

LEED v4 SUBMITTAL TIPS



LEED® for Building
Design and Construction

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PROJECT SUBMITTAL TIPS

These tips are provided from GBCI® reviewers and are based on experience with LEED® v4 project submittals. The tips are meant as a useful resource to consider during the course of preparing your submittal documentation. As presented, this list is not exhaustive in nature and projects are responsible for being familiar with, and adhering to, all applicable LEED documents published prior to the project’s registration date.

These tips, which are also available in the [LEED Credit Library](#), will be updated periodically.

GENERAL SUBMITTAL

Once your application is prepared and you have uploaded your completed materials to LEED Online, make sure to perform a rigorous quality check of your entire application before submitting for review. It’s suggested that you open each form and check that you have included all required information. Then open each additional file to verify that you have submitted the correct document and that they are logically named. Cross-check credits and prerequisites to make sure that you have reported common data points, such as gross square footage, occupancy, and total materials cost consistently. Here are some characteristics common among high quality submissions:

- Relevant prerequisite/credit information is clearly highlighted within the submission.
- File attachments are clearly and intuitively labeled.
- The required documentation is submitted, but no more. If only a few pages of a large report are needed to provide the required credit information, highlight or provide the relevant sections only.

Concise narratives are included to describe project-specific circumstances (these are really helpful for the GBCI reviewer).

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INTEGRATIVE PROCESS

Prerequisite: Integrative Project Planning and Design (Healthcare Only)

- Ensure that the LEED action plan includes all required information.

Integrative Process

- Note that the simple box energy model and water budget analysis must be completed *before* the completion of schematic design.
- For Energy-Related Systems, the worksheet must be complete and reflect the simple box energy modeling analysis from the discovery phase.
- The simple box energy modeling analysis must assess at least two potential strategies for each of the following; site conditions, massing and orientation, basic envelope attributes, lighting levels, thermal comfort ranges, plug and process loads, and programmatic and operational parameters.
- For Water- baseline Assumptions, the worksheet must be complete and correspond with the water budget analysis from the discovery phase.
- The water budget must include indoor, outdoor, and process water.

LOCATION AND TRANSPORTATION

LT Credit: LEED for Neighborhood Development Location

- Make sure to indicate the associated LEED ND project name, ID, rating system version, certification level, and certification date.
- Highlight both the LEED project boundary and the LEED ND project boundary in an uploaded map to confirm a compliant location.
- Ensure that an eligible LEED ND certification has been achieved at the project location.
- Remember not to attempt other Location and Transportation credits if pursuing this credit.

► LT Credit: Sensitive Land Protection

- Be sure to review the LEED definition of "previously developed" in the reference guide glossary. Determine what the development status of the development footprint was immediately prior to your project. The entire site doesn't need to be designated as previously developed.
- Previously developed status can't be claimed in cases where a master developer bought undeveloped land, installed infrastructure, and then sold it to the certifying project developer (this is considered part of the project scope).
- Ensure that information provided in this credit is consistent with other credits in the LEED submittal.

- Keep in mind that "Prime Farmland" now includes the following: prime farmland, unique farmland, or farmland of statewide or local importance.

LT Credit: High-Priority Site

► Option 1: Historical District

- Confirm infill status with a vicinity map showing the LEED project boundary and details on the surrounding previously developed land.
- Ensure the project is located within a historic district that has been locally, nationally, or internationally recognized as having significant historic or cultural value.

► Option 2: Priority Designation

- Ensure that at least a portion of the project is located in an area with a qualifying priority designation.
- For projects outside of the U.S., priority areas must be designated as such by a nationally administered program with similar goals and operations to the priority designations in the U.S.

► Option 3: Brownfield Remediation

- If the project has soil or groundwater contamination documented by a Phase I, II, or III Environmental Site Assessment (ESA), the project qualifies for Option 3 of this credit. Ensure that documentation describes the contamination and confirms that remediation will be completed.
- Keep in mind that projects with asbestos or other building-based contamination do not qualify for this credit.

LT Credit: Surrounding Density and Diverse Uses

► Option 1: Surrounding Density

- The required vicinity map must clearly label the project boundary, the density offset (which includes surrounding land one-quarter mile (400 meters) from the project boundary) and the location of existing residential and non-residential buildings. Note that the area of surrounding density is NOT measured as a circular radius from the project's geographic center.
- Ensure that all buildable land within one-quarter mile from the project boundary (the density offset) is included within the denominator of the density calculations, less noted exceptions.
- The density claimed toward compliance must be existing, rather than zoned.
- LEED BD+C: Schools projects may exclude from the density calculations outdoor physical education spaces such as playing fields and associated buildings used only during sporting events, playgrounds, and play equipment associated with the project building.

► Option 2: Diverse Uses

- Ensure that all contributing diverse uses are existing and available to the public. For any uses where public availability may not be clear to reviewers (e.g. fitness or library facilities within a campus), provide a narrative to confirm compliance.
- To be eligible, uses that are planned but not currently operating must be occupied within one year of the date of the LEED project's initial certificate of occupancy.
- Measure walking distances along infrastructure that is safe and comfortable for pedestrians, including sidewalks, all-weather-surface footpaths, crosswalks, or equivalent pedestrian facilities.
- Ensure that the counted uses represent at least three of the five categories listed in Appendix 1, Use Types and Categories, exclusive of the project building's primary use.
- A use may be counted as only one type. For example, a supermarket that also contains a pharmacy may contribute only once as either a supermarket use type or a pharmacy use type, at the project team's discretion.
- No more than two uses in each use type may be counted. For example, if five restaurants are within walking distance, only two may be counted.
- Remember that uses without a stationary postal address (e.g. mobile food vendors), automobile-oriented services (e.g. gas stations, repair shops) and automated facilities (e.g. ATMs, vending machines, touchscreens) do not contribute.

► Option 1: Development and Adjacency (Warehouse and Distribution Centers)

- Ensure that the project is located on a previously developed site.
- To achieve three points via Development and Adjacency, the project site must also meet the LEED definition of an adjacent site, and the bordering parcels must currently be used for commercial or industrial purposes.
- Ensure that the site either was used for industrial or commercial purposes immediately prior to the project or is adjacent to other previously developed sites that are currently being used for industrial or commercial purposes.

► Option 2: Transportation Resources (Warehouse and Distribution Centers)

- Clearly label on a vicinity map all transportation resources claimed. Include the project location and the driving distance from the project to each resource.

LT Credit: Access to Quality Transit

- Measure walking distances along infrastructure that is safe and comfortable for pedestrians, including sidewalks, all-weather-surface footpaths, crosswalks, or equivalent pedestrian facilities.
- Keep in mind that only transit that provides regular service in both directions along a set route (paired route service) can contribute. Note that private shuttles can't be used to comply with the credit requirements.
- Ensure that the documentation confirms the transit frequency for each contributing service

type. If formal, published frequencies are not available, supplemental information confirming how the frequencies were determined is acceptable.

- Ensure that contributing stops are totaled correctly. For each qualifying transit route, only trips in one direction are counted toward the threshold. If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted. Note that weekend trips are not included in the calculations for LEED BD+C: Schools projects.
- Future transit stops may be counted if they are sited, funded, and under construction by the date of the certificate of occupancy and are completed within 24 months of that date.

► **Option 1: Transit-Served Location (Schools)**

► **Option 2: Pedestrian Access (Schools)**

- Based on the school's attendance boundary and associated locations where concentrations of students are expected to live, determine the percentage of the student population within the walkshed boundary with safe, walkable access between a functional entrance to a school building and their homes. Precise student addresses are not required.

LT Credit: Bicycle Facilities

► **Case 1. Commercial or Institutional Projects**

- Ensure that project occupancy is reported consistently throughout all documentation. If a portion of the building population is excluded from the calculations for this credit (e.g. hospital patients, young children), verify the number excluded and provide a narrative explaining the reason for exclusion.
- Note that the minimum quantity of bicycle storage facilities must be met for both long and short term occupants.
- Note that shower requirements are measured up to the next occupancy threshold (e.g. LEED-NC projects must provide one shower for up to 100 occupants, two for up to 250, three for up to 400, etc.)
- Ensure that the documentation shows that the long-term bicycle storage is covered to protect bicycles from exposure to the elements. Short-term storage may be covered or exposed.
- Bicycle storage facilities must be within 100 feet (30 meters) of the building entrance (main entrance for short-term, any functional entrance for long-term) even if they are inside the building or outside the LEED Project Boundary.
- Bicycle storage and shower facilities outside the LEED Project Boundary that are shared with other users must be sized to meet the needs of all possible users. Alternatively, facilities may be reserved for LEED project users.
- Shower facilities outside the LEED Project Boundary must be fully accessible to project occupants. For example, showers provided within the base building for LEED-CI occupants must be available during all project operating hours.
- Qualifying diverse uses accessible by the bicycle network are the same as in LTc Surrounding Density and Diverse Uses. Qualifying public transit accessible by the bicycle network are the same as in LTc Access to Quality Transit. Employment centers are defined

as a nonresidential area of at least five acres with a job density of at least 50 employees per net acre.

- Retail projects must provide documentation of bicycle maintenance or route planning assistance programs.
- For Retail, Bicycle maintenance assistance must be available to employees and route planning assistance must be available to both employees and customers.

▶ **Case 2. Residential Projects**

▶ **Case 3. Mixed-Use Projects**

- For mixed-use projects, the requirements must be met independently for each space type in the building.

LT Credit: Reduced Parking Footprint

▶ **Case 1. Baseline location, Parking Provided**

▶ **Case 1. Baseline location, No Parking Provided**

▶ **Case 2. Dense and/or Transit-Served Location, Parking Provided**

▶ **Case 2. Dense and/or Transit-Served Location, No Parking Provided**

- Ensure that the total parking capacity includes all the off-street spaces available to the project building's users. If parking is shared with other buildings, located outside the LEED Project Boundary, or otherwise not clearly dedicated to the project building, it is strongly recommended that a brief narrative clarifying how the total capacity was determined be provided.
- Signage or pavement markings reserving the preferred parking spaces for carpool vehicles must be clear and permanently installed.
- If the parking area is subdivided for different kinds of building users (e.g. customers and employees, staff and students, ranking military officials), preferred parking spaces may be distributed proportionally across each parking area. Alternatively, one general preferred parking area with enough spaces for all user types (based on total parking capacity) may be provided.
- If a project has multiple main entrances or entrances for different groups, preferred spaces should be distributed.
- Be sure to select the appropriate project category to calculate the base ratio. For mixed-use projects with multiple space types, calculate and separately track the base ratio for each use.
- Be sure to select the appropriate project category to calculate the base ratio. If the appropriate category cannot be found within the table, or a tenant has not yet been selected for an incomplete space, select the best approximation and provide a narrative supporting that option.
- Projects that are not adding new parking must demonstrate that the existing parking meets the base ratio reduction requirements. The "No New Parking" option available in LEED v2009 is no longer available in LEED v4.

LT Credit: Green Vehicles

- ▶ **Option 1. Electrical Vehicle Charging / Preferred Parking (NC, CS, Schools, Retail, Hospitality, HC)**
- ▶ **Option 1. Electrical Vehicle Charging / Discounted Parking (NC, CS, Schools, Retail, Hospitality, HC)**
 - Ensure that spaces with charging are clearly identified and reserved for electric vehicle use only.
 - Ensure that charging equipment is provided for at least 2% of all parking spaces.
 - Be sure that the charging equipment cut sheet or other manufacturer documentation includes all required information (charging level, standard met, and network capability).
 - Ensure that the charging equipment meets the credit requirements for charging level, the relevant standard, and network capability.
- ▶ **Option 2. liquid, gas, or battery facilities / preferred parking - (NC, CS, Schools, Retail, Hospitality, HC)**
- ▶ **Option 2. liquid, gas, or battery facilities / discounted parking - (NC, CS, Schools, Retail, Hospitality, HC)**
 - Be sure that the fueling station cut sheet or other manufacturer documentation includes the refueling rate per vehicle.
 - Ensure that the fueling rate is equal to at least 2% of the total parking capacity.
- ▶ **All Options**
 - Ensure that the total parking capacity includes all the off-street spaces available to the project building's users. If parking is shared with other buildings, located outside the LEED Project Boundary, or otherwise not clearly dedicated to the project building, it is strongly recommended that a brief narrative clarifying how the total capacity was determined be provided.
 - Note that projects are ineligible for this credit if no parking is provided to building users.
 - Preferred parking spaces have the shortest walking distance to the main entrance of the project, exclusive of spaces designated for people with disabilities. If a project has multiple main entrances or entrances for different groups, preferred spaces should be distributed.
 - If the parking area is subdivided for different kinds of building users (e.g. customers and employees, staff and students, ranking military officials), preferred parking spaces may be distributed proportionally across each parking area. Alternatively, one general preferred parking area with enough spaces for all user types (based on total parking capacity) may be provided.
 - Signage or pavement markings reserving the preferred parking spaces for green vehicles must be clear and permanently installed. "Green Vehicles" is acceptable signage language, as is any language that reflects the intent of the credit and the referenced standard. The referenced standard includes both low-emitting and fuel-efficient green vehicles; therefore, signage should not exclude either category. For example, "hybrids only" excludes efficient conventionally-fueled vehicles and is therefore not acceptable.

