85. List what must be identified for each luminaire type in the project:

1. manufacturer
2. model number
3. lamp type
4. orientation
5. tilt angle (if applicable)
6. input wattage

86. List examples of exempt lighting:

1. emergency lighting
2. government-mandated roadway lighting
3. theatrical lighting
4. lighting of the national flag in certain lighting zones

87. If no lighting is required except what is listed in exemptions (see credit requirements) the project achieves the credit, provided the team justifies the exemptions.

88. Complete the following:

Lighting Zone	Ambient lighting description
LZ0	<u>No ambient lighting</u>
LZ1	<u>Low ambient lighting</u>
LZ2	<u>Moderate ambient lighting</u>
LZ3	<u>Moderately high ambient lighting</u>
LZ4	<u>High ambient lighting</u>



89. List the exceptions that would allow a project to modify the lighting boundary 5 feet beyond the project's property boundary when the property boundary abuts a public area that is a:

1. walkway
2. bikeway
3. plaza
4. parking lot

90. List the exceptions that would allow a project to modify the lighting boundary to the center line when the property boundary abuts a:

1. public roadway
2. public transit corridor

91. To more easily meet the credit requirements, avoid adjustable luminaire types as a primary lighting source.

92. A cooler (whiter) light source (above 2500 degrees Kelvin color temperature) with higher color rendering index (above 80 CRI) makes it easier for people to see and to distinguish detail.

93. The vertical illuminance calculation points must be no more than 5 feet (1.5 meters) apart and extend from grade level up to at least 33 feet (10 meters) above the tallest luminaire in the project.

94. Illuminance is the total quantity of light, or luminous flux, that falls on a surface, as measured in footcandles or lux.

95. SS Credit Site Master Plan applies to: Schools

96. SS Credit Site Master Plan requirements

The project must achieve at least four of the following six credits, using the associated calculation methods. The achieved credits must then be recalculated using the data from the master plan.

LT Credit: High Priority site

SS Credit: Site Development - Protect or Restore Habitat

SS Credit: Open Space

SS Credit: Rainwater Management

SS Credit: Heat Island Effect

SS Credit: Light Pollution Reduction

A site master plan for the school must be developed in collaboration with school authorities. Previous sustainable site design measures should be considered in all master-planning efforts so that existing infrastructure is retained whenever possible. The master plan must therefore include current construction activity plus future construction (within the building's lifespan) that affects the site. The master plan development footprint must also include parking, paving, and utilities.

Projects where no future development is planned are not eligible for this credit.

97. SS Credit Tenant Design and Construction Guidelines applies to: core and shell

98. SS Credit Tenant Design and Construction Guidelines requirements:

Publish for tenants an illustrated document with the following content, as applicable: 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; recommendations, including examples, for sustainable strategies, products, materials, and services; and information that enables a tenant to coordinate space design and construction with the building systems when pursuing the following LEED v4 for Interior Design and Construction prerequisites and credits:

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

MR Prerequisite: Storage and Collection of Recyclables

EQ Prerequisite: Minimum Indoor Air Quality Performance

EQ Prerequisite: Environmental Tobacco Smoke Control

EQ Credit: Enhanced Indoor Air Quality Strategies

EQ Credit: Low -Emitting Materials

EQ Credit: Construction Indoor Air Quality Management Plan

EQ Credit: Indoor Air Quality Assessment

EQ Credit: Thermal Comfort

EQ Credit: Interior Lighting

EQ Credit: Daylight

EQ Credit: Quality Views

EQ Credit: Acoustic Performance

Provide the guidelines to all tenants before signing the lease.

99. List the information that depending on the Core and Shell design and scope, projects should consider including in the tenant guidelines:

1. <u>water use</u>	10. <u>Indoor chemical and Pollutant source control</u>
2. <u>Energy Performance</u>	11. <u>Interior Lighting</u>
3. <u>Refrigerant Management</u>	12. <u>Thermal Comfort</u>
4. <u>Energy use and Metering</u>	13. <u>Views</u>
5. <u>Renewable Energy</u>	14. <u>Environmental Tobacco Smoke</u>
6. <u>Commissioning</u>	15. <u>Low-emitting materials</u>
7. <u>Measurement and Verification</u>	16. <u>Acoustic Performance</u>
8. <u>Ventilation and Outdoor Air Delivery</u>	17. <u>Storage and Collection of Recyclables</u>
9. <u>Construction IAQ Management</u>	18. <u>Sustainable Products, Materials, and Services</u>

100. SS Credit Places of Respite applies to: Healthcare

101. SS Credit Places of Respite requirements:

Provide places of respite that are accessible to patients and visitors, equal to 5% of the net usable program area of the building.

Provide additional dedicated places of respite for staff, equal to 2% of the net usable program area of the building.

Places of respite must be outdoors, or be located in interior atria, greenhouses, Solaria, or conditioned spaces; such interior spaces may be used to meet up to 30% of the required area if 90% of each qualifying space's gross floor area achieves a direct line of sight to unobstructed views of nature.

All areas must meet the following requirements.

The area is accessible from within the building or located within 200 feet (60 meters) of a building entrance or access point.

The area is located where no medical intervention or direct medical care is delivered.

Options for shade or indirect sun are provided, with at least one seating space per 200 square feet (18.5 square meters) of each respite area, with one wheelchair space per five seating spaces.

Horticulture therapy and other specific clinical or special-use gardens unavailable to all building occupants may account for no more than 50% of the required area.

