



DREAMERS

Design REsearch, implementation And Monitoring of Emerging technologies for a new generation of Resilient Steel buildings

WP 3: Executive design of the electric and mechanical systems, structural design of the façade and of the non-structural components, definition of the technical specifications to achieve the targeted sustainability.

Deliverable 3.3 – Technical specifications for construction products and systems complying with the sustainability standards set in WP1.

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Abbreviation

Basis of design (BOD)
Color Rendering Index (CRI)
Commissioning authority (CxA)
Commissioning process (CxP)
Demand response (DR)
Depletion potential (ODP)
Dwelling unit (DU)
Energy And Atmosphere (EA)
Energy Attribute Certificate (EAC)
Environmental Feasibility Study (SFA)
Floor-area ratio (FAR)
Global warming potential (GWP)
Greenhouse gas (GHG)
Heating, ventilation, air conditioning, and refrigeration (HVAC&R)
Indoor Environmental Quality (EQ)
Innovation (IN)
Integrative Process (IP)
Leadership in Energy and Environmental Design (LEED)
Location And Transportation (LT)
Materials And Resources (MR)
Minimum efficiency reporting value (MERV)
Minimum Environmental Criteria (CAM)
Model Lighting Ordinance (MLO)
Owner's Project Requirements (OPR)
Performance Cost Index (PCI)
Performance Cost Index Target (PCIt)
Sustainable Sites (SS)
Unified Glare Rating (UGR)
Volatile Organic Compounds (VOC)
Water Efficiency (WE)

2. INTEGRATIVE PROCESS (IP)

2.1. Integrative Process

Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems.

Use the analyses described below to create the document;

- Owner's Project Requirements (OPR);
- Basis of design (BOD):
- Design documents;
- Construction documents.

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

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

3. LOCATION AND TRANSPORTATION (LT)

3.1. Sensitive Land Protection

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

- Prime farmland. Prime farmland, unique farmland, or farmland of statewide or local importance;
- Floodplains. A flood hazard area is shown on a legally adopted flood hazard map or otherwise legally designated by the local or state jurisdiction. For projects in places without legally adopted flood hazard maps or legal designations, locate on a site that is entirely outside any floodplain subject to a 1% or greater chance of flooding in any given year.
- Habitat. Land identified as habitat for the following:
 - ✓ Species listed as threatened or endangered under the U.S. Endangered Species Act or the state's endangered species act, or
 - ✓ Species or ecological communities classified by NatureServe as GH (possibly extinct), G1(critically imperilled), or G2 (imperilled), or
 - ✓ Species listed as threatened or endangered are specified under local equivalent standards (for projects outside the U.S.) and are not covered by NatureServe data.
- Water bodies. Except for minor improvements, areas on or within 30 meters of a water body.
- Wetlands. Areas on or within 15 meters of a wetland, except for minor improvements.

3.2. High-Priority Site and Equitable Development

To encourage project location in areas with development constraints and promote the health of the surrounding area. Document implementation of the strategies, as well as the agreement of the partner organisation on the community benefits approach, is needed in the following steps.

- Step 1. Designate Community Benefits Expert
- Step 2. Define and Understand The Community
- Step 3. Partner with a Local Organization
- Step 4. Conduct Community Engagement Process
- Step 5. Demonstrate Community Benefits

In partnership with stakeholders and the local partner organisation, develop a community benefits plan to implement equity-building strategies that reflect the needs and assets of the community identified in Steps 2 and 4. Identify implementation steps, milestone dates, measurement methods, and benchmarks to track the progress of these strategies into the operations phase.

3.3. Surrounding Density and Diverse Uses

Locate on a site whose surrounding density within a 400-meter offset of the project boundary meets the values in Table 1.

Table 1 - Average density within 400 meters of the project (SI units)

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

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

Construct or renovate a building or a space within a building such that the building's main entrance is within an 800-meter walking distance from the following number of various services, such as libraries, stores, schools, restoration spots, and others.

3.4. Access to Quality Transit

Locate any available entry of the project within a 400-meter walking distance of existing or planned bus, streetcar, or informal transit stops or an 800-meter walking distance of existing or planned bus rapid transit stops, passenger rail stations (i.e. light, heavy, or commuter rail) or commuter ferry terminals. In aggregate, the transit service at those stops and stations must meet the minimums listed in Table 2.

Table 2 - Minimum daily public transit service

Weekday trips	Weekend trips
72	30
100	70
144	108
250	160
360	216

3.5. Bicycle Facilities

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

- at least ten diverse uses;
- a school or employment centre if the project's total floor area is 50% or more residential;
- or a bus, rapid transit stop, passenger rail station, or ferry terminal.

