

# LEED v4 SUBMITTAL TIPS



LEED<sup>®</sup> for Building  
Operations and Maintenance

# LEED for Building Operations and Maintenance

## 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.

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# 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).

## PROJECT INFORMATION

Remember that if the project includes completely vacant spaces; therefore, the project must adhere to guidance under the Variable Occupancy header in the Getting Started section of the LEED O+M v4 reference guide. Describe vacant spaces and associated floor area in the form narrative.

Ensure that the application is submitted to GBCI for review within 60 calendar days of the end of the latest performance period ending date in the application. Note that all performance periods must overlap and conclude within 30 days of each other.

Be sure that the form narrative describes all required details about the project, including a description of different space types and occupants, information on areas that have been excluded, changes in occupancy, and base building mechanical systems. Address any context or general characteristics of the project not covered elsewhere in this form.

## LOCATION AND TRANSPORTATION

### LT Credit: Alternative Transportation

#### ► Option 2: Alternative Transportation Rate

- The number of building full time equivalent employees listed elsewhere in the application may differ from the number of regular building occupants listed under this credit, but any notable differences must be quantified and explained. Regular building occupants are habitual users of a building and include both part-time and full-time employees.
- Remember that carpool riders should be counted as making a fraction of a trip based on the number of riders in the car.

- The copy of the occupant survey uploaded should demonstrate that the survey's methodology followed the guidance in the LEED O+M v4 reference guide.
- Remember that in addition to surveying all regular building occupants, visitors must be surveyed if either the typical peak or daily average number of visitors is greater than the number of occupants.
- Remember that the survey must collect information on modes of travel used to get to and from the project building during a specific work week, not typical behavior.
- The survey should cover a time period that reflects the building's typical occupancy patterns, not during a time of extreme weather or over a holiday.
- Be sure that the form narrative sufficiently describes the timing of and methodology used for the visitor survey, if applicable.
- The visitor survey must only collect information on modes of travel for one typical day of operation. The visitor survey can be conducted over multiple days, but the visitor survey results must only reflect a single, typical day of operation.
- The visitor survey must be independent from the occupant survey, but can be given on the same day.
- When extrapolating the responses to the entire population, be sure to use the correct extrapolation factor found in the reference guide.
- Remember that absences should not be counted in the survey results.
- If distributing the survey to a random sample of the building population, be sure that the sample size is determined based on Table 5 in the Further Explanation section of this credit in the LEED O+M v4 Reference Guide.
- If distributing the survey to a random sample of the building population, be sure that the sample is representative of the entire building population.
- Be sure that only vehicles that have an ACEEE green score greater than or equal to 45 are counted as a "green vehicle".
- Occupants who telecommute full time cannot be included in the calculations.
- Remember that any occupants or visitors that refused to take the survey must be accounted for as non-respondents in the calculations.

► **Option 3: Comprehensive Alternative Transportation Program**

- This option requires that you also meet the requirements of Option 1: Transportation Survey
- Ensure that the alternative transportation program addresses at least one element from each of the three categories (education, basic support, direct strategies).

# SUSTAINABLE SITES

## SS Prerequisite: Site Management Policy

- Be sure that the policy includes all operational elements listed in the prerequisite requirements, if applicable to the site. All projects must address erosion and sedimentation control, even if the building has a zero or minimal lot line or has established vegetation.
- Ensure that the policy clearly specifies a scope, goals, roles and responsibilities, standard operating procedures, implementation strategies, performance metrics, a schedule for reassessment, and quality assurance methods.
- The policy must describe its physical and programmatic scope. If any spaces on the site are excluded, describe the exemption and explain the reason.
- Ensure that the policy identifies the time period to which it applies.
- Identify the responsible party who will implement the policy by full name and title or position. If a vendor is responsible for implementing parts of the policy, name both the vendor and the building manager to whom the vendor reports. If there are multiple responsible parties, consider identifying clearly which components of the policy each oversees.
- Ensure the policy includes quality assurance process that describe how the responsible party will verify that the policy is being implemented, that the metrics reflect the actual outcomes, and that performance persists over time. This may include periodic checks to make sure the policy is consistently implemented and that the set goals are being achieved.
- Include specific goals for each operational element, i.e., quantitative thresholds and requirements by which to compare the performance measurements to achievement of the project goals. Goals must be measurable and are typically numerical. An example of an appropriate goal is “75% of deicer applied will be environmentally preferred”.
- The policy must establish quantitative performance measurement methods for each operational element addressed by this prerequisite. The selected performance measurement methods must allow one to quantify the extent to which environmentally preferred practices are used. An example of an appropriate performance metric for cleaning of the building exterior is the cost or weight of cleaning products applied. An example of an appropriate performance metric for maintenance equipment is the number of hours that each piece of environmentally preferable maintenance equipment is used during the performance period.
- Ensure that the policy goals and objectives established are better than standard practice. Include justification for any significant deviations from the strategies described under Table 1 in the Further Explanation section of this prerequisite in the reference guide.
- Identify criteria to determine whether a given piece of equipment is environmentally preferred. Examples of compliant criteria include low- or zero-emissions equipment, electric equipment, and manual equipment. Refer to Table 1 under this prerequisite in the LEED O+M v4 Reference Guide for more information.
- Be sure that the policy includes the criteria to determine whether a given deicer is environmentally preferable.

- Ensure that the policy addresses erosion and sedimentation control for ongoing landscape operations AND measures in the event of future construction projects.
- Ensure that the policy addresses the diversion of landscape waste from the waste stream via mulching, composting, or other low impact means.
- Remember that the policy must describe the processes for regularly monitoring for invasive species and using low-impact means to remove them.
- Be sure to specify processes for monitoring irrigation systems for appropriate water usage, system times, leaks, or breaks, either manually or with automated systems at least every two weeks during the operating season.
- Address the storage of materials and equipment. See Table 1 Site Management Best Practices in the Further Explanation section of this credit in the LEED O+M v4 Reference Guide for suggested best practices.
- A sample policy template is available from the Resources tab of this prerequisite in the [LEED Credit Library](#).
- Consider reviewing SSc Site Management to assess whether the policy goals established for this policy will align with the credit compliance options if attempting the credit. For example, goals for deicer use could be established to ensure compliance with the Site Management credit.
- Ensure any guidance included in the policy that is outside the scope of this prerequisite is consistent with the requirements of the other relevant credits and prerequisites.
- As indicated in a LEED O+M v4 Rating System Correction dated July 1, 2014, Environmental Choice standards are now administered by UL as the UL EcoLogo program. Ensure that the policy reflects these standards.

## SS Credit: Site Development – Protect or Restore Habitat

### ► Option 1: On-Site Restoration

- Ensure that lawn areas are not considered compliant unless they are able to survive without mowing, fertilization, pesticides, and irrigation.
- Ensure that only native or adapted vegetation is considered compliant in the calculations. Refer to the definitions of native and adapted species in the LEED O+M v4 Reference Guide.

### ► Option 2: Financial Support

### ► All Options

- Ensure that the value for the site area (including the building footprint) is consistently reported throughout the LEED application.

### ► Multifamily

- For projects with residential spaces, ensure that the calculations for both Option 1 and Option 2 include semi-private spaces (including but not limited to community gardens, paving areas, plantings, and outdoor tenant spaces maintained by the property manager).

## SS Credit: Rainwater Management

- 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.
- Ensure that the Rainfall Events Calculator accounts for the total site area, and that all site attribute areas are reported consistently with the remainder of the application.
- Ensure that the 95th percentile storm event was determined in accordance with the methodology described in the Percentile of Rainfall Events section of this credit in the LEED O+M v4 Reference Guide. For example, the Historical Data tab of the Rainfall Events Calculator must be fully completed to list daily precipitation amounts for at least ten years.
- Ensure the calculations clearly demonstrate how the project team determined the total runoff volume for 25% of impervious surfaces and the volume of runoff managed by LID or green infrastructure measures.
- This credit’s calculations are limited to the runoff from impervious surfaces (specifically, the water from at least 25% of the impervious surfaces) and low impact development (LID) and green infrastructure (GI) features only count toward credit compliance if the rainwater runoff from these impervious surfaces is directed to the LID and GI features. This calculation must only account for runoff from impervious surfaces and not runoff from vegetated areas and other permeable surfaces on the site. Ensure that this information clearly corresponds with the values listed in the calculator. Refer to Step 3 of the Step-by-Step Guidance section and the Further Explanation section under this credit in the LEED O+M v4 Reference Guide.
- Ensure the inspection report and log show that any needed maintenance or repairs were performed within 60 days of the inspection that uncovered them.

## SS Credit: Heat Island Reduction

### ► Option 1: Non-roof

- Ensure that the hardscape areas are consistent with other credits. Be sure that the tree-shaded 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). Any given surface area may only be counted in the calculations once, even if it is addressed through multiple strategies.

### ► Option 2: Roof

- Note that LEED Interpretation 10235 (exempting functional space such as helipads) is not applicable to O+M v4. It can only be applied to v2009.

### ► Option 3: Non-roof and Roof

- Be sure that all areas are included in the calculations, even if the non-roof or roof materials do not meet the requirements.

### ► Option 4: Parking under cover

- Ensure that all parking areas that are under the same management control as the building and that directly support the operations of the project building are included in the LEED project boundary and the calculations for this credit.
- Ensure that the number of parking spaces is consistent with the number of parking spaces stated within other credits. Include motorcycle parking in this value, but exclude bicycle parking.

## SS Credit: Light Pollution Reduction

### ► Option 1: Fixture Shielding

- Ensure that the documentation confirms that the installed fixtures do not directly emit any light at a vertical angle more than 90 degrees from straight down or confirms that the sum of the mean lamp lumens for each of the fixtures does not exceed 2,500 lamp lumens.
- Ensure that all lighting, including light fixtures located at the top level of parking garages, are properly shielded or that the sum of the mean lamp lumens for each fixture is 2,500 or less. Compliance with the shielding requirement can be confirmed via manufacturers' technical data sheets. If for any reason manufacturer documentation is unavailable, photographs of the luminaires can be provided.

### ► Option 2: Perimeter Measurements

- Ensure that measurements are from at least eight equally distanced measurement points, with a maximum of 100 feet (30 meters) between points. Measurement points must be located along the entire LEED project boundary.



# SS Credit: Site Management

## ► Option 1. Limited Turf Area

- Ensure that the site plan provided in Project Information clearly demonstrates that turf area represents no more than 25% of the vegetated area.

## ► Option 2: All Manual or Electric-Powered Equipment

- Be sure to provide list of all current maintenance equipment. The inventory must include the equipment type, manufacturer, and fuel type. Include all equipment used on the site, regardless of ownership. Ensure any equipment used for deicing, such as snow plows, has been accounted for within the inventory.

