



KING ABDULLAH UNIVERSITY
OF SCIENCE & TECHNOLOGY



SUSTAINABILITY
DESIGN CRITERIA

NEW
CONSTRUCTION

MAY 18, 2016

TABLE OF CONTENTS

LEED NC PROJECT CHECKLIST	2
1.0 GENERAL.....	4
2.0 LOCATION AND TRANSPORTATION	8
3.0 SUSTAINABLE SITES (SS).....	17
4.0 WATER EFFICIENCY (WE)	26
5.0 ENERGY & ATMOSPHERE	32
6.0 MATERIALS & RESOURCES	43
7.0 INDOOR ENVIRONMENTAL QUALITY	52
8.0 INNOVATION & DESIGN PROCESS.....	68
9.0 REGIONAL PRIORITY.....	69
10.0 LEED WORKSHEET.....	70
11.0 RESOURCES AND REFERENCES.....	71

LEED NC PROJECT CHECKLIST

Location and Transportation

	36 Possible Points
Credit 1 LEED for Neighborhood Development Location	3-16
Credit 2 Sensitive Land Protection	1-2
Credit 3 High Priority Site	2-3
Credit 4 Surrounding Density and Diverse Uses	1-6
Credit 5 Access to Quality Transit	6
Credit 6 Bicycle Facilities	1
Credit 7 Reduced Parking Footprint	1
Credit 8 Green Vehicles	1

Sustainable Sites

	15 Possible Points
Prereq 1 Construction Activity Pollution Prevention	Required
Prereq 2 Environmental Site Assessment	Required
Credit 1 Site Assessment	1
Credit 2 Site Development – Protect or Restore Habitat	1-2
Credit 3 Open Space	1
Credit 4 Rainwater Management	1-3
Credit 5 Heat Island Reduction	1-2
Credit 6 Light Pollution Reduction	1
Credit 7 Site Master Plan	1
Credit 8 Tenant Design and Construction Guidelines	1
Credit 9 Places of Respite	1
Credit 10 Direct Exterior Access	1
Credit 11 Joint Use of Facilities	1

Water Efficiency

	12 Possible Points
Credit 1.1 Water Efficient Landscaping - Reduce b 50%	Required
Prereq 1 Outdoor Water Use Reduction	Required
Prereq 2 Indoor Water Use Reduction	Required
Prereq 3 Building-Level Water Metering	Required
Credit 1 Outdoor Water Use Reduction	1-2
Credit 2 Indoor Water Use Reduction	1-7
Credit 3 Cooling Tower Water Use	1-2
Credit 4 Water metering	1

Energy & Atmosphere

	35 Possible Points
Prereq 1 Fundamental Commissioning -and Verification	Required

Prereq 2	Minimum Energy Performance	Required
Prereq 3	Building-Level Energy Metering	Required
Prereq 4	Fundamental Refrigerant Management	-Required
Credit 1	Enhanced Commissioning	2-6
Credit 2	Optimize Energy Performance	-1-20
Credit 3	Advanced Energy Metering	1
Credit 4	Demand Response	1-2
Credit 5	Renewable Energy Production	1-3
Credit 6	Enhanced Refrigerant Management	1
Credit 7	Green Power and Carbon Offsets	1-2

Materials & Resources

		20 Possible Points
Prereq 1	Storage & Collection of Recyclables	Required
Credit 1.1		
Prereq 2	Construction and Demolition Waste Management Planning	Required
Prereq 3	PBT Source Reduction – Mercury	Required
Credit 1	Building Life-Cycle Impact Reduction	2-6
Credit 2	Building Product Disclosure and Optimization Environment Product Declarations	1-2
Credit 3	Building Product Disclosure and Optimization – Sourcing of Raw Materials	1-2
Credit 4	Building Product Disclosure and Optimization – Material Ingredients	1-2
Credit 5	PBT Source Reduction Mercury	1
Credit 6	PBT Source Reduction – Lead, Cadmium, and Copper	2
Credit 7	Furniture and Medical Furnishings	1-2
Credit 8	Design for Flexibility	1
Credit 9	Construction and Demolition Waste Management	1-2

Indoor Environmental Quality

		18 Possible Points
Prereq 1	Minimum IAQ Performance	Required
Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
Prereq 3	Minimum Acoustic Performance	Required
Credit 1	Enhanced Indoor Air Quality Strategies	1-2
Credit 2	Low-Emitting Materials	1-3
Credit 3	Construction IAQ Management Plan	1
Credit 4	Indoor Air Quality Assessment	1-2

Credit 5	Thermal Comfort	1
Credit 6	Interior Lighting	1-2
Credit 7	Daylight	1-3
Credit 8	Quality View	1-2
Credit 9	Acoustic Performance	1-2
Innovation & Design Process		6 Possible Points
Credit 1	Innovation	1-5
Credit 2	LEED Accredited Professional	1
Regional Priority		4 Possible Points
Credit 1	Regional Priority	4
Project Totals: 69 Possible Points		147 Possible Points
	Certified	40 – 49 points
	Silver	50 – 59 points
	Gold	60 – 79 points
	Platinum	80 – 110 points

1.0 GENERAL

1.1 Vision and Mission

The vision of the King Abdullah University for Science and Technology centers around environmental innovation: to serve as a model for innovation for the Kingdom and for the world and, in its design, be itself a model for environmental innovation. In keeping with these goals the design of the university and the supporting community is to be a model for responsible protection of the environment, the highest level of stewardship of all natural resources, and a model of energy efficiency. The mission statement calls for "A campus designed and constructed for low environmental impact, with an emphasis on energy efficiency, sustainable development, and conservation of historical / cultural sites and sensitive ecosystems". It will "minimize the environmental footprint through efficient use of water, electricity and other resources, and through reuse and recycling". In a similar vein it will be extremely important for the success of the research mission that King Abdullah be able to attract and retain the highest quality research talent from within the Kingdom and from around the world. Towards this end, the design of the new facilities need to be attractive and to be healthy places to live and work, with high quality air, good temperature control, daylight and access to scenic views.

To ensure that these goals are met, the LEED Green Building Rating System will be used for the King Abdullah University. A local chapter of the World Green Building Council is being formed in the Arabia Gulf region and a regionally specific version of the LEED rating System is likely to be written in the next few years. The client will decide at a later date whether or not to formally apply for LEED certification for the project. Whether or not formal certification is sought, it is a goal for the project to be able to be designed to achieve at minimum Silver level for Research Park Facilities and Certified level rating for all other Buildings in the campus. King Abdullah University may however at its discretion choose to require Gold or Platinum certification for selected buildings.

1.2 Summary of Overall Sustainable Goals

- LEED as a Minimum (not a maximum) – There are many opportunities to move beyond LEED requirements in the design of the various facilities of the King Abdullah University and surrounding community. Every effort should be made to be as inventive and forward thinking with these facilities, and to exceed LEED wherever possible.
- Energy Reduction – Energy represents a very large part of the eventual operational cost for the university and community. In addition, there will be a significant first capital cost to provide the necessary energy infrastructure to support the demand. Every effort should be made in the design to make these facilities the most energy efficient in the region and the world.
- Renewable Energy – It is a goal of this project to maximize the percentage of total energy consumption generated by renewable energy sources – photovoltaic, solar hot water, wind, geothermal etc. Many of the smaller building should be able to be designed to operate almost exclusively on renewable energy source. The larger community and university buildings should also be able to achieve a large percentage of their power through these technologies.

- Water – Water is a precious resource anywhere in the region, but particularly for the King Abdullah University project where potable water demands are high. Key strategies to be applied include:

▪ Givens:

- Waterless urinals throughout the community
- Highly efficient flow fixtures throughout the community
- Recapture of condensate water from cooling units for on-site use
- Capture of gray water for toilet flushing
- Capture of the infrequent rain water for use on site
- No potable water use for irrigation
- Xeriscape landscaping throughout the community

To be studied further:

- Red Sea – The protection of the Red Sea, its plant and animal inhabitants, the coral reef just off shore and the shoreline mangroves should receive the highest level of protection. This includes
 - No off-site runoff into the red sea
 - No disturbance of the existing mangroves
 - No construction activities in the Red Sea except construction of the enlarged harbor and canal.
- Site Landscaping – The site landscaping guideline calls for the use of native plant materials with minimal need for watering after they are established. Consider plant material that thrives on sea water. A detailed plant list and additional information is included in the landscape design guidelines section. Xeriscape Landscaping must be implemented on all new projects on the campus unless otherwise specified by King Abdullah University.
- Light Pollution – one of the attractive aspects of the site is the night sky – seeing stars. Every effort should be made to retain this by careful design of lighting to keep lighting inside of buildings and to keep exterior lighting, where necessary, to a minimum and aimed toward the ground. In sensitive areas such the shoreline mangroves and the Red Sea, exterior lighting should be eliminated and considered detrimental to the existing ecosystem.

1.3 What is LEED – Leadership in Energy and Environmental Design

- #### 1.3.1 Buildings fundamentally impact people's lives and the health of the planet. The typical new building uses significant energy, water and other resources to build and to operate. The impact of the use of these resources has had increasingly negative impacts on the livability of the earth. They are frequently built with unhealthy materials leading to significant health problems for their occupants. For the last 15 years many organizations have been formed to deal creatively with building healthier buildings, that use resources more wisely and which minimize

the negative impacts on the rest of the earth. This trend is known by many phrases – green buildings, high performance buildings, sustainable buildings and, simply, smart buildings.

- 1.3.2 Originally, the LEED Green Building Rating System for New Construction (LEED-NC version 2.0) was used for the Academic campus was first published in 1999 as a way to measure the performance of a building. It is has gone through many changes and is now being used throughout the world both as a design tool as well as a way of rating buildings after construction is complete. Currently, KAUST has adopted LEED version 4.0 for the campus which was first published on July 1st, 2015.

1.4 LEED Certification Process

The certification process is straightforward should KAUST Engineering and Project Management desire to certify any or all buildings in the King Abdullah University or the new community. The steps are as follows:

- 1.4.1 The project will register with the U.S. Green Building Council (USGBC) if it is not possible to register it with the World Green Building Council in time for this project.
- 1.4.2 After project completion, the requirements listed below are submitted to the USGBC (or the WGBC) for verification and review. This process is completed entirely online. The applicant project must satisfactorily document achievement of all the prerequisites and a minimum number of points, according to the desired rating level.
- 1.4.3 The material is reviewed for completion.
- 1.4.4 The building is certified according to the number of points achieved.
- Certified 40–49 points
 - Silver 50–59 points
 - Gold 60–79 points
 - Platinum 80–110 points

LEED Certification Strategy at KAUST

KAUST has a general guideline in respect to LEED certification for various project typologies on the campus. Unless otherwise directed by KAUST Engineering and Project Management, the Consultant shall design their respective projects to meet the following LEED certification:

- Residential Projects – Certified*
- Research Park Laboratory Buildings - Silver
- Central Services Buildings – Certified
- Utility Plant Buildings – Certified
- Retail – Certified
- Entertainment and Sports Facilities – Certified

* Projects meeting LEED Certification requirements without formal submission.

- 1.5 Additionally, it is recommended that the following sustainability requirements are incorporated in the design of King Abdullah University buildings:

- 1.5.1 Specifications should include requirements that are sufficient to meet LEED-NC and LEED-EB commissioning prerequisites. The LEED-NC credit 3 for “Enhanced Commissioning” includes additional requirements. It is recommended that design-phase commissioning is included in the specifications.
- 1.5.2 Commissioning of the building envelope systems, domestic water heating, power distribution, ductwork and hydronic piping systems. To meet the LEED EA prerequisite 1 or the LEED-NC credit 3, commissioning must be completed, at a minimum, for:
- HVAC & R systems
 - Lighting and daylighting controls
 - Domestic hot water systems
 - Renewable energy systems
 - Commissioning of water-using systems and building envelope systems.
- 1.5.3 That LEED-NC credit 3 is followed. This encompasses that the Commissioning Agent and Commissioning Team develop a Systems Manual in addition to the Contractor’s Operation and Maintenance Manuals.
- 1.5.4 That LEED-NC credit 3 is followed. The requirements for LEED-NC credit 3 only requires that the Commissioning Agent verify that operational personnel training requirements were completed according to the Contract Documents. It is additionally recommended that the type of specific training for operational personnel is outlined in the specifications.
- 1.5.5 As per LEED-NC credit 3 that a delayed testing and post occupancy review is undertaken 8-10 months from completion.
- 1.5.6 Obtain a BEES (Building for Environmental and Economic Sustainability Technical Manual and User Guide) assessment from the product manufacturer instead of the designer. The process of acquiring the BEES analysis serves as an educational tool for the manufacturer.
- 1.5.7 That the Contractor is made responsible for undertaking the IAQ (Indoor Air Quality) testing. King Abdullah University may at its discretion require a separately contract for this testing.

1.6 PREREQUISITE: INTEGRATIVE PROJECT PLANNING AND DESIGN Required

This prerequisite applies to:

- Healthcare

Intent

Maximize opportunities for integrated, cost-effective adoption of green design and construction strategies, emphasizing human health as a fundamental evaluative criterion for building design, construction and operational strategies. Utilize innovative approaches and techniques for green design and construction.

Requirements

HEALTHCARE

Use cross-discipline design and decision making, beginning in the programming and pre-design phase. At a minimum, ensure the following process:

Owner's Project Requirements Document. Prepare an Owner's Project Requirements (OPR) document. Develop a health mission statement and incorporate it in the OPR. The health mission statement must address "triple bottom line" values—economic, environmental and social. Include goals and strategies to safeguard the health of building occupants, the local community and the global environment, while creating a high-performance healing environment for the building's patients, caregivers and staff.

Preliminary Rating Goals. As early as practical and preferably before schematic design, conduct a preliminary LEED meeting with a minimum of four key project team members and the owner or owner's representative. As part of the meeting, create a LEED® action plan that, at a minimum:

- Determines the LEED certification level to pursue (Certified, Silver, Gold, or Platinum);
- Selects the LEED credits to meet the targeted certification level; and
- Identifies the responsible parties to ensure the LEED requirements for each prerequisite and selected credit are met.

Integrated Project Team. Assemble an integrated project team and include as many of the following professionals as feasible (minimum of four), in addition to the owner or owner's representative.

- Owner's capital budget manager
- Architect or building designer
- Mechanical engineer
- Structural engineer
- Energy modeller
- Equipment planner
- Acoustical consultant
- Telecommunications designer
- Controls designer
- Food Service Consultant
- Infection Control Staff
- Building science or performance testing agents
- Green building or sustainable design consultant

- Facility green teams
- Physician and nursing teams
- Facility managers
- Environmental services staff
- Functional and space programmers
- Commissioning agent
- Community
- Representatives

- Civil engineer
- Landscape architect
- Ecologist
- Land planner
- Construction manager or general contractor
- Life cycle cost analyst; construction cost estimator
- Lighting Designer
- Other disciplines appropriate to the specific project type

Design Charrette. As early as practical and preferably before schematic design, conduct a minimum four-hour, integrated design charrette with the project team as defined above. The goal is to optimize the integration of green strategies across all aspects of building design, construction and operations, drawing on the expertise of all participants.

1.7 CREDIT: INTEGRATIVE PROCESS

BD&C

1 point

This credit applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare
- Intent

To support high-performance, cost-effective project outcomes through an early analysis of the interrelationships among systems.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

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.

Energy-Related Systems

Discovery: Perform a preliminary "simple box" energy modelling 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:

- *Site conditions.* Assess shading, exterior lighting, hardscape, landscaping, and adjacent site conditions.
- *Massing and orientation.* Assess massing and orientation affect HVAC sizing, energy consumption, lighting, and renewable energy opportunities.
- *Basic envelope attributes.* Assess insulation values, window-to-wall ratios, glazing characteristics, shading, and window operability.
- *Lighting levels.* Assess interior surface reflectance values and lighting levels in occupied spaces.
- *Thermal comfort ranges.* Assess thermal comfort range options.
- *Plug and process load needs.* Assess reducing plug and process loads through programmatic solutions (e.g., equipment and purchasing policies, layout options).
- *Programmatic and operational parameters.* Assess multifunctioning spaces, operating schedules, space allotment per person, teleworking, reduction of building area, and anticipated operations and maintenance.

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.

AND

Water-Related Systems

Discovery: Perform a preliminary water budget analysis before the completion of schematic design that explores how to reduce potable water loads in the building and accomplish related sustainability goals. Assess and estimate the project's potential non-potable water supply sources and water demand volumes, including the following:

- Indoor water demand. Assess flow and flush fixture design case demand volumes, calculated in accordance with WE Prerequisite Indoor Water Use Reduction.
- Outdoor water demand. Assess landscape irrigation design case demand volume calculated in accordance with WE Credit Outdoor Water-Use Reduction.
- Process water demand. Assess kitchen, laundry, cooling tower, and other equipment demand volumes, as applicable.
- Supply sources. Assess all potential nonpotable water supply source volumes, such as on-site rainwater and graywater, municipally supplied nonpotable water, and HVAC equipment condensate.

Implementation: Document how the above analysis informed building and site design decisions in the project's OPR and BOD. Demonstrate how at least one on-site nonpotable water supply source was analyzed to reduce the burden on municipal supply or wastewater treatment systems by contributing to at least two of the water demand components listed above. Demonstrate how the analysis informed the design of the project, including the following, as applicable:

- Plumbing systems;
- Sewage conveyance and/or on-site treatment systems;
- Rainwater quantity and quality management systems;
- Landscaping, irrigation, and site elements;
- Roofing systems and/or building form and geometry; and other systems.

2.0 LOCATION AND TRANSPORTATION

2.1 LT Credit: LEED for Neighborhood Development Location BD&C

3–16 points

This credit applies to

- New Construction (8–16 points)
- Core & Shell (8–20 points)
- Schools (8–15 points)
- Retail (8–16 points)
- Data Centers (8–16 points)
- Warehouses & Distribution Centers (8–16 points)
- Hospitality (8–16 points)
- Healthcare (5–9 points)

▪ Intent

To avoid development on inappropriate sites. To reduce vehicle distance travelled. To enhance liveability and improve human health by encouraging daily physical activity.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Locate the project within the boundary of a development certified under LEED for Neighbourhood Development (Stage 2 or Stage 3 under the Pilot or 2009 rating systems, Certified Plan or Certified Project under the LEED v4 rating system).

Projects attempting this credit are not eligible to earn points under other Location and Transportation credits.

Table 1. Points for LEED ND location.

Certification level	Points BD&C	Points BD&C (Core and Shell)	Points BD&C (Schools)	Points BD&C (Healthcare)
Certified	8	8	8	5
Silver	10	12	10	6
Gold	12	16	12	7
Platinum	16	20	15	9

2.2 LT Credit: Sensitive Land Protection BD&C

1-2 points

This credit applies to

- New Construction (1 point)

- Core & Shell (2 points)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

▪ Intent

To avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Option 1.

Locate the development footprint on land that has been *previously developed*.

OR

Option 2.

Locate the development footprint on land that has been *previously developed* or that does not meet the following criteria for sensitive land:

- *Prime farmland*. Prime farmland, unique farmland, or farmland of state-wide or local importance as defined by the U.S. Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5 (or local equivalent for projects outside the U.S.) and identified in a state Natural Resources Conservation Service soil survey (or local equivalent for projects outside the U.S.).
- *Floodplains*. A flood hazard area shown on a legally adopted flood hazard map or otherwise legally designated by the local jurisdiction or the state. For projects in places without legally adopted flood hazard maps or legal designations, locate on a site that is entirely outside any floodplain subject to a 1% or greater chance of flooding in any given year.
- *Habitat*. Land identified as habitat for the following:
 - Species listed as threatened or endangered under the U.S. Endangered Species Act or the state's endangered species act, or
 - Species or ecological communities classified by Nature Serve as GH (possibly extinct), G1 (critically imperilled), or G2 (imperilled), or
 - Species listed as threatened or endangered species under local equivalent standards (for projects outside the U.S.) that are not covered by Nature Serve data.

- *Water bodies.* Areas on or within 100 feet (30 meters) of a *water body*, except for minor improvements.
- *Wetlands.* Areas on or within 50 feet (15 meters) of a *wetland*, except for minor improvements.

Minor improvements within the wetland and water body buffers may be undertaken to enhance appreciation of them, provided such facilities are open all building users. Only the following improvements are considered minor:

- Bicycle and pedestrian pathways no more than 12 feet wide (3.5 meters), of which no more than 8 feet (2.5 meters) may be impervious;
- Activities to maintain or restore native natural communities and/or natural hydrology;
- One single-story structure per 300 linear feet (90 linear meters) on average, not exceeding 500 square feet (45 square meters);
- Grade changes necessary to ensure public access;
- Clearings, limited to one per 300 linear feet (90 linear meters) on average, not exceeding 500 square feet (45 square meters) each;
- Removal of the following tree types:
 - Hazardous trees, up to 75% of dead trees
 - Trees less than 6 inches (150 millimetres) diameter at breast height
 - Up to 20% of trees more than 6 inches (150 millimetres) diameter at breast height with a condition rating of 40% or higher.
 - Trees under 40% condition rating
- The condition rating must be based on an assessment by an arborist certified by the International Society of Arboriculture (ISA) using ISA standard measures, or local equivalent for projects outside the U.S.
- *Brownfield* remediation activities.

2.3 LT Credit: High-Priority Site

BD&C

2-3 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (2-3 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)

- Intent

To encourage project location in areas with development constraints and promote the health of the surrounding area.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Option 1. Historic District (1 point BD&C except Core and Shell, 2 points Core and Shell)

Locate the project on an *infill* location in a *historic district*.

OR

Option 2. Priority Designation (1 point BD&C except Core and Shell, 2 points Core and Shell)

Locate the project on one of the following:

- A site listed by the EPA National Priorities List;
- A Federal Empowerment Zone site;
- A Federal Enterprise Community site;
- A Federal Renewal Community site;
- A Department of the Treasury Community Development Financial Institutions Fund Qualified Low-Income Community (a subset of the New Markets Tax Credit Program);
- A site in a U.S. Department of Housing and Urban Development's Qualified Census Tract (QCT) or Difficult Development Area (DDA); or
- A local equivalent program administered at the national level for projects outside the U.S.

OR

Option 3. Brownfield Remediation (2 points BD&C except Core and Shell, 3 points Core and Shell)

Locate on a *brownfield* where soil or groundwater contamination has been identified, and where the local, state, or national authority (whichever has jurisdiction) requires its remediation. Perform remediation to the satisfaction of that authority.

LT Credit: Surrounding Density and Diverse Uses

BD&C

1-6 points

This credit applies to

- New Construction (1-5 points)
- Core & Shell (1-6 points)
- Schools (1-5 points)

- Retail (1–5 points)
- Data Centers (1–5 points)
- Warehouses & Distribution Centers (1–5 points)
- Hospitality (1–5 points)
- Healthcare (1 points)
- Intent
To conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. To promote walkability, and transportation efficiency and reduce vehicle distance travelled. To improve public health by encouraging daily physical activity.
- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, HOSPITALITY

Option 1. Surrounding Density (2–3 points BD&C except Core and Shell, 2-4 points Core and Shell)

Locate on a site whose surrounding existing density within a ¼-mile (400-meter) radius of the project boundary meets the values in Table 1. Use either the “separate residential and non-residential densities” or the “combined density” values.

