LEED v4.1 BUILDING DESIGN AND CONSTRUCTION

July 29, 2022

U.S. Green Building Council

INTEGRATIVE PROCESS (IP)

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 modeler
- 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.

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, equitable 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.

Discovery:
Choose two of the following to analyze:

Energy-Related Systems

Establish an energy performance target no later than the schematic design phase. The target must be established using one of the following metrics:

- kBtu per square foot-year (kWh per square meter-year) of site energy use
- KBtu per square foot-year (kWh per square meter-year) of source energy use
- pounds per square foot-year (Kg per square meter-year) of greenhouse gas emissions
- energy cost per square foot-year (cost per square meter-year)

Perform a preliminary "simple box" energy modeling analysis before the completion of schematic design that explores how to reduce energy loads in the building and accomplish related sustainability goals by questioning default assumptions. Assess strategies associated with each of the following, as applicable:

- *Site conditions.* Assess shading, exterior lighting, hardscape, landscaping, and adjacent site conditions.
- *Massing and orientation.* Assess how 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.

Water-Related Systems

Perform a preliminary water budget analysis before the completion of schematic design that explores how to reduce potable water loads in the building, reduce the burden on municipal supply or wastewater treatment systems, and accomplish related sustainability goals. Assess and estimate the project's potential nonpotable water supply sources and water demand volumes, including the following, as applicable:

- *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. Analyze how nonpotable water supply sources can contribute to the water demand components listed above.

Site Selection

Before site selection, analyze project goals to identify and select the building site or base building that will provide the most opportunities and fewest barriers for project. Assess at least two potential locations or base building options, taking into consideration at least the following:

- Building site attributes. Assess the building's location and site design characteristics.
- Transportation. Assess the tenant occupants' transportation needs for commuting to and from the site, including convenient access to alternative transportation that meets occupants' needs.
- Occupant and community well-being. Assess the building's ability to provide daylight and views, indoor air quality, and other indoor environmental quality characteristics. Identify community assets and the proximity of vulnerable populations surrounding the project. Assess the project's ability to provide positive social, economic, and environmental benefits for existing community members, as well as any potential negative impacts.

Social Equity

Beginning in pre-design and continuing throughout the design phases, review and then complete the LEED Project Team Checklist for Social Impact in order to assess and select strategies to address issues of inequity within the project and its community, team and supply chain. Through research and consultation with key stakeholders, ensure that all responses within the Checklist are ultimately documented as "Yes" or "No," and complete all sections for Stakeholders and Goals.

Health & Well-being

Beginning in pre-design and continuing throughout the design phases, use the following steps to inform the design and construction documents:

- Establish health goals. Set clear and specific goals to promote the health of core groups, including:
    - Building occupants and users
    - Surrounding community
    - Supply chain

Develop a statement of health goals for each population, including a summary of how this health goal relates to the highest priority health need for each population.

- Prioritize design strategies. Select specific design and/or programming strategies to address the project's health goals. This could be accomplished by holding a stand-alone "health charrette" or by integrating health considerations into an existing green charrette.
- Anticipate outcomes. Identify expected impacts on population health behaviors and outcomes associated with the project's prioritized design strategies

Implementation:

Develop a Project Team Letter. Provide a dated letter on the letterhead of the Integrative Process Facilitator that summarizes the team's integrative process approach and describes the difference that this integrative approach made in terms of improving project team interaction and project performance.

- Describe the approach developed by the project team for engaging a clearly defined and manageable integrative design process beginning in pre-design and continuing throughout the design phases.
- The letter must include a separate summary for each issue area analyzed by the project team, describing how the analysis informed the design and building form decisions in the project's OPR and BOD and the eventual design of the project. Describe the most important goals for each issue area and provide clear guidance on how to evaluate the project's impact on the selected goals.

The creation of this letter should be a team effort facilitated by the Integrative Process Facilitator. The letter must be signed by all principal project team members and made available to key stakeholders including, but not limited to the owner(s), facility manager(s), tenant(s), and community members. Describe how the letter was distributed to these stakeholders and/or made publicly available.

LOCATION AND TRANSPORATION (LT)

LT CREDIT: LEED FOR NEIGHBORHOOD DEVELOPMENT LOCATION

BD+C
5–20 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 traveled. To enhance livability 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 Neighborhood Development (Stage 2 or Stage 3 under the Pilot or v2009 rating systems, Certified Plan or Certified Built 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

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 cultivate community resilience, avoid the development of environmentally sensitive lands that provide critical ecosystem services 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. Previously Developed Land
Locate the development footprint on land that has been *previously developed*.

OR

Option 2. Avoidance of Sensitive Land
Locate the development footprint on land that does not meet the following criteria for sensitive land:

- *Prime farmland.* Prime farmland, unique farmland, or farmland of statewide 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 NatureServe as GH (possibly extinct), G1 (critically imperiled), or G2 (imperiled), or
    - species listed as threatened or endangered specifies under local equivalent standards (for projects outside the U.S.) that are not covered by NatureServe 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.

LT CREDIT: HIGH-PRIORITY SITE AND EQUITABLE DEVELOPMENT

BD+C
1-3 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 build the economic and social vitality of communities, encourage project location in areas with development constraints and promote the ecological, cultural, and community health of the surrounding area while understanding the needs and goals of existing residents and businesses.

Requirements

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

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

Path 1. Economically Disadvantaged Community Location (1 point BD+C except Core and Shell, 2 points Core and Shell)
Locate within one of the following areas

- Census tract* in which average household income is at or below 80% AMI
- Census tract in which at least 20% of population is at or below poverty rate of state, provincial, or other regional jurisdiction
- Census tract in which unemployment is at least 150% of the state, provincial, or other regional jurisdiction.

*or local equivalent government-defined municipal tract for projects outside the U.S.

OR

Path 2. Brownfield Remediation (1 point BD+C except Core and Shell, 2 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. In cases of voluntary remediation by the project team, provide confirmation by the local, state, or national authority (whichever has jurisdiction) to verify that the site is a brownfield. Perform remediation to the satisfaction of the relevant authority.

AND/OR

Option 2. Equitable Development (1 point BD+C except Core and Shell, 2 points Core and Shell)

Path 1. Equity & Community Benefits (1 point BD+C except Core and Shell, 2 points Core and Shell)

Develop and implement an equity plan.

OR

Path 2. Affordable Housing in Residential or Mixed-Use Projects (1 point)

Include a proportion of new rental and/or for-sale dwelling units priced for households earning less than the area median income (AMI). Rental units must be maintained at affordable levels for a minimum of 15 years. Existing dwelling units are exempt from requirement calculations. Meet or exceed the minimum thresholds in Table 1. Projects must meet or exceed the minimum percentage of units mandated through inclusionary zoning by their local jurisdictions.

Table 1. Minimum affordable units

Rental Dwelling Units	10 percent of total rental units (or at least one unit) priced up to 60% AMI
For-Sale Dwelling Units	5 percent of total for-sale units (or at least one unit) priced up to 80% AMI

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 point)

Intent

To conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. To support neighborhood and local economies promote walkability and low or no carbon transportation, and reduce vehicle distance traveled for all. To improve public health by encouraging daily physical activity.

Requirements

NC, CS, RETAIL, 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) offset of the project boundary meets the values in Table 1. Use either the "separate residential and nonresidential 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)	Nonresidential density (FAR)		
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	Residential density	Nonresidential density (FAR)		

buildable land	(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

Option 1. Surrounding Density and Connectivity (2–3 points)

Path 1. Surrounding Density

Locate on a site whose surrounding existing density within a ¼-mile (400-meter) offset of the project boundary meets the values in Table 1. Use either the "separate residential and nonresidential 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
Square feet per acre of buildable land	Residential density (DU/acre)	Nonresidential density (FAR)	
22,000	7	0.5	2
35,000	12	0.8	3

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

Combined density	Separate residential and nonresidential densities		Points
Square meters per hectare of buildable land	Residential density (DU/hectare)	Nonresidential density (FAR)	
5,050	17.5	0.5	2
8,035	30	0.8	3

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

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.

Path 2. Connected Site (1-2 points)

Locate the project on a previously developed site that also meets one of the connected site conditions listed below.

Table 2. Points for connected site

Type of site	Points
Adjacent	1
Infill	2

- To qualify as an adjacent site, at least 25% of the project boundary must border parcels that are previously developed sites.
- To qualify as an infill site, at least 75% of the project boundary must border parcels that are previously developed sites.
- Bordering rights-of-way do not constitute previously developed land; it is the status of the property on the other side of the right-of-way that contributes to the calculation. Any part of the boundary that borders a water body is excluded from the calculation.

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 from the following number of uses (see Appendix 1), as listed below.

Table 1. Points for proximity to uses

Uses	Points
4–7	1
≥ 8	2

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.

DATA CENTERS, 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 kilometer) 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) offset 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.

ALL PROJECTS

Option 3. Walkable Location (1-5 points BD+C except Core & Shell and Healthcare, 6 points Core & Shell, 1 point Healthcare)

Locate on a site with a Walk Score® or equivalent third-party walkability assessment for the following thresholds, as listed below.

Table 1. Points for walkable location

Walk Score®	Points	Points (Core & Shell)	Points (Healthcare)
90 to 100	5	6	-
80 to 89	4	4	-
70 to 79	3	3	-
60 to 69	2	2	-
50 to 59	1	1	-
≥ 50	-	-	1

Projects attempting Option 3 are not eligible to earn points under Option 1 or Option 2.

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

Path 1. Access to Public Transit Service (1 to 5 points BD+C, except Core and Shell; 1 to 6 points Core and Shell)

Locate any *functional entry* of the project within a ¼-mile (400-meter) *walking distance* of existing or planned bus, *streetcar*, or *informal transit stops,* or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, passenger rail stations (i.e. light, heavy, or commuter rail) or commuter ferry terminals. The transit service at those stops and stations in aggregate must meet the minimums listed in Table 1. 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.

- For each qualifying transit route, only trips in one direction are counted towards the threshold.
- For weekend trips, only trips on the day with the higher number of trips 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.
- Privately-run shuttles are only acceptable for Path 1 if the service is also made available to the public.

Table 1. Minimum daily public transit service

Weekday trips	Weekend trips	Points BD+C (except Core and Shell)	Points BD+C (Core and shell)
72	30	1	1
100	70	2	2
144	108	3	3
250	160	4	4

360	216	5	6

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

Path 2. Access to Project-sponsored Transit Service

Commit to providing year-round transit service (vans, shuttles, buses) for regular occupants and visitors that meets the minimums listed in Table 2, Service must be guaranteed for at least 3 years from the project's certificate of occupancy.

Within the project boundary, provide at least one transit stop shelter at each transit stop within a ¼-mile (400-meter) walking distance from a functional entry of the project. A building lobby is allowed instead of shelter if the transit stop is visible from inside and located no greater than 200 feet (60 meters) walking distance from the transit stop.

- For each qualifying transit route, total trips (inbound and outbound) 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.
- Only directly accessible trips within the specified distances are allowed. Trips available from connected transit facilities do not contribute to the minimum trips under Path 2.

Table 2. Minimum daily project-sponsored transit service

Total daily trips	Points
30	1
45	2

Provide a guaranteed ride home program for employees who have carpooled, taken transit, walked, or cycled to work but require alternative transportation home for emergencies or unscheduled overtime.

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 *informal transit* stops, or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, passenger 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.

- 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

Weekday trips	Points
72	1
144	2
250	3
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 dwelling units are within no more than a 3/4-mile (1200-meter) walking distance (for grades 8 and below, or ages 14 and below), and 1 1/2-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 2. Points for dwelling units within walking distance

Percentage of dwelling units in attendance boundary	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 areas in the attendance boundary.

HEALTHCARE

Locate any *functional entry* of the project within a ¼-mile (400-meter) *walking distance* of existing or planned bus, *streetcar*, or *informal transit* stops, or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, passenger 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.

- 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

Weekday trips	Weekend trips	Points
72	30	1
144	108	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.

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 traveled. To improve public health by encouraging utilitarian and recreational physical activity.

Requirements

NEW CONSTRUCTION, CORE AND SHELL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, RETAIL, HEALTHCARE

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 center,* if the project total floor area is 50% or more residential; or
- *a bus rapid transit* stop, passenger 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 three years 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 15% of all regular building occupants, but no less than one storage space per three residential units.

Case 3. Mixed-Use Projects
Meet the Case 1 and Case 2 storage requirements for the nonresidential and residential portions of the project, respectively.

Large-Occupancy Projects Only:

The following guidance should be applied when determining the number of showers needed for projects with a large number of occupants:

NEW CONSTRUCTION, SCHOOLS, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY, RETAIL, HEALTHCARE

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, up to 999 regular building occupants.

- one additional shower for every 500 regular building occupants, for the additional 1,000 – 4,999 regular building occupants
- one additional shower for every 1,000 regular building occupants, for the additional 5,000 + regular building occupants

CORE AND SHELL

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, up to 999 regular building occupants.

- one additional shower for every 750 regular building occupants, for the additional 1,000 – 4,999 regular building occupants
- one additional shower for every 1,500 regular building occupants, for the additional 5,000 + regular building occupants

For All Projects
Short-term bicycle storage must be within 200 feet (60meters) walking distance of any main entrance. *Long-term bicycle storage* must be within 300 feet (90 meters) walking distance of any *functional entry*. Vertical distances travelled by elevator are exempt from counting towards the walking distance requirements.

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. Indoor storage is acceptable as long as it meets the walking distance requirements. On-site bicycle sharing stations within the project boundary may count for 50% of the long-term and short-term bicycle storage space. Zero lot line projects may count publicly available bicycle parking towards their short-term storage requirements if it meets the maximum allowable walking distance.

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. Exclude patients and K-12 students from the regular building occupant count. Residential projects do not need to provide additional showers.

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 either of the following:

- a *bus rapid transit* stop or passenger rail station or ferry terminal; or
- 50% of dwelling units within the school's attendance boundary.

The stops/stations or dwelling units must be within no more than a 1 1/2-mile (2400-meter) biking distance (for grades 8 and below, or ages 14 and below), and 3-mile (4800-meter) biking distance (for grades 9 and above or ages 15 and above).
Provide dedicated bicycle lanes that extend at least to the end of the school property with no barriers (e.g., fences) on school property.

Bicycle Storage and Shower Rooms

Meet storage and shower requirements for all projects and 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.

RETAIL

Bicycle Network
Meet Bicycle Network requirements for all projects.

Bicycle Storage and Shower Rooms

Meet storage distance and shower requirements for all projects and 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 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.

HEALTHCARE

Bicycle Network
Meet Bicycle Network requirements for all projects.

Bicycle Storage and Shower Rooms
Meet storage and shower requirements for all projects and 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.

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

Option 1. No Parking or Reduce Parking (1 point)

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

Provide parking capacity that is a 30% reduction below the base ratios for parking spaces, by building type, found in Appendix 4. Table 1. Base Ratios for Parking. Alternatively, projects may demonstrate baseline and reduced parking capacity using calculations for the most appropriate land use found in the Institute of Transportation Engineers (ITE) *Parking Generation Manual, 5th Edition* or a comparable and current resource applied by a qualified transportation engineer or planner.

Projects with no off-street parking meet the requirements.

OR

Option 2. Carshare (1 point)

Provide dedicated parking for carshare vehicles. Provide carshare vehicle parking space(s) for at least 1% of total parking spaces, rounded up. If the project has fewer than 100 parking spaces, provide one carshare vehicle parking space.

Establish an agreement between the project and carshare company guaranteeing that new or existing carshare vehicle space(s) will be dedicated for a minimum of two years from the certificate of building occupancy.

Existing carshare vehicles located in nearby on- or off-street parking areas do not contribute to credit achievement.

OR

Option 3. Unbundling Parking (1 point)

Sell parking separately from all property sales or leases. For owner-occupied projects, do not provide free or subsidized parking for employees.

Implement a daily parking fee at a cost equal to or greater than the daily roundtrip cost of municipal public transit.

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.

LT CREDIT: ELECTRIC 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 fueled automobiles.

Requirements

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

Provide charging infrastructure for electric vehicles for on-site parking.

Option 1. Electric Vehicle Supply Equipment (1 point)
Install *electrical vehicle supply equipment (EVSE)* in 5% of all parking spaces used by the project or at least two spaces, whichever is greater. Clearly identify and reserve these spaces for the sole use by plug-in electric vehicles.

The EVSE must:

- Provide a Level 2 charging capacity (208 – 240 volts) or greater for each required space
- 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.
- Meet the *connected functionality* criteria for ENERGY STAR certified EVSE and be capable of responding to time-of-use market signals (e.g. price). Projects pursuing EA credit Grid Harmonization should incorporate EVSE into any demand response program or load flexibility and management strategies.

OR

Option 2. Electric Vehicle Ready Infrastructure (1 point)
Make 10% of parking spaces or at least 6 spaces, whichever is greater, *EV Ready*.

To be *EV Ready*, include a dedicated electrical circuit with sufficient capacity for each required space. Each circuit shall have conduit and wire sufficient to provide Level 2 charging or greater, and shall end at an electrical box or enclosure located near each required space.

SCHOOLS
Meet Option 1 or Option 2 above.

OR

Option 3: Electric buses or school-owned vehicles (1 point)
Develop and implement a plan for acquiring at least 1 electric bus and/or for every other 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 50% of all other (non-bus) vehicles owned or leased to serve the school to be electric vehicles.

WAREHOUSES & DISTRIBUTION CENTERS

Option 1. Electric Vehicle Charging (1 point)
Provide an on-site fleet with at least one *yard tractor* that is powered by electricity and provide on-site charging for the vehicles.

OR

Option 2. Reduced Truck Idling (1 point)
Provide an electrical connection for at least 50% of all dock door locations and/or truck parking locations to limit truck idling on the site.