## ► Option 3. Reduction in Emissions from Site Management Equipment

- In order for the equipment emissions calculator to function properly, ensure that emissions factors are identified for each piece of equipment in the Instructions tab of the calculator.

## ► All Options

- For all options, be sure that documentation (such as activity logs) or a detailed narrative are provided demonstrating that the environmentally sensitive site management performance criteria were met and maintained for each operational element covered by the building's policy provided under SSp Site Management Policy. For example, the documentation must demonstrate that 100% of plant material waste was diverted from landfills for the landscape waste operational element. Ensure that all information is quantitative where possible.
- Do not use deicers with sodium chloride or calcium chloride unless the project team is able to demonstrate that deicer treatment areas were reduced to at least 50% of the applicable paving area during the performance period by discontinuing deicer applications in low-traffic areas or converting some areas to environmentally preferred deicer.
- Note that even for buildings in urban settings, documentation (such as a narrative) must be provided confirming that environmentally preferred erosion and sedimentation control practices were implemented 100% of the time during the performance period. This should include any construction erosion and sedimentation control as well as ongoing erosion and sedimentation control that occurred at the project site, including erosion and sedimentation control activities for buildings with little or no landscaping (e.g., cleaning out storm drains, maintaining sidewalks, removing debris, etc.) as well as activities for potential construction projects.
- Be sure to provide product and manufacturer names for any fertilizers used and confirm that they are not ammonia-based fertilizers, bio solid-based fertilizers (for continuous application), synthetic quick-release fertilizers, or "weed and feed" formulations.

## SS Credit: Site Improvement Plan

- Ensure that the total area of vegetation is consistent between this credit and all other applicable credits in the application.
- Be sure that the plan includes details regarding protection and improvement of water bodies onsite; rainwater management and reuse opportunities; potable water-use reduction; documentation of existing vegetation onsite; turf area reduction; management of native and invasive plants; protection of threatened, endangered or unique species; documentation of general soil structure; preservation of healthy soils; remediation of compacted soils; and identification of previously disturbed area.
- In the plan, include site improvement objectives, performance standards to evaluate ongoing progress, and monitoring protocols for hydrology, vegetation, and soils. Refer to Steps 4 and 5 in the Step-by-Step Guidance section of this credit in the LEED O+M v4 Reference Guide for more information.
- Be sure to include no- and low-cost measures as a part of the site improvement plan and implement all such measures during the performance period. Note that in order to be eligible for this credit, all projects must include no- and low-cost measures as a part of their improvement plans. Additionally, note that the site improvement plan must be a five-year plan based on the state of the site at the beginning of the performance period for this credit.

## WATER EFFICIENCY

### WE Prerequisite: Indoor Water Use Reduction

#### ► Option 1. Calculated Water Use

- Be sure the occupancy values have been used consistently throughout the application. Describe any justifiable differences in a narrative.
- Use a 50/50 gender ratio in the calculations unless an alternate ratio is justified and will be valid for the life of the project.
- Be sure the Percent of Occupants column in the calculations has been completed correctly. This column is intended to represent the percentage of occupants within each gender that have access to each fixture type. The calculations should list 100% if all occupants within each gender have access to each fixture type or should sum to 100% for each gender if there are multiple flush/flow rates for a particular fixture type.
- Note that it is recommended that the Resources page of this prerequisite in the Credit Library be checked for the newest version of the calculator.
- Use a 50/50 gender ratio in the calculations unless an alternate ratio is justified and will be valid for the life of the project.

- Multiple fixtures from one fixture family cannot be assigned to the same fixture usage group unless the values in the “Percent of Occupants” column for a given fixture family and gender sum to no more than 100%. When completing the calculations:
  - Assign only one fixture from each fixture family to each fixture usage group. Fixture families include urinals, water closets, lavatory sinks, kitchen/break room sinks, etc. If multiple fixtures from within a fixture family are present, they should be represented in multiple fixture usage groups. List the Percent of Occupants as 100% for each fixture.
  - Modify the Percent of Occupants values for the fixtures to accurately represent the percentage of occupants within each gender that have access to each [list affected fixture families] with a differing [flush/flow] rate. For example, if 50% of males have access to one urinal model and 50% of males have access to another urinal model, enter “50%” in the “Percent of Occupants” column for each urinal.
- Don’t forget to include kitchen and break room sinks available to building occupants. If occupants do not have access to these types of fixtures, include a narrative. Commercial kitchen (food service) sinks and prep sinks, including pot filling sinks, wash-down, and cleaning sinks may be excluded.
- If unisex restrooms are present in the building, make sure the calculations have been adjusted accordingly. The value for “Percent of males expected to use restrooms with urinals” in the calculator can be modified as necessary to accurately identify the percentage of males who have access to or regularly use restrooms with urinals.
- Ensure information is reported consistently - if the floor plans show unisex restrooms, ensure that the calculations include unisex restrooms. If the floor plans show unisex restrooms, but the building does not in fact have these in place (if the floor plans are outdated, for example), clarify the inconsistency with a narrative.
- When categorizing lavatories as public or private, keep in mind that private use applies to those fixtures in residences, hotel or motel guest rooms, and private rooms in hospitals. All other applications are deemed to be public.
- When calculating the average flush rate for dual flush water closets, use the averaging method described in Step 3 under Option 1 in the Step-by-Step Guidance section of this prerequisite in the LEED O+M v4 Reference Guide. The value for weighted average flush rate must be based on an assumption of two low flow flushes per person per day and one high flow flush per person per day, and it must account for the fact that males will use urinals (if present), not water closets, for the low flow flushes.
- The LEED v4 Indoor Water Use Calculator includes a built-in dual flush calculator.
- If completely vacant spaces were present during the performance period, ensure the project has adhered to the guidance under the Variable Occupancy header in the Further Explanation section of this prerequisite in the LEED O+M v4 Reference Guide.
- Non-potable water use does not count toward compliance with the prerequisite requirements. Non-potable water use can count towards additional savings in WEc Indoor Water Use Reduction.
- For Retail, Hospitality, and Schools projects, the process and appliance water equipment purchasing policy should cover at minimum the purchase of products from Table 2 in the

prerequisite requirements that are within the building and site management's control.

► **Option 2: Metered Water Use**

- Verify that water systems serving at least 80% of the indoor plumbing fixtures and fittings are submetered. If not, the project must use Option 1.
- If any vacant spaces were present during the performance period, be sure to identify the occupancy rates for the performance period and baseline period. If there was more vacant space during the performance period than the baseline period, demonstrate that the water use savings are not due to the decrease in occupancy.

## WE Prerequisite: Building-Level Water Metering

- Ensure the letter of commitment is signed by a representative of the project owner organization.
- Ensure the project owner has clearly identified within the letter that when sharing the water usage data with USGBC, it will be compiled into monthly and annual summaries, for a five-year period (at minimum) beginning on the date of LEED certification.
- Note that the water usage data can be shared via the USGBC approved data template or a third-party data source. To see the most recent list of data sharing pathways, visit USGBC's credit library, at [usgbc.org/credits](http://usgbc.org/credits).

## WE credit: Outdoor Water Use Reduction

► **Option 1. No Irrigation**

- Make sure to include a description or 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.
- Remember that if an irrigation system is not installed, but the project is manually watered on an ongoing basis, it may not be meeting the Option 1 requirements. This Option is only applicable to projects with landscaping that does not require irrigation beyond a maximum two-year plant establishment period.
- Be sure that any temporary irrigation systems do not exceed the maximum two-year establishment period.

► **Option 2. No Irrigation Meter Installed**

- Remember that if an irrigation meter has been installed for at least 3 years prior to the 12-month performance period, Option 3. Irrigation Meter Installed must be used.
- Ensure to provide either the EPA WaterSense Water Budget Tool (accessible at [epa.gov/watersense/water\\_budget](http://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.

- The landscaped area should be consistent with the area of vegetation identified under SSc Site Development - Protect or Restore Habitat. Describe any justified differences in a narrative.
- 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 any provided landscape plans for clarity. These spaces can be included or excluded at the project team's discretion.
- Remember that natural surface water is not an eligible alternative water source. Eligible alternative water sources are listed in the Further Explanation section of this credit in the LEED O+M v4 Reference Guide.
- 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: Indoor Water Use Reduction

- **Option 1. Calculated Water Use**
- **Option 2. Metered Water Use**

## 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.
- For cooling towers and evaporative condensers, ensure that a potable water analysis has been conducted within five years of submission for certification, measuring at least the following five control parameters: calcium (as calcium hardness), total alkalinity, silicon dioxide, chloride, and conductivity.
- Ensure that cooling tower or evaporative condenser cycles are limited to avoid exceeding maximum concentration value for any of the five required control parameters: calcium (as calcium hardness), total alkalinity, silicon dioxide, chloride, and conductivity.
- If the number of cycles used for a given condenser water system exceeds the maximum number of cycles (i.e., the limiting factor), ensure that a narrative is provided that specifically describes the treatment strategy in place to maintain the appropriate levels of concentration and the method for removing or preventing deposit build-up.
- Ensure that all cooling towers and evaporative condensers have been accounted for.
- Ensure that the water analysis is performed for the makeup water used in the project's cooling towers and evaporative condensers.
- Refer to the LEED Pilot Credit Library regarding Pilot Alternative Compliance Path (ACP) options for projects with No Cooling Tower.

## WE Credit: Water Metering

- Remember that the interval between readings must be one week or less and the summaries must include all meters, including whole-building meters.
- When claiming credit for metering plumbing fixtures, clearly describe in a narrative how the metering configuration in place either measures 80% of the indoor plumbing fixtures and fittings or specifically isolates at least 80% of the water consumed by the water closets, urinals, lavatory faucets, kitchen sinks, and showers addressed by WEp Indoor Water-Use Reduction.

## ENERGY AND ATMOSPHERE

### EA Prerequisite: Energy Efficiency Best Management Practices

#### ► All (Except Data Centers)

- Ensure that the Current Facilities Requirements (CFR) and Operations and Maintenance Plan (OMP) documents include the systems narrative and building occupancy schedule for the entire project building. An excerpt of the sequence of operations, equipment run-time schedules, equipment setpoints, and preventive maintenance plan must be provided for at least two distinct systems.