Table 1a. Points for average density within 1/4 mile of project (IP units)

Combined density	Separate residential and nonresidential densities		Points BD&C (except Core and Shell)	Points BD&C (Core and Shell)
	Square feet per acre of buildable land	Residential density (DU/acre)		
22,000	7	0.5	2	2
35,000	12	0.8	3	4

Table 1b. Points for average density within 400 meters of project (SI units)

Combined density	Separate residential and nonresidential densities		Points BD&C (except Core and Shell)	Points BD&C (Core and Shell)
	Square meters per hectare of buildable land	Residential density (DU/hectare)		
5,050	17.5	0.5	2	2
8,035	30	0.8	3	4

DU = dwelling unit; FAR = floor-area ratio.

Schools only

Physical education spaces that are part of the project site, such as playing fields and associated buildings used during sporting events only (e.g., concession

stands) and playgrounds with play equipment, are excluded from the development density calculations.

AND/OR

Option 2. Diverse uses (1–2 points)

Construct or renovate a building or a space within a building such that the building’s main entrance is within a ½-mile (800-meter) walking distance of the main entrance of four to seven (1 point) or eight or more (2 points) existing and publicly available diverse uses (listed in Appendix 1).

The following restrictions apply.

- A use counts as only one type (e.g., a retail store may be counted only once even if it sells products in several categories).
- No more than two uses in each use type may be counted (e.g. if five restaurants are within walking distance, only two may be counted).
- The counted uses must represent at least three of the five categories, exclusive of the building’s primary use.

WAREHOUSES & DISTRIBUTION CENTERS

Option 1. Development and Adjacency (2–3 points)

Construct or renovate the project on a previously developed site that was used for industrial or commercial purposes. (2 points).

OR

Construct or renovate the project on a site that is both a previously developed and an adjacent site. The adjacent sites must be currently used for industrial or commercial purposes (3 points).

AND/OR

Option 2. Transportation Resources (1–2 points)

Construct or renovate the project on a site that has two or three (1 point) or four (2 points) of the following transportation resources:

- The site is within a 10-mile (16 kilometre) driving distance of a main logistics hub, defined as an airport, seaport, *intermodal facility*, or *freight village* with intermodal transportation.
- The site is within a 1-mile (1600-meter) driving distance of an on-off ramp to a *highway*.
- The site is within a 1-mile (1600-meter) driving distance of an access point to an active freight rail line.
- The site is served by an active freight rail spur.

In all cases, a planned transportation resource must be sited, funded, and under construction by the date of the certificate of occupancy and complete within 24 months of that date.

HEALTHCARE

Option 1. Surrounding Density (1 point)

Locate on a site whose surrounding existing density within a ¼-mile (400-meter) radius of the project boundary is:

1. At least 7 dwelling units per acre (17.5 DU per hectare) with a 0.5 floor-area ratio. The counted density must be *existing* density, not zoned density, or
2. At least 22,000 square feet per acre (5 050 square meters per hectare) of buildable land.

For previously developed existing rural healthcare campus sites, achieve a minimum development density of 30,000 square feet per acre (6890 square meters per hectare).

OR

Option 2. Diverse Uses (1 point)

Construct or renovate a building on a site such that the building’s main entrance is within a ½-mile (800-meter) walking distance of the main entrance of at least seven operational and publicly accessible uses (listed in Appendix 1).

The following restrictions apply.

- A use may be counted as only one type (e.g., a retail store may be counted only once even if it sells products in several categories).
- No more than two uses in each use type may be counted (e.g., if five restaurants are within walking distance, only two may be counted).
- The counted uses must represent at least three of the five categories, exclusive of the building’s primary use.

2.4 LT Credit: Access To Quality Transit

BD&C

1–6 points

This credit applies to

- New Construction (1–5 points)
- Core & Shell (1–6 points)
- Schools (1–4 points)
- Data Centers (1–5 points)
- Warehouses & Distribution Centers (1–5 points)
- Hospitality (1–5 points)
- Retail (1–5 points)
- Healthcare (1–2 points)

- Intent

To encourage development in locations shown to have multimodal transportation choices or otherwise reduced motor vehicle use, thereby reducing greenhouse gas emissions, air pollution, and other environmental and public health harms associated with motor vehicle use.

- Requirements

NC, CS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, RETAIL

Locate any *functional entry* of the project within a ¼-mile (400-meter) *walking distance* of existing or planned bus, *streetcar*, or *rideshare stops*, or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, light or heavy rail stations, commuter rail stations, or commuter ferry terminals. The transit service at those stops and stations in aggregate must meet the minimums listed in Tables 1 and 2. Planned stops and stations may count if they are sited, funded, and under construction by the date of the certificate of occupancy and are complete within 24 months of that date.

Both weekday and weekend trip minimums must be met.

- Qualifying transit routes must have paired route service (service in opposite directions).
- For each qualifying transit route, only trips in one direction are counted towards the threshold.
- If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted towards the threshold.

Table 1. Minimum daily transit service for projects with multiple transit types (bus, streetcar, rail, or ferry)

Weekday trips	Weekend trips	Points BD&C (except Core and Shell)	Points BD&C (Core and shell)
72	40	1	1
144	108	3	3
360	216	5	6

Table 2. Minimum daily transit service for projects with commuter rail or ferry service only

Weekday trips	Weekend trips	Points
24	6	1
40	8	2
60	12	3

Projects served by two or more transit routes such that no one route provides more than 60% of the documented levels may earn one additional point, up to the maximum number of points.

If *existing* transit service is temporarily rerouted outside the required distances for less than two years, the project may meet the requirements, provided the local transit agency has committed to restoring the routes with service at or above the prior level.

SCHOOLS

Option 1. Transit-Served Location (1–4 points)

Locate any *functional entry* of the project within a ¼-mile (400-meter) *walking distance* of existing or planned bus, *streetcar*, or rideshare stops, or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, light or heavy rail stations, commuter rail stations or commuter ferry terminals. The transit service at those stops and stations must meet the minimums listed in Tables 1 and 2. Planned stops and stations may count if they are sited, funded, and under construction by the date of the certificate of occupancy and are complete within 24 months of that date.

- Qualifying transit routes must have paired route service (service in opposite directions).
- For each qualifying transit route, only trips in one direction are counted towards the threshold.
- If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted towards the threshold.

Table 2. Minimum daily transit service for projects with commuter rail or ferry service only

Weekday trips	Points
24	1
40	2
60	3

Table 1. Minimum daily transit service for projects with multiple transit types (bus, streetcar, rail, or ferry)

Weekday trips	Points
72	1
144	2
360	4

Projects served by two or more transit routes such that no one route provides more than 60% of the prescribed levels may earn one additional point, up to the maximum number of points.

If existing transit service is temporarily rerouted outside the required distances for less than two years, the project may meet the requirements, provided the local transit agency has committed to restoring the routes with service at or above the prior level.

OR

Option 2. Pedestrian Access (1–4 points)

Show that the project has an *attendance boundary* such that the specified percentages of students live within no more than a ¾-mile (1200-meter) walking distance (for grades 8 and below, or ages 14 and below), and 1 ½-mile (2400-meter) walking distance (for grades 9 and above or ages 15 and above) of a functional entry of a school building. Points are awarded according to Table 3.

Table 3. Points for student population within walking distance

Percentage of students	Points
50%	1
60%	2
70% or more	4

In addition, locate the project on a site that allows pedestrian access to the site from all residential neighbourhoods that house the planned student population.

HEALTHCARE

Locate any *functional entry* of the project within a ¼-mile (400-meter) *walking distance* of existing or planned bus, *streetcar*, or rideshare stops, or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, light or heavy rail stations, commuter rail stations or commuter ferry terminals. The transit service at those stops and stations in aggregate must meet the minimums listed in Tables 1 and 2. Planned stops and stations may count if they are sited, funded, and under construction by the date of the certificate of occupancy and are complete within 24 months of that date.

Both weekday and weekend trip minimums must be met.

- Qualifying transit routes must have paired route service (service in opposite directions).
- For each qualifying transit route, only trips in one direction are counted towards the threshold.
- If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted towards the threshold.

Table 1. Minimum daily transit service for projects with multiple transit types (bus, streetcar, rail, or ferry).

Weekday trips	Weekend trips	Points
72	40	1
144	108	2

Table 2. Minimum daily transit service for projects with commuter rail or ferry service only

Weekday trips	Weekend trips	Points
24	6	1
40	8	2

Projects served by two or more transit routes such that no one route provides more than 60% of the prescribed levels may earn one additional point, up to the maximum number of points.

If *existing* transit service is temporarily rerouted outside the required distances for less than two years, the project may meet the requirements, provided the local transit agency has committed to restoring the routes with service at or above the prior level.

2.5 LT Credit: Bicycle Facilities

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Retail (1 point)
- Healthcare (1 point)

- Intent

To promote bicycling and transportation efficiency and reduce vehicle distance travelled. To improve public health by encouraging utilitarian and recreational physical activity.

- Requirements

NC, CS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY

Bicycle Network

Design or locate the *project* such that a *functional entry* or bicycle storage is within a 200-yard (180-meter) *walking distance* or *bicycling distance* from a *bicycle network* that connects to at least one of the following:

- at least 10 diverse uses (see Appendix 1);
- a school or *employment centre*, if the project total floor area is 50% or more residential; or
- A *bus rapid transit* stop, light or heavy rail station, commuter rail station, or ferry terminal.

All destinations must be within a 3-mile (4800-meter) bicycling distance of the project boundary.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within one year of that date.

Bicycle Storage and Shower Rooms

Case 1. Commercial or Institutional Projects

Provide *short-term bicycle storage* for at least 2.5% of all peak visitors, but no fewer than four storage spaces per building.

Provide *long-term bicycle storage* for at least 5% of all regular building occupants, but no fewer than four storage spaces per building in addition to the short-term bicycle storage spaces.

Provide at least one on-site shower with changing facility for the first 100 regular building occupants and one additional shower for every 150 regular building occupants thereafter.

Case 2. Residential Projects

Provide *short-term bicycle storage* for at least 2.5% of all peak visitors but no fewer than four storage spaces per building.

Provide *long-term bicycle storage* for at least 30% of all regular building occupants, but no less than one storage space per residential unit.

Case 3. Mixed-Use Projects

Meet the Case 1 and Case 2 storage requirements for the non-residential and residential portions of the project, respectively.

For All Projects

Short-term bicycle storage must be within 100 feet (30 meters) walking distance of any main entrance. *Long-term bicycle storage* must be within 100 feet (30 meters) walking distance of any *functional entry*.

Bicycle storage capacity may not be double-counted: storage that is fully allocated to the occupants of non-project facilities cannot also serve project occupants.

Core & Shell projects should refer to Appendix 2, Default Occupancy Counts, for occupancy count requirements and guidance.

SCHOOLS

Bicycle Network

Design or locate the *project* such that a *functional entry* and/or bicycle storage is within a 200-yard (180-meter) *walking distance* or *bicycling distance* of a *bicycle network* that connects to at least one of the following:

- at least 10 diverse uses (see Appendix 1); or
- A *bus rapid transit* stop, light or heavy rail station, commuter rail station, or ferry terminal.

All destinations must be within a 3-mile (4800-meter) bicycling distance of the project boundary.

Provide dedicated bicycle lanes that extend at least to the end of the school property with no barriers (e.g., fences) on school property.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within one year of that date.

Bicycle Storage and Shower Rooms

Provide *long-term bicycle storage* for at least 5% of all regular building occupants (excluding students grade 3 and younger), but no fewer than four storage spaces per building.

Provide at least one on-site shower with changing facility for the first 100 regular building occupants (excluding students) and one additional shower for every 150 regular building occupants (excluding students) thereafter.

Long-term storage spaces must be easily accessible to occupants and be within 100 feet (30 meters) walking distance of any main entrance.

Bicycle storage capacity may not be double-counted: storage that is fully allocated to the occupants of non-project facilities cannot also serve project occupants.

RETAIL

Bicycle Network

Design or locate the *project* such that a *functional entry* and/or bicycle storage is within a 200-yard (180-meter) *walking distance* or *bicycling distance* of a *bicycle network* that connects to at least one of the following:

- At least 10 diverse uses (see Appendix 1); or
- A *bus rapid transit* stop, light or heavy rail station, commuter rail station, or ferry terminal.

All destinations must be within a 3-mile (4800-meter) bicycling distance of the project boundary.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within one year of that date.

Bicycle Storage and Shower Rooms

Provide at least two *short-term bicycle storage* spaces for every 5,000 square feet (465 square meters), but no fewer than two storage spaces per building.

Provide *long-term bicycle storage* for at least 5% of regular building occupants, but no fewer than two storage spaces per building in addition to the short-term bicycle storage spaces.

Provide at least one on-site shower with changing facility for the first 100 regular building occupants and one additional shower for every 150 regular building occupants thereafter.

Short-term bicycle storage must be within 100 feet (30 meters) walking distance of any main entrance. *Long-term bicycle storage* must be within 100 feet (30 meters) walking distance of any *functional entry*.

Bicycle storage capacity may not be double-counted: storage that is fully allocated to the occupants of non-project facilities cannot also serve project occupants.

Provide a bicycle maintenance program for employees or bicycle route assistance for employees and customers. Route assistance must be provided in a manner easily accessible to both employees and customers.

For projects that are part of a multitenant complex only: If bicycle storage spaces have been provided in the complex in which the project is located, determine the number of spaces that may be attributed to the project by dividing the project's floor area by the total floor area of the development (buildings only) and multiplying the percentage result by the total number of spaces. If this number does

not meet the credit requirement, the project must provide additional bicycle storage.

HEALTHCARE

Bicycle Network

Design or locate the *project* such that a *functional entry* and/or bicycle storage is within a 200-yard (180-meter) *walking distance* or *bicycling distance* of a *bicycle network* that connects to at least one of the following:

- At least 10 diverse uses (see Appendix 1); or
- A *bus rapid transit* stop, light or heavy rail station, commuter rail station, or ferry terminal.

All destinations must be within a 3-mile (4800-meter) bicycling distance of the project boundary.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within one year of that date.

Bicycle Storage and Shower Rooms

Case 1. Commercial or Institutional Projects

Provide *short-term bicycle storage* for at least 2.5% of all peak visitors, but no fewer than four storage spaces per building.

Provide *long-term bicycle storage* for at least 5% of regular building occupants (excluding patients), but no fewer than four storage spaces per building in addition to the short-term bicycle storage spaces.

Provide at least one on-site shower with changing facility for the first 100 regular building occupants (excluding patients) and one additional shower for every 150 regular building occupants thereafter.

Case 2. Residential Projects

Provide secure, enclosed bicycle storage for at least 30% of all regular building occupants (excluding patients) measured at peak periods, but no less than one storage space per residential unit.

For All Projects

Short-term bicycle storage must be within 100 feet (30 meters) walking distance of any main entrance. *Long-term bicycle storage* must be within 100 feet (30 meters) walking distance of any *functional entry*.

Bicycle storage capacity may not be double counted: storage that is fully allocated to the occupants of non-project facilities cannot also serve project occupants.

2.6 LT Credit: Reduced Parking Footprint

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Retail (1 point)
- Healthcare (1 point)

- Intent

To minimize the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff.

- Requirements

NC, CS, RETAIL, SCHOOLS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Do not exceed the minimum local code requirements for parking capacity.

Provide parking capacity that is a percentage reduction below the base ratios recommended by the Parking Consultants Council, as shown in the Institute of Transportation Engineers' Transportation Planning Handbook, 3rd edition, Tables 18-2 through 18-4.

Case 1. Baseline Location

Projects that have not earned points under LT Credit Surrounding Density and Diverse Uses or LT Credit Access to Quality Transit must achieve a 20% reduction from the base ratios.

Case 2. Dense and/or Transit-Served Location

Projects earning 1 or more points under either LT Credit Surrounding Density and Diverse Uses or LT Credit Access to Quality Transit must achieve a 40% reduction from the base ratios.

For All Projects

The credit calculations must include all existing and new off-street parking spaces that are leased or owned by the project, including parking that is outside the project boundary but is used by the project. On-street parking in public rights-of-way is excluded from these calculations.

For projects that use pooled parking, calculate compliance using the project's share of the pooled parking.

Provide preferred parking for carpools for 5% of the total parking spaces after reductions are made from the base ratios. Preferred parking is not required if no off-street parking is provided.

Mixed-use projects should determine the percentage reduction by first aggregating the parking amount of each use (as specified by the base ratios) and then determining the percentage reduction from the aggregated parking amount.

Do not count parking spaces for fleet and inventory vehicles unless these vehicles are regularly used by employees for commuting as well as business purposes.

2.7 LT Credit: Green Vehicles

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Data Centers (1 point)
- Hospitality (1 point)
- Retail (1 point)
- Healthcare (1 point)
- Schools (1 point)
- Warehouses & Distribution Centers (1 point)

- Intent

To reduce pollution by promoting alternatives to conventionally fuelled automobiles.

- Requirements

NC, CS, DATA CENTERS, HOSPITALITY, RETAIL, HEALTHCARE

Designate 5% of all parking spaces used by the project as *preferred parking* for green vehicles. Clearly identify and enforce for sole use by green vehicles. Distribute preferred parking spaces proportionally among various parking sections (e.g. between short-term and long-term spaces).

Green vehicles must achieve a minimum green score of 45 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide (or local equivalent for projects outside the U.S.).

A discounted parking rate of at least 20% for green vehicles is an acceptable substitute for preferred parking spaces. The discounted rate must be publicly posted at the entrance of the parking area and permanently available to every qualifying vehicle.

In addition to preferred parking for green vehicles, meet one of the following two options for alternative-fuel fuelling stations:

Option 1. Electric Vehicle Charging

Install *electrical vehicle supply equipment (EVSE)* in 2% of all parking spaces used by the project. Clearly identify and reserve these spaces for the sole use by plug-in

electric vehicles. EVSE parking spaces must be provided in addition to preferred parking spaces for green vehicles.

The EVSE must:

- Provide a Level 2 charging capacity (208 – 240 volts) or greater.
- Comply with the relevant regional or local standard for electrical connectors, such as SAE Surface Vehicle Recommended Practice J1772, SAE Electric Vehicle Conductive Charge Coupler or IEC 62196 of the International Electrotechnical Commission for projects outside the U.S.
- Be networked or internet addressable and be capable of participating in a demand-response program or time-of-use pricing to encourage off-peak charging.

OR

Option 2. Liquid, gas, or battery facilities

Install liquid or gas *alternative fuel* fuelling facilities or a battery switching station capable of refuelling a number of vehicles per day equal to at least 2% of all parking spaces.

SCHOOLS

Option 1: Green passenger vehicles

Designate 5% of all parking spaces used by the project as *preferred parking* for green vehicles. Clearly identify and enforce for sole use by green vehicles. Distribute preferred parking spaces proportionally among various parking sections (e.g. between short-term and long-term spaces).

Green vehicles must achieve a minimum green score of 45 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide (or local equivalent for projects outside the U.S).

A discounted parking rate of at least 20% for green vehicles is an acceptable substitute for preferred parking spaces. The discounted rate must be publicly posted at the entrance of the parking area and permanently available to every qualifying vehicle.

In addition to preferred parking for green vehicles, meet one of the following two options for alternative-fuel fuelling stations:

Path 1. Electric Vehicle Charging

Install *electrical vehicle supply equipment (EVSE)* in 2% of all parking spaces used by the project. Clearly identify and reserve these spaces for the sole use by plug-in electric vehicles. EVSE parking spaces must be provided in addition to preferred parking spaces for green vehicles.

The EVSE must:

- Provide a Level 2 charging capacity (208 – 240 volts) or greater.
- Comply with the relevant regional or local standard for electrical connectors, such as SAE Surface Vehicle Recommended Practice J1772, SAE Electric

Vehicle Conductive Charge Coupler or IEC 62196 of the International Electrotechnical Commission for projects outside the U.S.

- Be networked or internet addressable and be capable of participating in a demand-response program or time-of-use pricing to encourage off-peak charging.

OR

Path 2. Liquid, gas, or battery facilities

Install liquid or gas *alternative fuel* fuelling facilities or a battery switching station capable of refuelling a number of vehicles per day equal to at least 2% of all parking spaces.

OR

Option 2: Green buses or school-owned vehicles

Develop and implement a plan for every bus serving the school to meet the following emissions standards within seven years of the building certificate of occupancy:

- nitrogen oxide (NOx) emissions of 0.50 grams or less per brake horsepower-hour; and
- Particulate matter emissions of 0.01 grams or less per brake horsepower-hour.

Emission standards must be met for each bus and not by an average of the entire fleet serving the school.

Develop and implement a plan for 100% of all other (non-bus) vehicles owned or leased to serve the school to be green vehicles. Green vehicles must achieve a minimum green score of 45 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide (or local equivalent for projects outside the U.S).

WAREHOUSES & DISTRIBUTION CENTERS

Option 1. Alternative-Fuel Vehicles (1 point)

Provide an on-site fleet with at least one *yard tractor* that is powered by electricity, propane, or natural gas. Provide on-site charging or refuelling stations for the vehicles. Liquid or gas refuelling stations must be separately ventilated or located outdoors.

OR

Option 2. Reduced Truck Idling (1 point)

Provide an electrical connection for at least 50% of all dock door locations to limit truck idling at the dock.

3.0 SUSTAINABLE SITES (SS)

3.1 SS Prerequisite 1: Construction Activity Pollution Prevention – Required

- BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare

- Intent

Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities associated with the project. The ESC Plan shall conform to the erosion and sedimentation requirements of the 2012 EPA Construction General Permit OR local Saudi Arabian erosion and sedimentation control standards and codes, whichever is more stringent. Project must apply the CGP regardless of size. The Plan shall describe the measures implemented to accomplish the following objectives:

SS Prerequisite 2: Environmental Site Assessment – Required

- BD&C

This prerequisite applies to

- Schools
- Healthcare

- Intent

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.

- Requirements

SCHOOLS, HEALTHCARE

Conduct a Phase I Environmental Site Assessment as described in ASTM E1527-05 (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.

3.2 SS Credit 1: Site Assessment

- BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

- Intent

To assess site conditions before design to evaluate sustainable options and inform related decisions about site design.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

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, and 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.

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.

3.3 SS Credit 2: Site Development – Protect or Restore Habitat

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
 - Core & Shell (1-2 points)
 - Schools (1-2 points)
 - Retail (1-2 points)
 - Data Centers (1-2 points)
 - Warehouses & Distribution Centers (1-2 points)
 - Hospitality (1-2 points)
 - Healthcare (1 point)
- Intent
To conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.
 - Requirements
NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE
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 disturbed. 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 state wide or local importance; or soils from other Greenfield sites, unless those soils are a by-product 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 kilometres] for projects outside the U.S.). For U.S. projects, the land trust must be accredited by the Land Trust Alliance.

3.4 SS Credit 3: Open Space

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

▪ Intent

To create exterior open space that encourage interaction with the environment, social interaction, passive recreation, and physical activities.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

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.