- ▶ **Option 1. Alternative-fuel vehicles - (Warehouses)**
- ▶ **Option 2. Reduced truck idling - (Warehouses)**
 - Ensure that the site plan highlights the electrical connectors provided at the dock doors.
- ▶ **Option 1 Green Passenger Vehicles - (Schools)**
- ▶ **Option 2 Green buses or school-owned vehicles - (Schools)**
 - Ensure the phase-in plans includes the emissions evaluation of the current bus fleet serving the school, the retrofit strategies and products identified for achieving emissions reductions, the timeline for phase-in, and the parties responsible for each stage of the plan.

SUSTAINABLE SITES

SS Prerequisite: Construction Activity Pollution Prevention

- Projects that decide to pursue LEED after early construction has begun, must have had a compliant ESC plan in place *before* construction began to meet the prerequisite requirements.
- ▶ **EPA Construction General Permit**
 - Be sure to describe how the project complies with the 2012 EPA Construction General Permit, Section 2.
- ▶ **Local Standards and Codes**
 - Remember to provide a copy of the erosion and sedimentation control plan. Make sure the ESC plan includes the items listed in the Construction General Permit, Section 2 (at minimum).
 - Be sure to provide the declaration from the contractor, photographs, or a description of implementation.
 - If using local standards or codes, remember to demonstrate how the project complies with them and how they are equal to or more stringent than the EPA CGP.
- ▶ **Zero Lot Line Project or no/minimal exterior work**
 - For zero lot line projects or projects with no or minimal exterior work, make sure to describe the special conditions of the project, if any, and how the project complies with the prerequisite requirements

SS Prerequisite: Environmental Site Assessment

- A Phase I Environmental Site Assessment (ESA), at a minimum, must be performed, by the appropriate professional, to confirm no contamination is present.
- If a site's Phase I ESA is more than 180 days old, but less than one year, the standard requires certain components to be updated, such as interviews, recorded environmental liens, records review, visual inspections of property and adjoining parcels, and declaration by the environmental professional responsible for the assessment or update.

- Perform a Phase II ESA or Phase III ESA (or local equivalent) if there is suspected contamination. Make sure to describe the contamination and remediation efforts and confirm that the site remediation meets residential (unrestricted) use standards. Local equivalents are acceptable provided they are equal to or more stringent than the Phase II ESA.

SS Credit: Assessment

- Make sure that the site survey and the completed Site Assessment Worksheet, or equivalent documentation, describing the environmental features and characteristics present on the site is provided.
- Ensure that the Site Assessment Worksheet (or equivalent documentation) includes the following details about the site: topography, hydrology, climate, vegetation, soils, human use, and human health effects. Include any special features that may be unique to the project site and may impact the project design.

SS Credit: Site Development— Protect or Restore Habitat

► Greenfield

- Keep in mind that sites with both Greenfield and previously disturbed areas must meet the respective requirements for each area. Previously Disturbed areas are those that have been graded, compacted, cleared, previously developed, or disturbed in any way. Such areas do not qualify as 'greenfield.'
- Remember that all projects must comply with the Greenfield requirements, if any such areas exist on-site, regardless of whether Option 1 or Option 2 is pursued.

► Option 1

- Ensure that the LEED Form includes the native or adapted vegetation calculations and the site plan depicts the project boundary, building footprint, preserved greenfield areas, previously disturbed area, restored area, native and adapted vegetation, plant species, other ecologically appropriate features, and any other relevant site conditions.
- Though this credit is a Design phase credit, the vegetation and soil restoration components of Option 1 must be completed in order to comply with the credit requirements. If the restoration has not yet been completed for a project, this credit should be submitted in the Construction phase rather than the Design phase.
- Areas using non-native or non-adapted vegetation can't be counted as restored area in the credit calculations.
- Lawn and turf grass areas generally don't qualify as native or adapted vegetation. Such areas are acceptable only if they're able to survive without mowing, fertilization, pesticides, and irrigation.
- Projects that achieve a density of 1.5 floor-area ratio may include vegetated roof surfaces in this calculation if the plants are native or adapted, provide habitat, and promote biodiversity. Additionally, they must meet the applicable soil restoration requirements.

► Option 2

- Ensure that the contract or agreement with the land trust or conservation organization indicates the location of the organization (EPA Level III ecoregion, state, or, for projects outside the U.S., distance within 160 km of the project), amount of financial support, and activities that the funds will support.
- Financial support must be provided to a nationally or locally recognized land trust or conservation organization within the same EPA Level III ecoregion or the project's state (or within 160 kilometers of the project for projects outside the U.S.). For U.S. projects, the land trust must be accredited by the Land Trust Alliance. For international projects, confirmation from the governing authority that the conservation organization is recognized, is required; please note that the project team alone cannot provide this justification.

SS Credit: Open Space

- Ensure the site plan indicates the project boundary and campus or master plan boundary (if applicable), and highlights the location and size of any open spaces, vegetated areas, plant species, wetlands or naturalistic man-made ponds (with side slopes noted), and vegetated roofs. Raised planters can count, provided they are vegetated. Make sure to include a description of how the open space is physically accessible and meets the area type criteria.
- Ensure that outdoor spaces claimed are physically accessible (occupants and site users can access the spaces for their own use when needed) and meet one or more of the necessary criteria for qualifying as open space as outlined in the LEED BD+C v4 Reference Guide.
- Remember that a minimum of 25% of that outdoor space must be vegetated (turf grass does not count as vegetation) or have overhead vegetated canopy. Plant beds that are mulched (with hardwood mulch, gravel, etc) can still be considered vegetated area if most surface area is covered by plant canopy.
- Keep in mind that turf grass does not count as vegetated open space.
- A project must have a floor-area ratio of at least 1.5 in order to include physically-accessible roof surfaces as open space.

SS Credit: Rainwater Management

► Option 1. Percentile Rain Events - Paths 1, 2, 3

- Green infrastructure (GI) and low-impact development (LID) strategies can be either structural or non-structural. Undisturbed natural areas on site could be considered LID/GI strategies and contribute to rainfall runoff management. Ensure that the chosen management practices qualify as LID/GI.
- Projects can use the provided calculator, or can submit their own rainfall data and calculations. If less than 10 years of historical rainfall data is provided, using the most conservative daily rainfall is acceptable, and a narrative explaining the data methodology should be provided by the project team.
- The project must manage rainwater runoff from the entire site, even if there is greenfield area within the project boundary. Note that the runoff volume of the chosen storm, under developed conditions, is what is required to be managed and documented, rather than the

rainfall volume. All required runoff volume must be retained (infiltrated, reused, etc) within the project boundary.

- The EPA Technical Guidance 438 is not to be followed in its entirety. Only the method to calculate the percentile storm event is applicable. The Credit Requirements do not allow "to the extent technically feasible", as is allowed in the EPA Standard.

► **Option 1, Path 3. Zero Lot Line Projects Only**

- Provide the floor area ratio; projects can reference the Floor Area Ratio listed in the local zoning code, if that information is available. A detailed count of all the buildings/parcels on a map, similar to LTc: Surrounding Density and Diverse Uses, is not required.
- If necessary, provide a narrative to justify why the project should be considered zero lot line.

► **Option 2. Natural Land Cover Conditions**

- Green infrastructure (GI) and low-impact development (LID) strategies can be either structural or non-structural. Undisturbed natural areas on site could be considered LID/GI strategies and contribute to rainfall runoff management. Ensure that the chosen management practices qualify as LID/GI.
- Projects can use the provided calculator, or can submit their own rainfall data and calculations. If less than 10 years of historical rainfall data is provided, using the most conservative daily rainfall is acceptable, and a narrative explaining the data methodology should be provided by the project team.
- Documents illustrating natural land cover conditions could include historical land cover maps, soil surveys, historical context of the site, interviews with government officials, universities, or community groups that know the history of land cover conditions.
- This option requires hydrologic analysis and comparison of the site under both natural and proposed conditions. Use representative rainfall data such as an analysis of all rainfall events during a statistically representative period of time.
- The term "natural land cover conditions" refers to the vegetation and soil conditions that would have been present on the site prior to development of any kind. This is not the same thing as "greenfield" for the purposes of this option.

► **Multi-tenant complex projects (all Options/Paths)**

- Show the calculations for the entire multi-tenant complex area. Take into account the runoff volume from the entire area, and design management facilities based on this number, rather than just the project area's runoff volume.
- Describe the centralized approaches and distributed techniques that are used.

SS Credit: Heat Island Reduction

► **Option 1**

- Be sure that all areas are included in the calculations, even if the non-roof or roof materials do not meet the requirements
- Note that LI 10235 (exempting functional space) is not applicable to v4, it can only be applied to v2009.

- Ensure that the hardscape and roof areas are consistent with other credits. Be sure that the shade tree area is calculated as the 10-year canopy width at noon (i.e., in plan view, plant canopy width has no extending shadows regardless of time of year).
- Ensure that the SR value is listed as a decimal value in the calculations.
- Selected materials may meet either the initial SR/SRI threshold or the 3-year aged SR/SRI threshold. They are not required to meet both. Assume that the SR/SRI is an initial value if not specified in the manufacturer documentation as a three-year value.
- Projects outside the U.S. can contact manufacturers directly and ask for SRI information. If manufacturers do not provide this information, the project team can identify a similar material from the Cool Roof Rating Council standard for comparison to show that the project's material meets the intent of the credit.
- Refer to LEED Interpretation 10411 for a listing of standard non-roof materials, in lieu of project-specific testing data. Manufacturer documentation or an independent testing report showing the tested SR value must be provided if not listed in LEED Interpretation 10411.

► Option 2

- Remember that parking for function of the site, for example maintenance vehicles, cannot be documented as spaces for this option. Include motorcycle parking in vehicle parking spaces.
- Note that any roof used to shade or cover parking must have a three-year aged SRI of at least 32 or initial SRI of at least 39, be a vegetated roof, or be covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.

SS Credit: Light Pollution Reduction

► All Projects

- Make sure the site lighting plan clearly highlights the lighting boundary. If the lighting boundary does not align with the LEED Project Boundary, make sure to explain any differences. See the credit requirements for an explanation of when the boundary can extend beyond the project boundary.
- The lighting plan must also include locations of fixtures, applicable measurements, and any other key features.
- Make sure to classify the project under the proper MLO lighting zone and to reference that lighting zone consistently throughout all documentation.
- Remember to check that all internally illuminated exterior signage does not exceed a luminance of 200 cd/m² during nighttime hours and 2,000 cd/m² during daytime hours. Provide the maximum luminance data of the sign(s).
- Remember to note any exterior lighting that is exempt from the requirements. Note that existing light fixtures used in the final project design are not exempt.

► Uplight - BUG

- Ensure the site lighting plan clearly notes the location and orientation of each exterior lighting fixture.

- Ensure that the lumens calculator shows each exterior lighting fixture and the corresponding BUG rating.
- Make sure the allowed uplight rating for the specified MLO lighting zone has not been exceeded.
- Note that if a light is under an overhang, the U rating is not automatically 0. It depends on where the light is located in relation to the overhang, and if there are any angles at which light can escape from the sides of the overhang.