- Whether providing an excerpt of the operations and maintenance plan (OMP) or the complete current facilities requirements (CFR) and OMP, ensure that all details required for each component as listed in the LEED O+M v4 Reference Guide are included. For example, the systems narrative must include information about system-specific setpoints, flows, and capacities, and must cover all major building systems and associated controls including the following: HVAC, electrical (power and exterior/interior lighting plumbing), building automation system (BAS), process equipment, heating and cooling systems for process equipment, and supplemental heating and cooling systems.
- Describe all mechanical, electrical, plumbing, and control systems at the project building and ensure that specific details are included. Specific design criteria (e.g. AHU design flow rates for supply, return, exhaust, and outdoor air flows, chiller tonnage, etc.) and current equipment status (operational, construction shut-down, inactive, etc.) must be included.
- Ensure that the sequence of operations has been provided for two distinct systems and that it prescribes processes by which building systems respond to external conditions (e.g. temperature, humidity) and commands (e.g. on, off, modulate). All modes of operation should be covered by the documentation.
- Remember that all documentation must be project specific. If generic or corporate templates for a sequence of operation are used, ensure that they are annotated to indicate which aspects apply to the project building and where project-specific equipment deviates from the template.
- Ensure that the excerpt of the preventive maintenance plan includes the schedule of activities and all required tasks for each activity for two distinct systems. For example, the preventive maintenance for an air handling unit may have monthly, quarterly, and annual activities with distinct tasks (e.g. check belt tightness, lubricate fan shaft bearings, etc.) completed at each time period.
- If providing a complete operations and maintenance plan (OMP), ensure that the documentation is clear and concise (i.e. summarize the plan or annotate the building's complete documentation), and that all building systems and equipment described in the systems narrative have been addressed.
- If the project has a significant amount of process energy use, ensure that the documentation for this prerequisite also addresses process equipment. Process loads are not excluded from best management practices for energy efficient operations.
- Ensure that the ASHRAE preliminary energy use analysis and ASHRAE Level 1 walk-through assessment include all required elements described in the ASHRAE Procedures for Commercial Building Energy Audits, Second Edition. For example, a preliminary energy use analysis requires an estimate of the end-use breakdown for the project building, while a calculated (and more detailed) end-use breakdown is a requirement of the Level 2 energy audit.
- Ensure that the energy use index (EUI) analysis includes target indices related to energy and cost reduction goals. These are not target ENERGY STAR scores, but should be used to inform decisions regarding recommendations from the energy audit process.
- The target-setting process for the EUI analysis is intended to represent savings to be achieved, not those that have already occurred. Ensure that a future target is presented in the documentation as the achievement of prior targets will be reflected in EAp Minimum Energy Performance and EAc Optimize Energy Performance.



- Ensure that the end-use breakdown addresses all major end-use categories expected to be present in the project.
- Although the end-use breakdown required for an ASHRAE preliminary energy use analysis may be estimated, ensure that it is project specific. Common assumptions for end-use breakdowns (e.g. Energy Information Administration, 1995 Commercial Buildings Energy Consumption Survey data) often require adjustment for factors such as the project's location, specific tenant activities (e.g. large quantities of computers, etc.), or occupancy patterns (e.g. 24/7 operations versus 9-5/M-F operation), among other factors.
- When preparing the list of potential no-cost and low-cost improvement opportunities as part of the ASHRAE Level 1 Report, ensure that the documentation includes the financial assessment (e.g., return on investment, payback) and maintenance implications of each opportunity.
- If an ASHRAE Level 1 audit has been conducted within the past five years, there is no need to repeat the procedure during the performance period, but an updated audit report must be provided that describes any significant changes in operating procedures or building systems, as well as any new energy conservation measures observed during the walk-through.
- If the project includes completely vacant spaces, ensure that vacant spaces have been accounted for in the building operating plan. For example, differences in setpoints and schedules for vacant spaces must be identified.

## EA Prerequisite: Minimum Energy Performance

### ► All Projects

- Ensure that calibration report summaries are provided for energy meters owned by the building owner, management organization, or tenant, and that they confirm that the meters have been calibrated within the manufacturer's recommended interval. For more information, refer to the Meter Calibration header in the Further Explanation section of this prerequisite in the LEED O+M v4 Reference Guide.

### ► Case 1. ENERGY STAR Rating, Recent Label

- Ensure that the documentation provided confirms that the building earned the ENERGY STAR within the 12 months preceding the LEED O+M application date.
- Ensure that the documentation provided clearly verifies the score associated with the ENERGY STAR certificate earned by the project building. To document a higher ENERGY STAR score than what was achieved in the ENERGY STAR certification, the No Recent Labels path must be pursued and all required documentation provided.

### ► Case 1. ENERGY STAR Rating, No Recent Label

- If sharing the ENERGY STAR Portfolio Manager account with the USGBC, ensure that the account has been shared with the GBCI Master Account ('LEED-EBOM GBCI Certification').
- To share the project building, follow the instructions detailed [here](#)



- When connecting to the GBCI Master Account, search for “LEED-EBOM” as the Name criteria, and connect with the account called “LEED-EBOM GBCI Certification.” Note that the Master account “USGBC – LEED Performance Reporting” offered in EAp Building Level Energy Metering is not the same master account as offered in EAp Minimum Energy Performance.
- Ensure that at least three months of energy bills have been provided for each energy source at the project building and that the energy bills provided correspond to the monthly energy use summaries entered into Portfolio Manager. Note that both the dates of the service period and the energy consumption values must be consistent.
- Ensure that the building occupancy is reported consistently throughout the LEED application. Note that the Number of Workers on the Main Shift reported in Portfolio Manager (e.g., for offices, etc.) represents the number of workers who are present at the same time.
- Ensure that the gross floor area is reported consistently throughout the LEED application. Additionally, ensure that the area reported meets the ENERGY STAR definition of gross floor area included in the Portfolio Manager glossary. For example, parking may not be included in the gross floor area and is reported separately in Portfolio Manager.
- Ensure that the number of operating hours input into Portfolio Manager is comparable to that identified in other credits and prerequisites and that it only includes time when the majority of the regular building occupants are present. Additionally, ensure that any building spaces with weekly operating hours that differ by ten hours or more are listed separately within Portfolio Manager. Note that the operating hours must not include time when the facility is occupied only by cleaning, maintenance, security, or other support personnel. Additionally, note that operating hours generally differ from equipment run-time hours.
- Ensure that all space types are categorized according to ENERGY STAR Portfolio Manager Guidance. For example, the gross floor area of the project’s office space should include all spaces within the building including offices, conference rooms and auditoriums, kitchens used by staff, lobbies, fitness areas for staff, storage areas, stairways, and elevator shafts. Restaurants, retail, or services (dry cleaners) should be included as part of the [Office Property Use](#), unless it meets one of the 4 exceptions to the rule.
- Ensure that Retail spaces are categorized according to Portfolio Manager Guidance. Note that according to the [ENERGY STAR definition](#), a space should be entered as Retail only if the retail space is a single store that is at least 5,000 square feet and has an exterior entrance to the public. Individual retail stores that are part of a larger non-mall building (i.e. office or hotel) are not eligible to receive an ENERGY STAR score and should be included as part of the main building space use type.
- Note that according to the [ENERGY STAR Buildings FAQs](#), EPA recommends you enter as few Property Uses as possible, as it does not increase your score to enter more space types and is consistent with the benchmark dataset. In fact, even if you enter multiple Uses separately, Portfolio Manager will add them back together into the Main Property Use before calculating your metrics. Also, entering one Property Use will simplify your property and make troubleshooting errors easier.
- Ensure that third-party energy sub-meters serving spaces that are excluded from the Portfolio Manager documentation are included in the LEED form. Similarly, ensure that calibration report summaries are provided for sub-meters serving excluded spaces if the sub-meters are owned by the building owner, management organization, or tenant.

- If any areas have been appropriately excluded from the Portfolio Manager documentation, ensure that summaries of monthly energy use for this area are provided. Additionally, ensure that at least three months of energy bills have been provided to verify this energy use. Refer to [ENERGY STAR Buildings FAQs](#) for more information on what may be excluded from Portfolio Manager.
- If including a Data Center space within Portfolio Manager, ensure that the Data Center satisfies the [ENERGY STAR definition of a data center space](#). For office buildings, server rooms that do not meet the definition of a Data Center but have separate cooling systems and operating hours that differ from the rest of the building must be entered as a separate space in Portfolio Manager using the Office space type. In this space, enter the weekly operating hours, zero workers, and a number of PCs that approximates the number of servers in the space.
- Ensure that the number of computers included for each space in the Portfolio Manager documentation represents the total number of computers, laptops, and data servers at the property. Ensure that this number does not include tablet computers, such as iPads, or any other types of office equipment.
- If vacant space is at least 10% of the building's gross floor area (over 12 months), ensure that it is reported appropriately as a separate Property Use, as follows:
  - Property Type = Property Type that it would be if it was occupied (Office, Medical Office, etc).
  - Weekly Operating Hours = 0
  - Workers on Main Shift = 0
  - Number of Computers = 0
  - Percent Heated and Percent Cooled = Report conditioning as it occurs in the vacant space
- For more information, refer to the [Portfolio Manager Frequently Asked Question](#) that addresses this issue.
- Ensure that the number of computers included for each space in the Portfolio Manager documentation represents the total number of computers, laptops, and data servers at the property. Ensure that this number does not include tablet computers, such as iPads, or any other types of office equipment.
- Ensure that energy generated by an on-site solar array is correctly reported in Portfolio Manager. Note that exported energy generated by the on-site solar array may not be identified as on-site renewable energy that is consumed on-site. This would not reflect the true energy efficiency of the building. Refer to the [ENERGY STAR Portfolio Manager Frequently Asked Questions](#) for additional information. All energy that is consumed by the project building from the grid must be entered into Portfolio Manager, and any onsite renewable energy that is sold to the grid must be tracked separately as such in [Portfolio Manager](#).

- Portfolio Manager must accurately reflect the total amount of energy generated by the solar array and consumed onsite as well as grid-provided electricity that was consumed by the project building. For all onsite renewable energy that was generated, ensure that the energy meter in Portfolio Manager Accounts for this and select the proper options in Portfolio Manager designating whether any of the renewable energy is sold or whether it is all consumed onsite, as outlined in the [Frequently Asked Questions for Portfolio Manager](#).