3.5 SS Credit 4: Rainwater Management

BD&C

1–3 points

This credit applies to

- New Construction (2–3 points)
- Core & Shell (2–3 points)
- Schools (2–3 points)
- Retail (2–3 points)
- Data Centers (2–3 points)
- Warehouses & Distribution Centers (2–3 points)
- Hospitality (2–3 points)
- Healthcare (1–2 points)

▪ Intent

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.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Option 1. Percentile of Rainfall Events

Path 1. 95th 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 95th 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 95th percentile amount.

OR

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

Achieve Path 1 but for the 98th 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 85th 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 post developed condition.

Projects that are part of a multitenant complex only

3.6 SS Credit 5: Heat Island Reduction

BD&C

1–2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1 point)

▪ Intent

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

Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Choose one of the following options:

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

Meet the following criterion:

$$\frac{\text{Area of Nonroof Measures}}{0.5} + \frac{\text{Area of High-Reflectance Roof}}{0.75} + \frac{\text{Area of Vegetated Roof}}{0.75} \geq \frac{\text{Total Site Paving Area}}{\text{Total Roof Area}}$$

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

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-sloped 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.

3.7 SS Credit 6: Light Pollution Reduction

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

▪ Intent

To increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

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.

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 TM-15-11, Addendum A.

Table 1. Maximum uplight ratings for luminaries

MLO lighting zone	Luminaire uplight rating
LZ0	U0
LZ1	U1
LZ2	U2
LZ3	U3
LZ4	U4

OR

Option 2. Calculation Method

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

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

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.

Luminaire mounting	MLO lighting zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
Allowed backlight ratings					
> 2 mounting heights from lighting boundary	B1	B3	B4	B5	B5
1 to 2 mounting heights from lighting boundary and properly oriented	B1	B2	B3	B4	B4
0.5 to 1 mounting height to lighting boundary and properly oriented	B0	B1	B2	B3	B3
< 0.5 mounting height to lighting boundary and properly oriented	B0	B0	B0	B1	B2
Allowed glare ratings					
Building-mounted > 2 mounting heights from any lighting boundary	G0	G1	G2	G3	G4
Building-mounted 1–2 mounting heights from any lighting boundary	G0	G0	G1	G1	G2
Building-mounted 0.5 to 1 mounting heights from any lighting boundary	G0	G0	G0	G1	G1
Building-mounted < 0.5 mounting heights from any lighting boundary	G0	G0	G0	G0	G1
All 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 abuts a public area that includes, but is not limited to, 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 abuts a public street, alley, or transit corridor, the lighting boundary may be moved to the centre 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.

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

MLO lighting zone	Vertical illuminance
LZ0	0.05 fc (0.5 lux)
LZ1	0.05 fc (0.5 lux)
LZ2	0.10 fc (1 lux)
LZ3	0.20 fc (1 lux)
LZ4	0.60 fc (6 lux)

FC = footcandle

AND

Internally Illuminated Exterior Signage

Do not exceed a luminance of 200 cd/m² (nits) during night-time hours and 2000 cd/m² (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 non-exempt lighting:

- specialized signal, directional, and marker lighting for transportation;
- lighting that is used solely for façade 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.

3.8 SS Credit 7: Site Master Plan

BD&C

1 point

This credit applies to

- Schools
- Intent

To ensure that the sustainable site benefits achieved by the project continue, regardless of future changes in program or demographics.

- Requirements

SCHOOLS

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 Reduction
- 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.

3.9 SS Credit 8: Tenant Design and Construction Guidelines

BD&C

1 point

This credit applies to

- Core & Shell/Intent

To educate tenants in implementing sustainable design and construction features in their tenant improvement build-outs

- Requirements

CS

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 Credits: Advanced Energy Metering
- EA Credit: Renewable Energy Production
- EA Credit: Enhanced Refrigerant Management
- MR Prerequisite: Storage and Collection of Recyclables
- EO Prerequisite: Minimum Indoor Air Quality Performance
- EO Prerequisite: Environmental Tobacco Smoke Control
- EO Credit: Enhanced Indoor Air Quality Strategies
- EO Credit: Low-Emitting Materials
- EO Credit: Construction Indoor Air Quality Management Plan
- EO Credit: Indoor Air Quality Assessment
- EO Credit: Thermal Comfort
- EO Credit: Interior Lighting
- EO Credit: Daylight
- EO Credit: Quality Views
- EO Credit: Acoustic Performance

Provide the guidelines to all tenants before signing the lease.

3.10 SS Credit 9: Places of Respite

BD&C

1 point

This credit applies to

- Healthcare

- Intent

To provide patients, staff, and visitors with the health benefits of the natural environment by creating outdoor places of respite on the healthcare campus

- Requirements

HEALTHCARE

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.

3.11 SS Credit 10: Direct Exterior Access

BD&C

1 point

This credit applies to

- Healthcare

- Intent

To provide patients and staff with the health benefits associated with direct access to the natural environment.

- Requirements

HEALTHCARE

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 non-smoking. 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.

3.12 SS Credit 11: Joint Use of Facilities

BD&C

1 point

This credit applies to

- Schools

- Intent

To integrate the school with the community by sharing the building and its playing fields for non-school events functions

- Requirements

SCHOOLS

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 centre;
- 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.

4.0 WATER EFFICIENCY (WE)

4.1 WE Prerequisite 1: Outdoor Water Use Reduction Required

BD&C

This prerequisite applies to

- New construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare
- Intent
 - To reduce outdoor water consumption.
- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Reduce outdoor water use through one of the following options. Nonvegetated surfaces, such as permeable or impermeable pavement, should be excluded from the landscape area calculations. Athletic fields and playgrounds (if vegetated) and food gardens may be included or excluded at the project team's discretion.

Option 1. No Irrigation Required

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OR

Option 2. Reduced Irrigation

Reduce the project's landscape water requirement by at least 30% from the calculated baseline for the site's peak watering month. Reductions must be achieved through plant species selection and irrigation system efficiency, as calculated by the Environmental Protection Agency (EPA) WaterSense Water Budget Tool.

4.2 WE Prerequisite 2: Indoor Water Use Reduction Required

BD&C

This prerequisite applies to

- New construction
- Core & Shell

- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare

- Intent

To reduce indoor water consumption

- Requirements

NC, CS, SCHOOLS, NC-RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, NC-HOSPITALITY, HEALTHCARE

Building Water Use

For the fixtures and fittings listed in Table 1, as applicable to the project scope, reduce aggregate water consumption by 20% from the baseline. Base calculations on the volumes and flow rates shown in Table 1.

All newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labelling must be WaterSense labelled (or a local equivalent for projects outside the U.S.).

Fixture or fitting	Baseline (IP units)	Baseline (SI units)
Toilet (water closet)*	1.6 gpf	6 lpf
Urinal*	1.0 gpf	3.8 lpf
Public lavatory (restroom) faucet	0.5 gpm at 60 psi** all others except private applications	1.9 lpm at 415 kPa, all others except private applications
Private lavatory faucets	2.2 gpm at 60 psi	8.3 lpm at 415 kPa
Kitchen faucet (excluding faucets used exclusively for filling operations)	2.2 gpm at 60 psi	8.3 lpm at 415 kPa
Showerhead*	2.5 gpm at 80 psi per shower stall	9.5 lpm at 550 kPa per shower stall

*WaterSense label available for this product type

gpf = gallons per flush

lpf = Liters per flush

Gpm = gallons per minute

lpm = liters per minute

Psi = pounds per square inch kPa = kilopascals

Appliance and Process Water Use

Install appliances, equipment, and processes within the project scope that meet the requirements listed in the tables below.

Table 2. Standards for appliances

Appliance	Requirement
Residential clothes washers	ENERGY STAR or performance equivalent
Commercial clothes washers	CEE Tier 3A
Residential dishwashers (standard and compact)	ENERGY STAR or performance equivalent
Prerinse spray valves	≤ 1.3 gpm (4.9 lpm)
Ice machine	ENERGY STAR or performance equivalent and use either air-cooled or closed-loop cooling, such as chilled or condenser water system

gpm = gallons per minute

lpm = liters per minute

Table 3. Standards for processes

Process	Requirement
Heat rejection and cooling	No once-through cooling with potable water for any equipment or appliances that reject heat
Cooling towers and evaporative condensers	Equip with <ul style="list-style-type: none"> • makeup water meters • conductivity controllers and overflow alarms • efficient drift eliminators that reduce drift to maximum of 0.002% of recirculated water volume for counterflow towers and 0.005% of recirculated water flow for cross-flow towers

Healthcare, Retail, Schools, and Hospitality Only

In addition, water-consuming appliances, equipment, and processes must meet the requirements listed in Tables 4 and 5.

Table 4. Standards for appliances

Kitchen equipment		Requirement (IP units)	Requirement (SI units)
Dishwasher	Undercounter	≤ 1.6 gal/rack	≤ 6.0 liters/rack
	Stationary, single tank, door	≤ 1.4 gal/rack	≤ 5.3 liters/rack
	Single tank, conveyor	≤ 1.0 gal/rack	≤ 3.8 liters/rack
	Multiple tank, conveyor	≤ 0.9 gal/rack	≤ 3.4 liters/rack
	Flight machine	≤ 180 gal/hour	≤ 680 liters/hour
Food steamer	Batch	≤ 6 gal/hour/pan	≤ 23 liters/hour/pan
	Cook-to-order	≤ 10 gal/hour/pan	≤ 38 liters/hour/pan
Combination oven,	Countertop or stand	≤ 3.5 gal/hour/pan	≤ 13 liters/hour/pan
	Roll-in	≤ 3.5 gal/hour/pan	≤ 13 liters/hour/pan

Table 5. Process requirements

Discharge water temperature tempering	Where local requirements limit discharge temperature of fluids into drainage system, use tempering device that runs water only when equipment discharges hot water OR Provide thermal recovery heat exchanger that cools drained discharge water below code-required maximum discharge temperatures while simultaneously preheating inlet makeup water OR If fluid is steam condensate, return it to boiler
Venturi-type flow-through vacuum generators or aspirators	Use no device that generates vacuum by means of water flow through device into drain

WE Prerequisite 3: Building-Level Water Metering Required
BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers

- Warehouses & Distribution Centers
- Hospitality
- Healthcare

▪ Intent

To support water management and identify opportunities for additional water savings by tracking water consumption.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Install permanent water meters that measure the total potable water use for the building and associated grounds. Meter data must be compiled into monthly and annual summaries; meter readings can be manual or automated.

Commit to sharing with USGBC the resulting whole-project water usage data for a five-year period beginning on the date the project accepts LEED certification or typical occupancy, whichever comes first.

This commitment must carry forward for five years or until the building changes ownership or lessee.

4.3 WE Credit 1: Outdoor Water Use Reduction

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1 point)

▪ Intent

To reduce outdoor water consumption.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Reduce outdoor water use through one of the following options. Nonvegetated surfaces, such as permeable or impermeable pavement, should be excluded from landscape area calculations. Athletic fields and playgrounds (if

vegetated) and food gardens may be included or excluded at the project team's discretion.

Option 1. No Irrigation required (2 points except Healthcare, 1 point Healthcare)

Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.

OR

Option 2. Reduced Irrigation (1-2 points except Healthcare, 1 point Healthcare)

Reduce the project's landscape water requirement (LWR) by at least 50% from the calculated baseline for the site's peak watering month. Reductions must first be achieved through plant species selection and irrigation system efficiency as calculated in the Environmental Protection Agency (EPA) Water Sense Water Budget Tool.

Additional reductions beyond 30% may be achieved using any combination of efficiency, alternative water sources, and smart scheduling technologies.

Table 1. Points for reducing irrigation water

Percentage reduction from baseline	Points (except Healthcare)	Points (Healthcare)
50%	1	1
100%	2	—

4.4 WE Credit 2: Indoor Water Use Reduction

BD&C

1-7 points

This credit applies to

- New Construction (1-6 points)
- Core & Shell (1-6)
- Schools (1-7 points)
- Retail (1-7 points)
- Data Centers (1-6 points)
- Warehouses & Distribution Centers (1-6 points)
- Hospitality (1-6 points)
- Healthcare (1-7 points)

▪ Intent

To reduce indoor water consumption

▪ Requirements

NC, CS, SCHOOLS, NC-RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, NC-HOSPITALITY, HEALTHCARE

Further reduce fixture and fitting water use from the calculated baseline in WE Prerequisite Indoor Water Use Reduction. Additional potable water savings can be earned above the prerequisite level using alternative water sources. Include fixtures and fittings necessary to meet the needs of the occupants. Some of these fittings and fixtures may be outside the tenant space (for Commercial Interiors) or project boundary (for New Construction). Points are awarded according to Table 1.

Table 1. Points for reducing water use

Percentage reduction	Points (BD&C)	Points (Schools, Retail, Hospitality, Healthcare)
25%	1	1
30%	2	2
35%	3	3
40%	4	4
45%	5	5
50%	6	--

Schools, Retail, Hospitality, and Healthcare only

Meet the percentage reduction requirements above.

AND

Appliance and Process Water. Install equipment within the project scope that meets the minimum requirements in Table 2, 3, 4, or 5. One point is awarded for meeting all applicable requirements in any one table. All applicable equipment listed in each table must meet the standard.

Schools, Retail, and Healthcare projects can earn a second point for meeting the requirements of two tables.

Table 2. Compliant commercial washing machines

To use Table 2, the project must process at least 120,000 lbs (57 606 kg) of laundry per year.

Washing machine	Requirement (IP units)	Requirement (SI units)
On-premise, minimum capacity 2,400 lbs (1 088 kg) per 8-hour shift	Maximum 1.8 gals per pound *	Maximum 7 liters per 0.45 kilograms *

* Based on equal quantities of heavy, medium, and light soil laundry.

Table 3. Standards for commercial kitchen equipment

To use Table 3, the project must serve at least 100 meals per day of operation. All process and appliance equipment listed in the category of kitchen equipment and present on the project must comply with the standards.

Kitchen equipment		Requirement (IP units)	Requirement (SI units)
Dishwasher	Undercounter	ENERGY STAR	ENERGY STAR or performance equivalent
	Stationary, single tank, door	ENERGY STAR	ENERGY STAR or performance equivalent
	Single tank, conveyor	ENERGY STAR	ENERGY STAR or performance equivalent
	Multiple tank, conveyor	ENERGY STAR	ENERGY STAR or performance equivalent
	Flight machine	ENERGY STAR	ENERGY STAR or performance equivalent
Food steamer	Batch (no drain connection)	≤ 2 gal/hour/pan including condensate cooling water	≤ 7.5 liters/hour/pan including condensate cooling water
	Cook-to-order (with drain connection)	≤ 5 gal/hour/pan including condensate cooling water	≤ 19 liters/hour/pan including condensate cooling water
Combination oven,	Countertop or stand	≤ 1.5 gal/hour/pan including condensate cooling water	≤ 5.7 liters/hour/pan including condensate cooling water
	Roll-in	≤ 1.5 gal/hour/pan including condensate cooling water	≤ 5.7 liters/hour/pan including condensate cooling water
Food waste disposer	Disposer	3-8 gpm, full load condition, 10 minute automatic shutoff; or 1 gpm, no-load condition	11-30 lpm, full load condition, 10-min automatic shutoff; or 3.8 lpm, no-load condition
	Scrap collector	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Pulper	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Strainer basket	No additional water usage	No additional water usage

gpm = gallons per minute
gph = gallons per hour
lpm = liters per minute
lph = liters per hour

Table 4. Compliant laboratory and medical equipment

To use Table 4, the project must be a medical or laboratory facility.

Lab equipment	Requirement (IP units)	Requirement (SI units)
Reverse-osmosis water purifier	75% recovery	75% recovery
Steam sterilizer	For 60-inch sterilizer, 6.3 gal/U.S. tray For 48-inch sterilizer, 7.5 gal/U.S. tray	For 1520-mm sterilizer, 28.5 liters/DIN tray For 1220-mm sterilizer, 28.35 liters/DIN tray
Sterile process washer	0.35 gal/U.S. tray	1.3 liters/DIN tray
X-ray processor, 150 mm or more in any dimension	Film processor water recycling unit	
Digital imager, all sizes	No water use	

Table 5. Compliant municipal steam systems

To use Table 5, the project must be connected to a municipal or district steam system that does not allow the return of steam condensate.

Steam system	Standard
Steam condensate disposal	Cool municipally supplied steam condensate (no return) to drainage system with heat recovery system or reclaimed water
OR	
Reclaim and use steam condensate	100% recovery and reuse

4.5 WE Credit 3: Cooling Tower Water Use

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouse & Distribution (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)
- Intent

To conserve water used for cooling tower makeup controlling microbes, corrosion, and scale in the condenser water system.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE.

For cooling towers and evaporative condensers, conduct a one-time potable water analysis, measuring at least the five control parameters listed in Table 1.

Table 1. Maximum concentrations for parameters in condenser water

Parameter	Maximum level
Ca (as CaCO ₃)	1000 ppm
Total alkalinity	1000 ppm
SiO ₂	100 ppm
Cl ⁻	250 ppm
Conductivity	2000 μS/cm

ppm = parts per million

μS/cm = micro siemens per centimeter

Calculate the number of cooling tower cycles by dividing the maximum allowed concentration level of each parameter by the actual concentration level of each parameter found in the potable makeup water. Limit cooling tower cycles to avoid exceeding maximum values for any of these parameters.

Table 2. Points for cooling tower cycles

Cooling tower cycles	Points
Maximum number of cycles achieved without exceeding any filtration levels or affecting operation of condenser water system (up to maximum of 10 cycles)	1
Achieve a minimum 10 cycles by increasing the level of treatment in condenser or make-up water OR Meet the minimum number of cycles to earn 1 point and use a minimum 20% recycled nonpotable water.	2

4.6 WE Credit 4: Water Metering

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)

- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

Intent

To support water management and identify opportunities for additional water savings by tracking water consumption.

Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Install permanent water meters for two or more of the following water subsystems, as applicable to the project:

- *Irrigation.* Meter water systems serving at least 80% of the irrigated landscaped area. Calculate the percentage of irrigated landscape area served as the total metered irrigated landscape area divided by the total irrigated landscape area. Landscape areas fully covered with xeriscaping or native vegetation that requires no routine irrigation may be excluded from the calculation.
- *Indoor plumbing fixtures and fittings.* Meter water systems serving at least 80% of the indoor fixtures and fitting described in WE Prerequisite Indoor Water Use Reduction, either directly or by deducting all other measured water use from the measured total water consumption of the building and grounds.
- *Domestic hot water.* Meter water use of at least 80% of the installed domestic hot water heating capacity (including both tanks and on-demand heaters).
- *Boiler with aggregate projected annual water use of 100,000 gallons (378 500 litres) or more, or boiler of more than 500,000 BtuH (150 kW).* A single makeup meter may record flows for multiple boilers.
- *Reclaimed water.* Meter reclaimed water, regardless of rate. A reclaimed water system with a makeup water connection must also be metered so that the true reclaimed water component can be determined.
- *Other process water.* Meter at least 80% of expected daily water consumption for process end uses, such as humidification systems, dishwashers, clothes washers, pools, and other subsystems using process water.

Healthcare Projects only

In addition to the requirements above, install water meters in any five of the following:

- Purified water systems (reverse-osmosis, de-ionized)
- Filter backwash water
- Water use in dietary department
- Water use in laundry
- Water use in laboratory
- Water used in central sterile and process department;
- Water use in physiotherapy and hydrotherapy and treatment areas;
- Water use in surgical suite
- Closed-looped hydronic system makeup; and
- Cold-water makeup for domestic hot water systems

5.0 ENERGY & ATMOSPHERE

5.1 EA Prerequisite 1: Fundamental Commissioning and Verification – Required

- Intent

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

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Commissioning Process Scope

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.

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.

- Develop the OPR.
- Develop a BOD.

The commissioning authority (CxA) must do the following:

- Review the OPR, BOD, and project design.
- Develop and implement a Cx plan.
- Confirm incorporation of Cx requirements into the construction documents.
- Develop construction checklists.
- Develop a system test procedure.
- Verify system test execution.
- Maintain an issues and benefits log throughout the Cx process.
- Prepare a final Cx process report.
- Document all findings and recommendations and report directly to the owner throughout the process.

The review of the exterior enclosure design may be performed by a qualified member of the design or construction team (or an employee of that firm) who is not directly responsible for design of the building envelope.

Commissioning Authority

By the end of the design development phase, engage a commissioning authority with the following qualifications.

- The 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 an employee of the design or construction firm who is not part of the project's design or construction team, or a disinterested subcontractor of the design or construction team.
 - For projects smaller than 20,000 square feet (1 860 square meters), the CxA may be a qualified member of the design or construction team. In all cases, the CxA must report his or her findings directly to the owner.

Project teams that intend to pursue EA Credit Enhanced Commissioning should note a difference in the CxA qualifications: for the credit, the CxA may not be an employee of the design or construction firm nor a subcontractor to the construction firm.

Current Facilities Requirements and Operations and Maintenance Plan

Prepare and maintain a current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently. The plan must include the following:

- A sequence of operations for the building;
- The building occupancy schedule;
- Equipment run-time schedules;
- Setpoint for all HVAC equipment;
- Set lighting levels throughout the building;
- Minimum outside air requirements;
- Any changes in schedules or setpoint for different seasons, days of the week, and times of day;
- A systems narrative describing the mechanical and electrical systems and equipment;
- A preventive maintenance plan for building equipment described in the systems narrative; and
- A commissioning program that includes periodic commissioning requirements, ongoing commissioning tasks, and continuous tasks for critical facilities.

Data Centers only

For small projects with computer room peak cooling loads less than 2,000,000 Btu/h (600 kW) or a total computer room peak cooling load less than 600,000

Btu/h (175 kW), the CxA may be a qualified employee of the design or construction team.

5.2 EA Prerequisite 2: Minimum Energy Performance – Required

BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare

▪ Intent

To reduce the environmental and economic harms of excessive energy use by achieving a minimum level of energy efficiency for the building and its systems.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Option 1. Whole-Building Energy Simulation

Demonstrate an improvement of 5% for new construction, 3% for major renovations, or 2% for core and shell projects in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), using a simulation model.

Projects must meet the minimum percentage savings before taking credit for renewable energy systems.

The proposed design must meet the following criteria:

- Compliance with the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.);
- inclusion of all energy consumption and costs within and associated with the building project; and
- Comparison against a baseline building that complies with Standard 90.1–2010, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.).

Document the energy modelling input assumptions for unregulated loads. Unregulated loads should be modelled accurately to reflect the actual expected energy consumption of the building.

If unregulated loads are not identical for both the baseline and the proposed building performance rating, and the simulation program cannot accurately model the savings, follow the exceptional calculation method (ANSI/ASHRAE/IESNA Standard 90.1–2010, G2.5). Alternatively, use the COMNET Modelling Guidelines and Procedures to document measures that reduce unregulated loads.

Retail only

For Option 1, Whole-Building Energy Simulation, process loads for retail may include refrigeration equipment, cooking and food preparation, clothes washing, and other major support appliances. Many of the industry standard baseline conditions for commercial kitchen equipment and refrigeration are defined in Appendix 3, Tables 1–4. No additional documentation is necessary to substantiate these predefined baseline systems as industry standard.

OR

Option 2. Prescriptive Compliance: ASHRAE 50% Advanced Energy Design

Guide

Comply with the mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.).