Universal-access natural trails that are available to visitors, staff, or patients may account for no more than 30% of the required area, provided the trailhead is within 200 feet (60 meters) of a building entrance.

Additionally, outdoor areas must meet the following requirements.

A minimum of 25% of the total outdoor area must be vegetated at the ground plane (not including turf grass) or have overhead vegetated canopy.

The area is open to fresh air, the sky, and the natural elements.

Signage must meet the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (Section 1.2-6.3 and Appendix A1.2-6.3: Wayfinding).

Places of respite may not be within 25 feet (7.6 meters) of a smoking area (see EQ Prerequisite Environmental Tobacco Smoke Control).

Existing places of respite on the hospital campus may qualify if they otherwise meet the credit requirements.

102. This credit rewards quality spaces that include vegetation, have exposure to the elements, and allow opportunities for exercise and movement.

103. Calculate the net usable program area of the project by summing all the interior areas available to house the project's program. Exclude areas for building equipment, vertical circulation, or structural components.

104. Complete Table 1. Places of respite criteria

Table 1. Places of respite criteria		
Type of Space	Maximum % of total places of respite area	Special conditions
Interior atria, greenhouses, solarium, or conditioned spaces	30%	90% of each qualifying space's gross floor area must achieve direct line of sight to unobstructed views of nature
Horticulture therapy and other specific clinical or special-use gardens unavailable to all building occupants.	50%	None
Universal-access natural trails	30%	Trailhead access must be within 200 feet (60 meters) of building entrance

105. Qualifying Spaces

All areas must meet these requirements:

The area is accessible from within the building or located within 200 feet (60 meters) of a building entrance or access point. Areas outside the project boundary can qualify as places of respite, provided they are within 200 feet (60 meters).

No medical intervention or direct medical care is delivered in the respite area.

For each 200 square feet (18 square meters) of respite area, at least one seating space and one wheelchair space for every five seating spaces are placed in shade or indirect sunlight. Examples of qualifying features include trellises and tree-shaded, wheelchair-accessible seating areas.

Outdoor spaces must meet these additional requirements:

At least 25% of the total outdoor area must be vegetated at the ground plane (not including turf grass) or have vegetated canopy (trees and shrubs).

The area is open to fresh air, the sky, and the natural elements.

Signage must meet the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (Section 1.2- 6.3 and Appendix A1.2-6.3, Wayfinding).

Places of respite may not be within 25 feet (7.5 meters) of a smoking area (see EQ Prerequisite Environmental Tobacco Smoke Control).

106. Projects may earn exemplary performance by demonstrating both of the following:

Provide 10% of net usable program area as places of respite for patients and visitors

Provide 4% of the net usable program area as places of respite for staff

107. SS Credit Direct Exterior Access applies to: Healthcare

108. SS Credit Direct Exterior Access requirements:

Provide direct access to an exterior courtyard, terrace, garden, or balcony. The space must be at least 5 square feet (0.5 square meters) per patient for 75% of all inpatients and 75% of qualifying outpatients whose clinical length of stay (LOS) exceeds four hours. Patients whose length of stay exceeds four hours, and whose treatment makes them unable to move, such as emergency, stage 1 surgical recovery, and critical care patients, may be excluded.

Places of respite outside the building envelope that meet the requirements of SS Credit  
Places of Respite that are immediately adjacent to clinical areas or with direct access from  
inpatient units may be included.

Qualifying spaces must be designated as nonsmoking. The spaces must also meet the  
requirements for outdoor air contaminant concentrations enumerated in EQ Credit Enhanced Indoor Air  
Quality Strategies, Option 2 and be located more than 100 feet (30 meters) from building  
exhaust air locations, loading docks, and roadways with idling vehicles.

109. Outpatients whose length of stay is less than four hours are considered nonqualifying. Do  
not include these outpatients in credit calculations

110. Complete Equation 1. Required outdoor area

Required outdoor area = 5 ft<sup>2</sup> X (.75) peak inpatients + 5 ft<sup>2</sup> X (.75) qualifying outpatients

111. SS Credit Joint Use of Facilities applies to: Schools

112. SS Credit Joint Use of Facilities requirements:

OPTION 1. Make Building Space Open to the General Public (1 point)

In collaboration with the school authorities, ensure that at least three of the  
following types of spaces in the school are accessible to and available for shared use by  
the general public:

auditorium;

gymnasium;

cafeteria;

one or more classrooms;

playing fields and stadiums; and

joint parking.

Provide access to toilets in joint-use areas after normal school hours.

OR

Option 2. Contract with Specific Organizations to Share Building Space (1 point)

In collaboration with the school authorities, contract with community or other  
organizations to provide at least two types of dedicated-use spaces in the building, such  
as the following:

commercial office;

health clinic;

Community service centers (provided by state or local offices);

police office;

library or media center;

parking lot; and

one or more commercial businesses.

Provide access to toilets in joint-use areas after normal school hours.

OR

Option 3. Use Shared Space Owned by Other Organizations (1 point)

In collaboration with the school authorities, ensure that at least two of the following six types of spaces that are owned by other organizations or agencies are accessible to students :

auditorium ;

gymnasium ;

cafeteria ;

one or more classrooms ;

Swimming pool; and

playing fields and stadiums.

Provide direct pedestrian access to these spaces from the school. In addition, provide signed joint-use agreements with the other organizations or agencies that stipulate how these spaces will be shared.