► **Case 2, Option 1. Projects Not Eligible for ENERGY STAR Rating, Benchmark Against Typical Buildings**

► **Case 2, Option 2. Projects Not Eligible for ENERGY STAR Rating, Benchmark Against Historical Data**

► **Case 2 - Option 1 or 2. Projects Not Eligible for ENERGY STAR Rating**

- Note that all buildings that are eligible to receive an ENERGY STAR rating based on their space types must follow Case 1. Only buildings that are not eligible for an ENERGY STAR Rating may pursue Case 2.
- Ensure that the weather-normalized source energy use intensity from Portfolio Manager is input into the LEED form. Note that this value is different from the source energy use intensity and the site energy use intensity.
- Ensure that the correct space types are input into Portfolio Manager and that they are based on the space use definitions utilized in the Commercial Buildings Energy Consumption Survey, as described on the [ENERGY STAR website](#).
- For manufacturing projects, ensure that the energy consumption is normalized on a per production unit basis, as indicated in Table 4 under the Further Explanation section of this prerequisite in the LEED O+M v4. Provide a narrative summarizing how manufacturing output and process loads impact energy use at the project building. To normalize energy use, identify the most appropriate metric for determining the source energy use intensity for the remainder of the facility relative to the manufacturing process (e.g., Btu/pound, Btu/unit, etc.). Determine the energy use intensity for each historical year of data and for the current year of data based on this metric. Provide documentation demonstrating the normalization methodology used.
- Ensure that the documentation provided for this prerequisite as well as the remainder of the LEED application demonstrates that the project includes a single building (i.e., not a portion of a building and not multiple buildings). For more information regarding this requirement, as well as its limited exceptions (e.g., hospitals, etc.), refer to the Minimum Program Requirements in the LEED O+M v4 Reference Guide, with Addenda. Additionally, refer to the [Portfolio Manager guidance](#) regarding what constitutes a single structure. If you have questions regarding whether your project constitutes a single building, please [contact USGBC](#) to discuss your project prior to proceeding.

## EA Credit: Optimize Energy Performance

- Ensure that the performance threshold indicated in this credit is consistent with EAp: Minimum Energy Performance.

## EA Prerequisite: Building-Level Energy Metering

- Ensure that the commitment to share energy use data with USGBC is for five years and has been signed by a representative of the project owner organization.
- Ensure that the total building energy consumption is metered at the building level. This must include all fuel sources and all areas within the project boundary, such as parking garages.

## EA Credit: Fundamental Refrigerant Management

### ► No CFC's

### ► Phase out plan

- Ensure that the CFC phase-out plan includes a firm timeline of no more than ten years from the end of the LEED O+M performance period. Ensure that the plan includes information regarding leakage rates and quantities.

### ► Economic analysis

- Ensure that the qualified third-party audit shows that both replacement and conversion of the CFC-containing base building HVAC&R systems are economically infeasible.

### ► Phase-out plan and Economic Analysis Options

- If CFC-based refrigerants are maintained in the building, ensure that the project reduces annual leakage for CFC-based equipment to 5% or less using the procedures in the Clean Air Act, Title VI, Rule 608, governing refrigerant management and reporting (or a local equivalent for projects outside the U.S.), and reduces the total leakage over the remaining life of the equipment to less than 30% of its refrigerant charge.

### ► All Options

- Ensure that all equipment containing 0.5 or more pounds of refrigerant has been accounted for (e.g., commercial refrigeration equipment for restaurants, data center cooling equipment, etc.) and that it is consistently identified throughout the LEED application. If the project is reusing existing HVAC&R equipment with CFC-based refrigerants, ensure that all CFC-based equipment with 0.5 or more pounds of refrigerant is listed on the form.

## EA Credit: Existing Building Commissioning – Analysis

### ► All Options

- Ensure that all energy-using and energy-producing systems have been accounted for.
- Be sure to include the energy use breakdown associated with each major system and/or end use based on estimated or measured data. If using estimated data, use one of the following methods: 1) Submetering specific systems and equipment, using either permanently installed meters or temporary data collectors; 2) Engineering analysis, such as energy modeling or manual calculations.

- The energy use breakdown for the building must include lighting, plug loads, heating, cooling, ventilation, and manufacturing process loads (as applicable). A breakdown of consumption by fuel type does not satisfy credit requirements.

#### ► **Option 1. Commissioning**

- Remember that the analysis phase of the commissioning plan is separate from the ASHRAE Level 1 Audit required by EAp Energy Efficiency Best Management Practices, and that using the results from the ASHRAE Level 1 Audit do not meet the requirements of this credit for Option 1.
- Ensure that a copy of the complete commissioning plan is provided.
- Ensure that the provided commissioning plan includes all testing requirements listed in the Step-by-Step Guidance and Further Explanation sections of the LEED O+M v4 Reference Guide.
- Remember that preventive maintenance and commissioning are two separate activities. Performing preventive maintenance on all equipment is a requirement of EAp Energy Efficiency Best Management Practices and does not meet the intent of this credit.
- Ensure that the commissioning plan not only describes the commissioning process in general, but also includes the specific details required by the Credit Form. Refer to Steps 2 through 6 in the Step-by-Step Guidance section and the Existing Building Commissioning Plan section under Further Explanation for this credit in the LEED-O+M v4 Reference Guide for more information on what details are required.
- Ensure that a table or similar documentation of the commissioning master list of findings, including any operating problems affecting either occupants' comfort or building energy use and proposed or potential operational changes that will solve these issues has been provided. The master list of findings differs from a list of proposed capital improvements.
- Ensure that a list of all capital improvement measures identified is provided, and includes the simple payback period, the rate of return, or the cost-benefit ratio for each measure.
- Be sure to include a commissioning summary report that includes all information listed on page 2 of the Credit Form.

#### ► **Option 2. Energy Auditing**

- Be sure to include all required details for each identified practical capital improvement measure as described in ASHRAE's Procedures for Commercial Building Energy Audits, Second Edition (2011).
- Provide a list of capital improvement measures identified, but felt to be impractical, with reasons for rejecting the implementation of the measures.
- Remember that ASHRAE's Procedures for Commercial Building Energy Audits, Second Edition (2011) requires that recommended measurement and verification methods be included for each proposed measure.
- If the ASHRAE Level 2 audit was performed within the last five years, a new audit is not required to be performed during the performance period, but the audit report and findings must be updated.

- All data center projects must complete the Air-Management Tool spreadsheet and Electrical Systems Tool spreadsheet from the DC Pro System Assessment Tools, in addition to the requirements stated in the LEED O+M v4 Reference Guide for the chosen compliance path.

## EA Credit: Existing Building Commissioning - Implementation

- Remember that to earn this credit, EAc Existing Building Commissioning - Analysis must be attempted and earned.
- All no- or low-cost measures identified as part of the process for EAc Existing Building Commissioning - Analysis are required to be implemented.
- Ensure that a copy of the five-year capital plan is provided, and includes a timetable for implementation.
- Remember that this credit builds off of the commissioning plan or ASHRAE Level II Audit performed for EAc: Existing Building Commissioning—Analysis; therefore, the implemented low/no cost measures are required to be a result of the ongoing commissioning exercise or ASHRAE Level II Audit, not the ASHRAE Level I Audit.
- Be sure to provide details on the training program to provide building operations staff with thorough knowledge of how to operate new or significantly altered equipment.
- Be sure to update the operations and maintenance plan and the current facilities requirements as needed to incorporate the newly implemented improvements.

## EA Credit: Ongoing Commissioning

- Remember that EAc Existing Building Commissioning - Analysis and EAc Existing Building Commissioning - Implementation must be attempted and earned to earn this credit.
- To satisfy the credit requirements, an ongoing commissioning cycle frequency of no more than 24 months is required. In addition, note that ongoing commissioning activities must occur at least quarterly for the first year.
- Remember that preventive maintenance and commissioning are two separate activities. Performing preventive maintenance on all equipment is a requirement of EAp Energy Efficiency Best Management Practices and does not meet the intent of this credit.
- The ongoing commissioning program must define measurement requirements (meters, points, metering systems, data access), the points to be tracked, with frequency and duration for trend monitoring, and the limits of acceptable values for tracked points and metered values. Functional performance testing includes device checks, sensor checks, functional or operational testing, alarm testing, point trending, and metering.
- Ensure that all direct energy-consuming and energy-producing systems, including, but not limited to, lighting, process loads, HVAC&R, domestic water heating, and renewable energy systems are included in the ongoing commissioning process.

- Ensure that the ongoing commissioning plan includes all required elements of ongoing commissioning (as opposed to retro-commissioning). Remember that ongoing commissioning is generally undertaken after a full retro-commissioning has been completed. The Step-by-Step Guidance section of this credit in the LEED O+M v4 Reference Guide provides details on what must be included as part of the ongoing commissioning process.
- All activities and tasks implemented as part of the ongoing commissioning process must be tracked, and a table or similar documentation listing these must be provided. Only activities and tasks completed within 24 months of the LEED application should be included.

## EA Credit: Advanced Energy Metering

- Ensure that meters used towards credit achievement have all of the required characteristics as listed in the Rating System, and that documentation confirming the characteristics is provided for review.
- Ensure that each individual end use that represents 20% or more of total annual building energy consumption is separately metered, with the exception of plug loads which are not required to be separately metered. Examples of building systems are listed in the Determining Major Energy End Uses section of this credit in the LEED-O+M v4 Reference Guide.
- Ensure that meters sufficiently isolate a single system or end-use. For example, a meter that measures the energy consumption of lighting and plug loads does not meet the credit requirements, nor does a tenant meter that measures all energy consumed by a building tenant.
- Ensure that manually read meters are not included, as they do not meet the credit requirements.
- Ensure that advanced energy metering is in place for all whole-building energy sources used by the building.
- Ensure that meters are permanently installed, record at intervals of one hour or less, and transmit data to a remote location.
- Ensure that the data collection system is capable of storing all meter data for at least 36 months.

## EA Credit: Demand Response

### ► Case 1. Demand Response Program Available

- Ensure that the demand response program in place is either semi-automated or fully automated. A manual demand response program does not meet the credit requirements.
- Ensure that the documentation provided for proof of enrollment in a demand response program includes all of the required information listed on the Credit Form.
- Ensure that documentation is provided demonstrating that the program has the ability to shed at least 10% of the annual peak electricity demand. Peak demand must be based on electric utility bills.
- On-site electricity generation does not meet the intent of the credit and may not be used to meet the required load reduction.



- Ensure that strategies used to achieve demand reduction do not affect compliance of other prerequisites and credits. For example, under EQp Minimum Indoor Air Quality Performance, minimum outside airflow must be provided during all operating conditions.

► **Case 3. Permanent Load Shifting**

- Ensure that the demand response program in place is either semi-automated or fully automated. A manual demand response program does not meet the credit requirements.