▶ **Uplight - Calculation**

- Make sure to include the total lumens per luminaire above horizontal for each exterior lighting fixture.

▶ **Light Trespass - BUG**

- Make sure to orient all luminaires less than two mounting heights away 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.
- Be sure that the allowed backlight or glare ratings for the specified MLO lighting zone have not been exceeded.
- Make sure to include the mounting height and distance from the lighting boundary, especially for any fixture where it may be difficult to visually determine if the distance from the lighting boundary is between 0.5 and 2 mounting heights from the lighting boundary.

▶ **Light Trespass - Calculation**

- Ensure the photometric plan shows a point-by-point calculation illustrating the worst-case scenario of vertical illuminance for each luminaire as it crosses the lighting boundary.

SS Credit: Site Master Plan

- Ensure that the achieved credits have been recalculated using the future development data from the master plan.
- Keep in mind that a minimum of four of the six specified credits must be achieved.
- Parking, paving, and utilities must be included in the development footprint.
- Ensure that the master plan includes future development.
- Ensure that any future development meets the LEED definition of "future development."

SS Credit: Tenant Design and Construction Guidelines

Ensure that tenant design and construction guidelines include 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.
- Information that enables a tenant to coordinate space design and construction with the building systems when pursuing LEED v4 for Commercial Interiors.

SS Credit: Places of Respite

- Projects in Canada may consider CSA Z8000 - Canadian Health Care Facilities - Planning, Design and Construction (Sections 6.1.9 and 6.2.2 Wayfinding) as an equivalent to meeting the 2010 FGI Guidelines for Design and Construction of Health Care Facilities (Section 1.2-6.3 and Appendix A1.2-6.3:Wayfinding) for the signage requirement of this credit.
- Ensure the site plan highlights the qualifying outdoor and/or indoor places of respite, identified by user (patient and visitor versus staff), and indicates their access points and distances, proximity to smoking areas (if applicable), planes of vegetation and vegetated canopy, and shaded seating spaces (showing shade pattern throughout the day).
- Ensure that the wayfinding signage follows the provisions outlined in the FGI 2010 Guidelines, Design Considerations and Requirements, Section 1.2-6.3 (including appendix sections) and is placed in enough locations to reasonably inform all building occupants of the places of respite.
- Projects must achieve EQp Environmental Tobacco Smoke Control in order to meet the intent of this credit.
- Respite areas cannot be located within 25 feet (7.5 meters) of a smoking area.
- Ensure that respite area calculations are based off of the net usable program area and not another area calculation, such as gross square footage. Net usable program area is the sum of all interior areas in the project available to house the project's program. Areas housing building equipment, vertical circulation, and structural components should be excluded.
- Make sure that wayfinding signage for outdoor respite areas reasonably informs all staff, patients, and visitors of the outdoor places of respite and is posted in a sufficient number of locations and decision points, in accordance with FGI 2010 Guidelines, Section 1.2-6.3.
- Ensure that areas claimed meet the definition of an area of respite. Note that areas subject to direct noise from vehicles or traffic do not qualify as areas of respite. Additionally, areas near ambulance and other emergency entrances are considered areas where direct medical intervention is delivered and therefore do not qualify as areas of respite.
- Ensure that at least one seating space for each 200 square feet (18 square meters) of required respite area is placed in shade or indirect sunlight. Also ensure that one wheelchair space for every five seating spaces is placed in shade or indirect sunlight.
- Make sure at least 25% of the total outdoor respite area is vegetated at the ground plane (turf grass does not count as vegetation) or with vegetated canopy (trees and shrubs).
- Keep in mind that there are limits to the amount of certain areas that can be claimed. Refer to the LEED BD+C: Reference Guide for additional information regarding spaces such as interior atria, greenhouses, conditioned spaces, clinical spaces, and universal-access nature trails.

- Ensure that outdoor areas of respite are located within 200 feet (60 meters) of a building entrance or access point.

SS Credit: Direct Exterior Access

- Make sure to indicate on a plan or map the locations of the accessible outdoor areas, area takeoffs, building exhaust air locations, exterior exhaust locations, and access points and distances to the outdoor areas.
- Ensure that patients can access the spaces claimed directly from their rooms or treatment areas.
- Direct Access is defined as a means of entering a space without having to leave the floor or pass through another patient's room, dedicated staff space, service or utility space, or major public space. Patients' and public circulation corridors, common sitting areas, and waiting and day space may be part of a direct access route.
- Ensure that the spaces claimed are 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

► Option 1: Make Building Space Open to the General Public

- Ensure that the shared-use policy includes details regarding how space availability is communicated to the public. If it does not, indicate how the public is made aware of the availability of the shared spaces.
- Make sure to indicate all the shared-use spaces, as well as the accessible restroom facilities, on the project drawings. Note that restricted access (secure entries) are not required.

► Option 2: Contract with Specific Organizations to Share Building Space

- Remember that signed agreements confirming the dedicated-uses are needed.
- Ensure that the drawings show all dedicated-use spaces, and the accessible restroom facilities. Note that restricted access (secure entries) are not required.

► Option 3: Use Shared Space Owned by Other Organizations

- Remember that signed agreements with the other organizations are needed. Note that there is no minimum length of contract required.
- Ensure that the site plan/map indicates the pedestrian access to the joint use spaces and the total walking distance.

WATER EFFICIENCY

WE Prerequisite: Outdoor Water Use Reduction

► Option 1

- Make sure to include a list of plant species and water needs for the landscape area. If applicable, include irrigation establishment plan information.

- Ensure that the narrative describes the water needs for the landscape areas (and the irrigation establishment plan, if applicable), to demonstrate that average rainfall will be sufficient to meet the plants' water demands and that the plantings will not require irrigation beyond their specified establishment periods.
- Be sure that any temporary irrigation systems do not exceed the maximum two-year establishment period.

► **Option 2. Reduced Irrigation**

- Ensure to provide either the EPA WaterSense Water Budget Tool (accessible at epa.gov/watersense/water_budget) or the LEED Outdoor Water Use Reduction Calculator (found under the prerequisite's "Resources" tab in the [Credit Library](#)) which may be used to document this credit.
- Ensure that only vegetated landscape area is included in the calculation, and that non-vegetated surfaces are excluded. Be sure that any vegetated playgrounds, athletic fields, food gardens, and urban agricultural areas are noted on the plans for clarity. These spaces can be included or excluded at the project team's discretion.
- The 30% reduction in the prerequisite must be achieved through plant species selection and irrigation system efficiency. Reductions beyond 30% may be achieved in the credit only using any combination of efficiency, alternative water sources, and smart scheduling technologies.

WE Prerequisite: Indoor Water Use Reduction

- For Core and Shell projects, ensure that the prerequisite documentation includes only the fixtures, appliance, and process water installed as part of the Core and Shell project's scope of work.
- Ensure that manufacturer documentation/cut sheets confirm the fixture model and flush or flow rates of the installed fixtures.
- Ensure that all newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling are WaterSense labeled (or a local equivalent for projects outside the U.S.). Note that the WaterSense label requirement does not apply to fixtures unlabeled by WaterSense when the LEED v4 rating system was published, including flushometer toilets, waterless urinals, composting toilets, kitchen sinks, and public lavatories.
- Ensure that all fixtures within the LEED project scope (existing and new) are included in the documentation.
- Ensure that manufacturer documentation/cut sheets confirm that the appliances and process water comply with the requirements.
- Although the CEE Commercial clothes washer specification has been suspended since 2013, LEED v4 projects must still demonstrate compliance with the CEE Tier 3A commercial clothes washer criteria (MEF of 1.80, WF of 7.5 (sdge.com/sites/default/files/regulatory/comwash_specs.pdf)) that was in effect at the time the LEED v4 rating system was published.
- LEED v4 projects may still choose a washer from the qualifying product list, if available (library.cee1.org/content/qualifying-products-list-commercial-clothes-washer). Alternatively,

project teams may demonstrate compliance with the CEE Tier 3A commercial clothes washer criteria (MEF of 1.80, WF of 7.5). Note that commercial clothes washers that comply with the current ENERGY STAR specification (v7.1) meet the CEE Tier 3A criteria.

- Ensure that all appliances and process water within the LEED project scope are included in the documentation.
- Ensure that occupancy is consistent throughout the submittal and that the water use calculations use daily average occupancy values.
- Ensure that the default gender ratio of 1:1 male to female is used. Refer to the Further Explanation, Gender Ratio section of the LEED BD+C and ID+C v4 Reference Guides for information regarding acceptable special gender circumstances.
- Make sure to use the most up-to-date version of the Indoor Water Use Calculator.
- For projects that do not include urinals in every male (or unisex) restroom, ensure that the percent of males expected to use restrooms with urinals in the Indoor Water Use Calculator is revised to reflect the anticipated usage.
- Ensure that the default uses outlined in the LEED reference guide are used in the calculations and that all occupants (100%) are included in the calculator for each fixture type.
- Use the default uses outlined in the LEED reference guide unless there are special circumstances to justify modifications. If project-specific conditions exist to justify different usage rates, provide a narrative and documentation/calculations to justify any special circumstances.
- Ensure that fixtures are not double-counted in the calculations (i.e. listed multiple times in the Indoor Water Use Reduction calculator as being used by 100% of occupants).
- Ensure that the flow rate listed in the calculator is consistent with the manufacturer data. If aerators are used, ensure that the cut sheet for the aerator model that is compatible with the specified faucet is provided.
- Ensure that the flush rate listed in the calculator is consistent with the manufacturer data.
- Ensure that the calculations use the default durations outlined in the LEED reference guide. Please note that preset, shorter durations specified by a manufacturer may not be used for LEED calculation purposes since these duration settings may not reflect typical usage patterns, given the variability in occupant behavior. Projects can still use metering or autocontrol faucets with any preset, shorter duration. If there are special circumstances to justify modifications, clearly explain the special circumstances and provide the published data/studies justifying an alternate usage duration.
- Ensure that metering faucets are listed in the calculation using the flow rate in gallons per minute (gpm) or liters per minute (lpm) instead of gallons or liters per cycle. Duration-based savings from autocontrol faucets are no longer allowed in LEED v4.
- "Private" is defined as fixtures in residences, hotel or motel guest rooms, and private rooms in hospitals. Fixtures used by residential occupants and fixtures used by residential-type occupants who use the building for sleeping accommodations fall into the private classification. Resident bathrooms in dormitories, patient bathrooms in hospital and nursing homes, and prisoner bathrooms are considered private use. All other applications are

deemed to be public.

- Ensure that private (residential) flow fixtures are selected for any fixture groups that include residential occupants. Residents include hospital inpatients, nursing home residents, apartment or dormitory residents, hotel/motel guests, prisoners, and any other people who use the building for sleeping accommodations. Ensure that public lavatories and non-residential flow fixtures (kitchen sink and shower) are also selected for any fixture groups that include non-residential occupants (FTE, Visitors, Retail Customers, Students).
- Ensure that the design case flow rate used in the water use calculations reflects the same rated pressure as the baseline case rated pressure stated in the rating system. Supply water pressure varies throughout the world, and the underlying assumptions must remain consistent between the baseline and design cases.
- For non-Core and Shell projects with incomplete spaces, ensure that all anticipated plumbing fixtures and occupants, including the future occupants and fixtures within the incomplete spaces, have been included in the water use calculations. Future tenant installed fixtures must be included in the calculations as neutral unless supported by a legally binding tenant sales or lease agreement.

WE Prerequisite: Building-Level Water Metering

- Ensure that all potable water sources that serve the project, including but not limited to public water supply, on-site well, and on-site potable water treatment system have been permanently metered.
- Ensure a letter is provided from the project owner committing to share water usage data, compiled into monthly and annual summaries, with USGBC for a five-year period beginning on the date of LEED certification or when the project reaches typical occupancy, whichever comes first. This letter may also address committing to share energy usage data may be used for EAp Building-Level Energy Metering.

WE Credit: Outdoor Water Use Reduction

- For projects claiming additional reduction through alternative water source and/or smart scheduling technologies, ensure that calculations or other documentation shows the projected savings. Look for synergies between this credit and SSc Rainwater Management.
- Keep in mind that savings from smart scheduling technology may not exceed 15%.
- If the rainwater system is shared, ensure that the calculations account for the cistern storage capacity, as well as for all projects using the shared system.