Comply with the HVAC and service water heating requirements, including equipment efficiency, economizers, ventilation, and ducts and dampers, in Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate ASHRAE 50% Advanced Energy Design Guide and climate zone:

- ASHRAE 50% Advanced Energy Design Guide for Small to Medium Office Buildings, for office buildings smaller than 100,000 square feet (9 290 square meters);
- ASHRAE 50% Advanced Energy Design Guide for Medium to Large Box Retail Buildings, for retail buildings with 20,000 to 100,000 square feet (1 860 to 9 290 square meters);
- ASHRAE 50% Advanced Energy Design Guide for K–12 School Buildings; or
- ASHRAE 50% Advanced Energy Design Guide for Large Hospitals, for hospitals over 100,000 square feet (9 290 square meters).

For projects outside the U.S., consult ASHRAE/ASHRAE/IESNA Standard 90.1–2010, Appendixes B and D, to determine the appropriate climate zone.

OPTION 3. Prescriptive Compliance: Advanced Buildings™ Core Performance™ Guide

Comply with the mandatory and prescriptive provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata (or USGBC approved equivalent standard for projects outside the U.S.).

Comply with Section 1: Design Process Strategies, Section 2: Core Performance Requirements, and the following three strategies from Section 3: Enhanced Performance Strategies, as applicable. Where standards conflict, follow the more stringent of the two. For projects outside the U.S., consult ANSI/ASHRAE/IESNA Standard 90.1-2010, Appendixes B and D, to determine the appropriate climate zone.

3.5 Supply Air Temperature Reset (VAV)

3.9 Premium Economizer Performance

3.10 Variable Speed Control

To be eligible for Option 3, the project must be less than 100,000 square feet (9 290 square meters).

Note: Healthcare, warehouse or laboratory projects are ineligible for Option 3.

DATA CENTERS

Whole-Building Energy Simulation

Demonstrate a 5% improvement in the proposed performance rating over the baseline performance rating. To determine total energy cost savings, create two models, one for building energy cost and the other for IT equipment energy cost. Calculate the baseline building performance according to ANSI/ASHRAE/IESNA Standard 90.1-2010, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), using a simulation model for the whole building and data centre modelling guidelines.

Determine the power utilization effectiveness (PUE) value of the proposed design.

For this prerequisite, a minimum of 2% of the 5% energy savings must come from building power and cooling infrastructure.

Projects must meet the minimum percentage savings before taking credit for renewable energy systems.

The proposed design must meet the following criteria:

- Compliance with the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1-2010, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.);
- inclusion of all energy consumption and costs within and associated with the building project; and
- comparison against a baseline building that complies with ANSI/ASHRAE/IESNA Standard 90.1-2010, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), and data centre modelling guidelines.

For data centres, regulated energy includes cooling units for computer and data processing rooms, critical power conditioning equipment, critical distribution equipment, heat rejection plants, and mechanical and electrical support rooms.

Include in process loads both the unregulated load and the IT equipment load. The IT load comprises critical systems and electrical power transformation, which may include servers, storage and networking power use, and operations affecting monthly server CPU utilization percentages.

Develop two sets of IT load models using two scenarios, one at the maximum estimated IT load rating and the second at the start up IT rating expected at the time of commissioning.

Document the energy modelling input assumptions for unregulated loads. Unregulated loads should be modelled accurately to reflect the actual expected energy consumption of the building.

If unregulated loads are not identical for both the baseline and the proposed building performance rating, and the simulation model cannot accurately model the savings, follow the exceptional calculation method (ANSI/ASHRAE/IESNA Standard 90.1-2010, G2.5) to document measures that reduce unregulated loads.

5.3 EA Prerequisite 3: Building-Level Energy Metering – Required

BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare

▪ Intent

To support energy management and identify opportunities for additional energy savings by tracking building-level energy use.

▪ Requirements

NC, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Install new or use existing building-level energy meters, or submeters that can be aggregated to provide building-level data representing total building energy consumption (electricity, natural gas, chilled water, steam, fuel oil, propane, biomass, etc.). Utility-owned meters capable of aggregating building-level resource use are acceptable.

Commit to sharing with USGBC the resulting energy consumption data and electrical demand data (if metered) for a five-year period beginning on the date

the project accepts LEED certification. At a minimum, energy consumption must be tracked at one-month intervals.

This commitment must carry forward for five years or until the building changes ownership or lessee.

CS

Install new or use existing base building-level energy meters, or submeters that can be aggregated to provide base building-level data representing total building energy consumption (electricity, natural gas, chilled water, steam, fuel oil, propane, etc.). Utility-owned meters capable of aggregating base building-level resource use are acceptable.

Commit to sharing with USGBC the resulting energy consumption data and electrical demand data (if metered) for a five-year period beginning on the date the project accepts LEED certification or typical occupancy, whichever comes first. At a minimum, energy consumption must be tracked at one-month intervals.

This commitment must carry forward for five years or until the building changes ownership or lessee.

5.4 **EA Prerequisite 4: Fundamental Refrigerant Management – Required**

BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare

- Intent

To reduce stratospheric ozone depletion.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Do not use chlorofluorocarbon (CFC)-based refrigerants in new heating, ventilating, air-conditioning, and refrigeration (HVAC&R) systems. When reusing existing HVAC&R equipment, complete a comprehensive CFC phase-out conversion before project completion. Phase-out plans extending beyond the project completion date will be considered on their merits.

5.5 **EA Credit 1: Enhanced Commissioning**

BD&C

2-6 points

This credit applies to

- New Construction (2-6 points)
- Core & Shell (2-6 points)
- Schools (2-6 points)
- Retail (2-6 points)
- Data Center (2-6 point)
- Warehouses & Distribution Centers (2-6 points)
- Hospitality (2-6 points)
- Healthcare (2-6 points)

- 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.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE.

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

Commissioning Authority

- The CxA shall have documented commissioning authority experience in 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 do 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.

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.

Address the following:

- Roles and responsibilities;
- Measurement requirements (meters, points, metering systems, data access);
- The points to be tracked, with frequency and duration for trend monitoring;
- The limits of acceptable values for tracked points and metered values (where appropriate, predictive algorithms may be used to compare ideal values with actual values);
- The elements used to evaluate performance, including conflict between systems, out-of-sequence operation of systems components, and energy and water usage profiles;
- An action plan for identifying and correcting operational errors and deficiencies;
- Training to prevent errors;
- Planning for repairs needed to maintain performance; and
- The frequency of analyses in the first year of occupancy (at least quarterly).

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.

Data Centers only

Projects that select Option 1 must complete the following commissioning process.

For small projects with peak cooling loads less than 2,000,000 Btu/h (600 kW), or a total computer room peak cooling load less than 600,000 Btu/h (175 kW), the CxA must perform the following activities:

- Conduct at least one commissioning verification review of the owner's project requirements, basis of design, and design documents before mid-construction documents development;
- Back-check the review comments in all subsequent design submissions; and
- Conduct an additional full verification review at 95% completion of the design documents and basis of design.

For projects with peak cooling loads 2,000,000 Btu/h (600 kW) or more, or a total computer room peak cooling load 600,000 Btu/h (175 kW) or more, the CxA must conduct at least three verification reviews of the basis of design:

- one verification review of design documents before the start of design development;
- one verification review of design documents before midconstruction documents; and

- One final verification review of 100% complete design documents, verifying achievement of the owner’s project requirements and adjudication of previous review comments.

5.6 EA Credit 2: Optimize Energy Performance

BD&C

1-20 points

This credit applies to

- New Construction (1-18 points)
- Core & Shell (1-18 points)
- Schools (1-16 points)
- Retail (1-18 points)
- Data Centers (1-18 points)
- Warehouses & Distribution Centers (1-18 points)
- Hospitality (1-18 points)
- Healthcare (1-20 points)

▪ Intent

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

Choose one of the options below.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Establish an energy performance target no later than the schematic design phase. The target must be established as kBtu per square foot-year (kW per square meter-year) of source energy use.

Choose one of the options below.

Option 1. Whole-Building Energy Simulation (1–18 points except Schools and Healthcare, 1–16 points Schools, 1–20 points Healthcare)

Analyse efficiency measures during the design process and account for the results in design decision making. Use energy simulation of efficiency opportunities, past energy simulation analyses for similar buildings, or published data (e.g., Advanced Energy Design Guides) from analyses for similar buildings.

Analyse efficiency measures, focusing on load reduction and HVAC-related strategies (passive measures are acceptable) appropriate for the facility. Project potential energy savings and holistic project cost implications related to all affected systems.

Project teams pursuing the Integrative Process credit must complete the basic energy analysis for that credit before conducting the energy simulation.

Follow the criteria in EA Prerequisite Minimum Energy Performance to demonstrate a percentage improvement in the proposed building performance rating compared with the baseline. Points are awarded according to Table 1.

Table 1. Points for percentage improvement in energy performance

New Construction	Major Renovation	Core and Shell	Points (except Schools, Healthcare)	Points Healthcare	Points Schools
6%	4%	3%	1	3	1
8%	6%	5%	2	4	2
10%	8%	7%	3	5	3
12%	10%	9%	4	6	4
14%	12%	11%	5	7	5
16%	14%	13%	6	8	6
18%	16%	15%	7	9	7
20%	18%	17%	8	10	8
22%	20%	19%	9	11	9
24%	22%	21%	10	12	10
26%	24%	23%	11	13	11
29%	27%	26%	12	14	12
32%	30%	29%	13	15	13
35%	33%	32%	14	16	14
38%	36%	35%	15	17	15
42%	40%	39%	16	18	16
46%	44%	43%	17	19	17
50%	48%	47%	18	20	18

Retail only

For all process loads, define a clear baseline for comparison with the proposed improvements. The baselines in Appendix 3, Tables 1–4, represent industry standards and may be used without additional documentation. Calculate the baseline and design as follows:

- *Appliances and equipment.* For appliances and equipment not covered in Tables 1–4, indicate hourly energy use for proposed and budget equipment, along with estimated daily use hours. Use the total estimated appliance/equipment energy use in the energy simulation model as a plug load. Reduced use time (schedule change) is not a category of energy improvement in this credit. ENERGY STAR ratings and evaluations are a valid basis for performing this calculation.
- *Display lighting.* For display lighting, use the space-by-space method of determining allowed lighting power under ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata (or a USGBC-approved equivalent standard for

projects outside the U.S.), to determine the appropriate baseline for both the general building space and the display lighting.

- *Refrigeration.* For hard-wired refrigeration loads, model the effect of energy performance improvements with a simulation program designed to account for refrigeration equipment.

OR

Option 2. Prescriptive Compliance: ASHRAE Advanced Energy Design Guide (1–6 points)

To be eligible for Option 2, projects must use Option 2 in EA Prerequisite Minimum Energy Performance. Implement and document compliance with the applicable recommendations and standards in Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate ASHRAE 50% Advanced Energy Design Guide and climate zone. For projects outside the U.S., consult ASHRAE/ASHRAE/IESNA Standard 90.1–2010, Appendixes B and D, to determine the appropriate climate zone.

ASHRAE 50% Advanced Energy Design Guide for Small to Medium Office Buildings

- *Building envelope, opaque:* roofs, walls, floors, slabs, doors, and continuous air barriers (1 point)
- *Building envelope, glazing:* vertical fenestration (1 point)
- *Interior lighting,* including daylighting and interior finishes (1 point)
- *Exterior lighting* (1 point)
- *Plug loads,* including equipment and controls (1 point)

ASHRAE 50% Advanced Energy Design Guide for Medium to Large Box Retail Buildings

- *Building envelope, opaque:* roofs, walls, floors, slabs, doors, and vestibules (1 point)
- *Building envelope, glazing:* fenestration - all orientations (1 point)
- *Interior lighting,* excluding lighting power density for sales floor (1 point)
- *Additional interior lighting* for sales floor (1 point)
- *Exterior lighting* (1 point)
- *Plug loads,* including equipment choices and controls (1 point)

ASHRAE 50% Advanced Energy Design Guide for K–12 School Buildings

- *Building envelope, opaque:* roofs, walls, floors, slabs, and doors (1 point)
- *Building envelope, glazing:* vertical fenestration (1 point)
- *Interior lighting,* including daylighting and interior finishes (1 point)
- *Exterior lighting* (1 point)

- *Plug loads,* including equipment choices, controls, and kitchen equipment (1 point)

ASHRAE 50% Advanced Energy Design Guide for Large Hospitals

- *Building envelope, opaque:* roofs, walls, floors, slabs, doors, vestibules, and continuous air barriers (1 point)
- *Building envelope, glazing:* vertical fenestration (1 point)
- *Interior lighting,* including daylighting (form or nonform driven) and interior finishes (1 point)
- *Exterior lighting* (1 point)
- *Plug loads,* including equipment choices, controls, and kitchen equipment (1 point)

Retail only

Meet the requirements of Option 2 and comply with the prescriptive measures in Appendix 3, Tables 1–4, for 90% of total energy consumption for all process equipment.

DATA CENTERS

Whole-Building Energy Simulation

Analyse efficiency measures focused on IT load reduction and HVAC-related strategies (air-side economizers, hot aisle–cold aisle, etc.). Project the potential energy savings and cost implications for all affected systems.

Follow the criteria in EA Prerequisite Minimum Energy Performance to demonstrate a percentage improvement in the proposed performance rating compared with the baseline.

Use energy cost savings from both the building and IT to determine the total percentage reduction.

5.7 EA Credit 3: Advanced Energy Metering

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

- Intent

To support energy management and identify opportunities for additional energy savings by tracking building-level and system-level energy use.

- Requirements

NC, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Install *advanced energy metering* for the following:

- All whole-building energy sources used by the building; and
- Any individual energy end uses that represent 10% or more of the total annual consumption of the building.

The advanced energy metering must have the following characteristics.

- Meters must be permanently installed, record at intervals of one hour or less, and transmit data to a remote location.
- Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate.
- The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure.
- The system must be capable of storing all meter data for at least 36 months.
- The data must be remotely accessible.
- All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.

CS

Install meters for future tenant spaces so that tenants will be capable of independently metering energy consumption (electricity, chilled water, etc.) for all systems dedicated to their space. Provide a sufficient number of meters to capture total tenant energy use with a minimum of one meter per energy source per floor.

Install *advanced energy metering* for all base building energy sources used by the building.

The advanced energy metering must have the following characteristics.

- Meters must be permanently installed, record at intervals of one hour or less, and transmit data to a remote location.
- Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate.
- The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure.
- The system must be capable of storing all meter data for at least 36 months.

- The data must be remotely accessible.
- All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.

5.8 EA Credit 4: Demand Response

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)

- Intent

To increase participation in demand response technologies and program that make energy generation and distribution systems more efficient, increase grid reliability, and reduce greenhouse gas emissions.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Design building and equipment for participation in demand response programs through load shedding or shifting. On-site electricity generation does not meet the intent of this credit.

Case 1. Demand Response Program Available (2 points)

- Participate in an existing demand response (DR) program and complete the following activities. Design a system with the capability for real-time, fully-automated DR based on external initiation by a DR Program Provider. Semi-automated DR may be utilized in practice.
- Enrol in a minimum one-year DR participation amount contractual commitment with a qualified DR program provider, with the intention of multiyear renewal, for at least 10% of the estimated peak electricity demand. Peak demand is determined under EA Prerequisite Minimum Energy Performance.
- Develop a comprehensive plan for meeting the contractual commitment during a Demand Response event.
- Include the DR processes in the scope of work for the commissioning authority, including participation in at least one full test of the DR plan.

Case 2. Demand Response Program Not Available (1 point)

Provide infrastructure to take advantage of future demand response programs or dynamic, real-time pricing programs and complete the following activities.

- Install interval recording meters with communications and ability for the building automation system to accept an external price or control signal.
- Develop a comprehensive plan for shedding at least 10% of building estimated peak electricity demand. Peak demand is determined under EA Prerequisite Minimum Energy Performance.
- Include the DR processes in the scope of work for the commissioning authority, including participation in at least one full test of the DR plan.
- Contact local utility representatives to discuss participation in future DR programs.

5.9 EA Credit 5: Renewable Energy Production

BD&C

1–3 points

This credit applies to

- New Construction (1–3 points)
- Core & Shell (1–3 points)
- Schools (1–3 points)
- Retail (1–3 points)
- Data Centers (1–3 points)
- Warehouses & Distribution Centers (1–3 points)
- Hospitality (1–3 points)
- Healthcare (1–3 points)

- Intent

To reduce the environmental and economic harms associated with fossil fuel energy by increasing self-supply of renewable energy.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Use renewable energy systems to offset building energy costs. Calculate the percentage of renewable energy with the following equation:

Table 1. Points for renewable energy

Percentage renewable energy	Points (except CS)	Points (CS)
1%	1	1
3%	—	2
5%	2	3
10%	3	—

5.10 EA Credit 6: Enhanced Refrigerant Management

$$\% \text{ renewable energy} = \frac{\text{Equivalent cost of usable energy produced by the renewable energy system}}{\text{Total building annual energy cost}} \times \frac{\text{Equivalent cost of usable energy produced by the renewable energy system}}{\text{Equivalent cost of usable energy produced by the renewable energy system}}$$

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)
- Intent

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to climate change.

- Requirements

NC, CS, SCHOOLS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Option 1. No Refrigerants or Low-Impact Refrigerants (1 point)

Do not use refrigerants, or use only refrigerants (naturally occurring or synthetic) that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50.

OR

Option 2. Calculation of Refrigerant Impact (1 point)

Select refrigerants that are used in heating, ventilating, air-conditioning, and refrigeration (HVAC&R) equipment to minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change. The combination of all new and existing base building and tenant HVAC&R equipment that serve the project must comply with the following formula:

IP units	SI units
$\frac{LCGW}{P} + \frac{LCOD}{P} \times 10^5 \leq 100$	$\frac{LCGW}{P} + \frac{LCOD}{P} \times 10^5 \leq 13$
Calculation definitions for LCGWP + LCODP x 10⁵ ≤ 100 (IP units)	Calculation definitions for LCGWP + LCODP x 10⁵ ≤ 13 (SI units)
LCODP = [ODPr x (Lr x Life +Mr) x Rc]/Life	LCODP = [ODPr x (Lr x Life +Mr) x Rc]/Life
LCGWP = [GWPr x (Lr x Life +Mr) x Rc]/Life	LCGWP = [GWPr x (Lr x Life +Mr) x Rc]/Life
LCODP: Lifecycle Ozone Depletion Potential (lb CFC 11/Ton-Year)	LCODP: Lifecycle Ozone Depletion Potential (kg CFC 11/(kW/year))
LCGWP: Lifecycle Direct Global Warming Potential	LCGWP: Lifecycle Direct Global Warming Potential
(lb CO ₂ /Ton-Year)	(kg CO ₂ /kW-year)
GWPr: Global Warming Potential of Refrigerant (0 to 12,000 lb CO ₂ /lbr)	GWPr: Global Warming Potential of Refrigerant (0 to 12,000 kg CO ₂ /kg r)
ODPr: Ozone Depletion Potential of Refrigerant (0 to 0.2 lb CFC 11/lbr)	ODPr: Ozone Depletion Potential of Refrigerant (0 to 0.2 kg CFC 11/kg r)
Lr: Refrigerant Leakage Rate (2.0%)	Lr: Refrigerant Leakage Rate (2.0%)
Mr: End-of-life Refrigerant Loss (10%)	Mr: End-of-life Refrigerant Loss (10%)
Rc: Refrigerant Charge (0.5 to 5.0 lbs of refrigerant per ton of gross AHRI rated cooling capacity)	Rc: Refrigerant Charge (0.065 to 0.65 kg of refrigerant per kW of AHRI rated or Eurovent Certified cooling capacity)
Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)	Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)

For multiple types of equipment, calculate a weighted average of all base building HVAC&R equipment, using the following formula.

Calculation definitions for $[\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}] / Q_{total} \leq 100$ (IP units)	Calculation definitions for $[\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}] / Q_{total} \leq 13$ (SI units)
Qunit = Gross AHRI rated cooling capacity of an individual HVAC or refrigeration unit (Tons)	Qunit = Eurovent Certified cooling capacity of an individual HVAC or refrigeration unit (kW)
Qtotal = Total gross AHRI rated cooling capacity of all HVAC or refrigeration	Qtotal = Total Eurovent Certified cooling capacity of all HVAC or refrigeration (kW)

RETAIL NC

Meet Option 1 or 2 for all HVAC systems.

Stores with commercial refrigeration systems must comply with the following.

- Use only non-ozone-depleting refrigerants.
- Select equipment with an average HFC refrigerant charge of no more than 1.75 pounds of refrigerant per 1,000 Btu/h (2.72 kg of refrigerant per kW) total evaporator cooling load.

- Demonstrate a predicted store-wide annual refrigerant emissions rate of no more than 15%. Conduct leak testing using the procedures in GreenChill's best practices guideline for leak tightness at installation.

Alternatively, stores with commercial refrigeration systems may provide proof of attainment of EPA GreenChill's silver-level store certification for newly constructed stores.

5.11 EA Credit 7: Green Power and Carbon Offsets

BD&C

1–2 points

This credit applies to

- New Construction (1–2 points)
- Core & Shell (1–2 points)
- Schools (1–2 points)
- Retail (1–2 points)
- Data Centers (1–2 points)
- Warehouses & Distribution Centers (1–2 points)
- Hospitality (1–2 points)
- Healthcare (1–2 points)
- Intent

To encourage the reduction of greenhouse gas emissions through the use of grid-source, renewable energy technologies and carbon mitigation projects.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Engage in a contract for qualified resources that have come online since January 1, 2005, for a minimum of five years, to be delivered at least annually. The contract must specify the provision of at least 50% or 100% of the project's energy from green power, carbon offsets, or renewable energy certificates (RECs).

Green power and RECs must be Green-e Energy certified or the equivalent. RECs can only be used to mitigate the effects of Scope 2, electricity use.

Carbon offsets may be used to mitigate Scope 1 or Scope 2 emissions on a metric ton of carbon dioxide-equivalent basis and must be Green-e Climate certified, or the equivalent.

For U.S. projects, the offsets must be from greenhouse gas emissions reduction projects within the U.S.

Determine the percentage of green power or offsets based on the quantity of energy consumed, not the cost. Points are awarded according to Table 1.

Table 1. Points for energy from green power or carbon offsets

<i>Percentage of total energy addressed by green power, RECs and/or offsets</i>	<i>Points</i>
50%	1
100%	2

Use the project's annual energy consumption, calculated in EA Prerequisite Minimum Energy Performance, if Option 1 was pursued; otherwise use the U.S. Department of Energy's Commercial Buildings Energy Consumption Survey (CBECS) database to estimate energy use.

CS Only

A core and shell building's energy is defined as the energy usage of the core and shell floor area as defined by the Building Owners and Managers Association (BOMA) standards, but not less than 15% of the project's floor area.

6.0 MATERIALS & RESOURCES

6.1 MR Prerequisite 1: Storage & Collection of Recyclables – Required

BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare
- Intent
- Intent

To reduce the waste that is generated by building occupants and hauled to and disposed of in landfills.
- Requirements

NC, CS, SCHOOLS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY NC, HEALTHCARE

Provide dedicated areas accessible to waste haulers and building occupants for the collection and storage of recyclable materials for the entire building. Collection and storage areas may be separate locations. Recyclable materials must include mixed paper, corrugated cardboard, glass, plastics, and metals. Take appropriate measures for the safe collection, storage, and disposal of two of the following: batteries, mercury-containing lamps, and electronic waste.