## EA Credit: Renewable Energy and Carbon Offsets

► **Off-Site Renewables**

- Be sure that the total energy use listed in the form matches the energy use values reported in the final EAp Minimum Energy Performance submittal.
- Ensure that the contract demonstrates that Green-e certified renewable energy has been purchased in the amount indicated on the form.
- If the renewable energy is not Green-e certified, provide documentation showing Green-e equivalence, including: 1) equivalence of the green power performance standards for the provider to Green-e as outlined under the Establishing Green-e Equivalency header in the Further Explanation section of this credit in the LEED O+M v4 Reference Guide, and 2) independent, third-party verification that those standards are being met by the green power supplier over time.
- Ensure that the contract demonstrates that the renewable energy has been or will be purchased for at least a two-year period.
- Ensure that the calculations account for all fuel sources used by the project building.
- Remember that Green-e certified renewable energy certificates are only approved to offset electricity use at the project building. Green-e certified carbon offsets must be used to offset emissions from all other fuel sources used by the project building.
- Provide a fully executed copy of the renewable energy contract that is signed by all applicable parties.
- Be sure not to complete the table on the Credit Form for non-electric energy consumption if the only fuel source for the building is electricity.
- For Guarantees of Origin (GOs), be sure to provide the following: confirmation that the renewable energy installation is not in a nature reserve area, the rating of the hydropower facility under the Water Framework Directive or proof of certification under a sustainable hydropower label, the country of EU biomass origin, and proof of GO cancellation.

► **On-Site Renewables**

- Ensure that any on-site renewable energy is eligible for this credit by referring to the Further Explanation, Eligible Renewable Energy Systems section of this credit in the LEED O+M v4 Reference Guide.



# EA Credit: Enhanced Refrigerant Management

## ► Option 1. No Refrigerant or Low-impact Refrigerants

## ► Option 2. Calculation of Refrigerant Impact

- Ensure that all equipment containing 0.5 or more pounds of refrigerant has been included on the form (e.g., commercial refrigeration equipment for restaurants, data center cooling equipment, etc.) and that it is consistently identified throughout the LEED application.
- Ensure that the Leakage Rate (Lr) is 2% for each piece of equipment, as required in the reference guide and on the LEED Form.
- Ensure that the Equipment Life values used in the form calculations align with the default values provided in Table 2 from the reference guide. If the calculations include non-default Equipment Life values, provide manufacturer documentation clearly justifying the alternative equipment life values used.
- Ensure that the values for the Refrigerant Charge (Rc) of Variable Refrigerant Flow (VRF) systems are correct and that documentation is provided to justify the listed values. Note that all refrigerant used to operate the system must be accounted for (e.g., indoor units, outdoor units, and interconnecting piping), not just the refrigerant within the outdoor units. Additionally, note that Rc values for VRF systems are not typically below 2 lb/ton.
- Ensure that the documentation provided for EAp Fundamental Refrigerant Management fully addresses all requirements.

## MATERIALS AND RESOURCES

### MR Prerequisite: Ongoing Purchasing and Waste Policy

- If the project does not meet at least the 75% waste diversion rate threshold under MRc Solid Waste Management - Ongoing during the performance period, then be sure to perform a waste stream audit of ongoing consumables in accordance with the Step-by-Step Guidance section of this prerequisite in the LEED-O+M v4 Reference Guide.
- In the policy, include a physical and programmatic scope, duration of applicability, responsible parties, sustainability goals and objectives, performance metrics, procedures and strategies for implementation, and a quality assurance process, as required by the Getting Started section of the LEED O+M v4 Reference Guide, under Effective Policy Development.
- Be sure to address at least the five most-purchased product categories for the building as well as those listed in the prerequisite.
- In the policy, establish sustainability criteria for ongoing consumables based solely on the requirements of MRc Purchasing - Ongoing.
- Be sure that the policy establishes quantitative goals and performance metrics for each aspect related to purchasing. As an example, a target percentage of purchases for each type of material that meets the applicable sustainability criteria, measured by cost, may be established (e.g., 75% of ongoing consumables purchases meet the required sustainability criteria, by cost).

- Remember that the ENERGY STAR criterion may only be applied to equipment types that do not yet fall under the EPEAT rating systems. Be sure that the policy indicates that electric-powered equipment must have an EPEAT Silver rating or better in order to be considered environmentally preferable.
- Be sure that the policy includes quantitative goals and performance metrics for each aspect of the policy related to waste management. As an example, a goal could be set for a specific percentage of each waste category to be diverted (by weight or volume).
- Note that school and hospitality projects must specifically include goals and performance metrics for the diversion of food waste, in addition to the five most purchased product categories, durable goods waste, and hazardous waste.
- Include specific details in the policy regarding the procedures and strategies in place to ensure the safe disposal of batteries and lamps.
- Remember that this prerequisite's requirements as they relate to waste are focused on the actual recycling or diversion of waste that has already been generated by the project building. While the reduction of waste generated is a commendable approach, this is outside the scope of the waste policy requirements under this prerequisite.
- If performing a waste audit, ensure that the documentation makes it clear that all waste and recycling generated during the audit period was measured using the methodology described in the Further Explanation section of this credit in the LEED O+M v4 Reference Guide. All of the waste and recycling generated and collected during the audit period must be measured and physically sorted into different types of waste.
- If performing a waste audit, ensure that the audit results reflect the destination of the recyclables and waste before the audit rather than any adjustments by auditors, vendors, or janitorial staff.
- It is atypical that 100% of the waste found in the audit would have been properly recycled by the occupants. If this is the case, be sure to confirm that the results documented in the audit report reflect the destination of the recyclables before the audit and do not reflect any additional diversion resulting from the audit.
- A policy template is available under the Resources section of [this prerequisite in the LEED Credit Library](#), and may be helpful as a reference. If using this template, ensure that it is tailored as appropriate to reflect the circumstances of operations in the project building.

## MR Prerequisite: Facility Maintenance and Renovation Policy

- In the policy, include a physical and programmatic scope, duration of applicability, responsible parties, sustainability goals and objectives, performance metrics, procedures and strategies for implementation, and a quality assurance process, as required by the Getting Started section of the LEED O+M v4 Reference Guide, under Effective Policy Development.
- Be sure to clearly distinguish routine maintenance from renovations in the policy, as required within Step 2 in the Step-by-Step Guidance section of this prerequisite in the LEED O+M v4 Reference Guide.
- Ensure that the facility maintenance and renovation policy addresses furniture disposal.

- Be sure that the policy includes quantitative goals and performance metrics for each aspect of the policy. As an example, a goal could be set for a specific percentage of each waste category to be diverted (by weight or volume).
- Be sure that the policy specifies an individual or team who is accountable for the implementation of the policy. At a minimum, include the name of the individual(s) or job title(s) responsible for overseeing the policy.
- Be sure to address safe storage and recycling and diversion of waste associated with facility maintenance activities. Ensure that the policy includes a goal and performance metric for the diversion of this waste type.
- Ensure that the policy includes requirements for each renovation project to establish waste diversion goals, target five materials for diversion, approximate the volume of waste anticipated, and identify waste diversion strategies to be used.
- Be sure that the indoor air quality (IAQ) management policy includes all elements listed in the LEED O+M v4 Reference Guide.
- Ensure that the policy includes provisions to develop a plan to determine whether a flush-out or air quality testing is needed after construction ends and all interior finishes are installed, but before occupancy.
- A sample policy template is available from the Resources tab of [this prerequisite in the LEED Credit Library](#) and may be helpful as a reference. If using this template, ensure that it is tailored as appropriate to reflect the circumstances of operations in the project building.

## MR Credit: Purchasing - Ongoing

- Be sure to provide sustainable criteria documentation for 100% of the purchases used to demonstrate credit compliance for the following, as applicable:
  - Sustainable agriculture
  - Bio-based materials
  - Paper and wood products (i.e. Vendor Chain of Custody certificate numbers for all paper and wood products with FSC certification)
- Remember that in order to demonstrate compliance for this credit, 40% of equipment purchases must either have a silver Electronic Product Environmental Assessment Tool (EPEAT) rating or better, OR, if the equipment does not yet fall under the EPEAT rating systems, it must be ENERGY STAR qualified or performance equivalent for projects outside the U.S.
- Be sure to provide a clarification narrative when no applicable electric-powered equipment was purchased during the performance period.

## MR Credit: Purchasing - Lamp

- Use the mean lumens value in the calculations. Refer to the Further Explanation, Reading Lamp Cutsheets section of this credit in the LEED O+M v4 Reference Guide for more information.
- Ensure that all mercury-free lamp types included are at least as energy efficient (lumens/W) as their mercury-containing alternatives.
- In the case when manufacturer documentation does not identify the mean lumens (as seen on manufacturer documentation for CFL lamps), subtract 20% from the initial lumen value.

## MR Credit: Purchasing – Facility Maintenance and Renovation

### ► Option 1. Products and Materials

- Remember that mechanical and electrical equipment, plumbing components, and specialty equipment, such as escalators and elevators must be excluded from the calculations for this credit.
- Remember that documentation from manufacturers or suppliers to verify product compliance is required for 100% of purchases of wood products, bio-based materials, GreenScreen Benchmark materials, Cradle to Cradle certified products, REACH optimization products, product manufacturer supply chain optimization products, and products with low emissions of VOCs. The documentation must clearly show that the product meets any criteria selected in the Purchasing Calculator.
- 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)

### ► Option 2. Furniture

### ► Option 3. No Alterations or Furniture Purchasing

## MR Credit: Solid Waste Management – Ongoing

- Waste diversion must be tracked over the performance period to earn this credit. Extrapolations from waste audits performed are not allowed.
- Ensure that the form narrative describes how mercury-containing lamp recycling and safe storage has been implemented as part of the solid waste management policy during the performance period. Describe the means for verifying the mercury-containing lamp diversion rate.

- If the diversion rate documented for the performance period is significantly higher than the rate found in the waste stream audit provided for MRp Ongoing Purchasing and Waste Policy, provide a narrative to justify the difference.
- Remember that mercury-containing lamps and batteries are considered hazardous waste, and are required to be disposed of safely. For this reason, mercury-containing lamps and batteries should not be included in the calculations for this credit.
- K-12 schools may exclude food waste from the final performance calculations if evidence can be provided that food waste composting services are not available or are not economically feasible. Include evidence that, during the performance period, an awareness program was implemented to encourage occupants to reduce food waste. See the credit requirements for additional guidance.

## MR Credit: Solid Waste Management—Facility Maintenance and Renovation

### ► All Options

- Remember that to earn this credit, qualifying maintenance or renovation projects that produced waste applicable to this credit must have occurred over the performance period.
- Remember that mechanical and electrical equipment, plumbing components, and specialty equipment, such as escalators and elevators should be excluded from the calculations for this credit.
- This credit requires that the waste management plan implemented for each project over the performance period be provided. This plan must include the five materials targeted for diversion, approximate weight or volume anticipated, and the diversion strategies used.