WE Credit: Indoor Water Use Reduction

- Remember that projects following the Prescriptive Achievement path in the prerequisite are not eligible for the credit.
- The credit calculations must 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).

- Core and Shell projects must include in the credit documentation all plumbing fixtures necessary to meet the occupants' needs, whether they will be installed as part of the project's scope of work or not. For example, include at a minimum all necessary restroom fixtures (toilets, urinals, and lavatories) to meet the project occupants' needs, and showers when seeking LT Credit Bicycle Facilities. Assume that the as-yet-uninstalled (future) fixtures have the baseline water consumption rates. A Core and Shell project may earn credit for the efficiency of not-yet-installed future plumbing fixtures by submitting a legally binding tenant sales or lease agreement. The agreement, signed by both owner and tenant, must state the performance requirements for the future fixtures, including the maximum water flush or flow rates and the WaterSense label (or a local equivalent for projects outside the U.S.) for all newly installed fixtures eligible for labeling. The project cannot earn credit this way unless the tenant sales or lease agreement is fully executed.
- The related prerequisite must be earned in order for the credit to be earned.
- If applying alternative water in the credit, provide alternative water system design drawings, a narrative describing the alternative source, and calculations confirming the alternative water quantity. Include climate data and storage size/use calculations.
- If the non-potable water is used for multiple applications - for example, flush fixtures and landscape irrigation - demonstrate that a sufficient quantity is available to meet the demands of all uses.
- Retail, Hospitality, Healthcare, and Schools projects can earn additional credit for meeting the appliance and process water requirements of any one table. Schools, Retail, and Healthcare projects can earn a second point for meeting the requirements of two tables.

WE Credit: Cooling Tower Water Use

- Ensure that a [potable / non-potable] water analysis is performed and either a description of the methodology conducted or the results of the analysis are provided.
- Refer to the [LEED Pilot Credit Library](#) regarding Pilot Alternative Compliance Path (ACP) options for projects with No Cooling Tower.

WE Credit: Water Metering

- Ensure that the submeter description includes a list of submeters, their locations, and the percentage of each subsystem metered (as applicable).
- For indoor plumbing fixtures, ensure that at least 80% of the indoor fixtures and fittings described in WE Prerequisite Indoor Water Use Reduction are metered, either directly or by deducting all other measured water use from the measured total water consumption of the building and grounds.
- Ensure that at least 80% of the irrigation, domestic hot water, and/or process water is metered. If process water is submetered, cross-check that process water equipment and appliances listed elsewhere in the submittal have been addressed.

ENERGY AND ATMOSPHERE

EA Prerequisite: Fundamental Commissioning and Verification

- Ensure the Commissioning authority experience has been provided and meets the requirements.
- Ensure that all required commissioning activities are complete.
- Ensure all energy related systems (mechanical, electrical, plumbing, and renewable energy systems and assemblies) have been included in the commissioning scope. Note that electrical and renewable are sometimes mistakenly omitted, or functional testing on these systems has not been performed before the LEED construction phase submission, as required.
- Ensure the Current Facilities Requirements (CFR) and Operations and Maintenance (O+M) Plan table of contents has been uploaded.
- Ensure that the Current Facilities Requirements (CFR) and Operations and Maintenance (O+M) Plan all of the following required elements: 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.
- Ensure the Commissioning plan table of contents has been provided and it includes a program overview and information on the commissioning team and process activities.
- Ensure at least one complete functional performance test for each of the applicable systems has been provided. Refer to the functional performance test section of the Further Explanation section of the LEED reference guide for details pertaining to expected test elements.
- Ensure the commissioning report executive summary has been provided and it includes a list of systems commissioned and by whom, a summary of issues corrected, and a list of major outstanding/unresolved issues.
- Ensure the commissioning authority (CxA) was engaged with the project during design development.

EA Prerequisite: Minimum Energy Performance

► Option 1. Whole Building Energy Simulation

- Ensure that the total building area is reported consistently throughout the LEED submittal.
- Remember to set an energy goal for the project early in the design process, as required to earn points under EAc Optimize Energy Performance. Consider using ENERGY STAR's

Target Finder to develop the energy use intensity (EUI) goal. Ensure the target is established as kBtu per square foot-year (kW per square meter-year) of source energy use.

- If using an energy model to demonstrate compliance, ensure that the Target Finder results (where applicable) are uploaded and are within 10% of the energy modeling results, or a supplemental narrative is provided to justify the discrepancy.

► **Option 1. Whole Building Energy Simulation (Envelope)**

- Ensure that the proposed case U-value descriptions within the Minimum Energy Performance Calculator are complete, describing both insulation within framed wall elements and continuous insulation where applicable (e.g. steel-framed R-13, U-0.124).
- Be sure that the U-factors modeled in the Proposed Case building are consistent with ASHRAE 90.1-2010 Appendix A.
- Remember that Baseline Case U-factors for unrenovated exterior wall, roof, and floor/slab constructions are consistent with the appropriate Table in Chapter 5 (Table 5.5-XX, where XX corresponds with the project's climate zone).
- Ensure that the Baseline Case slab-on-grade floors are modeled with the F-factor for unheated slabs consistent with Table G3.1.5 (Baseline) (b).
- Be sure that the Proposed Case roof solar reflectance and thermal emittance is modeled in accordance with Section 5.5.3.1.1(a) or 0.3/0.9 per Table G3.1#5(c).
- Ensure that the Baseline Case vertical fenestration is modeled using the SHGC values from Table 5.5-XX, where XX corresponds with the project's climate zone.
- Ensure that the Proposed Case window framed assembly U-values reported in the Minimum Energy Performance Calculator account for the impact of the window frames, and the calculator describes the method by which the U-factors were determined.
- Ensure that all envelope assemblies located in spaces that were conditioned prior to retrofit, model the Baseline Case envelope U-factors, SHGCs, and F-factors using the existing conditions prior to retrofit.
- Be sure that infiltration is modeled identically in the Proposed and Baseline Cases, consistent with reasonable estimations of infiltration in the designed building.
- Ensure the Baseline building results for all four cardinal orientations are reported within the Minimum Energy Performance Calculator as required by Table G3.1.5 (baseline) (a), or describe within the calculator how one of the exceptions to the rotation requirement is applicable.
- Ensure that the Proposed Case does not model credit for manually blinds or shades. Permanent shading devices shall be modeled within the Proposed Case.

► **Option 1. Whole Building Energy Simulation (Interior Lighting)**

- Ensure that the interior lighting calculations within the Minimum Energy Performance Calculator are complete and utilize either the Building Area Method or the Space-by-Space Method. The Baseline building design is to utilize the same method as used by the Proposed Case.
- For shell spaces where the lighting has yet to have been designed, note the lighting power shall be determined per the Building Area Method per Table G3.1.6 (proposed)(c).

- If utilizing the Space-by-Space lighting power calculations within the Minimum Energy Performance Calculator, ensure that the lighting power density per space function as well as the overall weighted average lighting power density for both the Baseline and Proposed Case.
- Since interior lighting power in dwelling units is not regulated by ASHRAE 90.1-2010, ensure the Baseline and Proposed Case are modeled identically unless savings are justified via the exceptional calculation method. Note that the Energy Star Multifamily High Rise Program Simulation Guidelines (Version 1.0, Revision 02, September 2013) are an acceptable methodology for documenting savings for space lighting within the dwelling units.
- Ensure that either the Building Area Method and the Space-by-Space Method is utilized for the entirety of the space.
- Ensure that no additional lighting power is modeled within the Baseline Case beyond the standard calculated allowance, unless this additional lighting power meets the requirements of Section 9.6.2 of ASHRAE 90.1-2010, and has been documented within the Minimum Energy Performance Calculator.
- Be sure that the Baseline and Proposed case lighting equivalent full load hours (determined by dividing the total annual fan consumption by the input total fan power) are reasonable given mandatory controls from Section 9 of ASHRAE 90.1-2010, and the anticipated schedule of operation for the building.
- Ensure that credit is not taken where occupancy sensors are required in accordance with Section 9.4.1.1 and indicate where occupancy sensor controls are modeled for credit (if any) within the Minimum Energy Performance Calculator, verifying that this credit aligns with ASHRAE 90.1-2010 Table G3.2 and is only applied to fixtures controlled by occupant sensors.
- If daylighting controls are included within the Proposed design, ensure a narrative is provided within the Minimum Energy Performance Calculator, describing the controls and how they are implemented to conform to Table G3.1.6 (proposed)(f).
- Ensure that the lighting demand reflected in the model outputs (and reported in the Performance Outputs tab of the Minimum Energy Performance Calculator) does not exceed the Baseline lighting power allowance reported within the Lighting tab of the calculator.

► **Option 1. Whole Building Energy Simulation (Exterior Lighting)**

- Ensure that the exterior lighting power design and calculations within the Minimum Energy Performance Calculator are consistent with the documentation provided within SSc: Light Pollution Reduction.
- Verify that the Proposed Case exterior lighting reflects the actual building design and the Baseline case reflects the allowed lighting power from Section 9. Ensure that no credit is taken in the Proposed design case for lighting reductions on non-tradable surfaces; additional lighting power allowance cannot be claimed in the Baseline model for surfaces that are not provided with lighting in the actual design and lighting fixtures cannot be double-counted for different exterior surfaces.

► **Option 1. Whole Building Energy Simulation (HVAC)**

- Confirm that the Baseline system was modeled consistent with the system mapping from Table G.3.1.1.A of ASHRAE 90.1-2010.
- Ensure that Secondary HVAC systems ARE NOT specified in the Baseline building unless

exception(s) to G3.1.1 of ASHRAE 90.1-2010 are applicable.

- Ensure that Secondary HVAC systems ARE specified in the Baseline building when exception(s) to G3.1.1 of ASHRAE 90.1-2010 are applicable.
- Ensure that thermal zoning has been modeled the same in the Baseline and Proposed Cases as required by Table G3.1.7 of ASHRAE 90.1-2010.
- Ensure that the HVAC Modeling Requirements tables at the bottom of the Minimum Energy Performance Calculator General HVAC tab are completed.
- Where no cooling system exists or no cooling system has been designed for a conditioned space, ensure a cooling system is modeled identical to that of the Baseline building design per Table G3.1.10(proposed)(d) of ASHRAE 90.1-2010.
- Ensure that there is no electric heating energy consumption end-use reported for Baseline system types 1, 3, 5, and 7. For System type 3, there should be no crankcase heating or electric space heaters modeled, and for System types 1,5, and 7, the hot water boiler must be modeled as a natural draft boiler and there should be no electric space heaters
- If the Proposed design includes heating only systems for the space types noted in exception (e) to G3.1.1 of ASHRAE 90.1-2010, ensure that the Baseline case includes System type 9 or 10 (based on the heating source). Note that if the project is served by a District Energy System and is following Option 1, Path 1 (ASHRAE 90.1-2010), the heating source in the Baseline case must be the same as the Proposed case, and a single zone constant volume air handler with purchased hot water (or steam) heating should be modeled.
- Ensure that HVAC pumping energy consumption is not modeled for Baseline system types 2, 3, 4, and 6.
- Ensure that the reported unitary cooling and heating efficiencies are entered into the model at ARI-rated conditions and that the part-load performance curves appropriately reflect the part-load performance of the installed equipment at the temperature range that the equipment is anticipated to operate at.
- Ensure that the Baseline Case fan power was modeled in accordance with Section G3.1.2.10 of ASHRAE 90.1-2010.
- Be sure that all Proposed Case fan part-load efficiency curves for variable volume fans have been modeled identically to the Baseline Case curves for variable volume fans, or provide details (bottom of General HVAC tab within the Minimum Energy Performance Calculator) confirming that the Proposed curves are representative of the actual design.
- Ensure that pressure drop adjustments for Baseline Case systems are calculated consistently with the methodology prescribed within the Air-Side HVAC tab of the Minimum Energy Performance Calculator, the pressure adjustments are only claimed for elements that are reflected within the as-designed building, and the adjustment calculation only accounts for the air flow rate through each applicable device.
- Ensure the Baseline case fan air flow rates were sized based on a 20 deg. F supply-air-to-room-air temperature difference for each Baseline system per G3.1.2.9 of ASHRAE 90.1-2010.
- Ensure the Baseline equipment capacities (i.e. system coil capacities) were based on sizing runs and oversized by 25% for heating and 15% for cooling.