Provide signage to communicate a reduced idling policy.

SUSTAINABLE SITES (SS)

SS PREREQUISITE: 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
To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust that disproportionately impact frontline communities.

Requirements

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

Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2017 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) or local equivalent, whichever is more stringent. Projects must apply the CGP regardless of size. The plan must describe the measures implemented.

SS PREREQUISITE: 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 E1527-13 (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.

SS CREDIT: 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, environmental justice concerns, and cultural and social factors, 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[1] that includes the following information:

Topography.

- Contour mapping
- Unique topographic features
- Slope stability risks

Hydrology.

- Special Flood Hazard Areas (SPFHA) as determined by FEMA's Flood Insurance Rate Map (FIRM) (or local equivalent for projects outside the U.S.)
- Delineated natural water bodies wetlands, lakes, streams, and shorelines (refer to U.S. EPA's Clean Water Act or local equivalent for projects outside the U.S.)
- Rainwater collection and reuse opportunities
- Impervious and pervious surfaces within the site boundary

Climate.

- Solar exposure and shading opportunities
- Heat island effect potential
- Seasonal sun angles
- Prevailing winds
- Average monthly precipitation and temperature ranges

Vegetation.

- Primary vegetation types
- Greenfield area
- Significant tree mapping
- Federal or state threatened or endangered species lists; for projects outside the U.S., International Union for Conservation of Nature (IUCN) Red List of Threatened Species

[1] Components adapted from the Sustainable Sites Initiative: Guidelines and Performance Benchmarks 2009, Prerequisite 2.1: Site Assessment.

- Invasive plant species listed by regional, state, or federal entities
- EPA Level III ecoregion description (or local equivalent)

Soils.

- Natural Resources Conservation Service soils delineation (or local equivalent for projects outside the U.S.)
- U.S. Natural Resources Conservation Service (or local equivalent for projects outside the United States) prime farmland, unique farmland, farmland of statewide importance, or farmland of local importance
- Healthy soils
- Previous development
- Disturbed soils

Human use.

- Views
- Adjacent transportation infrastructure, bicycle network, and bicycle storage
- Adjacent diverse uses
- 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 and water 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.

SS CREDIT: 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

Restore a portion of the site (including the building footprint) identified as *previously disturbed* and follow vegetation and soil requirements below. Vegetated roof surfaces may be included in the habitat area calculations if the plants are native or adapted and provide habitat. Points are awarded according to Table 1.

Table 1. Points for percentage of area restored

Restored Area	Points BD+C (except Healthcare)	Points BD+C (Healthcare)
15% of total site area	1	1
25% of total site area	2	-

Soil Restoration

Restore disturbed soils in areas that will later serve as the final habitat area.

- Imported soils may not include the following:
  - soils defined regionally by the Natural Resources Conservation Service web soil survey (or local equivalent for projects outside the U.S.) as *prime farmland*, unique farmland, or farmland of statewide or local importance;
  - soils from other *greenfield* sites; or
  - sphagnum peat moss.

Vegetation

Plant a minimum of 6 species of vegetation that are native or adapted to the project's EPA Level III ecoregion (or local equivalent for projects outside of the U.S.). Include a minimum of 2 out of the following plant categories: tree, shrub, and ground cover. Designate a portion of the habitat area for a pollinator garden consisting of native flowering plants and totaling at least 30 square feet (3 square meters).

Schools only:
Dedicated athletic fields that are solely for athletic uses are exempted from counting toward the total site area. These areas may not count toward the protected greenfield or restored habitat areas.

SS CREDIT: 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 encourages 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).

At least 25% of the calculated outdoor open space must be vegetated space planted with two or more types of vegetation or have *overhead vegetated canopy*.

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

- social area: a pedestrian-oriented paving or landscape area that accommodate outdoor social activities;
- recreational area: a recreation-oriented paving or landscape area that encourage physical activity;
- diverse green space: a landscape area with two or more types of vegetation that provide opportunities for year-round visual interest;
- garden: a garden space dedicated to community gardens or urban food production; or
- habitat area: preserved or created habitat that meets the criteria of SS Credit Protect or Restore Habitat and also includes elements of human interaction. These areas automatically meet the vegetation criteria of this credit.

Extensive or intensive vegetated roofs that are physically accessible can be used toward the minimum 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.

SS CREDIT: RAINWATER MANAGEMENT

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 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 to avoid contributing to flooding downstream in frontline communities.

Requirements

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

Option 1. Percentile of Rainfall Events (1-3 points except Healthcare, 1-2 points Healthcare)

In a manner best replicating *natural site hydrology* processes, retain *on site* the runoff from the associated percentile of regional or local rainfall events. The percentile event volume must be retained (i.e. infiltrated, evapotranspirated, or collected and reused) using *low-impact development (LID*) and *green infrastructure (GI) practices*. GI and LID strategies can be either structural or non-structural. Points are awarded according to Table 1.

Table 1. Points for percentile of rainfall retained

All Projects	Zero Lot Line Projects	Points	Points Healthcare
80th Percentile	70th Percentile	1	1
85th Percentile	75th Percentile	2	2
90th Percentile	80th Percentile	3	-

OR

Option 2. Natural land cover conditions (3 points except Healthcare, 2 points Healthcare)

Calculate the difference between the projected runoff volume under the proposed design conditions and the runoff volume under natural land cover conditions that existed prior to any disturbance. Retain (i.e. infiltrate, evapotranspirate, or collect and reuse) on site the increase in runoff volume using LID and GI *practices*.

SS CREDIT: 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 inequitable effects on microclimates and human, especially frontline communities, 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:

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

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. If the device or structure is a roof, it shall have an aged *solar reflectance (SR)* value of at least 0.28 as measured in accordance with ANSI/CRRC S100. If the device or structure is not a roof, or if aged solar reflectance information is not available, it shall have at installation an initial SR of at least 0.33 as measured in accordance with ANSI/CRRC S100.
- Provide shade with vegetated structures.
- Use paving materials with an initial *solar reflectance (SR)* value of at least 0.33.
- Use an *open-grid pavement system* (at least 50% unbound).

High-Reflectance Roof

Use roofing materials that have an aged SRI equal to or greater than the values in Table 1. If aged SRI is not available, the roofing material shall have an initial SRI equal to or greater than the values in Table 1.

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

	Slope	Initial SRI	Aged SRI
Low-sloped roof	≤ 2:12	82	64
Steep-sloped roof	> 2:12	39	32

Roof area that consists of functional, usable spaces (such as helipads, recreation courts, and similar amenity areas) may meet the requirements of nonroof measures. Applicable roof area excludes roof area covered by mechanical equipment, solar energy panels, skylights, and any other appurtenances.

Vegetated Roof
Install a vegetated roof using native or adapted plant species.

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 an aged SRI of at least 32 (if 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.

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.

SS CREDIT: 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 luminaires

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.

Table 3. Maximum backlight and glare ratings

	MLO lighting zone				
Luminaire mounting	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 center line of that street, alley, or corridor.
- When there are additional properties owned by the same entity that are contiguous to the property, or properties, that the LEED project is within and have the same or higher MLO lighting zone designation as the LEED project, the lighting boundary may be expanded to include those properties.

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

OR

Option 2. Calculation Method

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

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 (2 lux)
LZ4	0.60 fc (6 lux)

FC = footcandle.

AND

Internally Illuminated Exterior Signage
Do not exceed a luminance of 200 cd/m^2 (nits) during nighttime hours and 2000 cd/m^2 (nits) during daytime hours.

Exemptions from Uplight and Light Trespass Requirements

The following exterior lighting is exempt from the requirements, provided it is controlled separately from the nonexempt lighting:

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

SS CREDIT: 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 programs 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.

SS CREDIT: 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 v4.1 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
    - EA Credit: Enhanced Refrigerant Management
    - MR Prerequisite: Storage and Collection of Recyclables
    - EQ Prerequisite: Minimum Indoor Air Quality Performance
    - EQ Prerequisite: Environmental Tobacco Smoke Control
    - EQ Credit: Enhanced Indoor Air Quality Strategies
    - EQ Credit: Low-Emitting Materials
    - EQ Credit: Construction Indoor Air Quality Management Plan
    - EQ Credit: Indoor Air Quality Assessment
    - EQ Credit: Thermal Comfort
    - EQ Credit: Interior Lighting
    - EQ Credit: Daylight
    - EQ Credit: Quality Views
    - EQ Credit: Acoustic Performance

Provide the guidelines to all tenants before signing the lease.

SS CREDIT: PLACES OF RESPITE

BD+C
1 point
This credit applies to

- Healthcare

Intent
To provide patients, all 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 planted with two or more adapted or native vegetation types, or have *overhead vegetated canopy*. Monocultures, such as conventional grass lawns or turfgrass, do not count towards this requirement.
- 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.

SS CREDIT: DIRECT EXTERIOR ACCESS

BD+C
1 point
This credit applies to

- Healthcare

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

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

SS CREDIT: 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 nonschool events and 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 center;
- parking lot; and
- one or more commercial businesses.

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

OR

Option 3. Use Shared Space Owned by Other Organizations (1 point)
In collaboration with the school authorities, ensure that at least two of the following six types of spaces that are owned by other organizations or agencies are accessible to students:

- auditorium;
- gymnasium;
- cafeteria;
- one or more classrooms;
- swimming pool; and
- playing fields and stadiums.

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

WATER EFFICIENCY (WE)

WE PREREQUISITE: 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 potable water consumption and preserve no and low-cost potable water resources.

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.

WE PREREQUISITE: 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 potable water consumption and preserve no and low cost potable water resources.

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 labeling must be WaterSense labeled (or a local equivalent for projects outside the U.S.).

Table 1. Baseline water consumption of fixtures and fittings

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
gpm = gallons per minute
psi = pounds per square inch
lpf = liters per flush
lpm = liters per minute
kPa = kilopascals

Projects located where standard supply pressure is different than the LEED baseline supply pressure may calculate the water consumption of flow fixtures and fittings at the local standard supply pressure.

Appliance and Process Water Use

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

Existing appliances intended for reuse in the project are not required to meet the requirements in Table 2.

Table 2. Standards for appliances

Appliance	*Requirement*
Residential clothes washers	ENERGY STAR or performance equivalent*
Commercial clothes washers	ENERGY STAR or performance equivalent
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

*Projects in Europe may install residential appliances meeting the EU A label.

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 • 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: 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 conserve low cost potable water resources and 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.

WE CREDIT: OUTDOOR WATER USE REDUCTION

BD+C
1–3 points
This credit applies to

- New Construction (1–2 points)
- Core & Shell (1–3 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 point)

Intent

To reduce outdoor potable water consumption and preserve no and low-cost potable water resources.

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 and CS, 1 point Healthcare, 3 points CS)

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 and CS, 1 point Healthcare, 3 points CS)

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) WaterSense 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)*	*Points (CS)*
50%	1	1	1

75%	--	--	2
100%	2	—	3

WE CREDIT: INDOOR WATER USE REDUCTION

BD+C
1–7 points
This credit applies to

- New Construction (1–6 points)
- Core & Shell (1–4 points)
- 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 potable water consumption and preserve no and low-cost potable water resources.

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 (CS)	Points (Schools, Retail, Hospitality, Healthcare)
25%	1	1	1
30%	2	2	2
35%	3	3	3
40%	4	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

WE CREDIT: OPTIMIZE PROCESS WATER USE

BD+C
1–3 points
This credit applies to

- New Construction (1–2 points)
- Core & Shell (1–3 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 conserve low cost potable water resources used for mechanical processes while controlling, corrosion and scale in the condenser water system.

Requirements

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

Option 1. Cooling Tower and Evaporative Condenser Cycles of Concentration (1-2 points except CS, 1-3 points CS)

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 $CaCO_3$)	600 ppm
Total alkalinity	500 ppm
SiO_2	150 ppm
Cl^-	300 ppm
Conductivity	3300 µS/cm

ppm = parts per million
µS/cm = micro siemens per centimeter

Calculate the maximum 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 analysis. Limit cooling tower cycles to avoid exceeding maximum values for any of these parameters.

The materials of construction for the water system that come in contact with the cooling tower water shall be of the type that can operate and be maintained within the limits established in Table 1.

Table 2. Points for cooling tower cycles

Cooling tower cycles	*Points (all except CS)*	*Points (CS)*
Maximum number of cycles achieved without exceeding any maximum concentration levels or affecting operation of condenser water system	1	1
Meet the maximum calculated number of cycles to earn 1 point, and increase the number of cycles by a minimum of 25% by increasing the level of treatment and/or maintenance in condenser or make-up water systems OR Meet the maximum calculated number of cycles to earn 1 point and use a minimum 20% recycled nonpotable water	2	2
Meet the maximum calculated number of cycles to earn 1 point, and increase the number of cycles by a minimum of 30% by increasing the level of treatment and/or maintenance in condenser or make-up water systems OR Meet the maximum calculated number of cycles to earn 1 point and use a minimum 30% recycled nonpotable water	--	3

Minimum percentage recycled nonpotable water used in cooling tower makeup should be based on water use during the month with the highest demand for make-up water.

Projects may consider using water reclaimed from another process as a source of makeup water for evaporative cooling equipment as long as the resultant circulating water chemistry conforms to the parameters established in Table 1.

Projects whose cooling is provided by district cooling systems are eligible to achieve Option 1 if the district cooling system complies with the above requirements.

OR

Option 2. Optimize Water Use for Cooling (1-2 points except CS, 1-3 points CS)

To be eligible for Option 2, the baseline system designated for the building using ASHRAE 90.1-2016 Appendix G Table G3.1.1 must include a cooling tower (systems 7, 8, 11, 12, and 13)

Achieve increasing levels of cooling tower water efficiency beyond a water-cooled chiller system with axial variable-speed fan cooling towers having a maximum drift of 0.002% of recirculated water volume and three cooling tower cycles. Points are awarded according to Table 3.

Table 3. Points for reducing annual water use compared to Water-Cooled Chiller System

Percentage Reduction	Points (BD+C)	Points (CS)
25%	1	1
50%	2	2
100%	-	3

Projects whose cooling is provided by district cooling systems are eligible to achieve Option 2 if the district cooling system complies with the above requirements.

AND/OR

Option 3. Process Water Use (1-2 points except CS, 1-3 points CS)

Demonstrate that the project is using minimum 20% recycled alternative water to meet process water demand for 1 point, or using minimum 30% recycled alternative water to meet process water demand for 2 points. Ensure that recycled alternative water is of sufficient quality for its intended end use.

Minimum percentage of recycled alternative water used should be based on water use during the month with the highest water demand.

Process water uses eligible for achievement of Option 3 must represent at least 10% of total building regulated water use and may not include water used for cooling. Eligible subsystems may include:

- Boilers
- Humidification systems
- Other subsystems using process water

Projects served by district systems are eligible to achieve Option 3 if the district system complies with minimum thresholds for recycled alternative water use.

Core and Shell projects:

Demonstrate that the project is using minimum 20% recycled alternative water to meet process water demand for 1 point, using minimum 30% recycled alternative water to meet process water demand for 2 points, or using minimum 40% recycled alternative water to meet process water demand for 3 points. Ensure that recycled alternative water is of sufficient quality for its intended end use.

WE CREDIT: 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 conserve low cost potable water resources and 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 liters) 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 use in central sterile and processing department;
- water use in physiotherapy and hydrotherapy and treatment areas;
- water use in surgical suite;
- closed-looped hydronic system makeup water; and
- cold-water makeup for domestic hot water systems.

ENERGY AND ATMOSPHERE

EA PREREQUISITE: FUNDAMENTAL COMMISSIONING AND VERIFICATION Required

BD+C
This prerequisite applies to

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

Intent

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

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 0-2013 and ASHRAE Guideline 1.1–2007 for HVAC&R Systems, as they relate to energy, water, indoor environmental quality, and durability.

- 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.

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. ASTM E2947-16: Standard Guide for Building Enclosure Commissioning provides additional guidance.

The review of the exterior enclosure design may be performed by a qualified independent member of the

design or construction team (or an employee of that firm) who is not directly responsible for design of the building enclosure for the project.

Commissioning Authority Qualifications
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.

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;
- setpoints for all HVAC equipment;
- set lighting levels throughout the building;
- minimum outside air requirements;
- any changes in schedules or setpoints 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.

<u>Data Centers only</u>
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.

EA PREREQUISITE: 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 promote resilience and reduce the environmental and economic harms of excessive energy use that disproportionately impact frontline communities by achieving a minimum level of energy efficiency for the building and its systems.

Requirements

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

Comply with ANSI/ASHRAE/IESNA Standard 90.1–2016, with errata or a USGBC-approved equivalent standard.

ASHRAE 90.1-2016 Compliance pathways in Section 4.2.1.1 include compliance with all mandatory provisions, and compliance with one of the following:

- Prescriptive provisions of Sections 5 through 10
- Section 11 *Energy Cost Budget Method*
- Normative Appendix G *Performance Rating Method*. When using Appendix G, the Performance Cost Index (PCI) shall be less than or equal to the Performance Cost Index Target (PCI_t) in accordance with the methodology provided in Section 4.2.1.1. Document the PCI, PCI_t, and percentage improvement using metrics of cost or greenhouse gas (GHG) emissions.

For projects using Normative Appendix G *Performance Rating Method:*

- Greenhouse gas emissions: The total greenhouse gas emissions, in terms of carbon dioxide equivalents, shall be calculated for the baseline building performance rating and for the proposed building performance rating, and the percentage improvement shall be determined using carbon dioxide equivalent emissions.