## INDOOR ENVIRONMENTAL QUALITY

### EQ Prerequisite: Minimum Indoor Air Quality Performance

#### ► Case 1. System Able to Meet Required Outdoor Airflow Rates.

#### ► Case 2. System Unable to Meet Required Outdoor Airflow Rates

#### ► Combined Case 1 and 2

#### ► Case 1 and 2

- Determine whether your project is located in a non-attainment area for ozone. If your project is located in a non-attainment area for ozone and does not meet any of the Exceptions listed under Section 6.2.1.3 of ASHRAE 62.1-2010, ensure that an air-cleaning device for ozone is installed and that the device has a minimum volumetric ozone removal efficiency of 40%.
- Determine whether your project is located in a non-attainment area for PM2.5. If your project is located in a non-attainment area for PM2.5, ensure that MERV 11 particulate filters have been installed.

- Ensure that the ventilation system is set up to represent the worst-case condition (the condition that results in the least amount of outside air entering the building) during outside airflow measurement testing. A description of the outside airflow measurement method or protocol must be provided.
- Ensure that all air-handling units (AHUs), rooftop units (RTUs), and ventilation fans that supply ventilation to occupiable spaces have been accounted for.
- Ensure that all occupiable spaces have been accounted for. As indicated in the Definitions section of this prerequisite in the LEED O+M v4 Reference Guide, occupiable space includes enclosed spaces intended for human activities, excluding those spaces that are intended primarily for other purposes, such as storage rooms and equipment rooms, and that are occupied only occasionally and for short periods of time.
- Ensure that the calculations account for the appropriate zone population value (Pz), which should equal the largest (peak) number of people expected to occupy the ventilation zone during typical usage. The calculations must also account for the appropriate system population value (Ps), which should equal the largest (peak) number of people expected to occupy all ventilation zones served by the ventilation system during typical usage.
- Ensure that actual peak occupancy values are utilized in the calculations. Default occupancy values listed in table 6-1 of ASHRAE 62.1-2010 should only be used for completely vacant space.
- Ensure that partially occupied and vacant spaces have been accounted for under this prerequisite, as they are not exempt from the prerequisite requirements. For more information, refer to the Getting Started section of the LEED O+M v4 Reference Guide, under Variable Occupancy.
- Ensure that the project's ventilation systems have been categorized correctly as either single-zone systems, multiple-zone recirculating systems, or 100% outside air systems, and that the appropriate Ventilation Rate Procedure methodology has been followed. Note that the different calculation methodologies are incorporated into the Minimum IAQ Performance Calculator. The appropriate system type must be selected in the Calculator.
- Ensure that potentially critical zones have been analyzed for each system when performing the Ventilation Rate Procedure Calculations.
- Ensure that potentially critical zones have been identified correctly. Additionally, ensure that a sufficient number of potentially critical zones have been included in the calculations (to ensure that the critical zone is correctly identified). Refer to the Definition section of ASHRAE 62.1-2010 for additional information on what is considered a ventilation zone.
- Ensure that potentially critical zones have been identified in the supporting Ventilation Rate Procedure (VRP) calculations for AHUs serving vacant space. Zone level data is used to calculate the required outdoor air at the system level; therefore, sufficient information must be provided to show that potentially critical occupiable zones have been accounted for in the calculations individually to determine the critical zone. For an AHU that serves only vacant space, assume a reasonable distribution of future space use to identify potentially critical zones for the VRP calculations.
- Ensure that the Ventilation Rate Procedure Calculations are performed for the worst-case operating conditions. This typically occurs during heating mode when supply airflows are lowest or supply air temperature is highest.

- Determine whether the ventilation systems are constant volume or variable air volume. If the systems are variable air volume (VAV) systems, ensure that the Ventilation Rate Procedure calculations account for the worst-case conditions (typically when supply airflow volumes are at their minimum setpoints). The outside airflow measurements must also be performed for the worst-case operating conditions.
- Ensure that individual potentially critical zones (e.g., spaces with high occupant density such as conference rooms and meeting spaces, and spaces with low minimum flow per unit area or per person) are accounted for in the Ventilation Rate Procedure (VRP) calculations. If entering all ventilation zones into the calculator, the remaining ventilation zones listed may group a large number of spaces, as long as the space occupant category is the same (e.g., office), the space population density is similar, the value for  $E_z$  is the same, the  $V_{pz}$  value per unit floor area is similar, and the primary air fraction ( $E_p$ ) is similar. The values for  $A_z$ ,  $P_z$ ,  $V_{dz}$ , and  $V_{pz}$  should be entered as the sum of the values for all ventilation zones that are grouped into a single zone.
- If the project utilizes a demand controlled ventilation system with CO<sub>2</sub> sensors, ensure that CO<sub>2</sub> sensors are not located in the return air duct, as this design does not meet the prerequisite requirements. In addition, ensure that the minimum ventilation required by ASHRAE 62.1-2010 is being provided under all operating conditions while the project building is occupied. For additional information, refer to Section 6.2.7 of ASHRAE 62.1-2010 and Further Explanation, Considerations for Variable Operating Conditions under IEQp Minimum Indoor Air Quality Performance in the LEED O+M v4 Reference Guide.
- Ensure that the ventilation system is controlled to provide the required amount of outdoor air in each zone, based on current full occupancy. If the project includes demand controlled ventilation, ensure that the CO<sub>2</sub> setpoint for each zone is appropriate for the current full zone occupancy expected during normal operations. (Typically, the CO<sub>2</sub> setpoint is not the same for all zones.)
- If the project's ventilation system is designed with local recirculation (e.g., fan-powered VAV boxes), ensure that the Ventilation Rate Procedure (VRP) calculations account for this design and that the  $E_p$  and  $E_r$  variables have been adjusted accordingly.
- For constant volume systems without local recirculation, the  $V_{dz}$  and  $V_{pz}$  values are expected to be equal, resulting in an  $E_p$  value of 1.0. Supplemental heating or cooling equipment, such as perimeter fan coil units, that operate independently of the ventilation system should not be considered when determining whether the ventilation system includes local recirculation, as this equipment does not provide any ventilation benefit.
- Outside air flow rates must be measured at the system level for each individual ventilation system.
- Ensure that outside airflow calculations and measurements are performed at the furthest point along the distribution system prior to outside air being mixed with return air. For example, for projects in which a dedicated outdoor air supply fan supplies outdoor air to multiple air-handling units, the VRP calculations and outdoor airflow measures must be performed at the individual air handling units rather than at the dedicated outdoor supply fan.
- If using the temperature of outdoor air that enters the mixing plenum, the temperature of return air to the plenum, and the temperature of mixed outdoor and return air to determine the outdoor airflow rate, ensure that the temperature limitations of this methodology (as described in ASHRAE 111-2008) have been met.



- Ensure that documentation demonstrating that the HVAC system maintenance program has been implemented and maintained has been provided. Additionally, an explanation of whether or not the program is based on ASHRAE 62.1-2010, Section 8 is also required.
- Ensure that the ventilation systems provide the minimum ventilation rates required in the breathing zone whenever the zones served by the system are occupied, including all part-load conditions. If the ventilation system has been designed for varying operating conditions and short-term occupancy, refer to ASHRAE 62.1-2010 Section 6.2.6.2 for additional information.
- A new [USGBC VRP calculator](#) is available for LEED-O+M v4 projects.

#### ► Case 2

- Projects pursuing Case 2 must provide a narrative that clearly indicates why building AHUs are incapable of supplying the outdoor air flow required by ASHRAE 62.1-2010 and provide technical evidence that demonstrates that these limitations are true for all system operating conditions, even when functioning properly. If the project team is able to make minor adjustments, such as setpoint adjustments, damper positioning, etc., to meet the requirements of Case 1 they are required to do so for prerequisite achievement. It is not necessary make adjustments if it involves any amount of capital investment or equipment purchase.

#### ► Natural Ventilation

- Naturally ventilated spaces must meet the requirements of Section 6.4 of ASHRAE 62.1-2010.
- Documentation demonstrating that natural ventilation is an effective strategy for the project, as determined through the flow diagram process in Figure 2.8 of the CIBSE Application Manual 10: 2005, must be provided for naturally ventilated spaces.

## EQ Prerequisite: Environmental Tobacco Smoke Control (BD+C and ID+C)

- Be sure the documentation clearly confirms that signage has been posted within 10 feet (3 meters) of all building entrances indicating the no-smoking policy.
- A site plan, with a scale bar, must be included to clearly identify all designated exterior smoking areas, and to confirm that these areas are 25 feet from all entries, outdoor air intakes, and operable windows.
- It is required that schools prohibit smoking on the entire site. Signage must be posted at the property line indicating the no-smoking policy.
- 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, rather than simply including “no smoking” text.
- Signs with only crossed-out cigarette symbols and no text are unlikely to comply, unless posted around the property away from the building in strategic locations (e.g. near the site entrance or on tabletops), or accompanied by other signs more explicitly communicating the exterior policy. Consider the likely pedestrian and vehicular approaches to each building entrance and confirm that those approaches are intercepted somehow by a reasonably viewable sign that describes the exterior smoking policy.



- 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.
- 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.

#### ► Residential

- Ensure that testing reports are organized according to room names that correspond with architectural plans, for clarity.

## EQ Prerequisite: Green Cleaning Policy

#### ► Option 1. In-house Green Cleaning Policy

- Ensure that all Effective Policy Development elements from the Getting Started section of the LEED O+M v4 Reference Guide have been included.
- Include quantitative goals and performance metrics, in particular for cleaning products and equipment. As an example, a goal could be set for a specific percentage of cleaning product purchases (by cost) to satisfy the criteria of EQc Green Cleaning - Products and Materials.
- Sufficiently describe the responsible parties.
- Ensure the correct v4 sustainability criteria have been used, rather than using a policy with LEED O+M v2009 sustainability criteria.
- Remember that biodegradability alone is not one of the listed sustainability criteria for trashcan liners.
- Include all sustainability criteria in the Rating System, or provide a narrative to explain the exclusion of any of the criteria.
- If updating a policy that was based on the LEED O+M v2009 Rating System, make sure all credit identifiers/names are updated as well.
- Be careful about summarizing or abridging the list of sustainability criteria for powered cleaning equipment as listed in the Rating System. For example, ensure that the full guidance regarding ergonomic design is provided (including all ISO references), that all components of the sustainability criteria for vacuum cleaners are included, etc.
- There is a typographical error in the original version of the LEED v4 O+M reference guide for powered floor maintenance equipment. Use the updated version of the EQc Green Cleaning - Equipment reference guide language in the policy. In order to be considered environmentally preferred, powered floor maintenance equipment must have vacuums, guards, or other devices for capturing fine particles, and must operate with a maximum level of 70 dBA, in accordance with ISO 11201.