- Be sure that all HVAC system parameters (e.g. fan volumes, fan powers, efficiencies, heating/cooling capacities, etc.) are consistent with the design documents.
- Ensure that where efficiency ratings, such as EER and COP, include fan energy, the descriptor shall be broken down into its components so that supply fan energy can be modeled separately. While most energy simulation software programs have the capability to perform this step automatically, projects may optionally apply to addendum bl to ASHRAE 90.1-2010 for an alternative methodology.
- Ensure that the Baseline case has been modeled with the same number of thermal blocks as the Proposed case and that each Baseline case thermal block is modeled with a separate packaged single zone system (where applicable for Systems Types 1-4).
- Ensure the quantity and type of chillers and/or boilers modeled in the Baseline case is consistent with Sections G3.1.3.7 and G3.1.3.2 of ASHRAE 90.1-2010.
- Ensure the Baseline model reflects the specified temperature reset controls for chilled water, hot water, condenser water, and supply air per Sections G3.1.3.9, G3.1.3.4, G3.1.3.11, and G3.1.3.12 respectively of ASHRAE 90.1-2010.
- Ensure the Baseline hot water loop is modeled with variable primary flow (two way valves) with variable speed drives (or constant speed pump riding the curve for systems serving less than 120,000 sf) in accordance with G3.1.3.5 and operating between 180F and 130F as required by G3.1.3.3. Additionally, verify that the pump power complies with the requirements of section G3.1.3.5 (19 W/gpm).
- Ensure that the baseline chilled water loop is modeled with constant primary / variable secondary flow, with the number of primary pumps matching the number of chillers, and with variable speed secondary pumps as required by G3.1.3.10, and operating between 44F and 56F as required by G3.1.3.9.
- Ensure that the 22 W/gpm Baseline Case chilled water pump power is representative of the total pump power, and not applied individually to both the primary and secondary pumps separately. Refer to LEED interpretation 10299.
- Confirm that the Baseline condenser water loop is modeled with separate condenser water pumps interlocked to operate with the associated chiller as required by G3.1.3.11, the condenser water loop setpoint is 85F or 10F approach to design wet-bulb temperature, whichever is lower, and the pump power complies with the requirements of section G3.1.3.11 (19 W/gpm).
- When the minimum outdoor air intake flow in the Proposed Case is significantly greater than the amount required by the rating authority (GBCI - ASHRAE 62.1-2010 Ventilation Rate Procedure) or building official, ensure that the baseline is modeled per Section G3.1.2.6 exception c, and the Baseline minimum outdoor air intake flow is modeled as the greater of the outdoor airflow rate required by the rating authority or the building official, and will be less than the Proposed Case.
- Ensure that outside air is modeled with zero flow in both the Baseline and Proposed Case during unoccupied periods when fans are cycled on to meet unoccupied setback temperatures.
- Ensure that exhaust air energy recovery is modeled in the Baseline case per Section 6.5.6.1 and G3.1.2.11 of ASHRAE 90.1-2010.

- Be sure that Demand Controlled Ventilation (DCV) is modeled within the Baseline Case where required by Section 6.4.3.9 of ASHRAE 90.1-2010.
- Ensure that the minimum volume setpoints for VAV reheat terminals are modeled at 30% of zone peak air flow, unless this reduces the outside air rate below the minimum value.
- Ensure that all baseline heat pumps modeled with electric auxiliary heat only energized below 40°F (4°C) and as the last thermostat stage per G3.1.3.1 (compressor still enabled below 40°F (4°C)).
- Ensure that the Baseline and Proposed case fan equivalent full load hours (determined by dividing the total annual fan consumption by the input total fan power) are reasonable given the system type modeled and the anticipated schedule of operation for the building.
- Ensure that the fan demand reflected in the model outputs (and reported in the Performance Outputs tab of the Minimum Energy Performance Calculator) does not exceed the Baseline fan power allowance reported within the Air-Side HVAC tab of the calculator.

► **Option 1. Whole Building Energy Simulation (Service Water Heating)**

- If energy savings are claimed for service water heating, ensure the inputs within the Service Water Heating tab of the Minimum Energy Performance Calculator justify the savings through efficiency improvements or flow reduction.
- Ensure that the service water heating fuel source used in the Baseline building is consistent with that utilized in the Proposed Case, per Table G3.1.11.
- Ensure that the service water heating inputs of the Minimum Energy Performance Calculator are complete.
- Be sure that service hot water systems are included within the energy models if utilized within the building, or if these systems are expected to be utilized by future tenants of the building.

► **Option 1. Whole Building Energy Simulation (Process Energy)**

- Ensure that unregulated loads are modeled accurately to reflect the actual expected energy consumption of the building, and are not arbitrarily set to 25% of the Baseline building cost.
- Ensure the Proposed and Baseline Case models reflect the actual unregulated inputs (such as receptacle loads, kitchen loads, elevator loads, refrigeration equipment, etc.) in the appropriate spaces, and that these loads are described within the Process Loads tab of the Minimum Energy Performance Calculation.
- Nonregulated energy loads (e.g., manufacturing process loads) must be modeled identically within the Proposed and Baseline Case models unless savings for these items are justified via the exceptional calculation method. A narrative describing all baseline and proposed assumptions, the calculation methodology used to determine the savings, and a document verifying that the efficiency measure is not conventional practice (refer to the Further Explanation section of the LEED v4 BD+C Reference Guide for additional details).
- Ensure that the proposed design includes the parking garage exhaust controls (i.e., demand controlled ventilation) where required by ASHRAE 90.1-2010 Section 6.4.3.4.5.
- Ensure that garage fan power is reported within the Minimum Energy Performance Calculator (Process Loads tab), and that no credit for demand controlled ventilation is

claimed within the Proposed Case unless documented as described within the calculator.

► **Option 1. Whole Building Energy Simulation (Simulation Outputs)**

- Ensure that the savings for all energy end-uses are justified given the energy inputs reported in the Minimum Energy Performance Calculator. As is requested within the Performance_ Outputs tab of the calculator, a narrative to justify the savings of the three largest end use contributors to the cost savings is required. This narrative is expected to identify the energy conservation measures which contribute to the savings claimed.
- Ensure the number of unmet load hours for all models does not exceed 300 hours per ASHRAE 90.1-2010 Section G3.1.2.3, or, alternatively, provide sufficient justification (describing the source of the unmet load hours) that the accuracy of the simulation is not significantly compromised.

EA Prerequisite: Building-Level Energy Metering

- Ensure that all energy sources that serve the project, including but not limited to electricity, natural gas, chilled water, steam, fuel oil, propane, and biomass, have been permanently metered.
- Remember to provide a letter from the project owner committing to share energy usage data, compiled into monthly and annual summaries, with USGBC for a five-year period beginning on the date of LEED certification or when the project reaches typical occupancy, whichever comes first. The letter may also include WEp Building-Level Water Metering.

EA Prerequisite: Fundamental Refrigerant Management

- Ensure that the project, including district energy systems (DES) serving the project, utilize equipment that is chlorofluorocarbon (CFC) free. If reusing existing HVAC&R equipment on-site, ensure a comprehensive CFC phase-out conversion is completed before the project substantial completion. For projects served by DES that contain CFC equipment, ensure a phase out plan is in place with a firm timeline of five years from substantial completion of the LEED project.
- Ensure that the project utilizes equipment that is chlorofluorocarbon (CFC) free. If reusing existing HVAC&R equipment on-site, ensure a comprehensive CFC phase-out conversion is completed before the project substantial completion. Projects are not required to address CFCs contained in base building or upstream district energy systems (DES) equipment for this prerequisite; rather, only CFC-based HVAC&R equipment currently serving the ID+C space and within the purview of the project.

EA Credit: Enhanced Commissioning

► **Option 1. Path 1 and 2**

- Ensure that the commissioning documentation submitted for this credit as well as that submitted within EAp Fundamental Commissioning and Verification (i.e., commissioning plan table of contents, commissioning report summary) consistently communicate that all requirements of EAc Enhanced Commissioning are complete.
- Be sure that the On-going Commissioning Plan addresses all required elements as indicated

within the Step-by-Step guidance of the LEED v4 BD+C Reference Guide.

- Ensure that a single CxA leads, reviews and oversees the Cx process for all systems, including both Fundamental and Enhanced commissioning activities if Enhanced Commissioning is pursued.

► Option 2. Envelope Commissioning

- Be sure that the On-going Commissioning Plan addresses all required elements as indicated within the Step-by-Step guidance of the LEED v4 BD+C Reference Guide.

EA Credit: Optimize Energy Performance

- If using Option 1 to pursue points in EAc Optimize Energy Performance, ensure the project analyzes efficiency measures during the design process and accounts for the results in design decision making.

EA Credit: Advanced Energy Metering

- Ensure that the applicable meters and data collection system have all the required advanced characteristics (i.e., recording interval, ability to record consumption and demand (electrical meters), data transmission capability, data collection and storage, remote data retrieval).
- Ensure that all whole building energy sources AND all energy end-uses representing 10% or more of the total building annual energy consumption are separately metered.
- Ensure that installed meters give future tenants the capability of independently metering energy consumption (electricity, chilled water, etc.) for all systems serving their space, with a minimum of one meter installed per floor, per energy source.

EA Credit: Demand Response

- Ensure that on-site electricity generation is not a part of the action plan to reduce the peak electricity demand during a demand response (DR) event.
- Ensure that proof of enrollment in a demand response (DR) program has been provided.
- Ensure that documentation has been provided to confirm the project is able to shed 10% of the peak electricity demand load.
- Ensure the building automation system is capable of receiving and acting upon an external signal initiated by a demand response (DR) program provider.
- Be sure that a comprehensive action plan has been developed which describes how the project will reduce electricity demand reduction requirement during an event.
- Ensure the demand reduction sequence has been included in the commissioning authority's (CxA) scope of work.

EA Credit: Renewable Energy Production

- Ensure that the project building's energy rate has been appropriately entered based on the

Option selected in EAp Minimum Energy Performance.

- Ensure that the anticipated annual energy costs have been appropriately determined.
- Ensure that the system description and/or energy generation calculations are consistent with the design and that all relevant system variables are submitted.
- Ensure that the contract documentation has been provided to justify third party and community owned renewable energy systems have transferred the renewable energy benefits to the project.
- If the project is served by a district energy system (DES) using renewable energy, ensure the equivalent cost has been determined based on the percentage of DES energy delivered to the building.
- Be sure that the claimed energy source is an eligible renewable energy system (i.e., photovoltaic, solar thermal, wind, biofuel (in some cases), low-impact hydroelectricity, wave and tidal energy, geothermal energy (in some cases)).
- Ensure that the system is located within the same utility service area as the facility claiming the use.
- Ensure that the renewable energy system rated capacity has been reported consistently throughout the LEED submission.

EA Credit: Enhanced Refrigerant Management

- Note that no deviations are allowed from the default assumption that the refrigerant leakage rate (L_r) must be assumed to be 2%.
- Ensure that the default equipment life values from Table 2 of the LEED v4 BD+C Reference Guide (for both new and existing systems), are utilized unless manufacturers' documentation is provided to substantiate alternative life values.
- If pursuing Option 1. No refrigerants or low-impact refrigerants, provide a narrative in the LEED form that confirms that only no or low-impact refrigerants are used.
- Confirm that the refrigerant impact for each HVAC&R systems has been appropriately calculated.
- If projects containing VRF systems are designed, ensure that calculations are provided for systems to demonstrate how the refrigerant charge was calculated, and is inclusive of the combination of indoor units, outdoor units, and interconnecting piping.
- Ensure that buildings with commercial refrigeration systems applying the prescription path for demonstrating credit compliance (optional for non-retail projects), that the equipment is tested for leaks according to the procedures outlined in GreenChill's Best Practices Guideline for Leak Tightness at Installation or certified through US EPA GreenChill's certification program.
- If the project is served by a district energy system (DES), ensure all upstream refrigeration equipment has been included within the calculations for this credit.