  US
  - use U.S. Environmental Protection Agency's (EPA) regional grid mix coefficients to calculate GHG emissions by energy source; or
  - use hourly emissions profiles from U.S. Environmental Protection Agency's (EPA) AVoided Emissions and geneRation Tool (AVERT)

  Canada:
  - use the provincial (where available) emissions factors reported in the National Inventory Report, submitted by Canada to the United Nations Framework Convention on Climate Change, to calculate GHG emissions by energy source; these emissions factors are

readily found in the ENERGY STAR Portfolio Manager Greenhouse Gas Emissions Technical Reference.

International:

- use the latest national grid mix coefficients from the International Energy Agency to calculate GHG emissions by energy source
- ISO 52000-1:2017: Greenhouse gas emission factors for each building energy source shall be determined consistently with ISO Standard 52000-1:2017 and published for the country or region where the project is located

- Exception to Mandatory Measures requirements: For ASHRAE 90.1-2016 mandatory controls provisions that are quantified in the Appendix G *Performance Rating Method*, (e.g. lighting occupancy sensor controls, lighting daylighting controls, automated receptacle controls, etc.), projects may model the *Proposed Building Performance* control parameters identically to the *Baseline Building Performance* control parameters in lieu of compliance with the mandatory provisions.

- Exceptional Calculations modeled in accordance with Section G2.5 may be modeled to document minimum prerequisite compliance.

- Only on-site or on-campus renewable energy that meets ASHRAE Standard 90.1-2016 Section G 2.4.1 requirements for on-site renewable energy may be used to meet minimum ASHRAE Standard 90.1-2016 performance requirements.

EA PREREQUISITE: 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.

EA PREREQUISITE: 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 ozone depletion and global warming potential and support early compliance with the Kigali Amendment to the Montreal Protocol, while minimizing direct contributions to climate change.

Requirements

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

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

Existing small HVAC&R units (defined as containing less than 0.5 pound [225 grams] of refrigerant) and other equipment, such as standard refrigerators, small water coolers, and any other equipment that contains less than 0.5 pound (225 grams) of refrigerant, are exempt.

EA CREDIT: 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 Centers (2-6 points)
- 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 in place a contract to implement, the following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification.

Commissioning Authority 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.

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 0–2013 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. Building Enclosure Commissioning (2 points)

Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's enclosure 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 0–2013 and ASTM E2947-16: Standard Guide for Building Enclosure Commissioning, as they relate to energy, air and water tightness, indoor environmental quality, and durability.

The qualified independent member of the design or construction team responsible for building enclosure commissioning must complete the following:

- Review contractor submittals.
- Verify inclusion of systems manual requirements in construction documents for enclosure systems.
- For specialty enclosure systems with controls and automation:
    - 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 enclosure commissioning plan for maintenance, renewal and revitalization cycles.

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.

EA CREDIT: 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 that disproportionately impact frontline communities.

Requirements

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

Analyze 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.

Analyze 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.

Choose one of the options below.

Option 1. Energy Performance Compliance (1–18 points except Schools and Healthcare, 1–16 points Schools, 1–20 points Healthcare)

Demonstrate a Performance Cost Index (PCI)[1] below the Performance Cost Index Target (PCI_t) calculated in accordance with Section 4.2.1.1 of ANSI/ASHRAE/IESNA Standard 90.1-2016, Appendix G, Table 4.2.1.1. For mixed use buildings, the required PCI shall be calculated by using an area weighted average of the building types.

Calculate the PCI, PCI_t, and percentage improvement using metrics of cost and greenhouse gas (GHG) emissions. For each energy source serving the building, the GHG emission factors must be identical for the Baseline and Proposed building models.

LEED points are calculated based on the project percent improvement PCI below the PCI_t using metrics of cost and GHG emissions. Total points have been divided equally between the metrics of energy cost and greenhouse gas emissions. Points are awarded according to Table 1 and Table 2.

For project percent improvement for the cost metric, on-site renewable energy may be subtracted from proposed energy cost prior to calculating proposed building performance per ASHRAE Standard 90.1-2016 Section G 2.4.1.

Table 1. Points for percentage improvement in energy performance – % Cost PCI below PCI_t (1-9 points NC and CS, 1-8 points Schools, 1-10 points Healthcare)

New Construction	Healthcare, Major Renovation, CS	Points BD+C (except Schools, Healthcare)*	Points Healthcare	Points Schools
5%	2%	1	1	1
10%	5%	2	2	2
15%	10%	3	3	3
20%	15%	4	4	4
25%	20%	5	5	5
30%	25%	6	6	6
35%	30%	7	7	7
40%	35%	8	8	
45%	40%	9	9	8
50%	45%		10	

*BD+C projects except Data Centers with unregulated energy cost exceeding 50% of the total proposed building energy cost, and BD+C: Data Centers projects with at least 40% gross colocation data center area may use the "Healthcare, Major Renovation, CS" column in lieu of the "New Construction" column.

On-site renewable energy may be subtracted from proposed greenhouse gas emissions prior to calculating proposed building performance per ASHRAE Standard 90.1-2016 Section G 2.4.1. Tier 2 off-site renewable energy as defined in EA credit Renewable Energy may be subtracted from proposed greenhouse gas emissions prior to calculating proposed building performance.

Table 2. Points for percentage improvement in energy performance – % Greenhouse Gas Emissions PCI below PCI_t (1-9 points NC, 1-8 points Schools, 1-10 points Healthcare)

New Construction	Healthcare, Major Renovation, CS,	Points BD+C (except Schools, Healthcare)*	Points Healthcare	Points Schools
5%	2%	1	1	1
10%	5%	2	2	2
16%	10%	3	3	3
24%	16%	4	4	4
32%	24%	5	5	5

40%	32%	6	6	6
50%	40%	7	7	7
65%	50%	8	8	
80%	65%	9	9	8
100%	80%		10	

BD+C projects except Data Centers with unregulated energy cost exceeding 50% of the total proposed building energy cost, and BD+C: Data Centers projects with at least 40% gross colocation data center area may use the "Healthcare, Major Renovation, CS" column in lieu of the "New Construction" column.

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 90.1–2016, 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.

DATA CENTERS ONLY

In addition to the requirements above, analyze efficiency measures focused on IT load reduction and HVAC-related strategies. Collocated data centers may use the CS percentage improvement thresholds in lieu of NC thresholds to earn points in Table 1 and Table 2.

OR

Option 2. Prescriptive Compliance: ASHRAE Advanced Energy Design Guide (1–6 points, 1-4 points CS)

To be eligible for Option 2, projects must meet the Scope requirements of the applicable AEDGs (or combination of AEDGs for mixed use), and projects must use the ASHRAE 90.1-2016 Prescriptive compliance path 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.

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

- *Building envelope:* roofs, walls, floors, slabs, doors, continuous air barriers, and vertical fenestration (1 point, 2 points CS)
- *Interior and exterior lighting,* including daylighting and interior finishes (1 point).

- *Plug loads,* including equipment and controls (2 points, 0 points CS)
- *HVAC Systems and Controls (*2 points, 1 point CS).

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

- *Building envelope:* roofs, walls, floors, slabs, doors, vestibules and fenestration – all orientations (1 point, 2 points CS)
- *Interior and exterior lighting,* excluding lighting power density for sales floor (1 point).
- *Additional interior lighting* for sales floor (1 point, 0 points CS)
- *Plug loads,* including equipment choices and controls (1 point, 0 points CS)
- *HVAC efficiency and control requirements* (2 points, 1 point CS).

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

(Not applicable for CS)

- *Building envelope:* roofs, walls, floors, slabs, doors and vertical fenestration (1 point)
- *Interior and exterior lighting,* including daylighting and interior finishes (1 point)
- *Plug loads,* including equipment choices, controls, and kitchen equipment (2 points)
- *HVAC efficiency and control requirements* (2 points)

ASHRAE 50% Advanced Energy Design Guide for Large Hospitals

- *Building envelope:* roofs, walls, floors, slabs, doors, vestibules, continuous air barriers, and vertical fenestration (1 point, 2 points CS)
- *Interior and exterior lighting,* including daylighting (form or nonform driven) and interior finishes (1 point).
- *Plug loads,* including equipment choices, controls, and kitchen equipment (1 point, 0 points CS)
- *HVAC and Service Water Heating Systems and Equipment (2 points) (*1 point CS.)

ASHRAE 50% Advanced Energy Design Guide for Grocery Stores

- *Building envelope:* roofs, walls, floors, slabs, doors, vestibules, continuous air barriers, and vertical fenestration (1 point) (2 points – CS)
- *Interior and exterior lighting, including sales floor (1* points)
- *Refrigeration, Plug, and Process loads,* including equipment choices and controls (2 points)(0 points CS)
- *HVAC efficiency and control requirements (1 point) (*1 point CS.)

Option 3. Systems Optimization (1-6 points)

To be eligible for Option 3, projects must use the ASHRAE 90.1-2016 Prescriptive compliance path in EA Prerequisite Minimum Energy Performance, and must not have more than 2,000 square feet of data center space, laboratory space, or manufacturing space.

Demonstrate an improvement beyond ASHRAE/ASHRAE/IESNA Standard 90.1–2016, with errata, for the following systems: Interior and Exterior Lighting; Daylight controls; Building envelope; HVAC and service water heating equipment efficiency; and Equipment and appliances.

Use any combination of the strategies in any or all of the categories below, for a maximum of up to 6 points.

- *Interior and Exterior Lighting:*
    - 15% lighting power reduction (1 point)

- 30% lighting power reduction (1 point)
- 45% lighting power reduction (1 point)

- *Daylight controls:*
- Install daylight-responsive controls for a given percentage of connected lighting load (lighting in non-regularly occupied space with occupant sensor controls may be excluded from connected lighting load).
  - 40% (1 point)

- *Building envelope:*
  - Climate Zones 1 – 2: Achieve 2 of the 3 strategies below for 1 point.
    - Thermal Mass Enclosure: More than 70% of opaque above-grade wall area meets ASHRAE 90.1-2016 definition for “mass wall”; and more than 70% of floor area meets ASHRAE 90.1-2016 definition for “mass floor”
    - 25% Envelope UA reduction
    - 50% SHGC reduction (including window shade factors)
  - Climate Zones 3 – 8: Achieve 2 of the 3 strategies below for 1 point.
    - 25% Envelope UA reduction
    - 50% Envelope UA reduction
    - 25% reduction in air infiltration measured during commissioning

- *HVAC and Service Water Heating Equipment Efficiency*:
  - Reduction in total fan power allowance of:
    - 20% (1 point)
  - Improvement in efficiency for at least 75% of the combined cooling, heating, and service water heating capacity
    - 20% (1 point)
  - *Electric resistance heating except heat pump auxiliary heat must be included in total capacity.*

- *Equipment and Appliances*:
- Install a percentage (by rated power) of eligible equipment and appliances meeting the following requirements:
  - *ENERGY STAR* equipment including appliances, office equipment, electronics, and commercial food service equipment (lighting and building envelope products are excluded from this credit). (Electronic Product Environmental Assessment Tool (EPEAT) equipment may be used in lieu of Energy Star equipment where applicable).
  - Prescriptive commercial kitchen and refrigeration equipment requirements listed in Appendix 3, Table 1.

The project scope of work must include at least 0.25 Watts per square foot of eligible equipment to apply this strategy.

Percent of Eligible Equipment Installed by Rated Power:
- 75% (1 point)

OR

Option 4. Data Centers only– System Optimization (1-3 points)
Calculate an Overall *Systems* Design Value as the sum of the maximum *design Mechanical Load Component (MLC)* and maximum *design Electrical Load Component (ELC)* in accordance with ASHRAE 90.4-2016 Section 6.2, Section 8.2, and Section 11. Document that the Overall Systems Design value is less than the Maximum Overall Systems Value by:
- 10% (1 point)
- 20% (2 points)

- 30% (3 points)

**If the electrical system design is incomplete, the design values shall be assumed to match the values in Table 8.2.1.1 and 8.2.1.2.*

Collocated data centers: document that the Overall Systems Design value is less than the Maximum Overall Systems Value by:
- 6% (1 point)
- 12% (2 points)
- 18% (3 points)

EA CREDIT: 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.

EA CREDIT: GRID HARMONIZATION

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 programs that make energy generation and distribution systems more affordable and 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 and Participation (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.
- Enroll 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 annual on-peak electricity demand. On-peak demand is determined under EA Prerequisite Minimum Energy Performance. The on-peak demand may vary based on the utility climate and pricing structures.
- 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.
- Include the DR program and any installed technologies in the building systems manual or include in the current facilities requirements and operations and maintenance plan if the project is not pursuing EA credit Enhanced Commissioning.
- Initiate at least one full test of the DR plan.

OR

Case 2. Demand Response Capable Building (1 point)

Have infrastructure in place to take advantage of future demand response programs or dynamic, real-time pricing programs and complete the following activities:

- Install interval recording meters and have equipment capable of accepting an external signal.
- Develop a comprehensive plan for shedding at least 10% of the annual on-peak electricity demand. On-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.
- Include the DR program and any installed technologies in the building systems manual or include in the current facilities requirements and operations and maintenance plan if the project is not pursuing EA credit Enhanced Commissioning.
- Contact local utility representatives to discuss participation in future DR programs.

AND / OR

Case 3. Load Flexibility and Management Strategies (1-2 points)

Analyze the building's annual load shape and peak load based as calculated for EA prerequisite Minimum Energy Performance. Review the regional grid load profile using the metric of peak load or peak carbon emissions. The U.S. Environmental Protection Agency's (EPA) AVoided Emissions and geneRation Tool (AVERT) provides regional grid emissions data; local utilities may also provide this data.

Coordinate review of building load shape and peak load with review of the regional grid profile to identify the best value load management strategies that the building can provide.

Implement one or more of the load flexibility and management strategies described below for a maximum of up to two points. All projects must install interval recording meters and have equipment capable of accepting an external signal.

Load Flexibility and Management Strategies:

- Peak Load Optimization: demonstrate that strategy reduces on-peak load by at least 10% as compared to peak electrical demand referenced to the ASHRAE 90.1-2016 compliant case (1 point)
- Flexible Operating Scenarios: demonstrate that strategy moves at least 10% of peak load by a time period of 2 hours (1 point)
- On-site thermal and/or electricity storage: demonstrate that strategy reduces on-peak load by at least 10% as compared to peak electrical demand (1 point)
- Grid resilience technologies: project served by utilities with resilience programs in place, which leverage strategies such as islanding and part-load operation, automatically achieve this credit (1 point)

Include installed technology in the scope of work for the commissioning authority. Include load flexibility and management strategies and installed technologies in the building systems manual, or include in the current facilities requirements and operations maintenance plan if the project is not pursuing EA credit Enhanced Commissioning

Contact local utility representatives to discuss participation in future DR programs and to inform utility of building load flexibility and management strategies.

EA CREDIT: RENEWABLE ENERGY

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 reduce the environmental and economic harms associated with fossil fuel energy and reduce greenhouse gas emissions by increasing the supply of renewable energy projects and foster a just transition to a green economy.

Requirements

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

Use on-site renewable energy systems or procure renewable energy from offsite sources for all or a portion of the building's annual energy use.

Choose one or more strategies for renewable energy procurement from the categories below. Points achieved in each category may be added for a total of 5 points.

- **Tier 1: On-site renewable energy generation**
  - On-site renewable energy generation, environmental attributes (e.g. RECs) retained
- **Tier 2: New off-site renewable energy**
  - Off-site renewable electricity that is produced by a generation asset(s) built within the last five years or contracted to be operational within two years of building occupancy.
  - Green-e Energy certification or equivalent is required for one-time purchase and delivery of EACs of more than 100% of the project's annual electricity use.
- **Tier 3: Off-site renewable energy**
  - Off-site renewable electricity that is Green-e Energy certified or equivalent or captured bio-methane

Ownership of Environmental Attributes: All environmental attributes associated with renewable energy generation must be retired on behalf of the LEED project in order for the renewable energy procurement to contribute to credit achievement.

The default contract length for renewable energy procurement is 10 years. Contract lengths less than 10 years may be pro-rated.

For Tier 2, the age of the generation asset(s) is assessed at the beginning of the contract, and the generation asset(s) retain this attribute for the duration of the initial contract or lease term.

Off-site renewable energy must be generated by renewable electricity projects located in the same country or region where the LEED project is located. Methane capture in the form of biogas that is both captured and used on-site may qualify as a Tier 1 renewable energy resource.

Points are awarded according to Table 1, based on the percentage of total site energy use. Renewable electricity and EAC procurement can only be applied to project electricity use or district energy use. Captured bio-methane can only be applied to project fuel use.

Table 1. Points for Renewable Energy Procurement

Points	Tier 1	Tier 2	Tier 3
1	2%	10%	35%
2	5%	20%	70%
3	10%	30%	100%
4	15%	40%	
5	20%	50%	

Tier 1 renewable energy may be accounted for in the cost metric and the GHG emissions metric in EA credit Optimize Energy Performance.

Tier 2 renewable energy may be accounted for in the GHG emissions metric in EA credit Optimize Energy Performance. Calculate avoided GHG emissions by using the renewable energy asset's hourly generation profile and the hourly GHG emissions profile of the renewable energy asset's grid. Where hourly data are not available, calculate avoided GHG emissions using the emissions factors defined in EA prerequisite Minimum Energy Performance.

EA CREDIT: ENHANCED REFRIGERANT MANAGEMENT

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 eliminate ozone depletion and global warming potential, and support early compliance with the Montreal Protocol, including the Kigali Amendment, 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)

Comply with ASHRAE Standard 15-2019: Safety Standard for Refrigeration Systems, or USGBC-approved equivalent, as applicable to the project scope.

Develop and implement a refrigerant management plan that addresses leak detection, system retrofit, and end of life disposal for all HVAC&R systems containing more than 0.5 pound (225 grams) of refrigerant.