- Staffing and training of maintenance personnel must be covered by the policy. For more information, refer to the Establishment requirements of Option 1, under Personnel.
- The policy must include the project's established Standard Operating Procedures (SOPs).
- Develop guidelines for addressing the safe handling and storage of cleaning chemicals, and include these in the policy. Ensure that the policy includes a plan for managing hazardous spills and mishandling incidents.
- Develop goals and strategies for reducing the toxicity of chemicals used for laundry, warewashing, and other activities, and include these in the policy.
- Develop strategies for promoting hand hygiene, and include these in the policy.
- Protection of vulnerable building occupants during cleaning must be addressed in the policy.
- Anti-microbial soaps should not be described in the plan as an environmentally preferable practice.
- Remember that a contingency plan to manage staffing shortages must be included within the policy.
- Sample policies are available in the [USGBC LEED Credit Library](#).

► **Option 2. Certified Cleaning Service**

- Remember that even if using a third party certified cleaning service, a narrative, at minimum, must be provided to describe the goals and strategies for promoting the conservation of energy, water, and chemicals used for cleaning.

## EQ Credit: Indoor Air Quality Management Program

► **Indoor Air Quality Management Program**

- Ensure that the IAQ management program includes all components listed in Step 2 in the reference guide. If the documentation is lengthy, consider highlighting the required components to readily demonstrate that all items have been addressed.
- Ensure that the IAQ management program includes procedures to perform a full I-BEAM audit once every five years.
- Ensure that a report of the IAQ audit results is provided and that it includes all required elements:
  - List of the interior spaces, exterior spaces, and systems that were audited and a description of the checklist used for each.
  - List or brief description of all issues identified during the audit.
  - Description of actions taken to remedy no-cost issues and date of completion.
  - Description of the strategy and timeline to remedy issues that require expenditure.
  - Confirmation that the I-BEAM Baseline IAQ audit forms were used to conduct the audit.

- Ensure that the I-BEAM Baseline IAQ audit forms (Section A) are used to conduct the audit. The Section A Baseline IAQ Audit forms are available [here](#).
- Ensure that all HVAC system components included in the I-BEAM Baseline IAQ Audit forms (Section A) have been addressed. If any of the 24 HVAC system components listed in the I-BEAM forms are not included in the systems at the project building, consider providing a narrative explaining that this is the case.

## EQ Credit: Enhanced Indoor Air Quality Strategies

### ► Option 1. Entryway Systems

- Ensure that all regularly used exterior entrances have installed entryway systems at least 10 feet long in the direction of travel, including the main building entrance as well as building entryways attached to parking structures, underground parking garages, underground pathways, or outside spaces (including loading docks).
- Remember that typical building carpeting is not an acceptable permanent entryway system.

### ► Option 2. Filtration

- Be sure that the form narrative specifies the manufacturer recommended schedule for maintenance and replacement of the filtration media, and confirms that the media is replaced according to this schedule.
- Be sure to include a narrative or activity logs to demonstrate that filters were maintained during the performance period per the maintenance plan outlined in the Establishment section of this form.

### ► Option 2. Carbon Dioxide Monitors

- Ensure that CO2 sensors are configured to trend CO2 concentrations in intervals no greater than 30 minutes.
- CO2 sensors must be in all densely occupied spaces, and must be between 3 and 6 feet above the floor. Rooms smaller than 150 square feet (14 square meters) are exempt.
- Ensure that the narrative in the form summarizes the maintenance plan in place for all CO2 monitors, and that the plan includes regular testing and calibration of carbon dioxide sensors at least once every five years or per the manufacturer's recommendation, whichever is more frequent.
- Remember that a narrative or activity logs are required to document that CO2 sensors were maintained per the maintenance plan outlined in the Establishment section.
- Ensure that the carbon dioxide trending data provided covers a full 24-hour period to demonstrate that carbon dioxide trending is in place and is used to monitor carbon dioxide concentration.

### ► Option 2. Outdoor Air Monitoring for Mechanically Ventilated Spaces

- Ensure that the controls drawing sample or list of each of the outdoor air monitoring devices demonstrates that the outdoor air flow monitoring devices meet the credit requirements, as outlined in the Establishment and Further Explanation sections of this credit in the LEED O+M v4 Reference Guide.

- Ensure that the maintenance documentation (e.g., activity logs, narrative, etc.) demonstrates that airflow monitoring devices were maintained per the maintenance plan outlined in the Establishment section and confirms whether any devices were calibrated during the Performance Period.
- Ensure that the control system is configured to generate an alarm visible to the system operator if the outdoor airflow value varies by 15% or more from the outdoor airflow setpoint.
- It is only necessary to demonstrate compliance for one of the additional enhanced IAQ strategies listed under Option 2 on the Credit Form. Exemplary performance may be achieved if compliance with two or more additional enhanced IAQ strategies listed under Option 2 are demonstrated.

► **Option 2. Outdoor Air Monitoring for Naturally Ventilated Spaces**

► **Option 2. Alarmed Openings for Naturally Ventilated Spaces**

## EQ Credit: Thermal Comfort

► **Option 1. ASHRAE 55-2010**

- Ensure that a description of the thermal comfort criteria established for temperature, relative humidity, air speed and radiant temperature for the regularly occupied spaces has been provided and that it specifically demonstrates that they meet the criteria of ASHRAE 55-2010, Sections 5.2.4.1 and 5.2.4.2.
- Ensure that at least one air temperature sensor is installed in each individual thermal zone in regularly occupied spaces and that at least one humidity sensor is installed in each individual humidity zone in regularly occupied spaces.
- Ensure that the information provided clearly describes how air temperature and humidity measurements are captured and analyzed against the established comfort criteria.
- Ensure that humidity is continuously monitored within the occupied spaces with a maximum sample interval of 15 minutes.
- Note that radiant temperature is different from air temperature and is typically measured from within a space using handheld devices.
- At least one set of air speed and radiant temperature measurements must be taken for each thermal zone with occupied spaces during the performance period. To comply with credit requirements, air speed and radiant temperature are typically measured using handheld devices, as they cannot be measured from within the HVAC system.
- Ensure that the information provided clearly describes how the monitoring/testing data is used and the procedures in place for adjustments or repairs to be made in response to problems identified through monitoring, testing, and alarms associated with the thermal comfort criteria of ASHRAE 55-2010, Section 5.2. Ensure that these procedures include regular review of trending data from continuous monitoring and any periodic measurement reports.

► **Option 2. ISO and CEN Standards**

# EQ Credit: Interior Lighting

## ► Option 1. Lighting Control

- In order to contribute to compliance, individual occupant spaces must have lighting controls that provide at least three lighting levels or scenes: on, off, and a midlevel (defined as 30% to 70% of the maximum illumination level).
- Ensure that lighting controls in all multioccupant spaces (100%) have multizone control systems that enable occupants to adjust the lighting to meet group needs and preferences, with at least three lighting levels or scenes (on, off, midlevel); that lighting for any presentation or projection wall is separately controlled; and that switches or manual controls are located in the same space as the controlled luminaires (a person operating the controls must have a direct line of sight to the controlled luminaires).
- Ensure that all individual occupant spaces are included in the credit calculations. Individual occupant spaces are areas where an occupant performs distinct tasks, and should not be included in the calculations for multioccupant spaces. Examples of individual occupant spaces can be found under the Indoor Environmental Quality Overview Section of the LEED O+M v4 Reference Guide.
- Ensure that the calculations account for all shared multioccupant spaces. Shared multioccupant spaces are places of congregation, or where occupants pursue overlapping or collaborative tasks. Examples of shared multi-occupant spaces can be found under the Indoor Environmental Quality Overview Section of the LEED LEED-O+M v4 Reference Guide.
- Ensure that the number of individual occupant spaces included in the calculations is generally consistent with the number of FTE occupants in the building (as reported under other credits and prerequisites). Provide a narrative to address any apparent discrepancies (e.g., due to vacant spaces, etc.).
- Be aware that the number of individual occupant spaces with lighting controls should not exceed the total number of individual occupant spaces. Note that multiple forms of task lighting at one workstation must be counted as one workstation with lighting controls and may not be counted multiple times.
- Ensure that the lighting control strategy and method used to determine the number of individual occupant spaces accurately reports the percentage of compliant individual occupant spaces. For example, if documentation is provided showing individual occupant spaces with no lighting controls (e.g., photographs, etc.), it would be unexpected for the calculations to indicate that 100% of individual occupant spaces have individual lighting controls.

## ► Option 2. Lighting Quality

- Ensure that the Interior Lighting Calculator is provided. Note that at least four out of the eight strategies (A thru H) outlined under Option 2 in the Requirements section of this credit in the LEED O+M v4 Reference Guide must be implemented in order to demonstrate compliance for this credit.

- Strategies A–D are based on characteristics of the lighting fixtures, light sources, and luminaires. For strategies A, B, and C, the performance of lamps in a specific luminaire may need to be evaluated, either in the building or by a qualified lighting laboratory, to determine compliance. Project teams pursuing MRc Purchasing—Lamps may find synergies between the two credits. For strategies C and D, the total connected lighting load for the building needs to be determined. Strategies E–H are based on characteristics of the surfaces in the building and the illuminance levels that fall on those surfaces.
- Ensure that all regularly occupied spaces are included in the calculations. Regularly occupied spaces are enclosed areas where people normally spend time, defined as more than one hour of continuous occupancy per person per day, on average; the occupants may be seated or standing as they work, study, or perform other activities. For spaces that are not used daily, the classification should be based on the time a typical occupant spends in the space when it is in use. For more information, refer to the “Regularly versus nonregularly occupied spaces” section in the Indoor Environmental Quality Overview in the LEED O+M v4 Reference Guide.
- Ensure that the lamps identified in calculations for this credit are generally consistent with the lamps that have been identified in the Lamp Purchasing Calculator provided under MRc Purchasing - Lamps.
- Ensure that all light sources used in the building are accounted for when pursuing lighting strategy B. The only exceptions are lamps or fixtures specifically designed to provide colored lighting for effect, site lighting, and lamps or fixtures designed for some other special use.

## EQ Credit: Daylight and Quality Views

### ► Option 1. Daylight Measurement

- Ensure that the sample daylight measurement report demonstrates how the measurements were taken. The report must show recorded daylight measurements for at least one space, the height of the measurements, the measurement grid size, and results for the first and second measurements.
- Ensure that the daylight measurement report identifies the dates during which both sets of daylight measurements were taken and confirms that the measurement schedule in Table 1 under this credit in the LEED O+M v4 Reference Guide has been followed.
- Ensure that column N in the Calculator tab of the Daylight and Views calculator reflects only the regularly occupied areas that have illuminance levels between 300 lux and 3,000 lux for both sets of measurements.