EA Credit: Green Power and Carbon Offsets

- Ensure that a contract is provided indicating the amounts of green power, RECs, and/or carbon offsets purchased. Note that a single bulk purchase for the 5 year term is permitted.
- Ensure that the contract (or other documentation) confirms the green power, RECs, and/or carbon offsets are Green-e Energy/Climate certified products.
- Ensure that a minimum of 50% of the required energy must be provided by green power, RECS, or Carbon Offsets.
- Ensure that when a whole building energy simulation (Option 1) is pursued within EA Minimum Energy Performance/EA Optimize Energy Performance, that the annual energy consumption from the proposed case model is the basis of determining the required green power and carbon offset purchase.
- If the prescriptive path is pursued, ensure that the project square footage values are reported consistently across all LEED documentation.
- Ensure that the Core and Shell projects energy usage is the greater of the actual core and shell floor area (as defined by Building Owners and Managers Association (BOMA) standards) or 15% of the project gross floor area.

MATERIALS AND RESOURCES

MR Prerequisite: Storage and Collection of Recyclables

- Even if recycling service is not available for a particular material, all required recyclable waste streams must have dedicated storage areas in anticipation of future service.
- Safe storage and collection must be provided for two or more of the following material types: batteries, mercury-containing lamps, and e-waste.
- When a recycling storage area is shared by buildings or spaces in addition to the LEED project, demonstrate that the central recycling storage space is adequately sized to accommodate all the buildings or spaces it serves.
- If unable to describe the project's dedicated recycling storage areas because a building owner manages the recycling program, providing a letter from the landlord outlining the building's recycling program is encouraged.
- Describe the waste stream audit conducted for a project in an existing location or the waste projections based on historical data for similar establishments. Ensure that the top-five recyclable waste streams are identified and the top-four waste streams for which collection and storage space will be provided are listed.

MR Prerequisite: Construction and Demolition Waste Management Planning

- Be sure that excavated soil, land clearing debris, and alternative daily cover (ADC) are excluded from the calculations.

- Ensure that the construction waste management plan (CWMP) identifies at least five different materials for diversion and includes the anticipated percentage of total waste that the material streams represent. Include on-site diversion strategies or explain why on-site diversion strategies are not available.
- In the construction waste management plan (CWMP), make sure to address soil, land clearing debris, hazardous materials, and other materials not contributing to the diversion. Even materials that cannot be used toward credit compliance must be addressed in the CWMP.
- When materials are donated or given away, be sure that the construction waste management plan indicates how the materials will be tracked (including how much is received and information about where the materials are going).

MR Prerequisite: PBT Source Reduction—Mercury

- Even if mercury-containing items are not initially expected on the project, the recycling plan in MRp Storage and Collection of Recyclables must still address each component required for mercury recycling and handling.
- When providing a lighting schedule in lieu of the completed PBT Source Reduction calculator, the schedule itself must list the quantity, mercury content, and max mercury criteria (along with start ballasts and rated hours if the credit is being pursued) for each applicable lamp type. Keep in mind that all indoor and outdoor, new and existing, high-pressure sodium and fluorescent lamps must be documented. LEDs may be omitted from the calculator, but must be confirmed as being at least as energy-efficient as comparable mercury-containing lamps.
- For projects that include renovated spaces, either confirm that existing mercury-containing lamps, equipment, and products will not remain within the project boundary, or include a phase-out and/or upgrade plan that lists the item types, quantities, and mercury levels.
- Ensure that exit signs comply with both the mercury and wattage limits.
- Keep in mind that all applicable lamp types, including high-pressure sodium and fluorescent lamps, must comply with the maximum mercury criteria.

MR Credit: Building Life-Cycle Impact Reduction

► Option 1: Historic Building Reuse

- If any portion of the historic building will be demolished because of hazardous or unsound structure, include a narrative addressing this.
- Make sure the required historic preservation document is uploaded. If more than one applies, upload the most stringent document.

► Option 2. Renovation of Abandoned or Blighted Building

- Make sure to describe how the project building meets the local municipal or government criteria of an abandoned building or a building considered blighted.
- Nonstructural roofing material and window assemblies must be excluded from the credit calculations.

► **Option 3. Building and Material Reuse**

- Nonstructural roofing material and window assemblies must be excluded from the credit calculations.
- Materials contributing toward this credit can't contribute toward MRc Building Product Disclosure and Optimization - Sourcing of Raw Materials.

► **Option 4. Whole-Building Life-Cycle Assessment**

- Impact categories assessed as part of the life-cycle assessment can't increase by more than 5% compared with the baseline building.
- Be sure to include the material components of footings and foundations, structural wall assemblies (from cladding to interior finishes), structural floors and ceilings (not including finishes), and roof assemblies.
- In addition to the Form table, describe the baseline and proposed buildings and include the summary page from the life-cycle assessment tool.
- For the baseline and proposed buildings, define the wall, roof, and floor assemblies following the performance requirements of the building envelope as defined in ASHRAE 90.1-2010, Appendix G, Opaque Assemblies, Vertical Fenestration, Skylights, and Roof Solar Reflectance and Thermal Emittance sections, for the project's climate zone.
- Creating the baseline building using an early design for the building is recommended. There are four basic options for creating the baseline design: early design, existing building, building archetype, and alternative design. Refer to LEED Addenda 100002019 for more information.
- When small-scale reused materials are included in the building, refer to LEED Addenda 10002021 for information.

MR Credits for Building Product Disclosure and Optimization

► **All Options**

- Remember to upload the completed BPDO Calculator.
- Ensure that the products listed in the BPDO Calculator fall only under Construction Specifications Institute (CSI) 2012 MasterFormat Divisions 3-12, 21-28, 31 (section 31.60.00 Foundations), and 32 (sections 32.10.10 Paving, 32.30.00 Site Improvements, and 32.90.00 Planting).
- Ensure that all Division 12 items are included in the calculation and are consistently reported in all cost-based credits.
- Be sure that there are no active elements of the MEP systems in Divisions 11 and 21-28 or special equipment included in the numerator for Option 2.

MR Credit: Building Product Disclosure and Optimization—Environmental Product Declarations

► Option 1. Environmental Product Declaration

- Documentation must highlight or call-out the Manufacturer Name, Description of Material, EPD Program Operator, and EPD Type. Be sure that the EPD or EPD summary clearly indicates the impact method used (e.g. TRACI, CML).
- Be sure the EPD type entered into the calculator corresponds to the information on the supporting documentation.
- Because EPDs vary, verify that all EPDs included are a cradle-to-gate scope and highlight this information in the documentation.
- Be sure that the product EPDs comply with the relevant referenced standards and that the relevant information in them has been highlighted. The EPD must comply with ISO 14025, ISO 14040, and ISO 14044; the PCR must comply with EN 15804 or ISO 21930. Either the full EPD or an EPD summary and a link to the full Environmental Product Declaration (EPD) must be provided. If the link is separate from the summary, be sure to cross check that the same product is referenced on both.
- Note that LEED Interpretation 10425 states that a single industry-wide (generic) EPD can be used for up to 10 products listed within the industry-wide EPD, provided that each application has separately reported impacts within the EPD.

► Option 2. Multi-Attribute Optimization

- Ensure that structure and enclosure materials do not constitute more than 30% of the value of compliant building products.
- Note that LEED Interpretation 10415 states that in addition to the option outlined in the credit language, products that meet any of the following requirements can also contribute towards Option 2:
 - Demonstrate reduced impact with a product-specific EPD against an industry-wide generic EPD, provided the manufacturer was part of the study and the two conform to the same PCR.
 - Demonstrate reduced impact of the same product, over time, with two product-specific EPDs.

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

► Option 1. Raw Material Source and Extraction Reporting

- Verify that the CSR Types reported on the calculator (Sourcing of Raw Materials tab, column F) for each contributing product (Third-party verified, or Manufacturer-declared) are consistent with the types of reports provided.
- Show that at least 90% of the contents of each product are from raw materials covered by a compliant report.

- Ensure that the relevant information has been highlighted on all of the sourcing disclosure reports. This includes, the extraction locations(s) of the raw material, the commitment to long-term ecologically responsible land use, the commitment to reducing environmental harms from extractions and/or manufacturing processes, and the commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria.

► **Option 2. Leadership Extraction Practices**

- Legal Wood
 - Ensure that the Legal Wood calculator, the copy of the Pilot Credit registration confirmation email, and a copy of the Pilot Credit survey confirmation email are provided.
- Extended Producer Responsibility
 - The manufacturer brochure for each contributing product must describe the EPR program, including contact information and proof that the product is included in the program or describing the recycling process and stating the average rate of return for the material.
- Bio-Based Materials
 - Ensure that the products either have a Rainforest Alliance Certified™ seal (for products other than wood) and were grown on farms that meet the Sustainable Agricultural Network (SAN) Standard, or have been documented in accordance with the Alternative Compliance Path.
- Certified Wood
 - Ensure that an invoice from each final CoC certificate holder has been provided for all FSC certified non-custom wood products.
 - Be sure that each invoice includes the vendor's CoC certificate code, an itemized list of FSC-certified products and specific FSC claims, the entity being invoiced, and an indication that the delivery is intended for the LEED project.
 - If there are contributing custom wood products, ensure that documentation from the woodworker (in addition to the invoice) details the FSC-certified wood materials used and includes a total cost to the end-user/project of wood materials used.
 - FSC certified recycled content may not be counted as both FSC certified and recycled content. FSC 100% products must be listed as meeting the FSC criterion only, while FSC Recycled products must be listed as meeting only the post-consumer recycled content criterion. Additionally, FSC Mix products must be listed as either compliant with the FSC criterion OR one of the recycled content criterion, but not both (unless manufacturer documentation is provided confirming the minimum thresholds for both the FSC criterion and one of the recycled content criteria are met).

MR Credit: Building Product Disclosure and Optimization – Material Ingredients

► Option 1. Material Ingredient Reporting

- Confirm that each material ingredient report demonstrates the chemical inventory of the product to at least 0.1% (1000 ppm).
- Note that materials defined as trade secret or intellectual property in a manufacturer’s inventory may withhold the name and/or Chemical Abstract Service Registry Number (CASRN) but must disclose the role, amount and GreenScreen benchmark, as defined in GreenScreen v1.2 or globally harmonized system for the classification of chemicals. GreenScreen doesn’t screen products, it screens chemical ingredients. So, along with a GreenScreen assessment, the bill of materials for the product down to 1,000 part per million must be provided for Option 1 of this credit.
- Note that Material Safety Data Sheets (MSDS) are usually not compliant, because the manufacturers are not required to go beyond 99% of the ingredients. Often, a much lower percentage of the ingredients are listed. When the MSDS confirms that the manufacturer had verified that they reported down to 1,000 parts per million, the documentation is compliant. If there are ranges – the lowest ranges must add up to 99.9%.
- Be sure that components are broken down to their ingredient level. For instance for carpet or fabrics, expect to see the dyes broken out from the material, cotton, nylon 6, etc. Nylon 6 will have its own chemical components.
- The HPD Collaborative has provided information on their website for use when assessing HPDv1 and HPD v2 documentation: www.hpd-collaborative.org/leed-v4-credit-achievement/
- Remember that the Declare labels must indicate that all ingredients have been evaluated and disclosed down to 1,000 ppm.

► Option 2. Material Ingredient Optimization

- Materials defined as trade secret or intellectual property in a manufacturer’s inventory may withhold the name and/or Chemical Abstract Service Registry Number (CASRN) but must disclose the role, amount and GreenScreen benchmark, as defined in GreenScreen v1.2. GreenScreen doesn’t screen products, it screens chemical ingredients. So, along with a GreenScreen assessment, the bill of materials for the product down to 100 part per million must be provided for Option 2 of this credit.

► Option 3. Product Manufacturer Supply Chain Optimization

MR Credit: PBT Source Reduction—Mercury (Healthcare Only)

- Keep in mind that probe start metal halide lamps are not allowed and projects with such lamps are ineligible for this credit.
- Ensure that the rated hours and start ballast types are included for all fluorescent and high-pressure sodium lamps.