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**
$\frac{LCGWP}{} + \frac{LCODP}{} \times \frac{10}{5} \leq 100$	$\frac{LCGWP}{} + \frac{LCODP}{} \times \frac{10}{5} \leq 13$
Calculation definitions for $LCGWP + LCODP \times 10^5 \leq 100$ (IP units)	**Calculation definitions for $LCGWP + LCODP \times 10^5 \leq 13$ (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 (lb. CO_2/Ton-Year)	LCGWP: Lifecycle Direct Global Warming Potential (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:

IP units	**SI units**
$\frac{[\sum (LCGWP + LCODP \times 10^5) \times Qunit]}{Qtotal} \leq 100$	$\frac{[\sum (LCGWP + LCODP \times 10^5) \times Qunit]}{Qtotal} \leq 13$

Calculation definitions for $[\sum (LCGWP + LCODP \times 10^5) \times Qunit] / Qtotal \leq 100$ (IP units)	**Calculation definitions for $[\sum (LCGWP + LCODP \times 10^5) \times Qunit] / Qtotal \leq 13$ (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.

MATERIALS AND RESOURCES (MR)

MR PREREQUISITE: STORAGE AND COLLECTION OF RECYCLABLES Required

BD+C
This prerequisite applies to

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

Intent

To reduce the disproportionate burden of landfills and incinerators that is generated by building occupants' waste hauled to and disposed of in landfills and incinerators through reduction, reuse and recycling service and education, and to conserve natural resources for future generations.

Requirements

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

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.

MR PREREQUISITE: PBT SOURCE REDUCTION—MERCURY
Required

BD+C
This prerequisite applies to
- 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 vapor 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

Lamp	*Maximum content*
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, nonintegral 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

MR CREDIT: BUILDING LIFE-CYCLE IMPACT REDUCTION

BD+C
1–6 points
This credit applies to

- BD+C: New Construction (1-5 points)
- BD+C: Core & Shell (1-6 points)
- BD+C: Schools (1-5 points)
- BD+C: Retail (1-5 points)
- BD+C: Data Centers (1-5 points)
- BD+C: Warehouses & Distribution Centers (1-5 points)
- BD+C: Hospitality (1-5 points)
- BD+C: Healthcare (1-5 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. Building and Material Reuse (1-5 points BD+C, 2-6 points Core and Shell)

Maintain the existing building structure, envelope, and interior nonstructural elements. Reused or salvaged materials from off site that are incorporated into the building can also contribute to the credit calculations. However, reuse materials contributing toward this credit may not contribute toward MR Credit Material Disclosure and Optimization – Sourcing of Raw Materials.

Historic, abandoned or blighted buildings: Portions of buildings deemed structurally unsound or hazardous can be excluded from the credit calculations.

Path 1 and 2 reward projects that reuse structural and/or nonstructural elements based on the project area. Path 1 and 2 can be combined for points.

Path 1: Maintain Existing Structural Elements: Walls, Floors, Roofs, and Envelope (1-5 points BD+C, 2-6 points Core & Shell):

Maintain the existing building structure (including floor and roof decking) and envelope (the exterior skin and framing, excluding window assemblies and nonstructural roofing materials). Calculate reuse of the existing project area according to Table 1.

Table 1. Path 1 Points for reuse of building structural elements.

Percent of existing walls, floors and roof reuse by project area	*Points BD+C*	*Points – Core & Shell*

15%	***1***	***2***
30%	**2**	**3**
45%	**3**	**4**
60%	**4**	**5**
75%	**5**	**6**

AND/OR

Path 2: Maintain Interior Nonstructural Elements (1 point)

Use existing interior nonstructural elements (e.g. interior walls, doors, floor coverings and ceiling systems) for at least 30% of the entire completed building, including additions.

OR

Option 2. Whole-Building Life-Cycle Assessment (1-4 points)

For new construction (buildings or portions of buildings), conduct a cradle-to-grave life-cycle assessment of the project's structure and enclosure and select one or more of the following paths below to earn up to 4 points:

Path 1: Conduct a life cycle assessment of the project's structure and enclosure (1 point).

Path 2: Conduct a life cycle assessment of the project's structure and enclosure that demonstrates a minimum of 5% 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 (2 points).

Path 3: 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 (3 points).

Path 4: Meet requirements of Path 3 and incorporate reuse and/or salvage materials into the project's structure and enclosure for the proposed design. Demonstrate reductions compared with a baseline building of at least 20% reduction for global warming potential and demonstrate at least 10% reduction in two additional impact categories listed below (4 points).

For Paths 2, 3 and 4 listed above, no impact category assessed as part of the life-cycle assessment may increase by more than 5% compared with the baseline building. Include a narrative of how the life cycle assessment was conducted and if applicable for paths 2, 3 and 4 what changes were made to proposed buildings in order to achieve the related impact reductions.

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. Baseline assumptions must be based on standard design and material selection for the project location and building type. 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 kg CO_2e;
- depletion of the stratospheric ozone layer, in kg CFC-11e;
- acidification of land and water sources, in moles H+ or kg SO_2e;
- eutrophication, in kg nitrogen eq or kg phosphate eq;
- formation of tropospheric ozone, in kg NOx, kg O3 eq, or kg ethene; and
- depletion of nonrenewable energy resources, in MJ using CML / depletion of fossil fuels in TRACI.

MR CREDIT: 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 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 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. (10 different permanently installed products from three different manufacturers for CS and Warehouses & Distribution Centers).

- Life-cycle assessment and environmental product declarations.
    - 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 whole product for the purposes of credit achievement calculation.

    - Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071. Products with product-specific internal EPDs which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.

    - Industry-wide Type III 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. Products with industry-wide EPDs, which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.

- Environmental Product Declarations which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
    - Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review are valued as 1.5 products for the purposes of credit achievement calculation.

Option 2. Embodied Carbon/LCA Optimization (1 point)
Use products that have a compliant embodied carbon optimization report or action plan separate from the LCA or EPD. Use at least 5 permanently installed products sourced from at least three different manufacturers. Products are valued according to the table below.

<table>
<tr><th>Report type</th><th>Reference Document(s) for the Optimization Report</th><th>Report Verification</th><th>Valuation</th></tr>
<tr><td>Embodied Carbon/LCA Action Plan</td><td>Product-specific LCA or product-specific Type III EPD</td><td>Prepared by the manufacturer and signed by company executive</td><td>½ product</td></tr>
<tr><td>Reductions in Embodied Carbon:
<10% reduction in GWP relative to baseline</td><td rowspan="2">Baseline: Product-specific LCA, Product-specific Type III EPD, or Industry-wide Type III EPD
Optimized: Product-specific LCA or product-specific Type III EPD</td><td rowspan="3">Comparative analysis is verified by an independent party</td><td>1 product</td></tr>
<tr><td>Reductions in Embodied Carbon:
10%+ reduction in GWP relative to baseline</td><td>1.5 products</td></tr>
<tr><td>Reductions in Embodied Carbon:
20%+ reduction in GWP and 5%+ reduction in two additional impact categories, relative to baseline</td><td>Baseline: Product-specific LCA or Product-specific Type III EPD
Optimized: Product-specific LCA or product-specific Type III EPD</td><td>2 products</td></tr>
</table>

Note: Reference documents for the optimization reports must be compliant with EPD Credit Option 1.

Impact categories:

- global warming potential (greenhouse gases), in CO_2e;
- depletion of the stratospheric ozone layer, in kg CFC-11e;
- acidification of land and water sources, in moles H+ or kg SO_2e;
- eutrophication, in kg nitrogen equivalent or kg phosphate equivalent;
- formation of tropospheric ozone, in kg NOx, kg O3 eq, or kg ethene; and
- depletion of nonrenewable energy resources, in MJ using CML / depletion of fossil fuels in TRACI.

For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number of products, up to a maximum of 2 products.

MR CREDIT: 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 environmentally, economically, and socially preferable life cycle impacts. To reward project teams for 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

Responsible Sourcing of Raw Materials (1-2 points)
Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 15%, by cost, of the total value of permanently installed building products in the project (1 point).

Use products sourced from at least five different manufacturers that meet at least one of the responsible sourcing and extraction criteria below for at least 30%, by cost, of the total value of permanently installed building products in the project (2 points).

- *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 and materials other than wood must be tested using ASTM Test Method D6866 or equivalent method ISO 16620-2, or be certified to the USDA BioPreferred Voluntary Labeling Initiative that includes verification via ASTM 6866 testing. Exclude hide products, such as leather and other animal skin material.

    - Bio-based products that meet the criteria above: value at 50% of cost multiplied by the biobased content of the product for the purposes of credit achievement calculation.
    - Bio-based products that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard in addition to the testing requirements above: value at 100% of cost multiplied by the biobased content of the product 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 200% of their cost for the purposes of credit achievement calculation.

- *Recycled content.* Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

    - Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on weight.
    - The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

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

MR CREDIT: 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 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 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% (1,000 ppm). (10 different permanently installed products from at least three different manufacturers for CS and Warehouses & Distribution Centers)

- *ANSI/BIFMA e3 Furniture Sustainability Standard*. The documentation from the assessor or scorecard from BIFMA must demonstrate the product earned at least 3 points under 7.5.1.3 Advanced Level in e3-2014 or 3 points under 7.4.1.3 Advanced Level in e3-2012.
- *Cradle to Cradle.* Product has Material Health Certificate or is Cradle to Cradle Certified™ under standard version 3 or later with a Material Health achievement level at the Bronze level or higher.
- *Declare*. The Declare product label must meet the following requirements:
    - Declare labels designated as Red List Free, LBC Red List Free, or Declared.
    - Declare labels designated as LBC Red List Approved or LBC Compliant that demonstrate content inventory to 0.1% (1,000 ppm).
- *Facts – NSF/ANSI 336*: Sustainability Assessment for Commercial Furnishings Fabric at any certification level.
- *Global Green TAG*. Product Health Declaration (PHD) labels issued after January 1, 2020.
- *Health Product Declaration.* The end use product has a published and complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration Open Standard.
- *Living Product Challenge*. The included Declare product label must demonstrate content inventory to 0.1% (1,000 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) and/or European Community Number (EC Number).
- Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:
    - Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)
    - The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)
        - The hazard screen must be applied to each trade secret ingredient and the inventory lists the hazard category for each of the health hazards included in Part 3 of GHS (e.g. “GHS Category 2 Carcinogen”).
- *Product Lens Certification*

Any compliant reports above with third-party verification that includes the verification of content inventory are worth 1.5 products for credit achievement calculations.

AND/OR

Option 2: Material Ingredient Optimization (1 point)
Use products that have a compliant material ingredient optimization report or action plan. Use at least 5 permanently installed products sourced from at least three different manufacturers. Products are valued according to the table below.

Report Type & Criteria	Product Documentation	Report Verification	Valuation
Material Ingredient Screening and Optimization Action Plan	Action Plan based on publicly available material inventory to at least 1,000ppm.	Prepared by the manufacturer and signed by company executive	½ product
Advanced Inventory & Assessment: Inventory to at least 0.01% by weight (100 ppm) and no GreenScreen LT-1 hazards or GHS Category 1 hazards are present. Or Inventory to at least 0.01% by weight (100ppm) and at least 75% by weight of product is assessed using GreenScreen. The remaining 25% by weight of product has been inventoried and the GreenScreen assessment is publicly available.	*Cradle to Cradle Certified* or *Material Health Certificate* at Bronze level or higher. *Declare* labels designated as *Red List Free* or *LBC Red List Free.* *Health Product Declaration* that meet optimization and verification criteria. *Living Product Challenge* certified products that include a Red List Free or LBC Red List Free *Declare* label. *Manufacturer Inventory* that meet optimization and verification criteria.	Third-party verified	1 product
Material Ingredient Optimization: Inventory to at least 0.01% by weight (100 ppm) and at least 95% by weight of product is assessed using GreenScreen. No BM-1 hazards are present. The remaining 5% not assessed has been inventoried and screened using GreenScreen List Translator and no GreenScreen LT-1 hazards are present.	*Cradle to Cradle Certified* or *Material Health Certificate* at Silver level or higher. *Health Product Declaration* that meet optimization and verification criteria. *Living Product Challenge* certified products that achieve Imperative 09: Transparent Material Health. *Manufacturer Inventory* that meet optimization and verification criteria.		1.5 products
International Alternative Compliance Path: *Available to projects located outside of the US*	*REACH Optimization*: Material Inventory to 100ppm with no substances found on the Authorization List – Annex XIV, the Restriction list – Annex XVII and the SVHC candidate list. *Global Green TAG* PHD report.	REACH report prepared by the manufacturer PHD Report verified by *Global Green TAG*	1 product

For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number of products, up to a maximum of 2 products.

MR CREDIT: PBT SOURCE REDUCTION—MERCURY

BD+C
1 point
This credit applies to

- Healthcare

Intent

To reduce the release of persistent, bioaccumulative, 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 florescent, 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 start metal halide lamps.

MR CREDIT: PBT SOURCE REDUCTION—LEAD, CADMIUM, AND COPPER

BD+C
2 points
This credit applies to
- Healthcare

Intent

To reduce the release of persistent, bioaccumulative, 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.

MR CREDIT: 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, 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 nonstick treatments derived from perfluorinated compounds (PFCs), including perfluorooctanoic acid (PFOA); and
- added antimicrobial treatments.

AND/OR

Option 2. Testing and Modeling 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 modeling 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 modeling 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: Building Product Disclosure and Optimization

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.

- Life-cycle assessment and environmental product declarations.
    - 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 whole product for the purposes of credit achievement calculation.

    - Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071. Products with product-specific internal EPDs which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.

    - Industry-wide Type III 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. Products with industry-wide EPDs, which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole 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.
    - Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review are valued as 1.5 products for the purposes of credit achievement calculation.

- *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 and materials other than wood must be tested using ASTM Test Method D6866 or equivalent method ISO 16620-2, or be certified to the USDA BioPreferred Voluntary Labeling Initiative that includes verification via ASTM 6866 testing. Exclude hide products, such as leather and other animal skin material.

    - Bio-based products that meet the criteria above: value at 50% of cost multiplied by the biobased content of the product for the purposes of credit achievement calculation.
    - Bio-based products that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard in addition to the testing requirements above: value at 100% of cost multiplied by the biobased content of the product 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 200% of their cost for the purposes of credit achievement calculation.

- *Recycled content.* Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

    - Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on weight.
    - The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

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.

MR CREDIT: 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 adaptation 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.

MR CREDIT: 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 through waste prevention and by reusing, recovering, and recycling materials, and conserving resources for future generations. To delay the need for new landfill facilities that are often located in frontline communities and create green jobs and materials markets for building construction services.

Requirements

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

Develop and implement a construction and demolition waste management plan and achieve points through waste prevention and/or diversion.

Waste Management Plan and Report:
All projects must develop and implement a construction and demolition waste management plan:

- Identify strategies to reduce the generation of waste during project design and construction.
- Establish waste diversion goals for the project by identifying the materials (both structural and nonstructural) targeted for diversion.
- Describe the diversion strategies planned for the project. Describe where materials will be taken including expected diversion rates for each material.

Provide a final waste management report detailing all waste generated, including disposal and diversion rates for the project. Calculations can be by weight or volume but must be consistent throughout. Exclude excavated soil and land-clearing debris from calculations. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion). Any materials sent to a comingled recycling facility for processing must take the facility average recycling rate and must include any ADC as waste (not diversion).

Option 1. Diversion (1 point)

Follow the Waste Management Plan and divert at least 50% of the total construction and demolition materials from landfills and incineration facilities.

AND/OR

Option 2. Waste Prevention (1-2 points)

Prevent waste through reuse and source reduction design strategies. Salvage or recycle renovation and demolition debris and utilize waste minimizing design strategies for new construction elements. Track all materials generated by the project from start of construction through project completion to determine the project's total waste generation. Include all construction and demolition waste and diverted materials in the calculation of total project waste. Exclude hazardous materials and land-clearing debris from calculations.

Path 1. Generate less than 15 lbs./ft2 (75 kg/m2) (1 point)

Path 2. Generate less than 10 lbs./ft2 (50 kg/m2) (2 points)

INDOOR ENVIRONMENTAL QUALITY (EQ)

EQ PREREQUISITE: MINIMUM INDOOR AIR QUALITY 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 all building occupants by establishing minimum standards for indoor air quality (IAQ).

Requirements

NC, CS, SCHOOLS, RETAIL, DATA CENTERS, WAREHOUSES & DISTRIBUTION CENTERS, HOSPITALITY
Mechanically Ventilated Spaces
For mechanically ventilated spaces,
meet the requirements of ASHRAE Standard 62.1–2016, Sections 4, 5, 6.2, 6.5, and 7, or a local equivalent, whichever is more stringent.

AND

Provide outdoor air monitors for all mechanical ventilation systems with outdoor air intake flow greater than 1000 cfm (472 L/s). The monitoring device must be capable of measuring the minimum outdoor air intake flow and be capable of measuring the design minimum outdoor air intake flow with an accuracy of +/–10%. An alarm must indicate when the outdoor airflow value varies by 15% or more from the setpoint.

Alternatively, for constant-volume systems that do not employ demand control ventilation, provide an indicator capable of confirming the intake damper is open to the position needed to maintain the design minimum outdoor airflow as determined during the system startup and balancing.

Naturally Ventilated Spaces
For naturally ventilated spaces, meet one of the following ventilation requirements.

- **Option 1. ASHRAE prescriptive natural ventilation compliance path**
  Meet the requirements of ASHRAE 62.1-2016 with addendum l, Sections 4, 6.4.1, 6.4.3, 6.4.4, and 6.5.

  OR

- **Option 2. ASHRAE Engineered natural ventilation system compliance path**

Meet the requirements of ASHRAE 62.1-2016 with addendum l, Sections 4, 6.4.2, 6.4.4.5, 6.4.3, 6.4.4 and 6.5

OR

- **Option 3. Historic building using ASHRAE prescriptive natural ventilation path**
  This option is available to projects located in a building registered as a local or national historic building.