RETAIL NC

Conduct a waste stream study to identify the retail project's top five recyclable waste streams, by either weight or volume, using consistent metrics. Based on the waste stream study, list the top four waste streams for which collection and storage space will be provided. If no information is available on waste streams for the project, use data from similar operations to make projections. Retailers with existing stores of similar size and function can use historical information from their other locations.

Provide dedicated areas accessible to waste haulers and building occupants for the separation, collection, and storage of recyclable materials for at least the top four recyclable waste streams identified by the waste study. Locate the collection and storage bins close the source of recyclable waste. If any of the top four waste streams are batteries, mercury-containing lamps, or electronic waste, take appropriate measures for safe collection, storage, and disposal.

6.2 MR Prerequisite 2: Construction and Demolition Waste Management Planning – Required

BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare
- Intent

To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

- Requirements

NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY NC, HEALTHCARE

Develop and implement a construction and demolition waste management plan:

- Establish waste diversion goals for the project by identifying at least five materials (both structural and non-structural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.
- Specify whether materials will be separated or comingled and describe the diversion strategies planned for the project. Describe where the material 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.

Alternative daily cover (ADC) does not qualify as material diverted from disposal. Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion.

6.3 MR Prerequisite 3: PBT Source Reduction – Mercury – Required

BD&C

This prerequisite applies

- Healthcare
- Intent

To reduce mercury-containing products and devices and mercury release through product substitution, capture, and recycling.

Requirements

HEALTHCARE

As part of the project’s recycling collection system, identify the following:

- types of mercury-containing products and devices to be collected;
- criteria governing how they are to be handled by a recycling program; and
- Disposal methods for captured mercury.

Applicable mercury-containing products and devices include, but are not limited to, lamps (such as linear and circular fluorescents, integrally ballasted and nonintegrally ballasted compact fluorescents and HIDs) and dental wastes (such as scrap amalgam, chair side traps, and separator wastes).

In facilities delivering dental care, specify and install amalgam separation devices that meet or exceed the ISO-11143 standard.

Comply with the mercury elimination requirements outlined below, from the 2010 FGI Guidelines for Design and Construction of Health Care Facilities, Section A1.3- 4b, Mercury Elimination.

- 4.2.1.1. New construction: healthcare facilities may not use mercury-containing equipment, including thermostats, switching devices, and other building system sources. Lamps are excluded.
- 4.2.1.2. Renovation: healthcare facilities must develop a plan to phase out mercury-containing products and upgrade current mercury-containing lamps to high-efficiency, low-mercury, or mercury-free lamp technology.

Do not specify or install preheat, T-9, T-10, or T-12 fluorescents or mercury vapour high-intensity discharge (HID) lamps in the project. Do not specify probe-start metal halide HID lamps in any interior spaces.

Specify and install illuminated exit signs that do not contain mercury and use less than 5 watts of electricity.

Fluorescent and high-pressure sodium lamps must meet the criteria in Table 1.

Table 1. Maximum mercury content of lamps

<i>Lamp</i>	<i>Maximum content</i>
T-8 fluorescent, eight-foot	10 mg mercury
T-8 fluorescent, four-foot	3.5 mg mercury
T-8 fluorescent, U-bent	6 mg mercury
T-5 fluorescent, linear	2.5 mg mercury
T-5 fluorescent, circular	9 mg mercury
Compact fluorescent, non-integral ballast	3.5 mg mercury

Compact fluorescent, integral ballast	3.5 mg mercury, ENERGY STAR qualified
High-pressure sodium, up to 400 watts	10 mg mercury
High-pressure sodium, above 400 watts	32 mg mercury

Mg = milligram

6.4 MR Credit 1: Building Life-Cycle Impact Reduction

BD&C

2–6 points

This credit applies to

- New Construction (2–5 points)
- Core & Shell (2–6 points)
- Schools (2–5 points)
- Retail (2–5 points)
- Data Centers (2–5 points)
- Warehouses & Distribution Centers (2–5 points)
- Hospitality (2–5 points)
- Healthcare (2–5 points)

▪ Intent

To encourage adaptive reuse and optimize the environmental performance of products and materials.

▪ Requirements

NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY NC, HEALTHCARE

Demonstrate reduced environmental effects during initial project decision-making by reusing existing building resources or demonstrating a reduction in materials use through life-cycle assessment. Achieve one of the following options.

Option 1. Historic Building Reuse (5 points BD&C, 6 points Core and Shell)

Maintain the existing building structure, envelope, and interior non-structural elements of a historic building or contributing building in a historic district. To qualify, the building or historic district must be listed or eligible for listing in the local, state, or national register of historic places. Do not demolish any part of a historic building or contributing building in a historic district unless it is deemed structurally unsound or hazardous. For buildings listed locally, approval of any demolition must be granted by the local historic preservation review board. For buildings listed in a state register or the U.S. National Register of Historic Places (or local equivalent for projects outside the U.S.), approval must appear in a programmatic agreement with the state historic preservation office or National Park Service (or local equivalent for projects outside the U.S.).

Any alteration (preservation, restoration, or rehabilitation) of a historic building or a contributing building in a historic district on the project site must be done in accordance with local or national standards for rehabilitation, whichever are applicable. If building is not subject to historic review, include on the project team a preservation professional who meets U.S. federal qualifications for historic architects (or local equivalent for projects outside the U.S.); the preservation professional must confirm conformance to the Secretary of Interior's Standards for the Treatment of Historic Properties (or local equivalent for projects outside the U.S.).

OR

Option 2. Renovation of Abandoned or Blighted Building (5 points BD&C, 6 points Core and Shell)

Maintain at least 50%, by surface area, of the existing building structure, enclosure, and interior structural elements for buildings that meet local criteria of abandoned or are considered blight. The building must be renovated to a state of productive occupancy. Up to 25% of the building surface area may be excluded from credit calculation because of deterioration or damage.

OR

Option 3. Building and Material Reuse (2-4 points BD&C, 2-5 points Core and Shell)

Reuse or salvage building materials from off site or on site as a percentage of the surface area, as listed in Table 1. Include structural elements (e.g., floors, roof decking), enclosure materials (e.g., skin, framing), and permanently installed interior elements (e.g., walls, doors, floor covering, ceiling systems). Exclude from the calculation window assemblies and any hazardous materials that are remediated as a part of the project.

Table 1. Points for reuse of building materials

Percentage of completed project surface area reused	Points BD&C	Points BD&C (Core and Shell)
25%	2	2
50%	3	3
75%	4	5

OR

Option 4. Whole-Building Life-Cycle Assessment (3 points)

For new construction (buildings or portions of buildings), conduct a life-cycle assessment of the project's structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building, in at least three of the six impact categories listed below, one of which must be global warming potential. No impact category assessed as part of the life-cycle assessment may increase by more than 5% compared with the baseline building.

The baseline and proposed buildings must be of comparable size, function, orientation, and operating energy performance as defined in EA Prerequisite

Minimum Energy Performance. The service life of the baseline and proposed buildings must be the same and at least 60 years to fully account for maintenance and replacement. Use the same life-cycle assessment software tools and data sets to evaluate both the baseline building and the proposed building, and report all listed impact categories. Data sets must be compliant with ISO 14044.

Select at least three of the following impact categories for reduction:

- global warming potential (greenhouse gases), in CO₂e;
- depletion of the stratospheric ozone layer, in kg CFC-11;
- acidification of land and water sources, in moles H⁺ or kg SO₂;
- eutrophication, in kg nitrogen or kg phosphate;
- formation of tropospheric ozone, in kg NO_x, kg O₃ eq, or kg ethane; and
- Depletion of non-renewable energy resources, in MJ.

6.5 MR Credit 2: Building Product Disclosure and Optimization Environmental Product Declarations

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)
- Intent
To encourage the use of products and material for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.
- Requirements
NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Achieve one or more of the options below, for a maximum of 2 points.

Option 1. Environmental Product Declaration (EPD) (1 point)

Use at least 20 different permanently installed products sourced from at least five different manufacturers that meet one of the disclosure criteria below.

- Product-specific declaration.
 - Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope are valued as one quarter (1/4) of a product for the purposes of credit achievement calculation.
 - Environmental Product Declarations which conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - Industry-wide (generic) EPD – Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator are valued as one half (1/2) of a product for purposes of credit achievement calculation.
 - Product-specific Type III EPD – Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator are valued as one whole product for purposes of credit achievement calculation.
- USGBC approved program – Products that comply with other USGBC approved environmental product declaration frameworks.

Option 2. Multi-Attribute Optimization (1 point)

Use products that comply with one of the criteria below for 50%, by cost, of the total value of permanently installed products in the project. Products will be valued as below.

- Third party certified products that demonstrate impact reduction below industry average in at least three of the following categories are valued at 100% of their cost for credit achievement calculations.
 - global warming potential (greenhouse gases), in CO₂e;
 - depletion of the stratospheric ozone layer, in kg CFC-11;
 - acidification of land and water sources, in moles H⁺ or kg SO₂;
 - eutrophication, in kg nitrogen or kg phosphate;
 - formation of tropospheric ozone, in kg NO_x, kg O₃ eq, or kg ethane; and
 - Depletion of non-renewable energy resources, in MJ.
- USGBC approved program – Products that comply with other USGBC approved multi-attribute frameworks.

For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost.

Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

6.6 MR Credit 3: Building Product Disclosure and Optimization – Sourcing of Raw Materials.

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)

▪ Intent

To encourage the use of products and materials for which life cycle information is available and that have selecting products verified to have been extracted or sourced in a responsible manner.

▪ Requirements

NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY NC, HEALTHCARE

Option 1. Raw Material Source and Extraction Reporting (1 point)

Use at least 20 different permanently installed products from at least five different manufacturers that have publicly released a report from their raw material suppliers which include raw material supplier extraction locations, a commitment to long-term ecologically responsible land use, a commitment to reducing environmental harms from extraction and/or manufacturing processes, and a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria

- Products sourced from manufacturers with self-declared reports are valued as one half (1/2) of a product for credit achievement.
- Third-party verified corporate sustainability reports (CSR) which include environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain, are valued as one whole product for credit achievement calculation.

Acceptable CSR frameworks include the following:

- Global Reporting Initiative (GRI) Sustainability Report

- Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises
- U.N. Global Compact: Communication of Progress
- ISO 26000: 2010 Guidance on Social Responsibility
- USGBC approved program: Other USGBC approved programs meeting the CSR criteria.

Option 2. Leadership Extraction Practices (1 point)

Use products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project.

- *Extended producer responsibility.* Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility. Products meeting extended producer responsibility criteria are valued at 50% of their cost for the purposes of credit achievement calculation.
- *Bio-based materials.* Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material. Products meeting bio-based materials criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *Wood products.* Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *Materials reuse.* Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *Recycled content.* Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *USGBC approved program.* Other USGBC approved programs meeting leadership extraction criteria.

For credit achievement calculation, products sourced (extracted, manufactured and purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost. For credit achievement calculation, the base contributing cost of individual products compliant with multiple responsible extraction criteria is not permitted to exceed 100% its total actual cost (before regional multipliers) and double counting of single product components compliant with multiple responsible extraction criteria is not permitted and in no case is a product permitted to contribute more than 200% of its total actual cost.

Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

6.7 MR Credit 4: Building Product Disclosure and Optimization – Material Ingredients

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 point)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)
- Intent
To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.
- Requirements
NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY NC, HEALTHCARE
Option 1. Material Ingredient Reporting (1 point)
Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm).
 - *Manufacturer Inventory.* The manufacturer has published complete content inventory for the product following these guidelines:
 - A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN)
 - Materials defined as trade secret or intellectual property may withhold the name and/or CASRN but must disclose role, amount and GreenScreen benchmark, as defined in GreenScreen v1.2.
 - *Health Product Declaration.* The end use product has a published, complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.

- *Cradle to Cradle*. The end use product has been certified at the Cradle to Cradle v2 Basic level or Cradle to Cradle v3 Bronze level.
- *USGBC approved program*. Other USGBC approved programs meeting the material ingredient reporting criteria.

AND/OR

Option 2: Material Ingredient Optimization (1 point)

Use products that document their material ingredient optimization using the paths below for at least 25%, by cost, of the total value of permanently installed products in the project.

- *GreenScreen v1.2 Benchmark*. Products that have fully inventoried chemical ingredients to 100 ppm that have no Benchmark 1 hazards:
 - If any ingredients are assessed with the GreenScreen List Translator, value these products at 100% of cost.
 - If all ingredients are have undergone a full GreenScreen Assessment, value these products at 150% of cost.
- *Cradle to Cradle Certified*. End use products are certified Cradle to Cradle. Products will be valued as follows:
 - Cradle to Cradle v2 Gold: 100% of cost
 - Cradle to Cradle v2 Platinum: 150% of cost
 - Cradle to Cradle v3 Silver: 100% of cost
 - Cradle to Cradle v3 Gold or Platinum: 150% of cost
- *International Alternative Compliance Path – REACH Optimization*. End use products and materials that do not contain substances that meet REACH criteria for substances of very high concern. If the product contains no ingredients listed on the REACH Authorization or Candidate list, value at 100% of cost.
- *USGBC approved program*. Products that comply with USGGBC approved building product optimization criteria.

AND/OR

Option 3: Product Manufacturer Supply Chain Optimization (1 point)

Use building products for at least 25%, by cost, of the total value of permanently installed products in the project that:

- Are sourced from product manufacturers who engage in validated and robust safety, health, hazard, and risk programs which at a minimum document at least 99% (by weight) of the ingredients used to make the building product or building material, and
- Are sourced from product manufacturers with independent third party verification of their supply chain that at a minimum verifies:
 - Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation

- Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of chemical ingredients
- Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients
- Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients
- Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain
- Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain

Products meeting Option 3 criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

For credit achievement calculation of options 2 and 3, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost. For credit achievement calculation, the value of individual products compliant with either option 2 or 3 can be combined to reach the 25% threshold but products compliant with both option 2 and 3 may only be counted once.

Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

6.8 MR Credit 5: PBT Source Reduction – Mercury

BD&C

1 point

This credit applies to

- Healthcare

- Intent

To reduce the release of persistent, bio accumulative, and, and toxic (PBTs) chemicals associated with the life cycle of building materials.

- Requirements

HEALTHCARE

Specify and install fluorescent lamps with both low mercury content (MR Prerequisite PBT Source Reduction – Mercury) and long lamp life, as listed in Table 1.

Table 1. Criteria for rated life of low-mercury lamps

Lamp	Maximum content	Lamp life (hrs)
T-8 fluorescent, eight-foot	10 mg mercury	Standard output - 24,000 rated hours on instant start ballasts (3-hour starts) High output - 18,000 rated hours on instant start ballasts or program start ballasts (3-hour starts)
T-8 fluorescent, four-foot	3.5 mg mercury	Both standard and high output - 30,000 rated hours on instant start ballasts, or 36,000 rated hours on program start ballasts (3 hour starts)
T-8 fluorescent, two-foot and three-foot	3.5 mg mercury	24,000 rated hours on instant start ballasts or program start ballasts (3-hour starts)
T-8 fluorescent, U-bent	6 mg mercury	18,000 rated hours on instant start ballasts, or 24,000 rated hours on program start ballasts (3-hour starts)
T-5 fluorescent, linear	2.5 mg mercury	Both standard and high-output - 25,000 rated hours on program start ballasts
T-5 fluorescent, circular	9 mg mercury	Both standard and high-output - 25,000 rated hours on program start ballasts
Compact fluorescent, nonintegral ballast	3.5 mg mercury	12,000 rated hours
Compact fluorescent, integral ballast, bare bulb	3.5 mg mercury, ENERGY STAR qualified	Bare bulb - 10,000 rated hours Covered models such as globes, reflectors, A-19s - 8,000 hours
High-pressure sodium, up to 400 watts	10 mg mercury	Use noncycling type or replace with LED lamps or induction lamps
High-pressure sodium, above 400 watts	32 mg mercury	Use noncycling type or replace with LED lamps or induction lamps

Do not specify or install circular fluorescent lamps or probe stat metal halide lamps.

6.9 MR Credit 6: PBT Source Reduction – Lead, Cadmium, and Copper

BD&C

2 points

This credit applies to

- Healthcare

- Intent

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

To reduce the release of persistent, bio accumulative, and toxic (PBT) chemicals associated with the life cycle of building materials.

- Requirements

HEALTHCARE

Specify substitutes for materials manufactured with lead and cadmium, as follows.

Lead

- For water intended for human consumption, specify and use solder and flux to connect plumbing pipe on site that meets the California AB1953 standard, which specifies that solder not contain more than 0.2% lead, and flux not more than a weighted average of 0.25% lead for wetted surfaces. The “lead free” label as defined by the Safe Drinking Water Act (SDWA) does not provide adequate screening for the purposes of this credit because the SDWA defines “lead free” as solders and flux containing 0.2% lead or less.
- For water intended for human consumption, specify and use pipes, pipe fittings, plumbing fittings, and faucets that meet the California law AB1953 of a weighted average lead content of the wetted surface area of not more than 0.25% lead.
- Specify and use lead-free roofing and flashing.
- Specify and use electrical wire and cable with lead content less than 300 parts per million.
- Specify no use of interior or exterior paints containing lead.
- For renovation projects, ensure the removal and appropriate disposal of disconnected wires with lead stabilizers, consistent with the 2002 National Electric Code requirements.

Lead used for radiation shielding and copper used for MRI shielding are exempt.

Cadmium

- Specify no use of interior or exterior paints containing intentionally added cadmium.

Copper

- For copper pipe applications, reduce or eliminate joint-related sources of copper corrosion:
 - use mechanically crimped copper joint systems; or
 - Specify that all solder joints comply with ASTM B828 2002, and specify and use ASTM B813 2010 for flux.

6.10 MR Credit 7: Furniture and Medical Furnishings

BD&C

1-2 points

This credit applies to

- Healthcare

- Intent

To enhance the environmental and human health performance attributes associated with freestanding furniture and medical furnishings.

- Requirements

HEALTHCARE

Use at least 30% (1 point) or 40% (2 points), by cost, of all freestanding furniture and medical furnishings (e.g., mattresses, foams, panel fabrics, cubicle curtains, window coverings, and other textiles) that meet the criteria in one of the following three options.

Include built-in casework and built-in millwork in the base building calculations, even if manufactured off site. The dollar value of any individual product may be included in the total qualifying value if the product meets the criteria.

Option 1. Minimal Chemical Content

All components that constitute at least 5%, by weight, of a furniture or medical furnishing assembly, including textiles, finishes, and dyes, must contain less than 100 parts per million (ppm) of at least four of the five following chemical groups:

- Urea formaldehyde;
- Heavy metals, including mercury, cadmium, lead, and antimony;
- Hexavalent chromium in plated finishes consistent with the European Union Directive on the Restriction of the Use of Certain Hazardous Substances (EU RoHS);
- Stain and non-stick treatments derived from per fluorinated compounds (PFCs), including perfluorooctanoic acid (PFOA); and
- Added antimicrobial treatments.

AND/OR

Option 2. Testing and Modelling of Chemical Content

All components of a furniture or medical furnishing assembly, including textiles, finishes, and dyes, must contain less than 100 parts per million (ppm) of at least two of the five chemicals or materials listed in Option 1.

New furniture or medical furnishing assemblies must be in accordance with ANSI/BIFMA Standard Method M7.1–2011. Comply with ANSI/BIFMA e3-2010 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modelling approach or the emissions factor approach. Model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. USGBC-approved equivalent testing methodologies and contaminant thresholds are also acceptable. Documentation submitted for furniture must indicate the modelling scenario used to determine compliance.

Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

AND/OR

Option 3: Multi-Attribute Assessment of Products

Use products that meet at least one of the criteria below. Each product can receive credit for each criterion met. The scope of any environmental product declaration (EPD) must be at least cradle to gate.

- Product-specific declaration.
- Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope are valued as one quarter (1/4) of a product for the purposes of credit achievement calculation.
 - Environmental Product Declarations which conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - Industry-wide (generic) EPD – Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator are valued as one half (1/2) of a product for purposes of credit achievement calculation.
 - Product-specific Type III EPD – Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator are valued as one whole product for purposes of credit achievement calculation.
- *Materials reuse.* Use salvaged, refurbished, or reused products.
- *Recycled content.* Use products with recycled content. Recycled content is the sum of post-consumer recycled content plus one-half the pre-consumer recycled content.
- *Extended producer responsibility.* Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
- *Bio-based materials.* Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material.
- *Wood products.* Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent.

Products that meet the above criteria are valued according to source location (extraction, manufacture, and purchase point must be within the distances noted below):

For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost.

6.11 MR Credit 8: Design for Flexibility

BD&C

1 point

This credit applies to

- Healthcare

- Intent

Conserve resources associated with the construction and management of buildings by designing for flexibility and ease of future adaption and for the service life of components and assemblies.

- Requirements

HEALTHCARE

Increase building flexibility and ease of adaptive use over the life of the structure by employing at least three of the following strategies.

- Use *interstitial space*. Design distribution zone utility systems and equipment including HVAC, plumbing, electrical, information technology, medical gases, and life safety systems to serve the occupied zones and have the capacity to control multiple zones in clinical spaces.
- Provide programmed soft space, such as administration or storage, equal to at least 5% of *departmental gross area* (DGA). Locate soft space adjacent to clinical departments that anticipate growth. Determine a strategy for future accommodation of displaced soft space.
- Provide shell space equal to at least 5% of DGA. Locate it such that it can be occupied without displacing occupied space.
- Identify horizontal expansion capacity for diagnostic and treatment or other clinical space equal to at least 30% of existing floor area (excluding inpatient units) without demolition of occupied space (other than at the connection point). Reconfiguration of additional existing occupied space that has been constructed with demountable partition systems is permitted.
- Design for future vertical expansion on at least 75% of the roof, ensuring that existing operations and service systems can continue at or near capacity during the expansion.
- Designate space for future above-grade parking structures equal to 50% of existing on-grade parking capacity, with direct access to the main hospital lobby or circulation. Vertical transportation pathways that lead directly to the main hospital lobby or circulation are acceptable.
- Use demountable partitions for 50% of applicable areas.
- Use movable or modular casework for at least 50% of casework and custom millwork. Base the calculation on the combined value of casework and millwork, as determined by the cost estimator or contractor.

6.12 MR Credit 9: Construction and Demolition Waste Management

BD&C

1–2 points

This credit applies to

- New Construction (1–2 points)

- Core & Shell (1–2 points)
- Schools (1–2 points)
- Retail (1–2 points)
- Data Centers (1–2 points)
- Warehouses & Distribution Centers (1–2 points)
- Hospitality (1–2 points)
- Healthcare (1–2 points)

- Intent

To reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.

- Requirements

NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY NC, HEALTHCARE

Recycle and/or salvage nonhazardous construction and demolition materials. Calculations can be by weight or volume but must be consistent throughout.

Exclude excavated soil, land-clearing debris, and alternative daily cover (ADC). Include wood waste converted to fuel (biofuel) in the calculations; other types of waste-to-energy are not considered diversion for this credit.