### ► Option 2. Quality Views

- Ensure that sample documentation is provided demonstrating how the building was evaluated to meet the credit requirements for the view types. Ensure that documentation is provided for at least one space for each view type attempted.
- Ensure that spaces with views that are interrupted by permanent interior obstructions are not considered compliant for View Types 1, 2, and 3.
- For View Type 4, ensure that compliance has been correctly assessed based on the primary view or the break view.

### ► All Options

- Although not all gross floor area must be included in the calculations, if the amount of regularly occupied floor area identified in the calculations differs significantly from the gross floor area identified in LEED Online or elsewhere in the LEED application, consider providing a narrative to address the apparent discrepancy.
- Ensure that all regularly occupied floor area is included in the calculations. Note that regularly occupied spaces are enclosed areas where people normally spend time, defined as more than one hour of continuous occupancy per person per day, on average; the occupants may be seated or standing as they work, study, or perform other activities. For spaces that are not used daily, the classification should be based on the time a typical occupant spends in the space when it is in use.
- Ensure that the amount of regularly occupied floor area is reported consistently throughout the application.

## EQ Credit: Green Cleaning – Custodial Effectiveness Assessment

- Be sure that the audit report addresses the requirements outlined in Step 2 of the Step-by-Step Guidance section of this credit in the LEED O+M v4 Reference Guide.
- Ensure that the total area included in the audit is consistent with the total gross floor area of the project building identified in LEED Online and throughout the submittal. As spaces that are not cleaned are required to be included in the audit, some differences in square footage are acceptable, but large differences must be explained.
- Ensure that at least 10% of the cleanable area of the building is audited, as well as at least 10% of the number of rooms of each space type. At least five rooms must be audited for each space type (unless there are fewer than five rooms, in which case all rooms should be audited.)
- Appendix B in the LEED O+M v4 Reference Guide can help teams categorize space based on the 33 types of applicable space types that have been identified by APPA guidelines. When compiling the APPA forms, similar spaces maybe grouped to reduce the number of forms needed. Ensure that closed, private offices and open offices are not grouped together and are individually identified. Mechanical rooms and parking garages do not need to be audited. If the building contains space types not listed in Appendix B, select the closest category.
- Remember that each audited room must be examined in its entirety.
- Remember that an APPA score of 1 represents the highest level of cleanliness while a score of 5 reflects the most unkempt level of cleanliness.
- Ensure that the form narrative confirms that the strategies in the facility's green cleaning policy are being implemented, and describes how the cleaning staff performs routine and monitoring inspections.
- Ensure that the form narrative also describes opportunities identified for custodial effectiveness improvements where needed.



- The APPA audit can be conducted by a third party individual or by two individuals associated with the building management team. When using a third party to conduct the audit, ensure that the individual's professional experience validates their in-depth custodial knowledge. If using two individuals to conduct the audit, ensure that they are trained on APPA auditing procedures.

## EQ Credit: Green Cleaning – Products and Materials

- Ensure that the calculator identifies the specific Type 1 eco-label that the cleaning product has been certified under, rather than classifying the cleaning product as “Type 1 eco-label”. For example, cleaning and degreasing compounds could be labeled as “Blue Angel” rather than “Type 1 eco-label”.
- Teams are encouraged to use the official [LEED v4 green cleaning calculator](#) when compiling their data for this credit. If using a custom calculator, ensure that it includes all information required by the official LEED v4 calculator.
- For products that have not been certified under one of the third party standards listed in the credit requirements, remember that a side-by-side comparison of the applicable standard and the product's performance must be provided in full in order to demonstrate equivalence.
- Compostable or biodegradable trash bags do not contribute towards compliance unless they also meet the criteria for trash bags as outlined in the credit requirements.
- Ensure that all cleaning materials and products purchased during the performance period are included in the calculations. If purchases are made quarterly or in bulk, provide a narrative explaining these occurrences.

## EQ Credit: Green Cleaning – Equipment

- List the date of purchase for each item in the Green Cleaning Calculator. Estimated dates may be used for equipment purchased prior to the performance period. Verify that a phase-out plan was followed during the performance period for existing equipment that does not meet the criteria (to replace it with environmentally preferable products at the end of its useful life).
- Ensure the Green Cleaning Calculator has been provided and lists all janitorial equipment servicing the project building, including that owned by the building and by vendors. If the amount of equipment used is small or only consists of vacuum cleaners, consider including a narrative confirming that all equipment used in the building, regardless of ownership, has been included.
- Ensure that equipment is only considered compliant if all category-specific sustainability criteria have been met. For example, to be considered compliant, vacuum cleaners must be certified by the Carpet and Rug Institute Seal of Approval/Green Label Vacuum Program AND operate with a maximum sound level of 70 dBA or less in accordance with ISO 11201.
- This credit only pertains to equipment used inside the building. Equipment used on the exterior should be accounted for under SSc Site Management.



## EQ Credit: Integrated Pest Management

- Ensure the IPM tracking tool includes all non-chemical control strategies implemented during the performance period, in addition to recording information about the pesticides applied. For pesticide applications, ensure that pesticide names, active ingredients, EPA numbers, application dates, the location in each space where the pesticide was applied, and occupant notification information (if necessary) is included in the tracking tool.
- Ensure notification has been performed for all applications of non-least toxic pesticides, and make this clear in the IPM tracking tool.
- Make sure the in-house IPM plan includes all required elements.
- Ensure that the IPM plan identifies roles for building management, pest management contractors, maintenance staff, and liaisons with building occupants.
- A strategy for communications between the IPM team and the building occupants (for schools, faculty and staff) must be included in the plan.
- Verify that emergency circumstances are addressed. Anyone who requested notice must be notified within 24 hours of the application and given an explanation of the emergency.
- Ensure the plan includes integrated pest control methods as the first step in eliminating pests.
- If a building is located on a site in which integrated methods are unable to control pest populations, and non-least toxic pesticides are continuously applied to the site, regardless of whether notification is provided to those who request it, this credit may not be achievable.
- Ensure that the plan clearly indicates that integrated and nonchemical methods will be used first and exhausted prior to resorting to non-least toxic pesticides.
- The plan must identify an action threshold for each pest likely to be encountered in the building. The action threshold is point beyond which the property must take some remedial action.
- For each pest, list in the plan all potential control methods considered and adopt the lowest-risk options, considering the risks to the applicator, building occupants, and the environment. The plan must preferentially require nonchemical approaches, with pesticides registered for the site applied only if those approaches fail. Give preference to the use of least-risk pesticides based on inherent toxicity and exposure potential. If a pesticide that is not in the least-risk category is selected, document the reason.
- Only rodent baits that are solid blocks placed in locked outdoor dispensers should be used on site. No second-generation (single-feed) rodent baits should be used if the building is adjacent to parkland, wild areas, or other spaces where wildlife may be unintentionally affected. Be aware that rodent baits are not considered least toxic under any circumstances.
- Ensure that the plan includes a mechanism for documentation of inspection, monitoring, prevention, and control methods and for evaluation of the effectiveness of the IPM plan. Specify the metrics by which performance will be measured, and describe the quality assurance process to evaluate and verify successful implementation of the plan.
- Any product that meets San Francisco's Tier 3 hazard criteria (least hazardous) is considered a least-toxic pesticide. The Pesticide Research Institute's [PestSmart tool](#) or [Pesticide Product Evaluator tool](#) may be referenced in the plan to provide immediate San Francisco Hazard Review Process evaluation results for pesticides in the tools' database.

Nonrodent pesticides that exceed the Tier 3 criteria are considered least toxic if they are used in self-contained baits and placed in inaccessible locations. Rodent baits are not considered least toxic under any circumstances.

- The toxicity of a pesticide not listed in the Pesticide Research Institute's [PestSmart tool](#) or [Pesticide Product Evaluator tool](#) can be evaluated using the [San Francisco Hazard Review Process](#). Ensure that a narrative documenting the results of the screening process after assigning a ranking of High, Moderate, or Low for each characteristic is provided.
- If pesticides are applied during the performance period, an IPM tracking tool must be provided. Ensure that pesticide names, active ingredients, EPA numbers, application dates, the location in each space where the pesticide was applied, and occupant notification information (if necessary) is included in the tracking tool.
- A template for the IPM plan is available in the Resources section for EQc Integrated Pest Management in the [Credit Library](#).

## EQ Credit: Occupant Comfort Survey

- Ensure that the number of regular building occupants is calculated correctly and is identified consistently throughout the application. Regular building occupants are habitual users of a building (e.g., part-time employees, full-time employees, etc.). For this reason, the number of regular building occupants is not always equal to the number of FTE occupants. For more information, refer to the Occupancy portion of the Getting Started section in the LEED O+M v4 reference guide.
- Remember that the survey responses must be anonymous.
- Ensure that the survey covers all required aspects listed in credit requirements: acoustics, building cleanliness, indoor air quality, lighting, and thermal comfort.
- If more than 20% of respondents indicate dissatisfaction with any elements of the comfort criteria, ensure that a corrective action plan is implemented for those elements. The corrective action plan must identify the corrective actions implemented during the performance period to address no-cost issues. Additionally, the corrective action plan may include capital improvement measures for issues requiring cost to address (implementation of these measures is encouraged, but optional).
- Ensure that the survey summary identifies the percentage of occupants that are dissatisfied for each individual component of occupant comfort (i.e., acoustics, building cleanliness, indoor air quality, lighting, and thermal comfort), including dissatisfaction rates both above and below 20%.
- The corrective action plan implemented during the performance period must include actions to resolve the current source of discomfort, rather than actions for consideration in future fit-out designs. Note that no-cost measures must be implemented during the performance period, but implementation of capital improvement measures is optional.
- The occupant survey should collect responses based on a seven-point scale, as described in the Step-by-Step guidance for this credit in the LEED O+M v4 reference guide.

# INNOVATION

## IN Credit: Innovation

### ► Option 1: Innovation

- Innovation credits cannot be earned for strategies that contribute to existing LEED Credits.
- Be sure to identify the following in a narrative:
  - the intent of the proposed innovation credit;
  - proposed requirements for compliance;
  - proposed submittals to demonstrate compliance; and
  - the design approach or strategies used to meet the requirements.
- Be sure to show that the proposed innovation credit applies to the entire project being certified under LEED and has at least two components (i.e., it is not limited to use of a single product).

### ► Option 2: Pilot

### ► Option 3: Additional Strategies

- Exemplary performance points are dependent on base credit achievement.
- Up to 2 points may be earned through Exemplary Performance.

## IN Credit: LEED Accredited Professional

- Ensure 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.