  Meet the requirements of ASHRAE 62.1-2016 with addendum **l**, Sections 4, 6.4.1.1-6.4.1.6, 6.4.3, 6.4.4, and 6.5.

AND

Comply with at least one of the following monitoring 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 +/–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. *This strategy is not allowed for projects using Natural Ventilation Option 3. Historic building*.
- 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 (CO_2) concentrations within each thermal zone. CO_2 monitors must be between 3 and 6 feet (900 and 1 800 millimeters) above the floor and within the thermal zone. CO_2 monitors must have an audible or visual indicator or alert the building automation system if the sensed CO_2 concentration exceeds the setpoint by more than 10%. Calculate appropriate CO_2 setpoints using the methods in ASHRAE 62.1–2016, Appendix D.

All Spaces
The indoor air quality procedure defined in ASHRAE Standard 62.1–2016, Section 6.3 may not be used to comply with this prerequisite.

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 the requirements of LEED v4.1 Multifamily EQ Prerequisite: Minimum Indoor Air Quality Performance, EQ Prerequisite Combustion venting and EQ Prerequisite Radon-resistant construction.

HEALTHCARE

Meet the requirements of ASHRAE Standard 170-2017, Sections 6-10, and meet the requirements above for monitoring for mechanical ventilation systems.

EQ PREREQUISITE: ENVIRONMENTAL TOBACCO SMOKE CONTROL
Required

BD+C
This prerequisite applies to

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

Intent

To prevent or minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to environmental tobacco smoke.

Requirements

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

For this prerequisite smoking includes tobacco smoke, as well as smoke produced from the combustion of cannabis and controlled substances and the emissions produced by electronic smoking devices.

Prohibit smoking inside the building.

Prohibit smoking outside the building except in designated smoking areas located at least 25 feet (7.5 meters) (or the maximum extent allowable by local codes) from all entries, outdoor air intakes, and operable windows.

Communicate the no-smoking policy to occupants. Have in place provisions for enforcement or no-smoking signage.

Residential only

Option 1. No Smoking
Meet the requirements above.

OR

Option 2. Compartmentalization of Smoking Areas
Meet the requirements above for all areas inside and outside the building except dwelling units and private balconies.

Each dwelling unit where smoking is permitted 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 0.30 cubic feet per minute per square foot (1.53 liters 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). Renovation projects that retain their existing envelope must meet an allowable maximum leakage of 0.50 cfm50 per square foot (2.54 liters per second per square meter) of enclosure area.

SCHOOLS

Prohibit smoking on site.

Communicate the no-smoking policy to occupants. Have in place provisions for enforcement or no-smoking signage.

EQ PREREQUISITE: MINIMUM ACOUSTIC PERFORMANCE
Required

BD+C
This prerequisite applies to

- Schools

Intent

To provide classrooms that facilitate teacher-to-student 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, Acoustical Performance Criteria, Design Requirements and Guidelines for Schools 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

Design each of the classrooms and other core learning spaces to meet one of the following:

- 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.

- The calculated or measured reverberation times comply with ANSI Standard S12.60-2010, Part 1.

- For spaces ≥ 20,000 Cubic Feet (566 Cubic Meters), the calculated or measured reverberation times comply with Table 1:

Table 1. Maximum reverberation time for large volume spaces

Type of room	Mid-frequency Reverberation time (s)
Large lecture room (more than 50 people)	<=1.0
Library	<=1.0
Assembly hall, multi-purpose hall	0.8 ~ 1.2
Indoor sports hall, swimming pool	1.5~2.0
Gymnasium/activity studio	<=1.5
Dance studio	<=1.2

*For details of the above reverberation time requirements, please refer to Building Bulletin 93 – Acoustic Design of Schools: Performance Standards published by the UK's Department for Education in February 2015.

Note: the reverberation time is quoted in terms of the mid-frequency reverberation time, Tmf, which is the arithmetic average of the reverberation times in 500hz, 1 kHz, and 2kHz octave bands, or the arithmetic average of the reverberation times in the one-third octave bands from 400 Hz to 2.5 kHz.

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

For spaces which involve complex sound calculations and/or special considerations, such as those for music rehearsal/performance, recording studio, drama studio, teaching space intended specifically for students with special hearing or communication needs, this Prerequisite shall not apply and engagement with an acoustician is critical to the acoustic design and performance of the space.

EQ CREDIT: 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

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

Comply with 3 strategies for 1 point or 6 strategies for 2 points

Strategy 1. 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.

Strategy 2. 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.

Strategy 3. Filtration of Outdoor Air

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 52.2–2017; or

- Equivalent filtration media class of ePM_1 50% or higher, as defined by ISO 16890-2016, 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.

Strategy 4. Filtration of Recirculated Air

Each ventilation system that supplies recirculated 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 52.2–2017; or
- Equivalent filtration media class of ePM_1 50% or higher, as defined by ISO 16890-2016, 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.

Strategy 5. Increased Ventilation 15 Percent

Increase breathing zone outdoor air ventilation rates to 95% of all occupied spaces by at least 15% above the minimum rates as determined in EQ Prerequisite Minimum Indoor Air Quality Performance.

***Strategy 6. Increased Ventilation* 30 Percent**

Increase breathing zone outdoor air ventilation rates to 95% of all occupied spaces by at least 30% above the minimum rates as determined in EQ Prerequisite Minimum Indoor Air Quality Performance.

Strategy 7. Operable Windows

75% of the regularly occupied spaces have operable windows that provide access to outdoor air. The windows must meet the opening size and location requirements of ASHRAE 62.1-2016 with addendum l, section 6.4.1.2.

Strategy 8. Engineered Natural Ventilation

Achieve Option 2. ASHRAE Engineered natural ventilation system compliance path under EQ prerequisite. Minimum Indoor Air Quality Performance.

Strategy 9. Carbon Dioxide Monitoring

Monitor CO_2 concentrations within all densely occupied spaces. CO_2 monitors must be between 3 and 6 feet (900 and 1 800 millimeters) above the floor. CO_2 monitors must have an audible or visual indicator or alert the building automation system if the sensed CO_2 concentration exceeds the setpoint by more than 10%. Calculate appropriate CO_2 setpoints using methods in ASHRAE 62.1–2016, Appendix D.

Strategy 10. Additional Source Control and Monitoring

For spaces where air contaminants are likely, evaluate potential sources of additional air contaminants besides CO_2. 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.

EQ CREDIT: 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 and the environment, and to protect the health, productivity, and comfort of installers and building occupants.

Requirements

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

Use materials on the building interior (everything within the waterproofing membrane) that meet the low-emitting criteria below. Points are awarded according to Table 1:

Table 1. Points for low-emitting materials	
2 product categories	1 point
3 product categories	2 points
4 product categories	3 points
5 product categories	3 points + exemplary performance
Reach 90% threshold in at least three product categories	Exemplary performance *or 1 additional point if only 2 points are achieved.*

Paints and Coatings

At least 75% of all paints and coatings, **by volume or surface area**, meet the *VOC emissions evaluation* AND 100% meet the *VOC content evaluation*. To meet the 100% requirement for VOC content evaluation, a VOC budget may be used.

The paints and coatings product category includes all interior paints and coatings wet-applied on site. Exclude foamed-in place and sprayed insulation (include in Insulation category).

Adhesives and Sealants

At least 75% of all adhesives and sealants, **by volume or surface area**, meet the *VOC emissions evaluation* AND 100% meet the *VOC content evaluation*. To meet the 100% requirement for VOC content evaluation, a VOC budget may be used.

The adhesives and sealants product category includes all interior adhesives and sealants wet-applied on site.

Flooring

At least 90% of all flooring, **by cost or surface area**, meets the *VOC emissions evaluation OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria*.

The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), raised flooring, wall base, underlayments, and other floor coverings.

Exclude subflooring (include subflooring in the composite wood category, if applicable. Exclude wet-applied products applied on the floor (include in paints and coatings category).

Wall panels

At least 75% of all wall panels, **by cost or surface area**, meet the *VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.*

The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, interior and exterior doors, wall frames, interior and exterior windows, and window treatments.

Exclude cabinetry (include built-in cabinetry in the composite wood category and free-standing cabinetry in the furniture category), and vertical structural elements (include structural elements such as structural panels or structural composite wood in the composite wood category, if applicable).

Ceilings

At least 90% of all ceilings, **by cost or surface area**, meet the *VOC emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.*

The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights.

Exclude overhead structural elements (include structural elements in the composite wood category, if applicable).

Insulation

At least 75% of all insulation, by cost or surface area, meets the *VOC emissions evaluation.*

The insulation product category includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.

Exclude insulation for HVAC ducts and plumbing piping from the credit. Insulation for HVAC ducts may be included at the project team’s discretion.

Furniture

At least 75% of all furniture in the project scope of work, **by cost**, meets the *furniture emissions evaluation, OR inherently nonemitting sources criteria, OR salvaged and reused materials criteria.*

The furniture product category includes all seating, desks and tables, filing/storage, free-standing cabinetry, workspaces, and furnishing items purchased for the project.

Exclude office accessories from the credit.

Composite Wood

At least 75% of all composite wood**, by cost or surface area**, meets the *Formaldehyde emissions evaluation OR salvaged and reused materials criteria.*

The composite wood product category includes all particleboard, medium density fiberboard (both medium density and thin), hardwood plywood with veneer, composite or combination core, and wood structural panels or structural wood products.

Exclude products covered in the flooring, ceiling, wall panels, or furniture material categories from this category.

Low-emitting criteria

Inherently nonemitting sources
Product is an inherently nonemitting source of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood) and has no binders, surface coatings, or sealants that include organic chemicals.

Salvaged and reused materials
Product is more than one year old at the time of use. If finishes are applied to the product on-site, the finishes must meet the *VOC emissions evaluation* AND *VOC content evaluation* requirements.

VOC emissions evaluation
Product has been tested according to California Department of Public Health (CDPH) Standard Method v1.2–2017 and complies with the VOC limits in Table 4-1 of the method. Additionally, the range of total VOCs after 14 days (336 hours) was measured as specified in the CDPH Standard Method v1.2 and is reported (TVOC ranges: 0.5 mg/m^3 or less, between 0.5 and 5 mg/m^3, or 5 mg/m^3 or more).

Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use. Products used in any setting other than schools and classrooms must be modeled to private office scenario. For schools projects, modeling to office and/or schools scenario is permitted.

The statement of product compliance must include the exposure scenario(s) used, the range of total VOCs, and must follow the product declaration guidelines in CDPH Standard Method v1.2-2017, Section 8. Manufacturer statements must also include a summary report from the laboratory that is less than three years old and the amount of wet-applied product applied in mass per surface area (if applicable). Organizations that certify manufacturers' claims must be accredited under ISO/IEC 17065.

VOC content evaluation

Product meets the VOC content limits outlined in one of the applicable standards and for projects in North America, methylene chloride and perchloroethylene may not be intentionally added.

Statement of product compliance must be made by the manufacturer or a USGBC-approved third-party. Any testing must follow the test method specified in the applicable 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.

- Paints and coatings:
    - California Air Resource Board (CARB) 2007 Suggested Control Measure (SCM) for Architectural Coatings

- South Coast Air Quality Management District (SCAQMD) Rule 1113, effective February 5, 2016
- Adhesives and sealants:
  - SCAQMD Rule 1168, October 6, 2017

Formaldehyde emissions evaluation

Product meets one of the following:

- Certified as ultra-low-emitting formaldehyde (ULEF) product under EPA Toxic Substances Control Act, Formaldehyde Emission Standards for Composite Wood Products (TSCA, Title VI) (EPA TSCA Title VI)or California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM)
- Certified as no added formaldehyde resins (NAF) product under EPA TSCA Title VI or CARB ATCM
-
- Wood structural panel manufactured according to PS 1-09 or PS 2-10 (or one of the standards considered by CARB to be equivalent to PS 1 or PS 2) and labeled bond classification Exposure 1 or Exterior
- Structural wood product manufactured according to ASTM D 5456 (for structural composite lumber), ANSI A190.1 (for glued laminated timber), ASTM D 5055 (for I-joists), ANSI PRG 320 (for cross-laminated timber), or PS 20-15 (for finger-jointed lumber).

Furniture emissions evaluation

Product has been tested in accordance with ANSI/BIFMA Standard Method M7.1–2011 (R2016) and complies with ANSI/BIFMA e3-2014e or e3-2019e Furniture Sustainability Standard, Sections 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost) , OR 7.6.2 AND 7.6.3 for one and a quarter credit, by cost. Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

Seating products must be evaluated using the seating scenario. Classroom furniture must be evaluated using the standard school classroom scenario. Other products should be evaluated using the open plan or private office scenario, as appropriate. The open plan scenario is more stringent.

Statements of product compliance must include the exposure scenario(s). Organizations that certify manufacturers' claims must be accredited under ISO/IEC 17065.

EQ CREDIT: CONSTRUCTION INDOOR AIR QUALITY 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, 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 52.2–2017, with errata (or media with ISO_{coarse} 90% or higher, as defined by ISO 16890-2016, 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 smoking inside the building and within 25 feet (7.5 meters) of the building openings during construction. Smoking includes tobacco smoke, as well as smoke produced from the combustion of cannabis and controlled substances and the emissions produced by electronic smoking devices.

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 52.2–2017, with errata (or media with ISO_{coarse} 90% or higher, as defined by ISO 16890-2016, 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 2018 Guidelines for Design and Construction of Hospitals, Guidelines for Design and Construction of Outpatient Facilities, Guidelines for Design and Construction of Residential Health, Care, and Support Facilities and The Joint Commission 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 Guidelines for Environmental Infection Control in Health-Care Facilities, 2003, updated July 2019 to assess risk and to select mitigation procedures for construction activities.

EQ CREDIT: 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 to protect human health, productivity, and wellbeing.

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 liters 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 liters 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 liters 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 liters of outdoor air per square meter) has been delivered to the space.

OR

Option 2. Air Testing (1-2 points)
After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing in occupied spaces for the contaminants listed in Path 1. Particulate matter

and inorganic gases (for 1 point) and/or Path 2. Volatile organic compounds (for 1 point). Retail projects may conduct the testing within 14 days of occupancy.

Path 1. Particulate Matter and Inorganic Gases (1 point)

Test for the particulate matter (PM) and inorganic gases listed in Table 1, using an allowed test method, and demonstrate the contaminants do not exceed the concentration limits listed in the table.

Table 1. Particulate Matter and inorganic gases

Contaminant (CAS#)	**Concentration Limit ($\mu g/m^3$)**	**Allowed Test Methods**
Carbon monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	ISO 4224 EPA Compendium Method IP-3 GB/T 18883-2002 for projects in China Direct calibrated electrochemical instrument with accuracy of +/- 3% of reading and resolution of 0.1 ppm NDIR CO Sensors with accuracy of 1% of 10 ppm full scale and display resolution of less than 0.1ppm
PM 10	ISO 14644-1:2015, cleanroom class of 8 or lower 50 $\mu g/m^3$ Healthcare only: 20 $\mu g/m^3$	Particulate monitoring device with accuracy greater of 5 micrograms/m3 or 20% of reading and resolution (5 min average data) +/- 5 $\mu g/m^3$
PM 2.5	12 $\mu g/m^3$ or 35 $\mu g/m^3$**	
Ozone	0.07 ppm	Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min average data) +/- 5 ppb ISO 13964 ASTM D5149 -– 02 EPA designated methods for Ozone

**Projects in areas with high ambient levels of PM2.5 (known EPA nonattainment areas for PM2.5, or local equivalent) must meet the 35 ug/m^3 limit, all other projects should meet the 12 ug/m^3 limit.

AND/OR

Path 2. Volatile Organic Compounds (1 point)

Perform a screening test for Total Volatile Organic Compounds (TVOC). Use ISO 16000-6, EPA TO-17, or EPA TO-15 to collect and analyze the air sample. Calculate the TVOC value per EN 16516:2017, CDPH Standard Method v1.2 2017 section 3.9.4, or alternative calculation method as long as full method description is included in test report. If the TVOC levels exceed 500 $\mu g/m^3$, investigate for potential issues by comparing the individual VOC levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and re-test if necessary.

Additionally, test for the individual volatile organic compounds listed in Table 2 using an allowed test method and demonstrate the contaminants do not exceed the concentration limits listed in the table.

Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

Exemplary performance is available for projects that test for the additional target volatile organic compounds specified in CDPH Standard Method v1.2-2017, Table 4-1 and do not exceed the full CREL levels for these compounds adopted by Cal/EPA OEHHA in effect on June 2016.

Table 2. Volatile organic compounds

Contaminant (CAS#)	**Concentration Limit ($\mu g/m^3$)**	**Allowed Test Methods**
Formaldehyde 50-00-0	20 $\mu g/m^3$ (16 ppb)	ISO 16000-3, 4; EPA TO-11a, EPA comp. IP-6A ASTM D5197-16
Acetaldehyde 75-07-0	140 $\mu g/m^3$	
Benzene 71-43-2	3 $\mu g/m^3$	ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15 ISO 16017-1, 2; ASTM D6196-15
Hexane (n-) 110-54-3	7000 $\mu g/m^3$	
Naphthalene 91-20-3	9 $\mu g/m^3$	
Phenol 108-95-2	200 $\mu g/m^3$	
Styrene 100-42-5	900 $\mu g/m^3$	
Tetrachloroethylene 127-18-4	35 $\mu g/m^3$	
Toluene 108-88-3	300 $\mu g/m^3$	
Vinyl acetate 108-05-4	200 $\mu g/m^3$	
Dichlorobenzene (1,4-) 106-46-7	800 $\mu g/m^3$	
Xylenes-total 108-38-3, 95-47-6, and 106-42-3	700 $\mu g/m^3$	

EQ CREDIT: THERMAL COMFORT

BD+C
1 point
This credit applies to

- New Construction (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 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

Design heating, ventilating, and air-conditioning (HVAC) systems and the building envelope to meet the requirements of ASHRAE Standard 55–2017, Thermal Comfort Conditions for Human Occupancy with errata or a local equivalent.