However, for projects that cannot meet credit requirements using reuse and recycling methods, waste-to-energy systems may be considered waste diversion if the European Commission Waste Framework Directive 2008/98/EC and Waste Incineration Directive 2000/76/EC are followed and Waste to Energy facilities meet applicable European Committee for Standardization (CEN) EN 303 standards.

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.

OR

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.

OR

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.

7.0 INDOOR ENVIRONMENTAL QUALITY

7.1 EQ Prerequisite 1: Minimum IAQ Performance – Required

BD&C

This prerequisite applies to

- New Construction
- Core & Shell
- Schools
- Retail
- Data Centers
- Warehouses & Distribution Centers
- Hospitality
- Healthcare
- Intent
 - To contribute to the comfort and well-being of building occupants by establishing minimum standards for indoor air quality (IAQ).
- Requirements
 - NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY

Meet the requirements for both ventilation and monitoring.

Ventilation

Mechanically Ventilated Spaces

Option 1. ASHRAE Standard 62.1–2010

For mechanically ventilated spaces (and for mixed-mode systems when the mechanical ventilation is activated), determine the minimum outdoor air intake flow for mechanical ventilation systems using the ventilation rate procedure from ASHRAE 62.1–2010 or a local equivalent, whichever is more stringent.

Meet the minimum requirements of ASHRAE Standard 62.1–2010, Sections 4–7, Ventilation for Acceptable Indoor Air Quality (with errata), or a local equivalent, whichever is more stringent.

Option 2. CEN Standards EN 15251–2007 and EN 13779–2007

Projects outside the U.S. may instead meet the minimum outdoor air requirements of Annex B of Comité Européen de Normalisation (CEN) Standard EN 15251–2007, Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics; and meet the requirements of CEN Standard EN 13779–2007, Ventilation for non-residential buildings, Performance requirements for ventilation and room conditioning systems, excluding Section 7.3, Thermal environment; 7.6, Acoustic environment; A.16; and A.17.

Naturally Ventilated Spaces

For naturally ventilated spaces (and for mixed-mode systems when the mechanical ventilation is inactivated), determine the minimum outdoor air opening and space configuration requirements using the natural ventilation procedure from ASHRAE Standard 62.1–2010 or a local equivalent, whichever is more stringent. Confirm that natural ventilation is an effective strategy for the project by following the flow diagram in the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual AM10, March 2005, Natural Ventilation in Nondomestic Buildings, Figure 2.8, and meet the requirements of ASHRAE Standard 62.1–2010, Section 4, or a local equivalent, whichever is more stringent.

All Spaces

The indoor air quality procedure defined in ASHRAE Standard 62.1–2010 may not be used to comply with this prerequisite.

Monitoring

Mechanically Ventilated Spaces

For mechanically ventilated spaces (and for mixed-mode systems when the mechanical ventilation is activated), monitor outdoor air intake flow as follows:

- For variable air volume systems, provide a direct outdoor airflow measurement device capable of measuring the minimum outdoor air intake flow. This device must measure the minimum outdoor air intake flow with an accuracy of $\pm 10\%$ of the design minimum outdoor airflow rate, as defined by the ventilation requirements above. An alarm must indicate when the outdoor airflow value varies by 15% or more from the outdoor airflow setpoint.
- For constant-volume systems, balance outdoor airflow to the design minimum outdoor airflow rate defined by ASHRAE Standard 62.1–2010 (with errata), or higher. Install a current transducer on the supply fan, an airflow switch, or similar monitoring device.

Naturally Ventilated Spaces

For naturally ventilated spaces (and for mixed-mode systems when the mechanical ventilation is inactivated), comply with at least one of the following strategies.

- Provide a direct exhaust airflow measurement device capable of measuring the exhaust airflow. This device must measure the exhaust airflow with an accuracy of $\pm 10\%$ of the design minimum exhaust airflow rate. An alarm must indicate when airflow values vary by 15% or more from the exhaust airflow setpoint.
- Provide automatic indication devices on all natural ventilation openings intended to meet the minimum opening requirements. An alarm must indicate when any one of the openings is closed during occupied hours.
- Monitor carbon dioxide (CO₂) concentrations within each thermal zone. CO₂ monitors must be between 3 and 6 feet (900 and 1 800

millimetres) above the floor and within the thermal zone. CO₂ monitors must have an audible or visual indicator or alert the building automation system if the sensed CO₂ concentration exceeds the setpoint by more than 10%. Calculate appropriate CO₂ setpoint using the methods in ASHRAE 62.1–2010, Appendix C.

CS only

Mechanical ventilation systems installed during core and shell construction must be capable of meeting projected ventilation levels and monitoring based on the requirements of anticipated future tenants.

Residential only

In addition to the requirements above, if the project building contains residential units, each dwelling unit must meet all of the following requirements.

- Unvented combustion appliances (e.g., decorative logs) are not allowed.
- Carbon monoxide monitors must be installed on each floor of each unit.
- All indoor fireplaces and woodstoves must have solid glass enclosures or doors that seal when closed.
- Any indoor fireplaces and woodstoves that are not closed combustion or power-vented must pass a backdraft potential test to ensure that depressurization of the combustion appliance zone is less than 5 Pa.
- Space- and water-heating equipment that involves combustion must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting) or with power-vented exhaust, or located in a detached utility building or open-air facility.
- For projects in high-risk areas for radon, EPA Radon Zone 1 (or local equivalent for projects outside the U.S.), design and construct any dwelling unit on levels one through four above grade with radon-resistant construction techniques. Follow the techniques prescribed in EPA Building Radon Out; NFPA 5000, Chapter 49; International Residential Code, Appendix F; CABO, Appendix F; ASTM E 1465; or a local equivalent, whichever is most stringent.

HEALTHCARE

Meet the following requirements for both ventilation and monitoring.

Ventilation

Mechanically Ventilated Spaces

For mechanically ventilated spaces (and for mixed-mode systems when the mechanical ventilation is activated), determine the minimum outdoor air intake flow for mechanical ventilations systems using the ventilation rates in ASHRAE Standard 170–2008, Section 7; the requirements of the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (Table 2.1–2); or a local equivalent, whichever is most stringent. For any area not covered in 170 or the FGI guidelines, follow ASHRAE 62.1 or a local equivalent, whichever is more stringent and meet the minimum requirements of ASHRAE Standard 170–2008,

Sections 6–8, Ventilation of Health Care Facilities (with errata) or a USGBC-approved equivalent standard for projects outside the U.S.

Naturally Ventilated Spaces

For naturally ventilated spaces (and for mixed-mode systems when the mechanical ventilation is inactivated), determine the minimum outdoor air opening and space configuration requirements using the natural ventilation procedure of ASHRAE Standard 62.1–2010 (with errata) or a local equivalent, whichever is more stringent. Confirm that natural ventilation is an effective strategy for the project by following the flow diagram in Figure 2.8 of the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual AM10, March 2005, Natural Ventilation in Nondomestic Buildings.

Monitoring Mechanically Ventilated Spaces

For mechanically ventilated spaces (and for mixed-mode systems when the mechanical ventilation is activated), provide a direct outdoor airflow measurement device capable of measuring the minimum outdoor air intake flow. This device must measure the minimum outdoor air intake flow with an accuracy of +/- 10% of the design minimum outdoor airflow rate defined by the ventilation requirements above. An alarm must alert staff whenever the outdoor airflow value varies by 15% or more from the outdoor airflow setpoint.

Naturally Ventilated Spaces

For naturally ventilated spaces (and for mixed-mode systems when the mechanical ventilation is inactivated), comply with at least one of the following strategies.

- Provide a direct exhaust airflow measurement device capable of measuring the exhaust airflow with an accuracy of +/- 10% of the design minimum exhaust airflow rate. An alarm must indicate when airflow values vary by 15% or more from the exhaust airflow setpoint.
- Provide automatic indication devices on all natural ventilation openings intended to meet the minimum opening requirements. An alarm must indicate when any one of the openings is closed during occupied hours.
- Monitor carbon dioxide (CO₂) concentrations within each thermal zone. CO₂ monitors must be between 3 and 6 feet (900 and 1 800 millimetres) above the floor and within the thermal zone. CO₂ monitors must have an audible or visual indicator or alert the building automation system if the sensed CO₂ concentration exceeds the setpoint by more than 10%. Calculate appropriate CO₂ setpoint by using the methods in ASHRAE 62.1–2010, Appendix C.

7.2 EO Prerequisite 2: Environmental Tobacco Smoke (ETS) Control – Required

BD&C

This prerequisite applies to

- New Construction
- Core & Shell

- Schools
 - Retail
 - Data Centers
 - Warehouse & Distribution Centers
 - Hospitality
 - Healthcare
 - Intent
- To prevent or minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to Environmental Tobacco Smoke (ETS).

NC, CS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Prohibit smoking inside the building.

Prohibit smoking outside the building except in designated smoking areas located at least 25 feet (7.5 meters) from all entries, outdoor air intakes, and operable windows. Also prohibit smoking outside the property line in spaces used for business purposes.

If the requirement to prohibit smoking within 25 feet (7.5 meters) cannot be implemented because of code, provide documentation of these regulations.

Signage must be posted within 10 feet (3 meters) of all building entrances indicating the no-smoking policy.

Residential only

Option 1. No Smoking

Meet the requirements above.

OR

Option 2. Compartmentalization of Smoking Areas

Prohibit smoking inside all common areas of the building. The prohibition must be communicated in building rental or lease agreements or condo or coop association covenants and restrictions. Make provisions for enforcement.

Prohibit smoking outside the building except in designated smoking areas located at least 25 feet (7.5 meters) from all entries, outdoor air intakes, and operable windows. The no-smoking policy also applies to spaces outside the property line used for business purposes.

If the requirement to prohibit smoking within 25 feet (7.5 meters) cannot be implemented because of code, provide documentation of these regulations.

Signage must be posted within 10 feet (3 meters) of all building entrances indicating the no-smoking policy.

Each unit must be compartmentalized to prevent excessive leakage between units:

- Weather-strip all exterior doors and operable windows in the residential units to minimize leakage from outdoors.
- Weather-strip all doors leading from residential units into common hallways.
- Minimize uncontrolled pathways for the transfer of smoke and other indoor air pollutants between residential units by sealing penetrations in the walls, ceilings, and floors and by sealing vertical chases (including utility chases, garbage chutes, mail drops, and elevator shafts) adjacent to the units.
- Demonstrate a maximum leakage of 0.23 cubic feet per minute per square foot (1.17 litres per second per square meter) at 50 Pa of enclosure (i.e., all surfaces enclosing the apartment, including exterior and party walls, floors, and ceilings).

SCHOOLS

Prohibit smoking on site.

Signage must be posted at the property line indicating the no-smoking policy.

7.3 EQ Prerequisite 3: Minimum Acoustic Performance – Required

- Intent
- To provide classrooms that facilitate teacher-to-teacher and student-to-student communication through effective acoustic design.
- Requirements

SCHOOLS

HVAC Background Noise

Achieve a maximum background noise level of 40 dBA from heating, ventilating, and air-conditioning (HVAC) systems in classrooms and other core learning spaces. Follow the recommended methodologies and best practices for mechanical system noise control in ANSI Standard S12.60–2010, Part 1, Annex A.1; the 2011 HVAC Applications ASHRAE Handbook, Chapter 48, Noise and Vibration Control (with errata); AHRI Standard 885–2008; or a local equivalent for projects outside the U.S.

Exterior Noise

For high-noise sites (peak-hour Leq above 60 dBA during school hours), implement acoustic treatment and other measures to minimize noise intrusion from exterior sources and control sound transmission between classrooms and other core learning spaces. Projects at least one-half mile (800 meters) from any significant noise source (e.g., aircraft overflights, highways, trains, industry) are exempt.

Reverberation Time

Adhere to the following reverberation time requirements.

Classrooms and Core Learning Spaces < 20,000 Cubic Feet (566 Cubic Meters)

Design classrooms and other core learning spaces to include sufficient sound-absorptive finishes for compliance with the reverberation time requirements specified in ANSI Standard S12.60–2010, Part 1, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools, or a local equivalent for projects outside the U.S.

Option 1

For each room, confirm that the total surface area of acoustic wall panels, ceiling finishes, and other sound-absorbent finishes equals or exceeds the total ceiling area of the room (excluding lights, diffusers, and grilles). Materials must have an NRC of 0.70 or higher to be included in the calculation.

OR

Option 2

Confirm through calculations described in ANSI Standard S12.60-2010 that rooms are designed to meet reverberation time requirements as specified in that standard.

Classrooms and Core Learning Spaces \geq 20,000 Cubic Feet (566 Cubic Meters)

Meet the recommended reverberation times for classrooms and core learning spaces described in the NRC-CNRC Construction Technology Update No. 51, Acoustical Design of Rooms for Speech (2002), or a local equivalent for projects outside the U.S.

Exceptions

Exceptions to the requirements because of a limited scope of work or to observe historic preservation requirements will be considered.

7.4 EQ Credit 1: Enhanced Indoor Air Quality Strategies

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Core & Shell (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)

- Intent

Provide additional outdoor air ventilation to improve indoor air quality for improved occupant comfort, well-being and productivity.

To promote occupants comfort, well-being, and productivity by improving indoor air quality.

- Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Option 1. Enhanced IAQ Strategies (1 point)

Comply with the following requirements, as applicable.

Mechanically ventilated spaces:

- A. entryway systems;
- B. interior cross-contamination prevention; and
- C. Filtration.

Naturally ventilated spaces:

- A. entryway systems; and
- B. Natural ventilation design calculations.

Mixed-mode systems:

- A. entryway systems;
- B. interior cross-contamination prevention;
- C. filtration;
- D. natural ventilation design calculations; and
- E. Mixed-mode design calculations.

A. Entryway Systems

Install permanent entryway systems at least 10 feet (3 meters) long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances. Acceptable entryway systems include permanently installed grates, grilles, slotted systems that allow for cleaning underneath, rollout mats, and any other materials manufactured as entryway systems with equivalent or better performance. Maintain all on a weekly basis.

Warehouses & Distribution Centers only

Entryway systems are not required at doors leading from the exterior to the loading dock or garage but must be installed between these spaces and adjacent office areas.

Healthcare only

In addition to the entryway system, provide pressurized entryway vestibules at high-volume building entrances.

B. Interior Cross-Contamination Prevention

Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g., garages, housekeeping and laundry areas, copying and printing rooms), using the exhaust rates determined in EQ Prerequisite Minimum Indoor Air Quality Performance or a minimum of 0.50 cfm per square foot (2.54 l/s per square meter), to create negative pressure with respect to adjacent spaces when the doors to the room are closed. For each of these spaces, provide self-closing doors and deck-to-deck partitions or a hard-lid ceiling.

C. Filtration

Each ventilation system that supplies outdoor air to occupied spaces must have particle filters or air-cleaning devices that meet one of the following filtration media requirements:

- minimum efficiency reporting value (MERV) of 13 or higher, in accordance with ASHRAE Standard 52.2–2007; or
- Class F7 or higher as defined by CEN Standard EN 779–2002, Particulate Air Filters for General Ventilation, Determination of the Filtration Performance.

Replace all air filtration media after completion of construction and before occupancy.

Data Centers only

The above filtration media requirements are required only for ventilation systems serving regularly occupied spaces.

D. Natural Ventilation Design Calculations

Demonstrate that the system design for occupied spaces employs the appropriate strategies in Chartered Institution of Building Services Engineers (CIBSE) Applications Manual AM10, March 2005, Natural Ventilation in Non-Domestic Buildings, Section 2.4.

E. Mixed-Mode Design Calculations

Demonstrate that the system design for occupied spaces complies with CIBSE Applications Manual 13–2000, Mixed Mode Ventilation.

Option 2. Additional Enhanced IAQ Strategies (1 point)

Comply with the following requirements, as applicable.

Mechanically ventilated spaces (select one):

- A. exterior contamination prevention;
- B. increased ventilation;
- C. carbon dioxide monitoring; or
- D. Additional source control and monitoring.

Naturally ventilated spaces (select one):

- A. exterior contamination prevention;
- B. additional source control and monitoring; or

C. Natural ventilation room by room calculations.

Mixed-mode systems (select one):

- A. Exterior contamination prevention;
- B. Increased ventilation;
- C. Additional source control and monitoring; or
- D. Natural ventilation room-by-room calculations.

A. Exterior Contamination Prevention

Design the project to minimize and control the entry of pollutants into the building. Ensure through the results of computational fluid dynamics modelling, Gaussian dispersion analyses, wind tunnel modeling, or tracer gas modeling that outdoor air contaminant concentrations at outdoor air intakes are below the thresholds listed in Table 1 (or local equivalent for projects outside the U.S., whichever is more stringent).

Table 1. Maximum concentrations of pollutants at outdoor air intakes

Pollutants	Maximum concentration	Standard
Those regulated by National Ambient Air Quality Standards (NAAQS)	Allowable annual average OR 8-hour or 24-hour average where an annual standard does not exist OR Rolling 3-month average	National Ambient Air Quality Standards (NAAQS)

B. Increased Ventilation

Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates as determined in EQ Prerequisite Minimum Indoor Air Quality Performance.

C. Carbon Dioxide Monitoring

Monitor CO2 concentrations within all densely occupied spaces. CO2 monitors must be between 3 and 6 feet (900 and 1 800 millimetres) above the floor. CO2 monitors must have an audible or visual indicator or alert the building automation system if the sensed CO2 concentration exceeds the setpoint by more than 10%. Calculate appropriate CO2 setpoint using methods in ASHRAE 62.1–2010, Appendix C.

D. Additional Source Control and Monitoring

For spaces where air contaminants are likely, evaluate potential sources of additional air contaminants besides CO2. Develop and implement a materials-handling plan to reduce the likelihood of contaminant release. Install monitoring systems with sensors designed to detect the specific contaminants. An alarm must indicate any unusual or unsafe conditions.

E. Natural Ventilation Room-by-Room Calculations

Follow CIBSE AM10, Section 4, and Design Calculations, to predict that room-by-room airflows will provide effective natural ventilation.

7.5 EQ Credit 2: Low-Emitting Materials

BD&C

1-3 points

This credit applies to

- New Construction (1-3 points)
- Core & Shell (1-3 points)
- Schools (1-3 points)
- Retail (1-3 points)
- Data Centers (1-3 points)
- Warehouses & Distribution Centers (1-3 points)
- Hospitality (1-3 points)
- Healthcare (1-3 points)

▪ Intent

To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

This credit includes requirements for product manufacturing as well as project teams. It covers volatile organic compound (VOC) emissions into indoor air and the VOC content of materials, as well as the testing methods by which indoor VOC emissions are determined. Different materials must meet different requirements to be considered compliant for this credit. The building interior and exterior are organized in seven categories, each with different thresholds of compliance. The building interior is defined as everything within the waterproofing membrane. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system, such as waterproofing membranes and air- and water-resistive barrier materials.

Option 1. Product Category Calculations

Achieve the threshold level of compliance with emissions and content standards for the number of product categories listed in Table 2.

Table 1. Thresholds of compliance with emissions and content standards for 7 categories of materials

Category	Threshold	Emissions and content requirements
Interior paints and coatings applied on site	At least 90%, by volume, for emissions; 100% for VOC content	<ul style="list-style-type: none"> • General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings • VOC content requirements for wet applied products
Interior adhesives and sealants applied on site (including flooring adhesive)	At least 90%, by volume, for emissions; 100% for VOC content	<ul style="list-style-type: none"> • General Emissions Evaluation • VOC content requirements for wet applied products
Flooring	100%	General Emissions Evaluation
Composite wood	100% not covered by other categories	Composite Wood Evaluation
Ceilings, walls, thermal, and acoustic insulation	100%	<ul style="list-style-type: none"> • General Emissions Evaluation • Healthcare, Schools only Additional insulation requirements
Furniture (include in calculations if part of scope of work)	At least 90%, by cost	Furniture Evaluation
Healthcare and Schools Projects only: Exterior applied products	At least 90%, by volume	Exterior Applied Products

Table 2. Points for number of compliant categories of products

Compliant categories	Points
New Construction, Core Shell, Retail, Data Centers, Warehouse and Distribution Centers, Hospitality projects without furniture	
2	1
4	2
5	3
New Construction, Core Shell, Retail, Data Centers, Warehouse and Distribution Centers, Hospitality projects with furniture	
3	1
5	2
6	3
Schools, Healthcare without furniture	
3	1
5	2
6	3
Schools, Healthcare with furniture	
4	1
6	2
7	3

Option 2. Budget Calculation Method

If some products in a category do not meet the criteria, project teams may use the budget calculation method. (Table 3)

Table 3. Points for percentage compliance, under budget calculation method

Percentage of total	Points
≥ 50% and < 70%	1
≥ 70% and < 90%	2
≥ 90%	3

The budget method organizes the building interior into six assemblies:

- Flooring;
- Ceilings;
- Walls;
- Thermal and acoustic insulation;
- Furniture; and
- **Healthcare, Schools only:** exterior applied products

Include furniture in the calculations if it is part of the scope of work. Walls, ceilings, and flooring are defined as building interior products; each layer of the assembly, including paints, coatings, adhesives, and sealants, must be evaluated for compliance. Insulation is tracked separately.

Determine the total percentage of compliant materials according to Equation 1.

Equation 1. Total percentage compliance

Total % compliant for projects without furniture =	$\frac{(\% \text{ compliant walls} + \% \text{ compliant ceilings} + \% \text{ compliant flooring} + \% \text{ compliant insulation})}{4}$	
Total % compliant for projects with furniture =	$\frac{(\% \text{ compliant walls} + \% \text{ compliant ceilings} + \% \text{ compliant flooring} + \% \text{ compliant insulation})}{(\% \text{ compliant furniture})}$	5

Equation 2. System percentage compliant

Flooring, walls, ceilings, insulation % compliant =	$\frac{(\text{compliant surface area of layer 1} + \text{compliant surface area of layer 2} + \text{compliant surface area of layer 3} + \dots)}{\text{total surface area of layer 1} + \text{total surface area of layer 2} + \text{total surface area of layer 3} + \dots}$	X 1
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Equation 3. Furniture systems compliant, using ANSI/BIFMA evaluation

% compliant for furniture =	$\frac{0.5 \times \text{cost compliant with §7.6.1 of ANSI/BIFMA e3-2011} + \text{cost compliant with §7.6.2 of ANSI/BIFMA e3-2011}}{\text{total furniture cost}}$	X 100
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Calculate surface area of assembly layers based on the manufacturer's documentation for application.

If 90% of an assembly meets the criteria, the system counts as 100% compliant. If less than 50% of an assembly meets the criteria, the assembly counts as 0% compliant.

Manufacturers' claims. Both first-party and third-party statements of product compliance must follow the guidelines in CDPH SM V1.1–2010, Section 8. Organizations that certify manufacturers' claims must be accredited under ISO Guide 65.

Laboratory requirements. Laboratories that conduct the tests specified in this credit must be accredited under ISO/IEC 17025 for the test methods they use.

Emissions and Content Requirements

To demonstrate compliance, a product or layer must meet all of the following requirements, as applicable.