MR Credit: PBT Source Reduction—Lead, Cadmium, and Copper (Healthcare Only)

- Lead or cadmium content in all applicable products must be supported by manufacturer documentation.
- Keep in mind that terms such as "lead-free" and "no lead" are not necessarily as stringent as "100% lead free." If a lead standard other than California AB1953 is cited, refer to that standard (and the correct version) to verify the lead screening limits used.
- California AB1953 is the standard used in this credit for maximum lead limits of products conveying water for human consumption, but there are other lead standards available. Terms such as "lead-free" and "no lead" are not necessarily the as stringent as "100% lead free." If a lead standard other than California AB1953 is cited, refer to that standard (and the correct version) to verify what lead screening limits were used.
- Keep in mind that most wiring and cable jacketing currently contains lead but the amount is often not disclosed. Therefore, not every contractor may be aware of lead content information in electrical wire and cable.
- Remember that exterior paints are included in this credit.
- Remember that flashing and roofing products must be addressed in this credit.

MR Credit: Furniture and Medical furnishings (Healthcare Only)

- ▶ **Option 1. Minimal Chemical Content**
- ▶ **Option 2. Testing and Modeling of Chemical Content**
- ▶ **Option 3. Multi-Attribute Assessment of Products**
- ▶ **All Options**

- Remember to upload the completed MR Furniture and Medical Furnishings Calculator.
- Ensure that built-in casework and millwork are not included in the calculations for this credit (actual materials cost and calculator/numerator), even if manufactured off-site.
- Ensure that all medical furnishings in the project are included in the Actual Materials Cost (Instructions tab) of the Furniture and Medical Furnishings Calculator.

MR Credit: Design for Flexibility (Healthcare Only)

- Refer to the Further Explanation and Definitions section of the LEED BD+C v4 Reference Guide for information regarding what must be included in and excluded from the Departmental Gross Floor Area calculation.
- Review manufacturer documentation or details to confirm the functionality of a partition type. Plans alone may not confirm one way or another.
- Refer to the Definitions section of the LEED BD+C v4 Reference Guide for specifics on shell space and soft space.

- Refer to the Further Explanation section of the LEED BD+C v4 Reference Guide for specifics on expansion criteria.
- Refer to the Further Explanation section of the LEED BD+C v4 Reference Guide for specifics on expansion criteria.

MR Credit: Construction and Waste Demolition Waste Management

► Option 1. Waste Diversion

- Ensure that the calculations showing the waste diverted from landfill are provided.
- Be sure that at least three material streams are documented.
- When materials have been sent to a Waste to Energy facility, be sure that the facility meets the relevant EN standards. Waste to Energy is only acceptable if there are no other diversion methods available and the project explains that reuse and recycling methods are not readily available in the project's location.
- Ensure that alternative daily cover (ADC) has not been included as diverted waste in the calculations. If using the facility average diversion rate, ensure that the documentation to support the facility average confirms that the ADC has not been included in the facility diversion rate.
- Ensure that supporting documentation for commingled waste confirms the project specific diversion rates (by material) or the average annual recycling rate for the facility. If claiming the average annual recycling rate, the facility must be regulated by a governing authority.

► Option 2. Reduction of Total Waste Material

- Verify that the project's gross area is consistent with the gross area used throughout the submittal.
- Be sure that materials reused on-site have not been included within the calculations for Option 2. While projects using Option 1 may include items reused on-site in the calculations, this does not apply to Option 2.

INDOOR ENVIRONMENTAL QUALITY

EQ Prerequisite: Minimum Indoor Air Quality Performance

- Ensure the Ventilation Rate Procedure (VRP) calculations provided are consistent with the ventilation system design (i.e., Single-Zone System calculations provided for systems truly serving single ventilation zones; 100% Outdoor Air System calculations provided for systems that provide only outdoor air directly to the ventilation zone (and not to the return of FCU, HP, indoor VRV unit); and Multiple-one Recirculating System calculations are provided when a mixture of outdoor air and recirculated air are provided to more than one ventilation zone).

- Ensure that the worst case ventilation condition (the one that results in the highest outdoor air intake rate), is analyzed within the Ventilation Rate Procedure (VRP) calculations. For VAV systems, this means that the airflow rates to the critical zones, in the condition analyzed, are the lowest that can reasonably be expected to occur when the zone is fully occupied for the cooling condition, and the minimum primary air flow to the zone in the heating condition.
- Ensure that the appropriate value for Ez (zone air distribution effectiveness) from Table 6-2 of ASHRAE 62.1-2010 is used in the ventilation rate procedure (VRP) calculations (i.e, 0.8 for an overhead distribution system in heating mode).
- Be sure that all occupiable areas (as defined by ASHRAE 62.1-2010) are addressed by the Ventilation Rate Procedure (VRP) calculations.
- Ensure that a Demand Controlled Ventilation (DCV) strategy to reduce outdoor air intake rates below the calculated minimum level, which includes only return air duct CO2 sensors in a multiple-zone VAV air handling unit system, is not implemented. CO2 levels sensed in the return air duct of multiple-zone systems will measure the system average CO2 concentration, and controlling to this system average will not ensure that the required ventilation rate to the critical zone(s) of the system are met. This does not comply with ASHRAE 62.1-2010. Refer to the guidelines from ASHRAE Research Project Report 1547-RP CO2 Based Demand Controlled Ventilation for Multiple Zone HVAC Systems and the article “Dynamic Reset for Multiple-Zone Systems” ASHRAE Journal, March 2010, which provide strategies for dynamic reset control approaches. ASHRAE 62.1-2010 Section 6.2.7.1 describes addition considerations including a requirement that the minimum breathing zone outdoor airflow is reset no lower than the building area component ($R_a * Area$) of the DCV zone (Section 6.2.7.1.2).
- Ensure that the Ventilation Rate Procedure (VRP) calculations analyze the peak simultaneous number of occupants within the area served by the ventilation system, and that the total occupancy analyzed within the calculations is not less than the peak occupancy reported elsewhere with the LEED documentation.
- Ensure that dwelling units comply with the additional residential only rating system requirements regarding appliance venting, carbon monoxide monitors installed on each floor of the unit (even in all electric units), and radon-resistant construction for high-risk areas.
- Ensure the exhaust requirements (defined as air discharged to outdoors) of ASHRAE 62.1-2010 Table 6-4 are met for ventilation zones such as residential kitchens, parking garages.
- Ensure the exhaust requirements (defined as air discharged to outdoors) of ASHRAE 62.1-2010 Table 6-4 are met for ventilation zones such as residential kitchens, parking garages.
- Indicate whether the project is located in an area where the national standard or guideline for Particulate Matter small than 2.5 micrometers (PM2.5) is exceeded, and if so, confirm that filters with minimum efficiency reporting values (MERV) of 11 are installed per Section 6.2.1.2 of ASHRAE 62.1-2010.
- Indicate whether the project is in an area where ozone exceeds the most recent three-year average, annual fourth-highest daily maximum eight-hour average ozone concentration of 0.107 ppm, and if so, confirm that the project has or will have air-cleaning devices for ozone or meets one of the exceptions per Section 6.2.1.3 of ASHRAE 62.1-2010.

- For cases where the mechanical ventilation systems (i.e., fans) are designed within the Core and Shell scope of work, ensure the Ventilation Rate Procedure (VRP) calculations are based on a feasible tenant fit out plan, and the system is demonstrated to be capable of meeting the projected ventilation levels of the future tenants. If the scope of the core-and-shell project does not include mechanical systems, the project is exempt from the ventilation and monitoring requirements.
- Ensure that potentially critical zones analyzed within multiple-zone Ventilation Rate Procedure (VRP) calculations are analyzed based on the individual worst case condition of the potentially critical zones, and not the average/combined/grouped performance of similar zones.
- Ensure that mechanically ventilated systems are configured with outdoor airflow monitoring devices (i.e., direct outdoor airflow monitoring devices for VAV systems AND current transducers, airflow switches, or similar monitors for constant volume systems).

EQ Prerequisite: Environmental Tobacco Smoke Control

- Ensure that the signage text and signage graphics correspond with the selected exterior smoking policy. For instance, if the exterior smoking policy is to prohibit smoking on-site, ensure that that signage text and graphics communicate that policy.
- Ensure that permanent signage indicating the exterior smoking policy is provided within ten feet (three meters) of every building entrance.
- Ensure that the smoking policy letter addresses enforcement and implementation and includes the owner's signature.
- Note that code exemptions will only be granted for code requirements truly prohibiting a 25 foot no smoking policy. Provisions or regulations that are simply different from or less stringent than LEED will not be accepted.
- The extent of smoking areas, if any, should be highlighted on the site plan. Ensure that signage directs smokers to the location of the smoking area.
- Ensure that spaces located outside of the property line and/or LEED project boundary, but still within 25 feet (7.5 meters) of a LEED project entrance, are still addressed by the exterior smoking policy of the LEED project. This includes public sidewalks and business purpose space (including, but not limited to: outdoor seating, banking kiosks, courtyards, and outdoor stadium areas).
- If there are smoking areas on terraces, patios, rooftops, and balconies, ensure that they are located 25 feet (7.5 meters), horizontally and vertically, from entries, outdoor air intakes, and operable windows.
- For LEED BD+C: Schools projects, ensure that site signage is not overlooked.
- Highlight the pertinent language within covenant or restriction documents.
- Ensure that testing reports are organized according to room names that correspond with architectural plans, for clarity.

EQ Prerequisite: Minimum Acoustic Performance

- To justify the inclusion or exclusion of other spaces that could be considered core learning spaces (laboratories, workshops, art rooms, media centers, huddle rooms, flex rooms, etc.) make sure to describe the activity type and duration expected in that space during a typical school day, as well as the reasoning for inclusion or exclusion.
- While recommendations or preliminary reports from acoustical consultants are commendable and helpful, make sure to document what is actually incorporated into the finalized design or construction of the project.
- Sound path calculations and/or field measurements must confirm that the reported sound pressures were determined according to ANSI, ASHRAE, or AHRI procedures.
- Note that sound masking only distorts sound pressures and higher STC assemblies should already be reflected in the calculations or measurements. Therefore, neither of these strategies justify using a higher HVAC Background Noise limit.
- Non-dBA sound rating methods are acceptable; however, an equivalency narrative must confirm that the resulting rating is better than or equal to 40 dBA. Note that there are several schools-related space types with HVAC background noise limits shown in ASHRAE 2011 Handbook Chapter 48, Table 1, on page 48.3. However, these limits from Table 1 do not apply to LEED BD+C: Schools, which specifies 40 dBA for the prerequisite and 35 dBA for the credit.
- The exterior noise portion of this prerequisite depends on noise sources possibly located around the vicinity, so some research of the area will be necessary even if no significant noise sources are expected. Include detailed vicinity maps and notations to confirm the presence or absence of such sources.
- Ensure that noise reduction coefficient (NRC) values, which are overall values for a surface, and sound absorption coefficient (SAC) values, which are unique to each frequency for a surface, are not confused. NRC values should be obtainable from manufacturers.
- Reverberation time depends on the surface area, volume, and surface types of an enclosed space, so ensure that it is documented on a room-by-room basis.
- Ensure that noise reduction coefficient (NRC) values, which are overall values for a surface, and sound absorption coefficient (SAC) values, which are unique to each frequency for a surface, are not confused. SAC values should be obtainable from manufacturers or from the common materials table in the LEED BD+C v4 Reference Guide.
- Reverberation time depends on the surface area, volume, and surface types of an enclosed space, so ensure that it is documented on a room-by-room basis.
- Proprietary calculators for reverb time from ceiling tile manufacturers often omit wall and floor surface entries, inflating RT. It is to the project's benefit to include all surfaces in a room, including floors with low SAC values.

EQ Credit: Enhanced Indoor Air Quality Strategies

► Option 1. Enhanced IAQ Strategies - Mechanically Ventilated Space(s)

- Ensure that entryway systems are installed at all regularly used exterior entrances.

- Ensure that documentation is provided that demonstrates the spaces have been designed for sufficient exhaust and separation. The documentation must include a list of spaces, exhaust rates, and a description of the separation strategy.
- Ensure that all ventilation systems that supply outdoor air to occupied spaces have filtration with a minimum rating MERV 13 (Class F7), and that supporting design documentation (e.g., mechanical schedules, specifications) confirms compliance.