For natatoriums, demonstrate compliance with ASHRAE HVAC Applications Handbook, 2015 edition, Chapter 5, Places of Assembly, Typical Natatorium Design Conditions, with errata.

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 nighttime 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.

EQ CREDIT: 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

Meet 1 strategy for 1 point. Meet 3 strategies total for 2 points.

1. Glare Control

For all regularly occupied spaces, meet one of the following requirements:

- Use light fixtures with a luminance of less than 7,000 candela per square meter $(cd/m)^2$ between 45 and 90 degrees from nadir. OR
- Achieve a Unified Glare Rating (UGR) rating of <19 using software modelling calculations of the designed lighting.

Exceptions include wallwash fixtures properly aimed at walls, as specified by manufacturer's data, indirect uplighting fixtures, provided there is no view down into these uplights from a regularly occupied space above, and any other specific applications (i.e. adjustable fixtures).

2. Color Rendering

For all regularly occupied spaces meet one of the following requirements:

- Use light sources that have a Color Rendering Index (CRI) of at least 90.
- Use light sources that have a Color Fidelity Index greater than or equal to 78 and a gamut index between 97 and 110, determined in accordance with Illuminating Engineering Society (IES) TM-30.

3. Lighting Control

Provide dimmable or multilevel lighting for 90% of occupant spaces.

4. Surface Reflectivity

For at least 90% regularly occupied spaces, use interior finishes with a surface reflectance greater or equal to 80% for ceilings and 55% for walls. If included in the project scope, use furniture finishes with a surface reflectance greater or equal to 45% for work surfaces and 50% for movable partitions.

HEALTHCARE

Provide dimmable or multilevel lighting for 90% of occupant spaces in staff areas.

For at least 75% of patient sleeping rooms, provide lighting controls that are readily accessible from the patient's bed. In patient rooms with more than one patient, the controls must be individual lighting controls. Exceptions include in-patient critical care, pediatric, and psychiatric patient rooms.

EQ CREDIT: 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.

AND

Select one of the following three options.

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

Perform annual computer simulations for spatial daylight autonomy$_{300/50\%}$ (sDA$_{300/50\%}$), and annual sunlight exposure$_{1000,250}$ (ASE$_{1000,250}$) as defined in IES LM-83-12 for each regularly occupied space. Healthcare projects must use each regularly occupied space located in the perimeter area determined under EQ Credit Quality Views. Additionally, calculate the average sDA$_{300/50\%}$ value for the total regularly occupied floor area.

For any regularly occupied spaces with ASE$_{1000,250}$ greater than 10%, identify how the space is designed to address glare.

Points are awarded according to Table 1.

Table 1. Points for Option 1

	New Construction, Core and Shell, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality	Healthcare

The average $sDA_{300/50\%}$ value for the regularly occupied floor area is at least **40%**	1 point	1 point
The average $sDA_{300/50\%}$ value for the regularly occupied floor area is at least **55%**	2 points	2 points
The average $sDA_{300/50\%}$ value for the regularly occupied floor area is at least **75%**	3 points	Exemplary performance
Each regularly occupied space achieves $sDA_{300/50\%}$ value of at least **55%**	Exemplary performance *or 1 additional point if only 1 or 2 points achieved above.*	Exemplary performance *or 1 additional point if only 1 point achieved above.*

The sDA and ASE calculation grids should be no more than 2 feet (600 millimeters) square and laid out across the regularly occupied area at a work plane height of 30 inches (76 millimeters) above finished floor (unless otherwise defined). 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 (1–3 points, 1-2 points Healthcare)

Perform computer simulations for illuminance at 9 a.m. and 3 p.m. on a clear-sky day at the equinox for each regularly occupied space. Healthcare projects should use the regularly occupied spaces located in the perimeter area determined under EQ Credit Quality Views.

Demonstrate illuminance levels are between 300 lux and 3,000 lux at both 9 a.m. and 3 p.m. Spaces with view-preserving automatic (with manual override) glare-control devices may demonstrate compliance for only the minimum 300 lux illuminance level.

Points are awarded according to Table 2.

Table 2. Points for Option 2

New Construction, Core and Shell, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		*Healthcare*	
Percentage of regularly occupied floor area	*Points*	*Percentage of regularly occupied floor area within perimeter area*	*Points*
55%	1	55%	1
75%	2	75%	2
90%	3	90%	Exemplary performance

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 (1-3 points, 1-2 points Healthcare)

Measure illuminance in each regularly occupied space. Healthcare projects should use the regularly occupied spaces located in the perimeter area determined under EQ Credit Quality Views.

Achieve illuminance levels between 300 lux and 3,000 lux. Spaces with view-preserving automatic (with manual override) glare-control devices may demonstrate compliance for only the minimum 300 lux illuminance level.

Points are awarded according to Table 3.

Table 3. Points for Option 3

New Construction, Core and Schools, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		*Healthcare*	
Percentage of regularly occupied floor area	*Points*	*Percentage of regularly occupied floor area within perimeter area*	
55% at **one** time in the year	1	55% at **one** time in the year	1
75% at **two** times in the year	2	75% at **two** times in the year	2
90% at **two** times in the year	3	90% at **two** times in the year	exemplary performance

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.
- If pursuing one point, take one measurement in any regularly occupied month. If pursuing two points, take two measurements: 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 millimeters) 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

EQ CREDIT: 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 point)
- 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

Provide occupants in the building with a view to the outdoor natural or urban environment for 75% of all regularly occupied floor area. Auditoriums, conference rooms dedicated to video conferencing, and gymnasiums may be excluded. Views into interior atria may be used to meet up to 30% of the required area.

Views must be through glass with a visible light transmittance (VLT) above 40%. If the glazing has frits, patterns, or tints the view must be preserved. Neutral gray, bronze, and blue-green tints are acceptable.

Views must include at least one of the following:

- nature, urban landmarks, or art; or
- objects at least 25 feet (7.5 meters) from the exterior of the glazing.

Occupants must have direct access to the view and be within three times the head height of the glazing.

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

EQ CREDIT: 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 two of the following: HVAC background noise, Sound Transmission, and/or Reverberation time. Meet all three for an exemplary performance point.

Confirm compliance via calculations or measurements in representative rooms, and/or design documentation from a person experienced in the field of acoustics.

HVAC Background Noise
Achieve maximum background noise levels from heating, ventilating, and air conditioning (HVAC) systems per 2015 ASHRAE Handbook-- HVAC Applications, Chapter 48, Table 1 ; AHRI Standard 885-2008, Table 15; or a local equivalent.

If confirming compliance via measurements, use a sound level meter that conforms to ANSI S1.4 for type 1 (precision) or type 2 (general purpose) sound measurement instrumentation, the International Electrotechnical Commission (2013) IEC 61672-1:2013 Electroacoustics – Sound Level Meters – Part 1: Specifications, or a local equivalent.

Comply with design criteria for HVAC noise levels resulting from the sound transmission paths listed in 2015 ASHRAE Handbook—HVAC Applications, Chapter 48, Table 6; or a local equivalent.

Sound Transmission

Categorize all occupied spaces by use and desired level of acoustic privacy.

Meet the composite sound transmission class (STC_C) ratings or noise isolation class (NIC) listed in Table 1. For NIC measurements, use ASTM E336-17a or Annex A.3 of ANSI S12.60-2010.

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

Adjacency combinations		**STC_C ****	**NIC****
Retail	Retail	50	45
Collaborative / multi-use	Hallway, stairway	25	20
Private	Hallway, stairway	35	30

Confidential	Hallway, stairway	40	35
Collaborative / multi-use	Collaborative / multi-use	35	30
Collaborative / multi-use	Private	45	40
Collaborative / multi-use	Confidential	50	45
Private	Private	45	40
Private	Confidential	50	45
Confidential	Confidential	50	45
Conference room	Conference room	50	45
Mechanical equipment room*	Hallway, stairway	50	45
Mechanical equipment room*	Occupied area	60	55

*Minimum STCc or NIC has to be met unless proven that the equipment noise in conjunction with the sound isolation performance of the partitions and doors will not exceed the maximum background noise requirements of the adjacent space.
**If a sound masking system is implemented at a minimum level of 40 dBA, the STCc ratings or NIC values in Table 1 may be lowered by 5 points. This applies to all space types except mechanical equipment rooms. The sound masking system must be designed by an acoustical professional and meet the following criteria:

- The overall level for sound masking must be set by an acoustical professional and must not exceed 48 dBA in open offices, libraries, cafeterias, corridors/hallways, 45 dBA in enclosed offices, and 42 dBA in conference rooms, and wellness rooms. The combined level of masking and HVAC background noise must not exceed these limits.
- The system design and commissioning must provide overall level uniformity of +/-1 dBA and one-third octave band uniformity of +/-2 dB from at least 100 to 5,000 Hz when tested according to ASTM E1573-18
- The sound masking spectrum must conform to the National Research Council of Canada COPE Optimum Masking Spectrum or an alternate spectrum if specified by an acoustical engineer.

Reverberation Time
Meet the reverberation time requirements in Table 2 (adapted from Table 9.1 in the Performance Measurement Protocols for Commercial Buildings[2]).

Table 2. Reverberation time requirements

Room type	**Application**	**T60 (sec), at 500 Hz, 1000 Hz, and 2000 Hz**
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

[2] Adapted from ASHRAE (2007d), ASA (2008), ANSI (2002), and CEN (2007)

	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

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.

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 Option 1 (1 point) and/or Option 2 (1 point).

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.

Design the facility to meet the criteria outlined in the following sections, as applicable:
- 2018 FGI Guidelines for Design and Construction of Hospitals—Section 1.2-6.1.5 and Section 1.2-6.1.6
- 2018 FGI Guidelines for Design and Construction of Outpatient Facilities—Section 1.2-5.1.6 and Section 1.2-5.1.6.2
- 2018 FGI Guidelines for Design and Construction of Residential Health, Care, and Support Facilities--Section 2.5-8.6

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 criteria outlined in the following sections, as applicable:
- 2018 FGI Guidelines for Design and Construction of Hospitals—Section 1.2-6.1.4 (Table 1.2-5)
- 2018 FGI Guidelines for Design and Construction of Outpatient Facilities—Section 1.2-5.1.4 (Table 1.2-5)
- 2018 FGI Guidelines for Design and Construction of Residential Health, Care, and Support Facilities--Section 2.5-8.4 (Table 2.5-5)

Calculate or measure sound levels in representative rooms and spaces of each type to confirm compliance with criteria in the above-referenced tables 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 2015 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 following:

- 2018 FGI Guidelines for Design and Construction of Hospitals—Section 1.2-5.1.3 (Table 1.2-4)
- 2018 FGI Guidelines for Design and Construction of Outpatient Facilities—Section 1.2-5.1.3 (Table 1.2-4)
- 2018 FGI Guidelines for Design and Construction of Residential Health, Care, and Support Facilities--Section 2.5-8.3 (Table 2.5-4)

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) background noise requirements above, whichever is more stringent.
Comply with the 2018 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 analyze data to determine the exterior noise classification (A, B, C, or D) of the facility site and design the building envelope to meet the following, as applicable:

- 2018 FGI Guidelines for Design and Construction of Hospitals—Table 1.2-3
- 2018 FGI Guidelines for Design and Construction of Outpatient Facilities— Table 1.2-3
- 2018 FGI Guidelines for Design and Construction of Residential Health, Care, and Support Facilities—Table 2.5-3

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 E966-18, Standard Guide for Field Measurements of Airborne Sound Insulation of Building Façades and Façade Elements.

INNOVATION (IN)

IN CREDIT: 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 to benefit human and environmental health and equity. To foster LEED expertise throughout building design, construction, and operation and collaboration toward project priorities.

Requirements

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

To achieve all five innovation points, a project team must achieve at least one pilot credit, at least one innovation credit and no more than two exemplary performance credits.

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.

Examples of innovation may be found in the LEED Innovation Catalog.

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.

IN CREDIT: 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 encourage the team 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 must be a LEED Accredited Professional (AP) with a specialty appropriate for the project.

REGIONAL PRIORITY (RP)

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.

APPENDICES

APPENDIX 1. USE TYPES AND CATEGORIES

Table 1. Use Types and Categories

Category	Use type
Food retail	Supermarket
	Grocery with produce section
Community-serving retail	Convenience store
	Farmers market
	Hardware store
	Pharmacy
	Other retail
Services	Bank
	Family entertainment venue (e.g., theater, sports)
	Gym, health club, exercise studio
	Hair care
	Laundry, dry cleaner
	Restaurant, café, diner (excluding those with only drive-thru service)
Civic and community facilities	Adult or senior care (licensed)
	Child care (licensed)
	Community or recreation center
	Cultural arts facility (museum, performing arts)
	Education facility (e.g., K—12 school, university, adult education center, vocational school, community college)
	Government office that serves public on-site
	Medical clinic or office that treats patients
	Place of worship
	Police or fire station
	Post office
	Public library
	Public park
	Social services center
Community anchor uses (BD+C and ID+C only)	Commercial office (100 or more full-time equivalent jobs)
	Housing (100 or more dwelling units)

Adapted from Criterion Planners, INDEX neighborhood completeness indicator, 2005.

APPENDIX 2. DEFAULT OCCUPANCY COUNTS

Use Table 1 to calculate default occupancy counts. Only use the occupancy estimates if occupancy is unknown.

For the calculation, use gross floor area, not net or leasable floor area. Gross floor area is defined as the sum of all areas on all floors of a building included within the outside faces of the exterior wall, including common areas, mechanical spaces, circulation areas, and all floor penetrations that connect one floor to another. To determine gross floor area, multiply the building footprint (in square feet or square meters) by the number of floors in the building. Exclude underground or structured parking from the calculation.

Table 1. Default Occupancy Numbers

	Gross square feet per occupant		Gross square meters per occupant	
	Employees	Transients	Employees	Transients
General office	250	0	23	0
Retail, general	550	130	51	12
Retail or service (e.g., financial, auto)	600	130	56	12
Restaurant	435	95	40	9
Grocery store	550	115	51	11
Medical office	225	330	21	31
R&D or laboratory	400	0	37	0
Warehouse, distribution	2,500	0	232	0
Warehouse, storage	20,000	0	1860	0
Hotel	1,500	700	139	65
Educational, daycare	630	105	59	10
Educational, K–12	1,300	140	121	13
Educational, postsecondary	2,100	150	195	14

Sources:
ANSI/ASHRAE/IESNA Standard 90.1–2004 (Atlanta, GA, 2004).
2001 Uniform Plumbing Code (Los Angeles, CA)
California Public Utilities Commission, 2004–2005 Database for Energy Efficiency Resources (DEER) Update Study (2008).
California State University, Capital Planning, Design and Construction Section VI, Standards for Campus Development Programs (Long Beach, CA, 2002).
City of Boulder Planning Department, Projecting Future Employment—How Much Space per Person (Boulder, 2002).
Metro, 1999 Employment Density Study (Portland, OR 1999).
American Hotel and Lodging Association, Lodging Industry Profile Washington, DC, 2008.
LEED for Core & Shell Core Committee, personal communication (2003 - 2006).
LEED for Retail Core Committee, personal communication (2007)
OWP/P, Medical Office Building Project Averages (Chicago, 2008).
OWP/P, University Master Plan Projects (Chicago, 2008).
U.S. General Services Administration, Childcare Center Design Guide (Washington, DC,2003).