Inherently nonemitting sources. Products that are inherently nonemitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include integral organic-based surface coatings, binders, or sealants.

General emissions evaluation. Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturers or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area.

Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:

- 0.5 mg/m³ or less;
- between 0.5 and 5.0 mg/m³; or
- 5.0 mg/m³ or more.

Projects outside the U.S. may use products tested and deemed compliant in accordance with either (1) the CDPH standard method (2010) or (2) the German AgBB Testing and Evaluation Scheme (2010). Test products either with (1) the CDPH Standard Method (2010), (2) the German AgBB Testing and Evaluation Scheme (2010), (3) ISO 16000-3: 2010, ISO 16000-6: 2011, ISO 16000-9: 2006, ISO 16000-11:2006 either in conjunction with AgBB, or with French legislation on VOC emission class labelling, or (4) the DIBt testing method (2010). If the applied testing method does not specify testing details for a product group for which the CDPH standard method does provide details, use the specifications in the CDPH standard method. U.S. projects must follow the CDPH standard method.

Additional VOC content requirements for wet-applied products. In addition to meeting the general requirements for VOC emissions (above), on-site wet-applied products must not contain excessive levels of VOCs, for the health of the installers and other trades workers who are exposed to these products. To demonstrate compliance, a product or layer must meet the following requirements, as applicable. Disclosure of VOC content must be made by the

manufacturer. Any testing must follow the test method specified in the applicable regulation.

- All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
- All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.
- For projects outside the U.S., all paints, coatings, adhesives, and sealants wet-applied on site must either meet the technical requirements of the above regulations, or comply with applicable national VOC control regulations, such as the European Decopaint Directive (2004/42/EC), the Canadian VOC Concentration Limits for Architectural Coatings, or the Hong Kong Air Pollution Control (VOC) Regulation.
- If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
- If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
- For projects in North America, methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

Composite Wood Evaluation. Composite wood, as defined by the California Air Resources Board, Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, must be documented to have low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

Furniture evaluation. New furniture and furnishing items must be tested in accordance with ANSI/BIFMA Standard Method M7.1–2011. Comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modelling approach or the emissions factor approach. Model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. USGBC-approved equivalent testing methodologies and contaminant thresholds are also acceptable. For classroom furniture, use the standard school classroom model in CDPH Standard Method v1.1. Documentation submitted for furniture must indicate

the modelling scenario used to determine compliance.

Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

Healthcare, Schools only

Additional insulation requirements. Batt insulation products may contain no added formaldehyde, including urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde.

Exterior applied products. Adhesives, sealants, coatings, roofing, and waterproofing materials applied on site must meet the VOC limits of California Air Resources Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings, and South Coast Air Quality Management District (SCAQMD), Rule 1168, effective July 1, 2005. Small containers of adhesives and sealants subject to state or federal consumer product VOC regulations are exempt.

Projects outside North America may use either the jurisdictional VOC content requirements or comply with the European Decopaint Directive (2004/42/EC, to be updated to most current version when available) Phase II, for water-borne coatings, as analyzed according to ISO 11890 parts 1 and 2, instead of the CARB and SCAQMD regulatory standards.

Two materials are prohibited and do not count toward total percentage compliance: hot-mopped asphalt for roofing, and coal tar sealants for parking lots and other paved surfaces.

7.6 EO Credit 3: Construction IAQ Management Plan

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

Intent

To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.

Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY

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.

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, and Chapter 3.

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

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), 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.

Prohibit the use of tobacco products inside the building and within 25 feet (7.5 meters) of the building entrance during construction.

HEALTHCARE

Moisture. Develop and implement a moisture control plan to protect stored on-site and installed absorptive materials from moisture damage. Immediately remove from site and properly dispose of any materials susceptible to microbial growth and replace with new, undamaged materials. Also include strategies for protecting the building from moisture intrusion and preventing occupants’ exposure to mold spores.

Particulates. 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), 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.

VOCs. Schedule construction procedures to minimize exposure of absorbent materials to VOC emissions. Complete painting and sealing before storing or installing “dry” materials, which may accumulate pollutants and release them over time. Store fuels, solvents, and other sources of VOCs separately from absorbent materials.

Outdoor emissions. For renovation projects involving waterproofing, repairing asphalt roofing, sealing parking lots, or other outdoor activities that generate high VOC emissions, develop a plan to manage fumes and avoid infiltration to occupied spaces. Comply with the procedures established by NIOSH, Asphalt Fume Exposures during the Application of Hot Asphalt to Roofs (Publication 2003–112).

Tobacco. Prohibit the use of tobacco products inside the building and within 25 feet (7.5 meters) of the building entrance during construction.

Noise and vibration. Develop a plan based on the British Standard (BS 5228) to reduce noise emissions and vibrations from construction equipment and other nonroad engines by specifying low-noise emission design or the lowest decibel level available that meets performance requirements in the British Standard. Construction crews must wear ear protection in areas where sound levels exceed 85 dB for extended periods.

Infection control. For renovations and additions adjacent to occupied facilities or phased occupancy in new construction, follow the FGI 2010 Guidelines for Design and Construction of Health Care Facilities and the Joint Commission on Standards to establish an integrative infection control team comprising the owner, designer, and contractor to evaluate infection control risk and document the required precautions in a project-specific plan. Use the infection control risk assessment standard published by the American Society of Healthcare Engineering and the U.S. Centers for Disease Control and Prevention (CDC) as a guideline to assess risk and to select mitigation procedures for construction activities.

7.7 **EO Credit 4: Indoor Air Quality Assessment**

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Schools (1-2 points)
- Retail (1-2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1-2 points)

▪ Intent

To establish better quality indoor air in the building after construction and during occupancy.

▪ Requirements

NC, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Select one of the following two options, to be implemented after construction ends and the building has been completely cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished. The options cannot be combined.

Option 1. Flush-Out (1 point)

Path 1. Before Occupancy

Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot (4 267 140 litres of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.

OR

Path 2. During Occupancy

If occupancy is desired before the flush-out is completed, the space may be occupied only after delivery of a minimum of 3,500 cubic feet of outdoor air per square foot (1 066 260 litres of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.

Once the space is occupied, it must be ventilated at a minimum rate of 0.30 cubic foot per minute (cfm) per square foot of outdoor air (1.5 litres per second per square meter of outside air) or the design minimum outdoor air rate determined in EQ Prerequisite Minimum Indoor Air Quality Performance, whichever is greater. During each day of the flush-out period, ventilation must begin at least three hours before occupancy and continue during occupancy. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outdoor air (4 270 litres of outdoor air per square meter) has been delivered to the space.

OR

Option 2. Air Testing (2 points)

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing using protocols consistent with the methods listed in Table 1 for all occupied spaces. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use. Retail projects may conduct the testing within 14 days of occupancy.

Demonstrate that contaminants do not exceed the concentration levels listed in Table 1.

Table 1. Maximum concentration levels, by contaminant and testing method

Contaminant	Maximum concentration	Maximum concentration (Healthcare only)	ASTM and U.S. EPA methods	ISO method
Formaldehyde	27 ppb	16.3 ppb	ASTM D5197; EPA TO-11 or EPA Compendium Method IP-6	ISO 16000-3
Particulates (PM10 for all buildings; PM2.5 for buildings in EPA nonattainment areas, or local equivalent)	PM10: 50 micrograms per cubic meter PM2.5: 15 micrograms per cubic meter	20 micrograms per cubic meter	EPA Compendium Method IP-10	ISO 7708
Ozone (for buildings in EPA nonattainment areas)	0.075 ppm	0.075 ppm	ASTM D5149 - 02	ISO 13964
Total volatile organic compounds (TVOCs)	500 micrograms per cubic meter	200 micrograms per cubic meter	EPA TO-1, TO-15, TO-17, or EPA Compendium Method IP-1	ISO 16000-6
Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde	CDPH Standard Method v1.1—2010, Allowable Concentrations, Table 4-1	CDPH Standard Method v1.1—2010, Allowable Concentrations, Table 4-1	ASTM D5197; EPA TO-1, TO-15, TO-17	ISO 16000-3, 16000-6
Carbon monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	9 ppm; no more than 2 ppm above outdoor levels	EPA Compendium Method IP-3	ISO 4224

ppb = parts per billion; ppm = parts per million; µg/cm = micrograms per cubic meter

Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the test.

For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.

7.8 EQ Credit 5: Thermal Comfort

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

- Intent
To promote occupants productivity, comfort, and well-being by providing quality thermal comfort.
- Requirements
Meet the requirements for both thermal comfort design and thermal comfort control.

Thermal Comfort Design

NC, SCHOOLS, RETAIL, DATA CENTERS, HOSPITALITY, HEALTHCARE

Option 1. ASHRAE Standard 55-2010

Design heating, ventilating, and air-conditioning (HVAC) systems and the building envelope to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy with errata or a local equivalent.

For natatoriums, demonstrate compliance with ASHRAE HVAC Applications Handbook, 2011 edition, Chapter 5, Places of Assembly, Typical Natatorium Design Conditions, with errata.

OR

Option 2. ISO and CEN Standards

Design HVAC systems and the building envelope to meet the requirements of the applicable standard:

- ISO 7730:2005, Ergonomics of the Thermal Environment, analytical determination and interpretation of thermal comfort, using calculation of the PMV and PPD indices and local thermal comfort criteria; and
- CEN Standard EN 15251:2007, Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings, addressing indoor air quality, thermal environment, lighting, and acoustics, Section A2.

Data Centers only

Meet the above requirements for regularly occupied spaces.

WAREHOUSES & DISTRIBUTION CENTERS

Meet the above requirements for office portions of the building.

In regularly occupied areas of the building’s bulk storage, sorting, and distribution areas, include one or more of the following design alternatives:

- Radiant flooring;
- Circulating fans;
- Passive systems, such as night time air, heat venting, or wind flow;
- Localized active cooling (refrigerant or evaporative-based systems) or heating systems; and
- Localized, hard-wired fans that provide air movement for occupants’ comfort.

- Other equivalent thermal comfort strategy.

Thermal Comfort Control

NC, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY

Provide individual thermal comfort controls for at least 50% of individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces.

Thermal comfort controls allow occupants, whether in individual spaces or shared multioccupant spaces, to adjust at least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

Hospitality only

Guest rooms are assumed to provide adequate thermal comfort controls and are therefore not included in the credit calculations.

Retail only

Meet the above requirements for at least 50% of the individual occupant spaces in office and administrative areas.

HEALTHCARE

Provide individual thermal comfort controls for every patient room and at least 50% of the remaining individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces.

Thermal comfort controls allow occupants, whether in individual spaces or shared multioccupant spaces, to adjust at least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

7.9 EO Credit 6: Interior Lighting

BD&C

1-2 points

This credit applies to

- New Construction (1-2 points)
- Schools (1-2 points)
- Retail (2 points)
- Data Centers (1-2 points)
- Warehouses & Distribution Centers (1-2 points)
- Hospitality (1-2 points)
- Healthcare (1 point)

- Intent
To promote occupants productivity, comfort, and well-being by providing high-quality lighting.

▪ Requirements

NC, SCHOOLS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY

Select one or both of the following two options.

Option 1. Lighting Control (1 point)

For at least 90% of individual occupant spaces, provide individual lighting controls that enable occupants to adjust the lighting to suit their individual tasks and preferences, with at least three lighting levels or scenes (on, off, midlevel). Midlevel is 30% to 70% of the maximum illumination level (not including daylight contributions).

For all shared multioccupant spaces, meet all of the following requirements.

- Have in place multizone control systems that enable occupants to adjust the lighting to meet group needs and preferences, with at least three lighting levels or scenes (on, off, midlevel).
- Lighting for any presentation or projection wall must be separately controlled.
- Switches or manual controls must be located in the same space as the controlled luminaires. A person operating the controls must have a direct line of sight to the controlled luminaires.

Hospitality only

Guest rooms are assumed to provide adequate lighting controls and are therefore not included in the credit calculations.

AND/OR

Option 2. Lighting Quality (1 point)

Choose four of the following strategies.

- A. For all regularly occupied spaces, use light fixtures with a luminance of less than 2,500 cd/m² between 45 and 90 degrees from nadir.
- B. Exceptions include wall wash fixtures properly aimed at walls, as specified by manufacturer's data, indirect up lighting fixtures, provided there is no view down into these upright from a regularly occupied space above, and any other specific applications (i.e. adjustable fixtures).
- C. For the entire project, use light sources with a CRI of 80 or higher. Exceptions include lamps or fixtures specifically designed to provide coloured lighting for effect, site lighting, or other special use.
- D. For at least 75% of the total connected lighting load, use light sources that have a rated life (or L70 for LED sources) of at least 24,000 hours (at 3-hour per start, if applicable).
- E. Use direct-only overhead lighting for 25% or less of the total connected lighting load for all regularly occupied spaces.

- F. For at least 90% of the regularly occupied floor area, meet or exceed the following thresholds for area-weighted average surface reflectance: 85% for ceilings, 60% for walls, and 25% for floors.
- G. If furniture is included in the scope of work, select furniture finishes to meet or exceed the following thresholds for area-weighted average surface reflectance: 45% for work surfaces, and 50% for movable partitions.
- H. For at least 75% of the regularly occupied floor area, meet a ratio of average wall surface illuminance (excluding fenestration) to average work plane (or surface, if defined) illuminance that does not exceed 1:10. Must also meet strategy E, strategy F, or demonstrate area-weighted surface reflectance of at least 60% for walls.
- I. For at least 75% of the regularly occupied floor area, meet a ratio of average ceiling illuminance (excluding fenestration) to work surface illuminance that does not exceed 1:10. Must also meet strategy E, strategy F, or demonstrate area-weighted surface reflectance of at least 85% for ceilings.

RETAIL NC

For at least 90% of the individual occupant spaces in office and administrative areas, provide individual lighting controls.

In sales areas, provide controls that can reduce the ambient light levels to a midlevel (30% to 70% of the maximum illumination level not including daylight contributions).

HEALTHCARE

Provide individual lighting controls for at least 90% of individual occupant spaces in staff areas.

For at least 90% of patient positions, provide lighting controls that are readily accessible from the patient's bed. In multioccupant patient spaces, the controls must be individual lighting controls. In private rooms, also provide exterior window shades, blinds, or curtain controls that are readily accessible from the patient's bed. Exceptions include in-patient critical care, paediatric, and psychiatric patient rooms.

For all shared multioccupant spaces, provide multizone control systems that enable occupants to adjust the lighting to meet group needs and preferences, with at least three lighting levels or scenes (on, off, midlevel). Midlevel is 30% to 70% of the maximum illumination level (not including daylight contributions).

7.10 EQ Credit 7: Daylight

BD&C

1-3 points

This credit applies to

- New Construction (1-3 points)
- Core & Shell (1-3 points)
- Schools (1-3 points)
- Retail (1-3 points)

- Data Centers (1-3 points)
 - Warehouses & Distribution Centers (1-3 points)
 - Hospitality (1-3 points)
 - Healthcare (1-2 points)
- Intent
- To connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space.

Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Provide manual or automatic (with manual override) glare-control devices for all regularly occupied spaces.

Select one of the following three options.

Option 1. Simulation: Spatial Daylight Autonomy and Annual Sunlight Exposure (2–3 points, 1-2 points Healthcare)

Demonstrate through annual computer simulations that spatial daylight autonomy300/50% (sDA300/50%) of at least 55%, 75%, or 90% is achieved. Use regularly occupied floor area. Healthcare projects should use the perimeter area determined under EO Credit Quality Views. Points are awarded according to Table 1.

Table 1. Points for daylit floor area: Spatial daylight autonomy

New Construction, Core and Shell, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		Healthcare	
sDA (for regularly occupied floor area)	Points	sDA (for perimeter floor area)	Points
55%	2	75%	1
75%	3	90%	2

AND

Demonstrate through annual computer simulations that annual sunlight exposure1000, 250 (ASE1000, 250) of no more than 10% is achieved. Use the regularly occupied floor area that is daylit per the sDA300/50% simulations.

The SDA and ASE calculation grids should be no more than 2 feet (600 millimetres) square and laid out across the regularly occupied area at a work plane height of 30 inches (76 millimetres) above finished floor (unless otherwise define d). Use an hourly time-step analysis based on typical meteorological year data, or an equivalent, for the nearest available weather station. Include any permanent interior obstructions. Moveable furniture and partitions may be excluded.

CS only

If the finishes in the space will not be completed, use the following default surface reflectances: 80% for ceilings, 20% for floors, and 50% for walls. Assume that the entire floor plate, except for the core, will be regularly occupied space.

OR

Option 2. Simulation: Illuminance Calculations (1–2 points)

Demonstrate through computer modelling that illuminance levels will be between 300 lux and 3,000 lux for 9 a.m. and 3 p.m., both on a clear-sky day at the equinox, for the floor area indicated in Table 2. Use regularly occupied floor area. Healthcare projects should use the perimeter area determined under EO Credit Quality Views.

Table 2. Points for daylit floor area: Illuminance calculation

New Construction, Core and Shell, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		Healthcare	
Percentage of regularly occupied floor area	Points	Percentage of perimeter floor area	Points
75%	1	75%	1
90%	2	90%	2

Calculate illuminance intensity for sun (direct component) and sky (diffuse component) for clear-sky conditions as follows:

- Use typical meteorological year data, or an equivalent, for the nearest available weather station.
- Select one day within 15 days of September 21 and one day within 15 days of March 21 that represent the clearest sky condition.
- Use the average of the hourly value for the two selected days.

Exclude blinds or shades from the model. Include any permanent interior obstructions. Moveable furniture and partitions may be excluded.

CS only

Assume the following default surface reflectances if the finishes in the space will not be completed: 80% for ceilings, 20% for floors, and 50% for walls. Assume that the entire floor plate, except for the core, will be regularly occupied space.

OR

Option 3. Measurement (2-3 points, 1-2 points Healthcare)

Achieve illuminance levels between 300 lux and 3,000 lux for the floor area indicated in Table 3.

Table 3. Points for daylit floor area: Measurement

New Construction, Core and Schools, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		Healthcare	
Percentage of regularly occupied floor area	Points	Percentage of perimeter floor area	Points
75	2	75	1
90	3	90	2

With furniture, fixtures, and equipment in place, measure illuminance levels as follows:

- Measure at appropriate work plane height during any hour between 9 a.m. and 3 p.m.

- Take one measurement in any regularly occupied month, and take a second as indicated in Table 4.
- For spaces larger than 150 square feet (14 square meters), take measurements on a maximum 10 foot (3 meter) square grid.
- For spaces 150 square feet (14 square meters) or smaller, take measurements on a maximum 3 foot (900 millimetres) square grid.

Table 4. Timing of measurements for illuminance

If first measurement is taken in ...	take second measurement in ...
January	May-September
February	June-October
March	June-July, November-December
April	August-December
May	September-January
June	October-February
July	November-March
August	December-April
September	December-January, May-June
October	February-June
November	March-July
December	April-August

7.11 EQ Credit 8: Quality Views

BD&C

1-2 points

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 points)
- Hospitality (1 point)
- Healthcare (1-2 points)
- Intent
To give building occupants a connection to the natural outdoor environment by providing quality views.
- Requirements
NC, CS, SCHOOLS, RETAIL, DATA CENTERS, HOSPITALITY
Achieve a direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area.
View glazing in the contributing area must provide a clear image of the exterior, not obstructed by frits, fibers, patterned glazing, or added tints that distort colour balance.

Additionally, 75% of all regularly occupied floor area must have at least two of the following four kinds of views:

- Multiple lines of sight to vision glazing in different directions at least 90 degrees apart;
- Views that include at least two of the following: (1) flora, fauna, or sky; (2) movement; and (3) objects at least 25 feet (7.5 meters) from the exterior of the glazing;
- Unobstructed views located within the distance of three times the head height of the vision glazing; and
- Views with a view factor of 3 or greater, as defined in "Windows and Offices; A Study of Office Worker Performance and the Indoor Environment."

Include in the calculations any permanent interior obstructions. Movable furniture and partitions may be excluded.

Views into interior atria may be used to meet up to 30% of the required area.

WAREHOUSES & DISTRIBUTION CENTERS

For the office portion of the building, meet the requirements above.

For the bulk storage, sorting, and distribution portions of the building, meet the requirements above for 25% of the regularly occupied floor area.

HEALTHCARE

For inpatient units (IPUs), meet the requirements above (1 point).

For other areas, configure the building floor plates such that the floor area within 15 feet (4.5 meters) of the perimeter exceeds the perimeter area requirement (Table 1), and meet the requirements above for the perimeter area (1 point).

Table 1. Minimum compliant perimeter area, by floor plate area

Floor plate area		Perimeter area	
(square feet)	(square meters)	(square feet)	(square meters)
Up to 15,000	Up to 1 400	7,348	682
20,000	1 800	8,785	816
25,000	2 300	10,087	937
30,000	2 800	11,292	1 049
35,000	3 300	12,425	1 154
40,000	3 700	13,500	1 254
45,000	4 200	14,528	1 349
50,000 and larger	4 600 and larger	15,516	1 441

7.12 EQ Credit 9: Acoustic Performance

BD&C

1-2 points

This credit applies to

- New Construction (1 point)
- Schools (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1-2 points)

Intent

To provide workspaces and classrooms that promote occupants well-being, productivity, and communications through effective acoustic design.

Requirements

NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY

For all occupied spaces, meet the following requirements, as applicable, for HVAC background noise, sound isolation, reverberation time, and sound reinforcement and masking.

HVAC Background Noise

Achieve maximum background noise levels from heating, ventilating, and air conditioning (HVAC) systems per 2011 ASHRAE Handbook, HVAC Applications, Chapter 48, Table 1; AHRI Standard 885-2008, Table 15; or a local equivalent. Calculate or measure sound levels.

For measurements, use a sound level meter that conforms to ANSI S1.4 for type 1 (precision) or type 2 (general purpose) sound measurement instrumentation, or a local equivalent.

Comply with design criteria for HVAC noise levels resulting from the sound transmission paths listed in ASHRAE 2011 Applications Handbook, Table 6; or a local equivalent.

Sound Transmission

Meet the composite sound transmission class (STCC) ratings listed in Table 1, or local building code, whichever is more stringent.

Table 1. Minimum composite sound transmission class ratings for adjacent spaces

Adjacency combinations		STC _c
Residence (within a multifamily residence), hotel or motel room	Residence, hotel or motel room	55
Residence, hotel or motel room	Common hallway, stairway	50
Residence, hotel or motel room	Retail	60
Retail	Retail	50
Standard office	Standard office	45
Executive office	Executive office	50
Conference room	Conference room	50
Office, conference room	Hallway, stairway	50
Mechanical equipment room	Occupied area	60

Reverberation Time

Meet the reverberation time requirements in Table 2 (adapted from Table 9.1 in the Performance Measurement Protocols for Commercial Buildings3).