► **Option 2. Additional Enhanced IAQ Strategies - Mechanically Ventilated Space(s)**

- If the Increased ventilation is pursued and Demand Controlled Ventilation is included within the system design, ensure the CO2 setpoints are consistent with the expectations of providing 30% increased ventilation air to the zone. Ensure that documentation is provided that demonstrates the spaces have been designed for sufficient exhaust and separation. The documentation must include a list of spaces, exhaust rates, and a description of the separation strategy.
- Ensure that CO2 sensors are installed within each densely occupied zone. Confirm that occupant density is reported consistently with the EQp Minimum IAQ Performance Calculator submitted within EQp Minimum IAQ Performance.

EQ Credit: Low-Emitting Materials

- Ensure that the appropriate category and/or product type is selected for each material listed in the Low-Emitting Materials Calculator (Products tab).
- For the Budget Calculation Method, ensure that the assembly name provided on the Low-emitting Materials Calculator is a unique identifier for the assembly in which the product is a part (e.g. Wall Type 1A). Note that each product within an assembly will have the same assembly name. This will enable the grouping of the assembly in the calculation. If a product is included within more than one assembly, it may be listed more than once.
- Ensure that all of the flooring, ceiling, wall, thermal, and acoustic insulation assemblies used on the project have been included in the Low-Emitting Materials Calculator. To ensure that all installed products are listed, cross check the project specifications, Calculator, and general project documents (floor and ceiling plans, elevations, connection details, photographs, etc.). Each assembly should have several components listed.
- Confirm that the descriptions of materials in the Low-Emitting Materials Calculator (Products tab) match the manufacturers' naming conventions of the products or materials.
- Ensure that manufacturer or testing documentation demonstrates that the applicable sustainable criteria are met for each product.
- For projects outside of the U.S. including products tested using AgBB or ISO methods, ensure that manufacturer documentation demonstrates that the products meet the French VOC emissions class labeling of A+ or do not exceed a formaldehyde limit of 10 µg/m³ at 28 days.
- Ensure that the general emissions evaluation reports state the exposure scenario used to determine compliance and the measurement of TVOCs.
- Ensure that the VOC content documentation states that testing follows the test method specified in the applicable regulation and that this information is highlighted.

- For wet-applied products in the VOC content section of the Low-Emitting Materials Calculator, ensure that the volume used has been included for every wet-applied product (unless 100% of the products are compliant). Alternatively, the "volume used" column may be completed for enough of the wet-applied products to determine budget compliance.

EQ Credit: Construction Indoor Air Quality Management Plan

- Ensure that the construction IAQ management plan prohibits the use of tobacco products inside the building and within 25 feet (7.5 meters) of the building entrance during construction.
- Ensure that the construction IAQ management plan meets or exceeds the SMACNA IAQ Guidelines for Occupied Buildings Under Construction, 2nd edition, 2007, ANSI/SMACNA008-2008, Chapter 3. SMACNA guidelines can be found in the LEED reference guide.
- Confirm that narratives adequately describe the filtration for air handling units (if air handlers were used during construction) and the methods in which absorptive materials were protected from moisture damage during the construction and pre-occupancy phases.
- Confirm that the construction IAQ management plan for the project has been uploaded.
- Be sure that photographs or a narrative document each of the IAQ measures implemented, as well as the methods employed to protect absorptive materials from moisture damage during construction and pre-occupancy. Photographs should be annotated to indicate the IAQ measure depicted and the general location of the photograph.
- If permanently installed air-handling equipment is used during construction, ensure that MERV 8 or F5 (or higher) filters are used. Filters must be replaced immediately prior to occupancy.
- For LEED for Healthcare projects, ensure that an environmental quality management plan (EQMP) is provided.

EQ Credit: Indoor Air Quality Assessment

- Option 1: Flush-out
- Option 1: Ensure the Gross Floor Area (i.e., all spaces - including unoccupied spaces) of the project is accounted for in determination of the flush out volume of air needed.
- Option 1: Ensure that all interior finishes, movable furnishings, and major VOC punch list items were installed and complete before the [flush-out / air testing] commences.
- Option 1: Ensure that the description of the flush-out procedure includes the flush-out date(s), occupancy date, outdoor air delivery rates, internal temperature, and relative humidity.
- Ensure that the date of occupancy reported within the submittal documentation is reported consistently within other prerequisites/credits.

- For Option 2, ensure testing for each contaminant is performed using an approved test method. Additionally, ensure the chemical analysis of formaldehyde and the volatile organic compounds is performed by a laboratory accredited under ISO/IEC 17025 for the test method used.
- If the project is located in an EPA (or local equivalent) nonattainment area for PM2.5 or Ozone, ensure those contaminants are included in the air testing.

EQ Credit: Thermal Comfort

► Thermal Comfort Design

- Ensure the air speed reported is the air speed experienced by the occupant and not the outlet velocity from the diffuser.
- Ensure that the compliance approach utilized is consistent with the applicable limits of the approach as defined by ASHRAE 55-2010. For example the Graphical Method applicability is for Met rates between 1.0 and 1.3, Clo between 0.5 and 1.0, 0.012 lb/lb humidity ratio limit, airspeed not greater than 0.20 m/s (40 fpm), unless adjustments for factors such as elevated air speed (per Section 5.2.3) or intermediate values of clo (per 5.2.1.1) have been applied.
- Ensure that all unique space types and/or spaces with unique design parameters are included separately in the thermal comfort analysis
- Confirm that the compliance documentation includes all applicable design parameters and personal/environmental factors (e.g., clo, met, operative temperature, humidity, air speed).
- For naturally conditioned spaces, ensure that the documentation demonstrate that 100% of occupied hours are within the 80% threshold limits of adaptive model chart (Figure 5.3). Documentation must include the worst case outdoor conditions and the worst case indoor conditions derived from a thermal comfort simulation) for each month.

► Thermal Comfort Control

- Note that compliance with both the Thermal Comfort Design and Thermal Comfort Control elements of the credit are required to earn the credit.
- Ensure that the individual occupant spaces and shared multi-occupant spaces are appropriately classified. For example, open office spaces must count the workstations as individual occupant spaces.
- Ensure that the thermal controls allow the occupants to adjust their local thermal environment.
- Ensure that the number of individual occupant spaces aligns with the project full-time equivalent (FTE) reported elsewhere in the submission (e.g., WE Prerequisite: Indoor Water Use Reduction) in cases where the vast majority of FTE are reasonably expected to have individual workstations.
- Ensure that the quantity of individual occupant spaces and multi-occupant spaces are consistent among all submittals, in particular, EQ Interior Lighting.

EQ Credit: Interior Lighting

► Option 1: Lighting Control

- Ensure that the quantity of individual workstations and multi-occupant spaces are consistent among all submittals, in particular, EQ Thermal Comfort.
- Be sure that the individual occupant spaces and shared multi-occupant space are appropriately classified. For example, open office spaces must count the workstations as individual occupant spaces.

► Option 2: Lighting Quality

- Make sure you are using the latest Interior Lighting Calculator, available at usgbc.org/resources/interior-lighting-calculator.
- Remember that a minimum of four of the eight strategies need to be demonstrated, in order to be awarded the credit.
- Make sure the regularly occupied spaces reported in this credit are reported consistently with those reported in other credits.
- When considering Option 2a, remember that luminance of less than 2,500 cd/m² is only required between 45 and 90 degrees, for all regularly occupied spaces.
- For Options 2b and 2c, remember that cut-sheets for all lamp types within regularly occupied spaces must note the CRI values and rated life in hours.
- For Option 2d, ensure that the total connected lighting load shown within this credit has been coordinated with the total connected lighting load shown within EAp Minimum Energy Performance.
- Remember that 10% of the regularly occupied floor area may be excluded for Option 2e.

EQ Credit: Daylight

- Be sure that the floor plans highlight regularly occupied spaces and daylit areas/zones. Reference the EQ Overview section of the LEED reference guide for examples of regularly occupied versus non-regularly occupied spaces. For LEED for Healthcare projects, the entire floor plate (except for the core) should be considered regularly occupied space.
- Remember to provide the Supplemental Daylight and Views Calculation Spreadsheet and confirm that the results have been correctly input into the LEED Form.
- Describe all glare control devices provided for all regularly occupied spaces and specify whether each device is manually controlled or automatic with manual override. If automatic with manual override, ensure the sequence of operation is described.

► Option 1. Simulation: Spatial Daylight Autonomy

- The daylight simulations should use the same building information and methodology, be performed at 30 inches above the floor (or at appropriate desk/work height for the space) at a two-foot or less calculation interval, and include permanent interior obstructions.

► Option 2. Simulation: Illuminance Calculations

- The daylight simulation model should be performed with clear sky conditions at 9 a.m. and

3 p.m. within 15 days of each equinox, using the project's geographic location, and at 30 inches above the floor (or at appropriate desk/work height for the space) at five-foot or less calculation interval. Illuminance intensity for sun and sky should be calculated using typical meteorological year data for the nearest weather station (average of the hourly value for both equinox 15-day window). Permanent interior obstructions should be included but blinds/shades should be excluded.

► Option 3. Measurement

- Project drawings should include the recorded daylight measurements and show they were conducted at 30 inches above the floor (or at appropriate desk/work height for the space). Furniture, fixtures, and equipment must be in place during the testing.

EQ Credit: Quality Views

- Be sure that the floor plans highlight regularly occupied spaces and daylit areas/zones. Reference the EQ Overview section of the LEED reference guide for examples of regularly occupied versus non-regularly occupied spaces. For LEED for Healthcare projects, the entire floor plate (except for the core) should be considered regularly occupied space.
- Remember to provide the Supplemental Daylight and Views Calculation Spreadsheet and confirm that the results have been correctly input into the LEED Form.
- Be sure that applicable project documentation shows the line of sight from interior spaces through exterior windows in both plan and sectional views, with glazing elements, and confirms that views are not through permanent interior obstructions, opaque walls, partitions, or doors.
- Remember that glazing must provide a clear view to the outdoors. Views cannot be obstructed by frit, fibers, patterned glazing, or added tints that distort the color balance. Some patterns and lightly tinted glazing is acceptable if they preserve the view.

EQ Credit: Acoustic Performance

- Non-dBA sound rating methods are acceptable; however, an equivalency narrative must also be provided to confirm that the resulting rating is better than or equal to 40 dBA.
- Ensure that STCc ratings are presented as composite ratings. It may be necessary to select acoustically compliant assemblies early in the design process because acoustic requirements may be more stringent than fire rating requirements in some cases.
- Highlighting assembly locations in a floor plan and including notations directing toward other uploaded documentation relevant to STCc can aid the reviewer in piecing together the source of STC data.
- Keep in mind that sound transmission requirements must be achieved plane-by-plane. If prescriptive STCc minimums cannot be met, the field testing option may be more appropriate.
- Floor-ceiling assemblies are often overlooked but must meet STCc ratings just like wall assemblies.
- Non-dBA sound rating methods are acceptable; however, in such cases, an equivalency narrative must confirm that the resulting rating is better than or equal to 40 dBA.

INNOVATION

IN Credit: Innovation

► Option 1: Innovation

- Remember that an Innovation strategy must be comprehensive (more than one product or process), include quantitative performance improvements (comparing a baseline and design case), and be significantly better than standard sustainable design practices.
- Ensure that the Innovation strategy is specific to the LEED project under review.

► Option 2: Pilot Credit

- Projects can earn up to three points using Pilot Credits. Visit usgbc.org/pilotcredits for a complete list.

► Option 3: Exemplary Performance

- Be sure to check the Exemplary Performance criteria for each credit.
- No more than two points can be awarded for exemplary performance strategies.
- One point is reserved for Pilot Credits and one for Innovation. To use all five points, projects must use at least one pilot credit and one innovation credit.

IN Credit: LEED AP

- Confirm that a copy of the certificate (scanned image) for the LEED AP on the project team has been uploaded to that individual's team member profile within LEED Online.
- The LEED AP on the project must have a specialty that matches the rating system family of the project.