APPENDIX 3. RETAIL PROCESS LOAD BASELINES

Table 1a. Commercial kitchen appliance prescriptive measures and baseline for energy cost budget (IP units)

	Baseline energy usage for energy modeling path				**Levels for prescriptive path**	
Appliance type	Fuel	Function	Baseline efficiency	Baseline idle rate	Prescriptive efficiency	Prescriptive idle rate
Broiler, underfired	Gas	Cooking	30%	16,000 Btu/h/ft^2 peak input	35%	12,000 Btu/h/ft^2 peak input
Combination ovens, steam mode (P = pan capacity)	Elec	Cooking	40% steam mode	0.37P+4.5 kW	50% steam mode	0.133P+0.6400 kW
Combination ovens, steam mode	Gas	Cooking	20% steam mode	1,210P+35,810 Btu/h	38% steam mode	200P+6,511 Btu/h
Combination ovens, convection mode	Elec	Cooking	65% convection mode	0.1P+1.5 kW	70% convection mode	0.080P+0.4989 kW
Combination ovens, convection mode	Gas	Cooking	35% convection mode	322P+13,563 Btu/h	44% convection mode	150P+5,425 Btu/h
Convection oven, full-size	Elec	Cooking	65%	2.0 kW	71%	1.6 kW
Convection oven, full-size	Gas	Cooking	30%	18,000 Btu/h	46%	12,000 Btu/h
Convection oven, half-size	Elec	Cooking	65%	1.5 kW	71%	1.0 kW
Conveyor oven, > 25-inch belt	Gas	Cooking	20%	70,000 Btu/h	42%	57,000 Btu/h
Conveyor oven, ≤ 25-inch belt	Gas	Cooking	20%	45,000 Btu/h	42%	29,000 Btu/h
Fryer	Elec	Cooking	75%	1.05 kW	80%	1.0 kW
Fryer	Gas	Cooking	35%	14,000 Btu/h	50%	9,000 Btu/h
Griddle (based on 3 ft model)	Elec	Cooking	60%	400 W/ft^2	70%	320 W/ft^2
Griddle (based on 3 ft model)	Gas	Cooking	30%	3,500 Btu/h/ft^2	38%	2,650 Btu/h/ft^2
Hot food holding	Elec	Cooking	na	40 W/ft^3	Na	21.5V Watts

cabinets (excluding drawer warmers and heated display), 0 < V < 13 ft³ (V = volume)						
Hot food holding cabinets (excluding drawer warmers and heated display), 13 ≤ V < 28 ft³	Elec	Cooking	na	40 W/ft^3	Na	2.0V + 254 Watts
Hot food holding cabinets (excluding drawer warmers and heated display), 28 ft³ ≤ V	Elec	Cooking	na	40 W/ft^3	Na	3.8V + 203.5 Watts
Large vat fryer	Elec	Cooking	75%	1.35 kW	80%	1.1 kW
Large vat fryer	Gas	Cooking	35%	20,000 Btu/h	50%	12,000 Btu/h
Rack oven, double	Gas	Cooking	30%	65,000 Btu/h	50%	35,000 Btu/h
Rack oven, single	Gas	Cooking	30%	43,000 Btu/h	50%	29,000 Btu/h
Range	Elec	Cooking	70%		80%	
Range	Gas	Cooking	35%	na	40% and no standing pilots	na
Steam cooker, batch cooking	Elec	Cooking	26%	200 W/pan	50%	135 W/pan
Steam cooker, batch cooking	Gas	Cooking	15%	2,500 Btu/h/pan	38%	2,100 Btu/h/pan
Steam cooker, high production or cook to order	Elec	Cooking	26%	330 W/pan	50%	275 W/pan
Steam cooker, high	Gas	Cooking	15%	5,000 Btu/h/pan	38%	4,300 Btu/h/pan

production or cook to order						
Toaster	Elec	Cooking	—	1.8 kW average operating energy rate	Na	1.2 kW average operating energy rate
Ice machine, IMH (ice-making head, H = ice harvest), H ≥ 450 lb./day	Elec	Ice	6.89 - 0.0011H kWh/100 lb. ice	na	$37.72*H^{-0.298}$ kWh/100 lb. ice	na
Ice machine, IMH (ice-making head), H ≤ 450 lb./day	Elec	Ice	10.26 – 0.0086H kWh/100 lb. ice	na	$37.72*H^{-0.298}$ kWh/100 lb. ice	na
Ice machine, RCU (remote condensing unit, w/o remote compressor, H < 1,000 lb./day	Elec	Ice	8.85 - 0.0038H kWh/100lb ice	na	$22.95*H^{-0.258}$ + 1.00 kWh/100 lb. ice	na
Ice machine, RCU (remote condensing unit), 1600 > H ≥ 1000 lb./day	Elec	ice	5.10 kWh/100 lb. ice	Na	$22.95*H^{-0.258}$ + 1.00 kWh/100 lb. ice	na
Ice machine, RCU (remote condensing unit), H ≥ 1600 lb./day	Elec	Ice	5.10 kWh/100lb ice	Na	-0.00011*H + 4.60 kWh/100 lb. ice	na
Ice machine, SCU (self-contained unit), H < 175 lb./day	Elec	Ice	18.0 - 0.0469H kWh/100lb ice	Na	$48.66*H^{-0.326}$ + 0.08 kWh/100 lb. ice	na
Ice machine self-contained	Elec	Ice	9.80 kWh/100 lb. ice	Na	$48.66*H^{-0.326}$ + 0.08 kWh/100 lb. ice	na

unit, H ≥ 175 lb./day						
Ice machine, water-cooled ice-making head, H ≥ 1436 lb./day (must be on chilled loop)	Elec	Ice	4.0 kWh/100 lb. ice	Na	3.68 kWh/100 lb. ice	na
Ice machine, water-cooled ice-making head, 500 lb./day < H < 1436 (must be on chilled loop)	Elec	Ice	5.58 – 0.0011H kWh/100 lb. ice	Na	5.13 - 0.001H kWh/100 lb. ice	na
Ice machine, water-cooled ice-making head, H < 500 lb./day (must be on chilled loop)	Elec	Ice	7.80 – 0.0055H kWh/100 lb. ice	Na	7.02 - 0.0049H kWh/100 lb. ice	na
Ice machine, water-cooled once-through (open loop)	Elec	Ice	Banned	Banned	Banned	Banned
Ice machine, water-cooled SCU (self-contained unit), H < 200 lb./day (must be on chilled loop)	Elec	Ice	11.4 – 0.0190H kWh/100 lb. ice	Na	10.6 - 0.177H kWh/100 lb. ice	na
Ice machine, water-cooled self-contained unit, H ≥ 200 lb./day	Elec	Ice	7.6 kWh/100 lb. ice	Na	7.07 kWh/100 lb. ice	na

(must be on chilled loop)						
Chest freezer, solid or glass door	Elec	Refrig	0.45V + 0.943 kWh/day	Na	≤ 0.270V + 0.130 kWh/day	na
Chest refrigerator, solid or glass door	Elec	Refrig	0.1V + 2.04 kWh/day	Na	≤ 0.125V + 0.475 kWh/day	na
Glass-door reach-in freezer, 0 < V < 15 ft^3	Elec	Refrig	0.75V + 4.10 kWh/day	Na	≤ 0.607V + 0.893 kWh/day	na
Glass-door reach-in freezer, 15 ≤ V < 30 ft^3	Elec	Refrig	.75V + 4.10 kWh/day	Na	≤ 0.733V – 1.00 kWh/day	na
Glass-door reach-in freezer, 30 ≤ V < 50 ft^3	Elec	Refrig	.75V + 4.10 kWh/day	Na	≤ 0.250V + 13.50 kWh/day	na
Glass-door reach-in freezer, 50 ≤ V ft^3	Elec	Refrig	0.75V + 4.10 kWh/day	Na	≤ 0.450V + 3.50 kWh/day	na
Glass-door reach-in refrigerator, 0 < V < 15 ft^3	Elec	Refrig	0.12V + 3.34 kWh/day	Na	≤ 0.118V + 1.382 kWh/day	na
Glass-door reach-in refrigerator, 15 ≤ V < 30 ft^3	Elec	Refrig	0.12V + 3.34 kWh/day	Na	≤ 0.140V + 1.050 kWh/day	na
Glass-door reach-in refrigerator, 30 ≤ V < 50 ft^3	Elec	Refrig	0.12V + 3.34 kWh/day	Na	≤ 0.088V + 2.625 kWh/day	na
Glass-door reach-in refrigerator, 50 ≤ V ft^3	Elec	Refrig	0.12V + 3.34 kWh/day	Na	≤ 0.110V + 1.500 kWh/day	na
Solid-door reach-in freezer, 0 < V < 15 ft^3	Elec	Refrig	0.4V + 1.38 kWh/day	Na	≤ 0.250V + 1.25 kWh/day	na
Solid-door reach-in	Elec	Refrig	0.4V + 1.38 kWh/day	Na	≤ 0.400V – 1.000 kWh/day	na

freezer, 15 ≤ V < 30 ft³						
Solid-door reach-in freezer, 30 ≤ V < 50 ft³	Elec	Refrig	0.4V + 1.38 kWh/day	Na	≤ 0.163V + 6.125 kWh/day	na
Solid-door reach-in freezer, 50 ≤ V ft³	Elec	Refrig	0.4V + 1.38 kWh/day	Na	≤ 0.158V + 6.333 kWh/day	na
Solid-door reach-in refrigerator, 0 < V < 15 ft³	Elec	Refrig	0.1V + 2.04 kWh/day	Na	≤ 0.089V + 1.411 kWh/day	na
Solid-door reach-in refrigerator, 15 ≤ V < 30 ft³	Elec	Refrig	0.1V + 2.04 kWh/day	Na	≤ 0.037V + 2.200 kWh/day	na
Solid-door reach-in refrigerator, 30 ≤ V < 50 ft³	Elec	Refrig	0.1V + 2.04 kWh/day	Na	≤ 0.056V + 1.635 kWh/day	na
Solid-door reach-in refrigerator, 50 ≤ V ft³	Elec	Refrig	0.1V + 2.04 kWh/day	Na	≤ 0.060V + 1.416 kWh/day	na
Clothes washer	Gas	Sanitation	1.72 MEF	Na	2.00 MEF	na
Door-type dish machine, high temp	Elec	Sanitation	na	1.0 kW	Na	0.70 kW
Door-type dish machine, low temp	Elec	Sanitation	na	0.6 kW	Na	0.6 kW
Multitank rack conveyor dish machine, high temp	Elec	Sanitation	na	2.6 kW	Na	2.25 kW
Multitank rack conveyor dish machine, low temp	Elec	Sanitation	na	2.0 kW	Na	2.0 kW
Single-tank rack conveyor	Elec	Sanitation	na	2.0 kW	Na	1.5 kW

dish machine, high temp						
Single-tank rack conveyor dish machine, low temp	Elec	Sanitation	na	1.6 kW	Na	1.5 kW
Undercounter dish machine, high temp	Elec	Sanitation	na	0.9 kW	Na	0.5 kW
Undercounter dish machine, low temp	Elec	Sanitation	na	0.5 kW	Na	0.5 kW

The energy efficiency, idle energy rates, and water use requirements, where applicable, are based on the following test methods:
ASTM F1275 Standard Test Method for Performance of Griddles
ASTM F1361 Standard Test Method for Performance of Open Deep Fat Fryers
ASTM F1484 Standard Test Methods for Performance of Steam Cookers
ASTM F1496 Standard Test Method for Performance of Convection Ovens
ASTM F1521 Standard Test Methods for Performance of Range Tops
ASTM F1605 Standard Test Method for Performance of Double-Sided Griddles
ASTM F1639 Standard Test Method for Performance of Combination Ovens
ASTM F1695 Standard Test Method for Performance of Underfired Broilers
ASTM F1696 Standard Test Method for Energy Performance of Single-Rack Hot Water Sanitizing, ASTM Door-Type Commercial Dishwashing Machines
ASTM F1704 Standard Test Method for Capture and Containment Performance of Commercial Kitchen Exhaust Ventilation Systems
ASTM F1817 Standard Test Method for Performance of Conveyor Ovens
ASTM F1920 Standard Test Method for Energy Performance of Rack Conveyor, Hot Water Sanitizing, Commercial Dishwashing Machines
ASTM F2093 Standard Test Method for Performance of Rack Ovens
ASTM F2140 Standard Test Method for Performance of Hot Food Holding Cabinets
ASTM F2144 Standard Test Method for Performance of Large Open Vat Fryers
ASTM F2324 Standard Test Method for Prerinse Spray Valves
ASTM F2380 Standard Test Method for Performance of Conveyor Toasters
ARI 810-2007: Performance Rating of Automatic Commercial Ice Makers
ANSI/ASHRAE Standard 72–2005: Method of Testing Commercial Refrigerators and Freezers with temperature setpoints at 38°F for medium-temp refrigerators, 0°F for low-temp freezers, and -15°F for ice cream freezers

Table 1b. Commercial Kitchen Appliance Prescriptive Measures and Baseline for Energy Cost Budget (SI units)

	Baseline energy usage for energy modeling path				**Levels for prescriptive path**	
Appliance type	Fuel	Function	Baseline efficiency	Baseline idle rate	Prescriptive efficiency	Prescriptive idle rate

Broiler, underfired	Gas	Cooking	30%	50.5 kW/m^2	35%	37.9 kW/m^2
Combination oven, steam mode (P = pan capacity)	Elec	Cooking	40% steam mode	0.37P+4.5 kW	50% steam mode	0.133P+0.6400 kW
Combination oven, steam mode	Gas	Cooking	20% steam mode	(1 210P+ 35 810)/3 412 kW	38% steam mode	(200P+6 511)/ 3 412 kW
Combination oven, convection mode	Elec	Cooking	65% convection mode	0.1P+1.5 kW	70% convection mode	0.080P+0.4989 kW
Combination oven, convection mode	Gas	Cooking	35% convection mode	(322P+ 13 563)/ 3412 kW	44% convection mode	(150P+5 425)/ 3412 kW
Convection oven, full-size	Elec	Cooking	65%	2.0 kW	71%	1.6 kW
Convection oven, full-size	Gas	Cooking	30%	5.3 kW	46%	3.5 kW
Convection oven, half-size	Elec	Cooking	65%	1.5 kW	71%	1.0 kW
Conveyor oven, > 63.5 cm belt	Gas	Cooking	20%	20.5 kW	42%	16.7 kW
Conveyor oven, < 63.5 cm belt	Gas	Cooking	20%	13.2 kW	42%	8.5 kW
Fryer	Elec	Cooking	75%	1,05 kW	80%	1.0 kW
Fryer	Gas	Cooking	35%	4.1 kW	50%	2.64 kW
Griddle (based on 90-cm model)	Elec	Cooking	60%	4.3 kW/m^2	70%	3 .45 kW/m^2
Griddle (based on 90-cm model)	Gas	Cooking	30%	11 kW/m^2	33%	8.35 kW/m^2
Hot food holding cabinets (excluding drawer warmers and heated display) 0 < V < 0.368 m^3 (V = volume)	Elec	Cooking	na	1.4 kW/m^3	Na	(21.5*V)/0.0283 kW/m^3
Hot food holding cabinets (excluding	Elec	Cooking	na	1.4 kW/m^3	Na	(2.0*V + 254)/0.0283 kW/m^3

drawer warmers and heated display), 0.368 ≤ V < 0.793 m^3						
Hot food holding cabinets (excluding drawer warmers and heated display), 0.793 m^3 ≤ V	Elec	Cooking	na	1.4 kW/m^3	Na	(3.8*V + 203.5)/0.0283 kW/m^3
Large vat fryer	Elec	Cooking	75%	1.35 kW	80%	1.1 kW
Large vat fryer	Gas	Cooking	35%	5.86 kW	50%	3.5 kW
Rack oven, double	Gas	Cooking	30%	19 kW	50%	10.25 kW
Rack oven, single	Gas	Cooking	30%	12.6 kW	50%	8.5 kW
Range	Elec	Cooking	70%	na	80%	na
Range	Gas	Cooking	35%	na	40% and no standing pilots	**na**
Steam cooker, batch cooking	Elec	Cooking	26%	200 W/pan	50%	135 W/pan
Steam cooker, batch cooking	Gas	Cooking	15%	733 W/pan	38%	615 W/pan
Steam cooker, high production or cook to order	Elec	Cooking	26%	330 W/pan	50%	275 W/pan
Steam cooker, high production or cook to order	Gas	Cooking	15%	1.47 kW/pan	38%	1.26 kW/pan
Toaster	Elec	Cooking	**na**	1.8 kW average operating energy rate	**Na**	1.2 kW average operating energy rate
Ice machine, IMH (ice making head, H = ice harvest) H ≥ 204 kg/day	Elec	Ice	0.0015 - 5.3464E^{-07} kWh/kg ice	na	≤ 13.52*H$^{-0.298}$ kWh/100 kg ice	na
Ice machine, IMH (ice making	Elec	Ice	0.2262 - 4.18E^{-04} kWh/kg ice	na	≤ 13.52*H$^{-0.298}$ kWh/100 kg ice	na

head), H < 204 kg/day						
Ice machine, RCU (remote condensing unit, w/o remote compressor) H < 454 kg/day	Elec	Ice	0.1951 - 1.85E^{-04} kWh/kg ice	na	≤ 111.5835H$^{-0.258}$) + 2.205 kWh/100 kg ice	na
Ice machine, RCU (remote condensing unit) 726 > H ≥ 454 kg/day	Elec	Ice	0.1124 kWh/kg ice	na	≤ 111.5835H$^{-0.258}$) + 2.205 kWh/100 kg ice	na
Ice machine, RCU (remote condensing unit), H ≥ 726kg/day	Elec	Ice	0.1124 kWh/kg ice	na	≤ -0.00024H + 4.60 kWh/100 kg ice	na
Ice machine, SCU (self contained unit), H < 79 kg/day	Elec	Ice	0.3968 - 2.28E^{-03} kWh/kg ice	na	236.59H$^{-0.326}$ +0.176 kWh/100 kg ice	na
Ice machine, SCU (self contained unit), H ≥ 79 kg/day	Elec	Ice	0.2161 kWh/kg ice	na	236.59H$^{-0.326}$ +0.176 kWh/100 kg ice	na
Ice machine, water-cooled ice-making head, H ≥ 651 kg/day(must be on a chilled loop)	Elec	Ice	0.0882 kWh/kg ice	na	≤ 8.11 kWh/100 kg ice	na
Ice machine, water-cooled ice-making head, 227 ≤ H < 651 kg/day (must be on a chilled loop)	Elec	Ice	0.1230 - 5.35E^{-05} kWh/kg ice	na	≤ 11.31 - 0.065H kWh/100 kg ice	na
Ice machine, water-cooled ice-making head, H < 227 kg/day(must be on a chilled loop)	Elec	Ice	0.1720 - 2.67E^{-04} kWh/kg ice	na	≤ 15.48 - 0.0238H kWh/100 kg ice	na