Table 2. Reverberation time requirements

Room type	Application	T60 (sec), at 500 Hz, 1000 Hz, and 2000 Hz
Apartment and condominium	—	< 0.6
Hotel/motel	Individual room or suite	< 0.6
	Meeting or banquet room	< 0.8
Office building	Executive or private office	< 0.6
	Conference room	< 0.6
	Teleconference room	< 0.6
	Open-plan office without sound masking	< 0.8
	Open-plan office with sound masking	0.8
Courtroom	Unamplified speech	< 0.7
	Amplified speech	< 1.0
Performing arts space	Drama theaters, concert and recital halls	Varies by application
Laboratories	Testing or research with minimal speech communication	< 1.0
	Extensive phone use and speech communication	< 0.6
Church, mosque, synagogue	General assembly with critical music program	Varies by application
Library	—	< 1.0
Indoor stadium, gymnasium	Gymnasium and natatorium	< 2.0
	Large-capacity space with speech amplification	< 1.5
Classroom	—	< 0.6

Sound Reinforcement and Masking Systems

Sound Reinforcement

For all large conference rooms and auditoriums seating more than 50 persons, evaluate whether sound reinforcement and AV playback capabilities are needed.

If needed, the sound reinforcement systems must meet the following criteria:

- Achieve a speech transmission index (STI) of at least 0.60 or common intelligibility scale (CIS) rating of at least 0.77 at representative points within the area of coverage to provide acceptable intelligibility.
- Have a minimum sound level of 70 dBA.
- Maintain sound-level coverage within +/-3 dB at the 2000 Hz octave band throughout the space.

Masking Systems

For projects that use masking systems, the design levels must not exceed 48 dBA. Ensure that loudspeaker coverage provides uniformity of +/-2 dBA and that speech spectra are effectively masked.

SCHOOLS

HVAC Background noise

Achieve a background noise level of 35 dBA or less from heating, ventilating, and air-conditioning (HVAC) systems in classrooms and other core learning spaces. Follow the recommended methodologies and best practices for mechanical system noise control in ANSI Standard S12.60–2010, Part 1, Annex A.1; the 2011 HVAC Applications ASHRAE Handbook, Chapter 48, Sound and Vibration Control, with errata; AHRI Standard 885–2008; or a local equivalent.

Sound Transmission

Design classrooms and other core learning spaces to meet the sound transmission class (STC) requirements of ANSI S12.60–2010 Part 1, or a local equivalent. Exterior windows must have an STC rating of at least 35, unless outdoor and indoor noise levels can be verified to justify a lower rating.

HEALTHCARE

Design the facility to meet or exceed the sound and vibration criteria outlined below, which are adapted from the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (“2010 FGI Guidelines”) and the reference document on which it is based, Sound and Vibration Design Guidelines for Health Care Facilities (“2010 SV Guidelines”).

Option 1. Speech Privacy, Sound Isolation, and Background Noise (1 point)

Speech Privacy and Sound Isolation

Design sound isolation to achieve speech privacy, acoustical comfort, and minimal annoyance from noise-producing sources. Consider sound levels at both source and receiver locations, the background sound at receiver locations, and the occupants’ acoustical privacy and acoustical comfort needs. Speech privacy is defined as “techniques ... to render speech unintelligible to casual listeners” (ANSI T1.523-2001, Telecom Glossary 2007).

Design the facility to meet the criteria outlined in the sections of Table 1.2-3, Design Criteria for Minimum Sound Isolation Performance between Enclosed Rooms, and Table 1.2-4 Speech Privacy for Enclosed Room and Open-Plan Spaces (in the 2010 FGI Guidelines and 2010 SV Guidelines).

Calculate or measure sound isolation and speech privacy descriptors achieved for representative adjacencies as necessary to confirm compliance with the criteria in the 2010 FGI Guidelines, Sections 1.2-6.1.5 and 1.2-6.1.6, and the 2010 SV Guidelines (including the appendix).

Background Noise

Consider background noise levels generated by all building mechanical-electrical-plumbing systems, air distribution systems and other facility noise sources under the purview of the project building design-construction team.

Design the facility to meet the 2010 FGI Guidelines, Table 1.2-2 Minimum-Maximum Design Criteria for Noise in representative interior rooms and spaces.

Calculate or measure sound levels in representative rooms and spaces of each type to confirm compliance with criteria in the above-referenced table using a sound level meter that conforms to ANSI S1.4 for type 1 (precision) or type 2 (general purpose) sound measurement instrumentation. For spaces not listed in

Table 1.2-2, refer to ASHRAE 2011 Handbook, Chapter 48, Sound and Vibration Control, Table 1.

Option 2. Acoustical Finishes and Site Exterior Noise (1 point)

Meet the requirements for acoustical finishes and site exterior noise.

Acoustical Finishes

Specify materials, products systems installation details, and other design features to meet the 2010 FGI Guidelines, Table 1.2-1, Design Room Sound Absorption Coefficients (including associated sections of the appendix) and the 2010 SV Guidelines.

Calculate or measure the average sound absorption coefficients for representative unoccupied rooms of each type in the building to confirm conformance with the requirements.

Site Exterior Noise

Minimize the effect on building occupants of site exterior noise produced by road traffic, aircraft flyovers, railroads, on-site heliports, emergency power generators during maintenance testing, outdoor facility MEP and building services equipment, etc. Also minimize effects on the surrounding community from all facility MEP equipment and activities as required to meet (1) local applicable codes or (2) Table 1.2-1 of the 2010 FGI Guidelines, Table 1.2-1, and the 2010 SV Guidelines, Table 1.3-1, whichever is more stringent.

Comply with the 2010 FGI Guidelines for the following noise sources:

- Heliports, A1.3-3.6.2.2;
- Generators, 2.1-8.3.3.1;
- Mechanical equipment, 2.1-8.2.1.1; and
- Building services, A2.2-5.3

Measure and analyse data to determine the exterior noise classification (A, B, C, or D) of the facility site. See the 2010 FGI Guidelines, Categorization of Health Care Facility Sites by Exterior Ambient Sound, Table A1.2a, and the 2010 SV Guidelines, Table 1.3-1.

Design the building envelope composite STC rating based on the 2010 FGI Guidelines, Categorization of Health Care Facility Sites by Exterior Ambient Sound, and show conformance with requirements. For exterior site exposure categories B, C, or D, calculate or measure the sound isolation performance of representative elements of the exterior building envelope to determine the composite sound transmission class (STCc) rating for representative façade sections. Measurements should generally conform to ASTM E966, Standard Guide for Field Measurements of Airborne Sound Insulation of Building Façades and Façade Elements, current edition.

8.0 INNOVATION & DESIGN PROCESS

8.1 IN Credit: 1: Innovation

BD&C

1-5 points

This credit applies to

- New Construction (1-5 points)
- Core & Shell (1-5 points)
- Schools (1-5 points)
- Retail (1-5 points)
- Data Centers (1-5 points)
- Warehouses & Distribution Centers (1-5 points)
- Hospitality (1-5 points)
- Healthcare (1-5 points)

▪ Intent

To encourage projects to achieve exceptional or innovative performance.

▪ Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Project teams can use any combination of innovation, pilot, and exemplary performance strategies.

Option 1. Innovation (1 point)

Achieve significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system.

Identify the following:

- The intent of the proposed innovation credit;
- Proposed requirements for compliance;
- Proposed submittals to demonstrate compliance; and
- The design approach or strategies used to meet the requirements.

AND/OR

Option 2. Pilot (1 point)

Achieve one pilot credit from USGBC's LEED Pilot Credit Library.

AND/OR

Option 3. Additional Strategies

- Innovation (1-3 points)
Defined in Option 1 above.

- Pilot (1-3 points)

Meet the requirements of Option 2.

- Exemplary Performance (1–2 points)

Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition. An exemplary performance point is typically earned for achieving double the credit requirements or the next incremental percentage threshold.

8.2 IN Credit 2: LEED Accredited Professional

BD&C

1 point

This credit applies to

- New Construction (1 point)
- Core & Shell (1 point)
- Schools (1 point)
- Retail (1 point)
- Data Centers (1 point)
- Warehouses & Distribution Centers (1 point)
- Hospitality (1 point)
- Healthcare (1 point)

▪ Intent

To support and encourage the design integration required by a LEED-project and to streamline the application and certification process.

▪ Requirements

NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

At least one principal participant of the project team shall be a LEED Accredited Professional (AP) with a specialty appropriate for the project.

9.0 REGIONAL PRIORITY

9.1 RP Credit: Regional Priority

BD&C

4 points

This credit applies to

- New Construction (1-4 points)
- Core & Shell (1-4 points)
- Schools (1-4 points)
- Retail (1-4 points)
- Data Centers (1-4 points)
- Warehouses & Distribution Centers (1-4 points)
- Hospitality (1-4 points)
- Healthcare (1-4 points)

- Intent

To provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities.

- Requirements

NC, CS, SCHOOLS, RETAIL NC, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, HEALTHCARE

Earn up to four of the six Regional Priority credits. These credits have been identified by the USGBC regional councils and chapters as having additional regional importance for the 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, up to a maximum of four.

10.0 LEED WORKSHEET

The following LEED worksheet will be provided to each design team electronically to help them follow LEED during their design process

Credit Category Name		Point Range	Point Status			Applicability			
			Approved	Not Approved	Not Applicable	Remarks	Primary Responsibility	First Cost	Operating Cost
<p>Prerequisite 1: Construction Activity Pollution Prevention</p> <p>Develop an implementation plan and Sedimentation Control (SSC) Plan for all construction activities associated with the project. The SSC Plan shall conform to the erosion and sedimentation requirements of the SDQP (Construction General Permit) and all applicable local, state and federal regulations and codes, whether or not changed. The SSC Plan shall describe the measures implemented to complete the following objectives:</p> <ul style="list-style-type: none"> Prevent loss of sediment and silt to stormwater runoff and/or to waterways, including precluding any discharge to water. Prevent sedimentation of stormwater receiving waters. Prevent pollution to air with dust and particulate matter. <p>The Construction General Permit (CGP) includes the requirements to comply with Phase I and Phase II of the National Pollutant Discharge Elimination System (NPDES) program. While the CGP is not applicable to construction sites greater than 1 acre, the requirements are applicable to projects for the purposes of this prerequisite. Information on the SDQP is available at http://www.waterboards.ca.gov/sdqp</p>									
Credit 1: Site Selection	<p>Develop a site selection plan that includes the following:</p> <ul style="list-style-type: none"> Prevent and/or reduce the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Subchapter, Part 455 to 459, Section 455.10 (USDA) (12 USC 1701-1705) Prevent and/or reduce the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Subchapter, Part 455 to 459, Section 455.10 (USDA) (12 USC 1701-1705) Lead to a specifically identified lot for any existing or future site (including or independent) Within 100 feet of any wetlands as defined by United States Code of Federal Regulations 40 CFR, Parts 223.22 and Part 32, and related wetlands or areas of special concern identified by state or local rule, OR within 100 feet of any wetlands as defined by state or local regulations, as defined by local or state rule or law, whichever is more stringent. Prevent and/or reduce the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Subchapter, Part 455 to 459, Section 455.10 (USDA) (12 USC 1701-1705) Lead to a site that is suitable for the proposed use, including the availability of water, sewer, storm and drainage water supply and disposal, and other infrastructure, as considered with the intent of the Clean Water Act. Lead to a site that is suitable for the proposed use, including the availability of water, sewer, storm and drainage water supply and disposal, and other infrastructure, as considered with the intent of the Clean Water Act. 								
Credit 2: Development Density & Community Connectivity	<p>OPTION 1 - DEVELOPMENT DENSITY</p> <p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: Develop a site plan that includes the following: <p>OPTION 2 - COMMUNITY CONNECTIVITY</p> <p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: Develop a site plan that includes the following: <p>Baseline includes include the following:</p> <p>1) Bank, 2) Plaza of Streets, 3) Conference Center, 4) Day Care, 5) Grocery, 6) The Station, 7) Beauty Salon, 8) Laundry, 9) Library, 10) Medical Center, 11) Senior Care facility, 12) Police, 13) Pharmacy, 14) Post Office, 15) Restaurant, 16) School, 17) Supermarket, 18) Theater, 19) Community Center, 20) Fitness Center, 21) Museum.</p> <p>Priority is determined by density: 12 miles radius around the main building, 15 miles radius around the main building, 20 miles radius around the main building, 25 miles radius around the main building.</p>								
Credit 3: Brownfield Redevelopment	<p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: 								
Credit 4.1: Alternative Transportation - Public Transportation Access	<p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: 								
Credit 4.2: Alternative Transportation - Bicycle Storage & Changing Rooms	<p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: 								
Credit 4.3: Alternative Transportation - Low Emitting & Fuel Efficient Vehicles	<p>OPTION 1</p> <p>Provide low-emitting and fuel-efficient vehicles for 25% of the total fleet of 100 or more vehicles for the building.</p> <p>OPTION 2</p> <p>Provide preferred parking for low-emitting and fuel-efficient vehicles for 25% of the total vehicle parking capacity of the site.</p> <p>OPTION 3</p> <p>Provide preferred parking for low-emitting and fuel-efficient vehicles for 25% of the total vehicle parking capacity of the site.</p> <p>OPTION 4</p> <p>Provide preferred parking for low-emitting and fuel-efficient vehicles for 25% of the total vehicle parking capacity of the site.</p> <p>For the purposes of this credit, low-emitting and fuel-efficient vehicles are defined as vehicles that are either classified as Zero Emission Vehicle (ZEV) by the California Air Resources Board or have achieved a minimum green score of 40 on the American Council on Energy Efficient Design (ACEED) annual vehicle rating.</p> <p>"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of open spaces) for the purpose of parking, or parking spaces provided in a designated area.</p>								
Credit 4.4: Alternative Transportation - Parking Capacity	<p>OPTION 1 - NON-RESIDENTIAL</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: <p>OPTION 2 - NON-RESIDENTIAL</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: <p>OPTION 3 - RESIDENTIAL</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: <p>OPTION 4 - ALL</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: <p>"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of open spaces) for the purpose of parking, or parking spaces provided in a designated area.</p>								
Credit 5.1: Site Development - Paved or Restore H2O	<p>OPTION 1</p> <p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: <p>OPTION 2</p> <p>Develop a site plan that includes the following:</p> <ul style="list-style-type: none"> Develop a site plan that includes the following: 								

11.0 RESOURCES AND REFERENCES

11.1 Sustainable Web Resources

- Building Green <http://www.buildinggreen.com/>

Building Green is the preeminent site for practice, thoughtful advice on building sustainable buildings. It has many resources.

Sustainable Design Resources in Print

A select list of resources we have found to be especially helpful...

11.2 General

- Ray Anderson. *Mid-Course Correction: Toward a Sustainable Enterprise: The Interface Model*. White River Junction, VT: Chelsea Green Publishing Company, 1999.

The personal story of Ray Anderson's realization that businesses need to embrace principles of sustainability, and of his efforts, often frustrating, to apply these principles within a billion-dollar corporation that is still measured by the standard scorecards of the business world. While the path has proved to have many curves, Interface is demonstrating that the principles of sustainability and financial success can co-exist within a business and can lead to a new prosperity that includes human dividends as well.

- Janine M. Benyus. *Biomimicry: Innovation Inspired by Nature*. New York: Perennial, 2002.

Biomimicry is a revolutionary new science that analyzes nature's best ideas and adapts them for human use. Science writer and lecturer Janine Benyus takes us into the lab and out in the field with the maverick researchers who are applying nature's ingenious solutions to the problem of human survival.

- Building Design & Construction. *White Paper on Sustainability*. Oak Brook, IL: Reed Business Information, November 2003.

In this White Paper, the editors of *Building Design & Construction* offer a brief history of green building; present the results of a specially commissioned survey of readers; and analyze the chief trends, issues, and published research, based on interviews with dozens of experts and participants in green building.

- Building Design & Construction. *Progress Report on Sustainability*. Oak Brook, IL: Reed Business Information, November 2004.

This Progress Report follows up on the recommendations made in the 2003 White Paper; reviews the latest developments in the U.S. Green Building Council's "LEED" certification program; provides exclusive data on reader's involvement in sustainability; examines several key building types (notably education and healthcare facilities) that are crucial to the market we serve; and analyses key trends and public-policy issues related to sustainable buildings.

- Paul Ekins. *The Gaia Atlas of Green Economics*. New York: Anchor Books, 1992.

The book shows a way out of the destructive obsession with economic growth. It explores a new concept of wealth and wealth creation; it describes a new economics synthesis between the market, state, families, and communities; it sets

out what governments and people can do to build a sustainable society—to create prosperity and a fairer world in a healthy environment.

- Paul Hawken. *Ecology of Commerce: A Declaration of Sustainability*. New York: HarperCollins, 1994.

The first extensive, truly ecological analysis of business. A visionary new program that business can follow to help restore the planet.

- Paul Hawken, Amory B. Lovins, and L. Hunter Lovins. *Natural Capitalism: Creating the Next Industrial Revolution*. Boston: Back Bay Books, 2000.

Three top strategists show how leading-edge companies are practicing "a new type of industrialism" that is more efficient and profitable while saving the environment and creating jobs. The authors write that in the next century, cars will get 200 miles per gallon without compromising safety and power, manufacturers will relentlessly recycle their products, and the world's standard of living will jump without further damaging natural resources.

- Mathis Wackernagel and William Rees. *Our Ecological Footprint: Reducing Human Impact on the Earth*. Philadelphia: New Society Publications, 1995.

The book provides useful charts and thought-provoking illustrations, and introduces a revolutionary new way to determine humanity's impact on the Earth. It presents a tool for measuring and visualizing the resources required to sustain households, communities, regions, and nations.

11.3 Sustainable Site

- Craig S. Campbell, Michael Ogden. *Constructed Wetlands in the Sustainable Landscape*. New York: John Wiley and Sons, 1999.

Clearly written and accessible to non-engineers and nonscientists, this book is a crucial guide for landscape architects, environmental engineers, planners, developers, and others responsible for the design and management of our built environment.

- J.T. Lyle. *Regenerative Design for Sustainable Development*. New York: John Wiley and Sons, 1996.

A design guide and information resource on sustainable building and planning in the context of living systems.

- J. William Thompson, Kim Sorvig and Craig D. Farnsworth. *Sustainable Landscape Construction: A Guide to Green Building Outdoors*. Washington, D.C.: Island Press, spring 2000.

A practical, professional guide to alternatives in landscape construction, design, and maintenance, organized around ten key principles, as well as balanced discussion of attitudes and controversies that help or hinder stewardship of the land. Over a hundred projects from around the world illustrate sustainable methods.

- U.S. Environmental Protection Agency, Policy, Planning and Evaluation. *Cooling our Communities: A Guidebook On Tree Planting and Light-Colored Surfacing*. Washington, D.C.: EPA, 1992.

A practical guide published by the US EPA Climate Outreach and Innovation Division in collaboration with the Department of Energy's Lawrence Berkeley

Laboratory. The publication presents the environmental potential and economic benefits of strategic landscape planning to reduce urban heat islands and also considers the resulting potential to significantly reduce energy use for cooling. To order, visit the EPA Web site at <http://www.epa.gov/globalwarming>. Order publication no. EPA22P-2001.

- U.S. Department of the Interior, National Park Service. *Guiding Principles of Sustainable Design*. Denver, CO: DOI, 1993.

An excellent statement of the vision for sustainable development, particularly for site design of parks and recreational facilities. Environmental challenges are balanced with opportunities and guidelines for architects and planners.

<http://concessions.nps.gov/document/GuidingPrinciplesofSustainableDesign.pdf>

11.4 Water Efficiency

- Donald A. Hammer, ed. *Constructed Wetlands for Wastewater Treatment: Municipal, Industrial and Agricultural*. Chelsea, MI: Lewis Publishers, Inc., 1989.

This book provides general information about constructed wetlands and their potential to provide relatively simple and economical solutions for wastewater treatment. Included are principles about wetland ecology, hydrology, soil chemistry, vegetation, and wildlife as well as management guidelines, policies and regulations, siting and construction requirements.

- Robert H. Kadlec and Robert L. Knight. *Treatment Wetlands*. Boca Raton: Lewis Publishers, Inc. 1995.

A comprehensive book that describes all major wetland configurations, wastewater sources, and combinations of climatic conditions, as well as design approaches that can be tailored to specific wetland treatment projects. It examines the planning, design, construction, and operation of wetlands used for water quality treatment as a promising and efficient technology. The book also includes detailed information on wetland ecology, wetland water quality, selection of appropriate technology, design for consistent performance, construction guidance, and operational control through effective monitoring.

- Gerald A. Moshiri. *Constructed Wetlands for Water Quality Improvement*. Boca Raton, FL: Lewis Publishers, Inc., 1993.

The book assembles contributions from prominent scientists and serves as an encyclopedia of information on the use of constructed wetlands for improving water quality.

11.5 Energy & Atmosphere

- G.Z. Brown and Mark DeKay. *Sun, Wind & Light: Architectural Design Strategies*, 2nd edition. New York: John Wiley and Sons, 2000.

Developed for rapid use during schematic design, this book clarifies relationships between form and energy and gives designers tools for sustainable design.

- Othmar Humm and Peter Toggweiler. *Photovoltaics in Architecture: The Integration of Photovoltaic Cells in Building Envelopes*. Basel: Birkhäuser Verlag, 1993.

A multi-language book (in German, French, Italian, and English) that presents the technical and design requirements for photovoltaic facades and roofs to make use

of solar energy. The book demonstrates how these elements can be integrated into the architecture of buildings while embracing ecological, technical, and aesthetic aspects.

11.6 Materials & Resources

- Alex Wilson, Ed. *GreenSpec Directory*, 5th edition, Brattleboro, VT: BuildingGreen Inc., 2005.

More than 1,850 product listings that designers, builders and building owners can use in identifying products to improve the environmental performance of their buildings. The new edition reflects significant changes. More than 200 product listings have been added since the 4th edition was released, while about 100 have been dropped, because they have been discontinued, the manufacturing has changed (resulting in reduced recycled content, for example) or the GreenSpec criteria have been tightened so the lowest-performing products have been removed. As the green-building industry evolves, GreenSpec evolves with it. Our goal is to constantly push the envelope.

- Kim Leclair and David Rousseau. *Environmental by Design: A Sourcebook of Environmentally Aware Material Choices*. Vancouver, BC: Hartley & Marks, 1992.

Defines the health and environmental issues surrounding the use of interior materials and finishes and provides recommendations. Identifies building materials in fourteen categories, including Canadian, U.S., and European products.

11.7 Indoor Environmental Quality

- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA). *Indoor Air Quality Guidelines for Occupied Buildings under Construction*. Chantilly, VA: SMACNA, 1995.

Guidelines for protecting indoor air quality in retrofit, renovation, or phased construction.

11.8 Case Studies

- David Lloyd Jones. *Architecture and the Environment: Bioclimatic Building Design*. Woodstock, N.Y.: Overlook Press, 1998.

An international survey of the most striking contemporary architecture built green. Fifty buildings are examined, explaining how they all respond to the need to achieve harmony with their settings, to conserve energy, and to provide for the health and well-being of their occupants.

- Rocky Mountain Institute. *Green Development: Integrating Ecology and Real Estate*. New York: John Wiley and Sons, Inc., 1998.

A guidebook on environmentally sustainable development based upon eighty case studies drawn from RMI's extensive worldwide research and consulting work.

- James Steele. *Sustainable Architecture: Principles, Paradigms, and Case Studies*. New York: McGraw Hill, 1997.

The book sets forth a strategy for redefining the post-industrial role of architecture and urbanism, illustrated by case histories from both industrialized and non-industrialized nations.