Ice machine, water-cooled once-through (open loop)	Elec	Ice	Banned	Banned	Banned	Banned
Ice machine, water cooled SCU (self-contained unit) H < 91 kg/day (must be on a chilled loop)	Elec	Ice	0.2513 - $9.23E^{-04}$ kWh/kg ice	na	≤ 23.37-0.086H kWh/100 kg ice	na
Ice machine, water cooled SCU (self-contained unit) H ≥ 91 kg/day (must be on a chilled loop)	Elec	Ice	0.1676 kWh/kg ice	na	15.57 kWh/100 kg ice	na
Chest freezer, solid or glass door	Elec	Refrig	15.90V + 0.943 kWh/day	na	9.541V + 0.130 kWh/day	na
Chest refrigerator, solid or glass door	Elec	Refrig	3.53V + 2.04 kWh/day	na	≤ 4.417 V + 0.475 kWh/day	na
Glass-door reach-in freezer, 0 < V < 0.42 m^3	Elec	Refrig	26.50V + 4.1 kWh/day	na	≤ 21.449V + 0.893 kWh/day	na
Glass-door reach-in freezer, 0.42 ≤ V < 0.85 m^3	Elec	Refrig	26.50V + 4.1 kWh/day	na	≤ 25.901V – 1.00 kWh/day	na
Glass-door reach-in freezer, 0.85 ≤ V < 1.42 m^3	Elec	Refrig	26.50V + 4.1 kWh/day	na	≤ 8.834V + 13.50 kWh/day	na
Glass-door reach-in freezer, 1.42 ≤ V m^3	Elec	Refrig	26.50V + 4.1 kWh/day	na	≤ 15.90V + 3.50 kWh/day	na
Glass-door reach-in refrigerator, 0 < V < 0.42m^3	Elec	Refrig	4.24V + 3.34 kWh/day	na	≤ 4.169V + 1.382 kWh/day	na
Glass-door reach-in refrigerator, 0.42 ≤ V < 0.85 m^3	Elec	Refrig	4.24V + 3.34 kWh/day	na	≤ 4.947V + 1.050 kWh/day	na
Glass-door reach-in refrigerator,	Elec	Refrig	4.24V + 3.34 kWh/day	na	≤ 3.109V + 2.625 kWh/day	na

0.85 ≤ V < 1.42 m^3						
Glass-door reach-in refrigerator, 1.42 ≤ V m^3	Elec	Refrig	4.24V + 3.34 kWh/day	na	≤ 3.887V + 1.500 kWh/day	na
Solid-door reach-in freezer, 0 < V < 0.42 m^3	Elec	Refrig	14.13V + 1.38 kWh/day	na	≤ 8.834V + 1.25 kWh/day	na
Solid-door reach-in freezer, 0.42 ≤ V < 0.85 m^3	Elec	Refrig	14.13V + 1.38 kWh/day	na	≤ 4.819V – 1.000 kWh/day	na
Solid-door reach-in freezer, 0.85 ≤ V < 1.42 m^3	Elec	Refrig	14.13V + 1.38 kWh/day	na	≤ 5.760V + 6.125 kWh/day	na
Solid-door reach-in freezer, 1.42 ≤ V m^3	Elec	Refrig	14.13V + 1.38 kWh/day	na	≤ 5.583V + 6.333 kWh/day	na
Solid-door reach-in refrigerator, 0 < V < 0.42m^3	Elec	Refrig	3.53V + 2.04 kWh/day	na	≤ 3.145V + 1.411 kWh/day	na
Solid-door reach-in refrigerator, 0.42 ≤ V < 0.85 m^3	Elec	Refrig	3.53V + 2.04 kWh/day	na	≤ 1.307V + 2.200 kWh/day	na
Solid-door reach-in refrigerator, 0.85 ≤ V < 1.42 m^3	Elec	Refrig	3.53V + 2.04 kWh/day	na	≤ 1.979V + 1.635 kWh/day	na
Solid-door reach-in refrigerator, 1.42 ≤ V m^3	Elec	Refrig	3.53V + 2.04 kWh/day	na	≤ 2.120V + 1.416 kWh/day	na
Clothes washer	Gas	Sanitation	1.72 MEF		2.00 MEF	
Door-type dish machine, high temp	Elec	Sanitation	na	1.0 kW	Na	0.70 kW
Door-type dish machine, low temp	Elec	Sanitation	na	0.6 kW	Na	0.6 kW
Multitank rack conveyor dish	Elec	Sanitation	na	2.6 kW	Na	2.25 kW

machine, high temp						
Multitank rack conveyor dish machine, low temp	Elec	Sanitation	na	2.0 kW	Na	2.0 kW
Single-tank rack conveyor dish machine, high temp	Elec	Sanitation	**na**	2.0 kW	Na	1.5 kW
Single-tank rack conveyor dish machine, low temp	Elec	Sanitation	na	1.6 kW	Na	1.5 kW
Undercounter dish machine, high temp	Elec	Sanitation	na	0.9 kW	Na	0.5 kW
Undercounter dish machine, low temp	Elec	Sanitation	na	0.5 kW	Na	0.5 kW

The energy efficiency, idle energy rates, and water use requirements, where applicable, are based on the following test methods:

ASTM F1275 Standard Test Method for Performance of Griddles
ASTM F1361 Standard Test Method for Performance of Open Deep Fat Fryers
ASTM F1484 Standard Test Methods for Performance of Steam Cookers
ASTM F1496 Standard Test Method for Performance of Convection Ovens
ASTM F1521 Standard Test Methods for Performance of Range Tops
ASTM F1605 Standard Test Method for Performance of Double-Sided Griddles
ASTM F1639 Standard Test Method for Performance of Combination Ovens
ASTM F1695 Standard Test Method for Performance of Underfired Broilers
ASTM F1696 Standard Test Method for Energy Performance of Single-Rack Hot Water Sanitizing, ASTM Door-Type Commercial Dishwashing Machines
ASTM F1704 Standard Test Method for Capture and Containment Performance of Commercial Kitchen Exhaust Ventilation Systems
ASTM F1817 Standard Test Method for Performance of Conveyor Ovens
ASTM F1920 Standard Test Method for Energy Performance of Rack Conveyor, Hot Water Sanitizing, Commercial Dishwashing Machines
ASTM F2093 Standard Test Method for Performance of Rack Ovens
ASTM F2140 Standard Test Method for Performance of Hot Food Holding Cabinets
ASTM F2144 Standard Test Method for Performance of Large Open Vat Fryers
ASTM F2324 Standard Test Method for Prerinse Spray Valves
ASTM F2380 Standard Test Method for Performance of Conveyor Toasters
ARI 810-2007: Performance Rating of Automatic Commercial Ice Makers
ANSI/ASHRAE Standard 72–2005: Method of Testing Commercial Refrigerators and Freezers with temperature setpoints at 38°F (3°C) for mediumtemp refrigerators, -18°C for low-temp freezers, and -26°C for ice cream freezers.

Table 2. Supermarket refrigeration prescriptive measures and baseline for energy cost budget

Item	Attribute	Prescriptive measure	Baseline for energy modeling path
Commercial Refrigerator and Freezers	Energy Use Limits	ASHRAE 90.1-2010 Addendum g. Table 6.8.1L	ASHRAE 90.1-2010 Addendum g. Table 6.8.1L
Commercial Refrigeration Equipment	Energy Use Limits	ASHRAE 90.1-2010 Addendum g. Table 6.8.1M	ASHRAE 90.1-2010 Addendum g. Table 6.8.1M

Table 3. Walk-in coolers and freezers prescriptive measures and baseline for energy cost budget

Item	Attribute	Prescriptive measure	Baseline for energy modeling path
Envelope	Freezer insulation	R-46	R-36
	Cooler insulation	R-36	R-20
	Automatic closer doors	Yes	No
	High-efficiency low- or no-heat reach-in doors	40W/ft (130W/m) of door frame (low temperature), 17W/ft (55W/m) of door frame (medium temperature)	40W/ft (130W/m) of door frame (low temperature), 17W/ft (55W/m) of door frame (medium temperature)
Evaporator	Evaporator fan motor and control	Shaded pole and split phase motors prohibited; use PSC or EMC motors	Constant-speed fan
	Hot gas defrost	No electric defrosting.	Electric defrosting
Condenser	Air-cooled condenser fan motor and control	Shaded pole and split phase motors prohibited; use PSC or EMC motors; add condenser fan controllers	Cycling one-speed fan
	Air Cooled condenser design approach	Floating head pressure controls or ambient subcooling	10°F (-12°C) to 15°F (-9°C) dependent on suction temperature
Lighting	Lighting power density (W/sq.ft.)	0.6 W/sq.ft. (6.5 W/sq. meter)	0.6 W/sq.ft. (6.5 W/sq. meter)
Commercial Refrigerator and Freezers	Energy Use Limits	N/A	Use an Exceptional Calculation Method if attempting to take savings
Commercial Refrigerator and Freezers	Energy Use Limits	N/A	Use an Exceptional Calculation Method if attempting to take savings

Table 4. Commercial kitchen ventilation prescriptive measures and baseline for energy cost budget

Strategies	Prescriptive measure	Baseline

Kitchen hood control	ASHRAE 90.1-2010 Section 6.5.7.1, except that Section 6.5.7.1.3 and Section 6.5.7.1.4 shall apply if the total kitchen exhaust airflow rate exceeds 2,000 cfm (960 L/s) (as opposed to 5,000 cfm (2,400 L/s) noted in the ASHRAE 90.1-2010 requirements)	ASHRAE 90.1-2010 Section 6.5.7.1 and Section G3.1.1 Exception (d) where applicable

APPENDIX 4. BASE RATIOS FOR PARKING CAPACITY

Table 1. Base ratios for parking spaces, by building type

Use	Size or condition	Parking Spaces
Arena		0.33/seat
Assisted living		0.35/DU
Boarding house, B&B, convent, and other sleeping rooms		1/unit or room plus 2 for owner and staff
Church		0.4/seat
College, university	School population: students, faculty and staff	0.4/school population
Condo, townhouse		Use Owned Apartment ratios
Consumer services (including banks)		4.6/1,000 ft^2 (5.0/100 m^2)
Convention centers not in hotel, or in hotel but exceeding 50 ft^2 per guest room (4.65 m^2 per guest room)	< 25,000 ft^2 (2 325 m^2)	30/1,000 ft^2 (32.29/100 m^2)
Convention centers not in hotel, or in hotel but exceeding 50 ft^2 per guest room (4.65 m^2 per guest room)	25,000 ft^2 to 50,000 ft^2 (2 325 m^2 to 4 650 m^2)	Scaled If x is ft^2, 30-[10 x (x-25,000)/25,000] spaces per 1,000 ft^2 If y is m^2 per room, 32.3-[10.8 x (y-2325)/2325] spaces per 100 m^2 GLA
Convention centers not in hotel, or in hotel but exceeding 50 ft^2 per guest room (4.65 m^2 per guest room)	50,000 ft^2 to 100,000 ft^2 (4 650 to 9 300 m^2)	Scaled If x is ft^2, 20-(10 x (x-50,000)/50,000) spaces per 1,000 ft^2 If y is m^2 per room, 10.8-[10.8 x (y-4650)/4650] spaces per 100 m^2 GLA
Convention centers not in hotel, or in hotel but exceeding 50 ft^2 per guest room (4.65 m^2 per guest room)	100,000 to 250,000 ft^2 (9 300 to 23 225 m^2)	Scaled If x is ft^2, 10-(4 x (x-100,000)/ 150,000) spaces per 1,000 ft^2 If y is m^2 per room, 10.8-[4.3 x (y-9300)/13925] spaces per 100 m^2 GLA
Convention centers not in hotel, or in hotel but exceeding 50 ft per guest room (4.65 m per guest room)	More than 250,000 ft2 (23 225 m2)	6/1,000 ft2 (6.5/100 m2)
Data processing, telemarketing		6.0/1,000 ft2 (6.5/100 m2)
Day care		0.3/licensed student
Dry cleaners		Use General and Convenience Retail ratio
Elderly housing		0.5/DU
Elementary school		Higher of 0.2/auditorium or gym seat, or 0.25/student
Fast food	With or without drive-through	15/1,000 ft^2 (16/100 m^2)
Free-standing discount super store		5.5/1,000 ft^2 (5.92/100 m^2), including outdoor sales areas

General and convenience retail	Not in shopping center	2.75/1,000 ft^2 (2.96/100 m^2)
General light industrial, industrial park, and manufacturing		1.85/1,000 ft^2 (1.99/100 m^2)
Government office building		Use Office Building radio if general office only; otherwise, parking study prepared for complex
Health, fitness club		7/1,000 ft^2 (7.5/100 m^2)
Heavy, hard goods, furniture store, carpet store		2.5/1,000 ft^2 (2.7/100 m^2)
High school		Higher of 0.3/auditorium or gym seat, or 0.3/student
High-turnover restaurant	No bar	15/1,000 ft^2 (16/100 m^2)
High-turnover restaurant	With bar	20/1,000 ft2 (21.5/100 m2)
Hospital		1.1/employee
Hotel, motel		1.25/room. Add 10/1,000 ft^2 (10.8/100 m^2) for lounge/restaurant. Add conference/ banquet at following rates: 1. < 20 ft^2/room (1.86 m^2/room): none 2. 20 ft^2/room (1.86 m^2/room) to 50 ft2/room (4.65 m^2/room): Scaled If x is ft^2 per room, 30-[10 x (x-20)/30] spaces per 1,000 ft^2 GLA conference banquet. If y is m^2 per room, 32.3-[10.8 x (y-1.86)/2.79] spaces per 100 m^2 GLA conference banquet 3. > 50 ft^2/room (4.65 m^2/room): 20/1,000 ft^2 (21.5/100 m^2)
Junior or community college	School population: students, faculty and staff	0.25/school population
Live theater		0.4/seat
Medical, dental office building	Not on hospital campus	4.5/1,000 ft^2 (4.8/100 m^2)
Medical, dental office building	On hospital campus	4/1,000 ft^2 (4.3/100 m^2)
Mini-warehouse		1.75/100 units
Movie theater with matinee	1 screen	0.5/seat
Movie theater with matinee	2 to 5 screens	0.33/seat
Movie theater with matinee	5 to 10 screens	0.3/seat
Movie theater with matinee	More than 10 screens	0.27/seat
Nightclub		19/1,000 ft^2 (20.5/100 m^2)
Nursing home		0.5/bed
Office building	< 25,000 ft^2 (2 325 m^2)	3.8/1,000 ft^2 (4.1/100 m^2)

Office building	25,000 to 100,000 ft^2 (2 325 to 9 300 m^2)	Scaled If x is ft^2, 3.8-[0.4 x (x-25,000)/ 75,000] spaces per 1,000 ft^2 If y is m^2, 4.1-[0.43 x (y-2325)/6975] spaces per 100 m^2
Office building	100,000 ft^2 (9 300 m^2)	3.4/1,000 ft^2 (3.67/100 m^2)
Office building	100,000 to 500,000 ft^2 (9 300 to 46 500 m^2)	Scaled If x is ft^2: 3.4-[0.6 x (x-100,000)/ 400,000] spaces per 1,000 ft^2 If y is m^2: 3.67-[0.67 x (y-9300)/ 37 200] spaces per 100 m^2
Office building	More than 500,000 ft^2 (more than 46 500 m2)	2.8/1,000 ft^2 (3.0/100 m^2)
Other public assembly		0.25/person in permitted capacity where not seated, or 0.3/seat where seated
Owned accessory dwelling unit		1/Accessory DU. Den must be counted as bedroom if it has closet. Ratios include 0.15 space per unit for visitors.
Owned apartment	Efficiency	1/DU for efficiency units. Den must be counted as bedroom if it has closet. Ratios include 0.15 space per unit for visitors.
Owned apartment	With bedroom	1.75/DU for first bedroom plus 0.25 space for each additional bedroom. Den must be counted as bedroom if it has closet. Ratios include 0.15 space per unit for visitors.
Pharmacy	With or without drive-through	Use General and Convenience Retail ratio
Pro baseball stadium		0.35/seat
Pro football stadium		0.31/seat
Quality restaurant		20/1,000 ft^2 (21.5/100 m^2)
Rental apartment	Efficiency	1/DU for efficiency units. Den must be counted as bedroom if it has closet. Ratios include 0.15 space per unit for visitors.
Rental apartment	With bedroom	1.5/DU for first bedroom plus 0.25 space for each additional bedroom. Den must be counted as bedroom if it has closet. Ratios include 0.15 space per unit for visitors.
Rental apartment	In college or university housing district	1/DU for efficiency and 1-bedroom units plus 0.5 space for each additional bedroom. Den must be counted as bedroom if it has closet. Ratios include 0.15 space per unit for visitors.

Shopping center, not more than 10% GLA in nonretail uses	< 400,000 ft^2 (37 200 m^2) GLA	4/1,000 ft^2 (4.3/100 m^2)
Shopping center, not more than 10% GLA in nonretail uses	400,000 to 600,000 ft^2 (37 200 m^2 to 55 750 m^2) GLA	Scaled: If x is ft^2, 4+[0.5 x (x-400,000)/ 200,000] spaces per 1,000 ft^2 If y is m^2, 4.3+[0.5 x (y-37 200)/ 18 550] spaces per 100 m^2
Shopping center, not more than 10% GLA in nonretail uses	More than 600,000 ft^2 (55 750 m^2) GLA	4.5/1,000 ft^2 (4.8/100 m^2)
Shopping center, more than 10% GLA in other uses		Shared parking analysis
Single-family detached residential	< 2000 ft^2 (186 m^2)	1/DU
Single-family detached residential	2,000 to 3,000 ft^2 (186 to 279 m^2)	2/DU
Single-family detached residential	More than 3,000 ft^2 (280 m^2)	3/DU
Specialty super stores, home improvement		4.5/1,000 ft^2 (4.8/100 m^2), including outdoor sales areas
Supermarket, convenience market		6.75/1,000 ft^2 (7.3/100 m^2)
Video rental		Use General and Convenience Retail ratio
Warehousing		0.67/1,000 ft^2 (0.72/100 m^2)

DU = dwelling unit
GLA = gross leasable area

Adapted from PCC Recommended Zoning Ordinance Provisions (2006), by Parking Consultants Council (PCC), National Parking Association, published by Institute of Transportation Engineers, Transportation Planning Handbook, 3rd edition.