All destinations must be within 4800-meter bicycling distance of the project boundary.

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

- Provide long-term bicycle storage for at least 5% of all regular building occupants, but no fewer than four storage spaces per building in addition to the short-term bicycle storage spaces. Short-term bicycle storage must be within 60 meters of walking distance of any main entrance.
- Long-term bicycle storage must be within 90 meters of walking distance of any available entry.
- Vertical distances travelled by elevator are exempt from counting towards the walking distance requirements.

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

3.6. Reduced Parking Footprint

To minimise the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff. Do not exceed the minimum local code requirements for parking capacity; choose one option.

Option 1:

- Provide parking capacity that is a 30% reduction below the base ratios for parking spaces by building type.

- Alternatively, projects may demonstrate baseline and reduced parking capacity using calculations for the most appropriate land use found in the Institute of Transportation Engineers Parking Generation Manual, 5th Edition or a comparable and current resource applied by a qualified transportation engineer or planner.
- Projects with no off-street parking meet the requirements.

Option 2:

- Carshare: Provide dedicated parking for carshare vehicles for at least 1% of total parking spaces, rounded up. Provide one carshare vehicle parking space if the project has fewer than 100 parking spaces.
- Establish an agreement between the project and carshare company that guarantees that new or existing carshare vehicle space(s) will be dedicated for a minimum of two years from the building occupancy certificate.
- Existing carshare vehicles in nearby on- or off-street parking areas do not contribute to credit achievement.

3.7. Electric Vehicles (EV)

Make 10% of parking spaces or at least six spaces, whichever is greater, EV Ready. To be EV Ready, include a dedicated electrical circuit with sufficient capacity for each required space. Each circuit shall have a conduit and wire sufficient to provide Level 2 charging or, more significantly, end at an electrical box or enclosure near each required space.

4. SUSTAINABLE SITES (SS)

4.1. Construction Activity Pollution Prevention

Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must describe the measures implemented.

4.2. Site Assessment

Complete and document a site survey or assessment that includes the following information:

Topography.

- Contour mapping;
- Unique topographic features;
- Slope stability risks.

Hydrology.

- Special Flood Hazard Areas;
- Delineated natural water bodies, wetlands, lakes, streams, and shorelines;
- Rainwater collection and reuse opportunities;
- Impervious and pervious surfaces within the site boundary.

Climate.

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

Vegetation.

- Primary vegetation types;
- Greenfield area;
- Significant tree mapping;
- International Union for Conservation of Nature Red List of Threatened Species;
- Regional, state, or federal entities list invasive plant species.

Soils.

- Natural Resources Conservation Service soils delineation (or local equivalent) prime farmland, unique farmland and others with importance;
- Healthy soils;
- Previous development.
- Disturbed soils.

Human use.

- Views;
- Adjacent transportation infrastructure, bicycle network, and bicycle storage;
- Adjacent diverse uses.
- Construction materials with existing recycle or reuse potential.

Human health effects.

- The proximity of vulnerable populations;
- Adjacent physical activity opportunities;
- Proximity to significant sources of air and water pollution.

The survey or assessment should demonstrate the relationships between the site features and topics listed above and how these features influenced the project design; give the reasons for not addressing any of those topics.

4.3. Protect or Restore Habitat

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

Restore a portion of the site (including the building footprint) identified as previously disturbed and follow the vegetation and soil requirements below. Vegetated roof surfaces

may be included in the habitat area calculations if the plants are native or adapted and provide habitat.

- Soil Restoration: Restore disturbed soils in areas later serving as the final habitat.
- Vegetation: Plant a minimum of 6 species of vegetation native or adapted to the project's EPA Level III ecoregion (or local equivalent for projects outside the U.S.). Include a minimum of 2 out of the following plant categories: tree, shrub, and ground cover. Designate a portion of the habitat area for a pollinator garden consisting of native flowering plants and totalling at least 30 square feet (3 square meters).

4.4. Open Space

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

- social area: a pedestrian-oriented paving or landscape area that accommodates outdoor social activities;
- recreational area: a recreation-oriented paving or landscape area that encourages physical activity;
- Diverse green space: a landscape area with two or more types of vegetation that provide opportunities for year-round visual interest;

4.5. Rainwater Management

Natural land cover conditions: Calculate the difference between the projected runoff volume under the proposed design conditions and the runoff volume under natural land cover conditions before any disturbance. Retain (i.e. infiltrate, evapotranspiration, or collect).

4.6. Heat Island Reduction

To minimise effects on microclimates and human and wildlife habitats by reducing heat islands. Choose the following options:

- Nonroof Measures: Use the existing plant material or install plants that provide shade over paving areas (including playgrounds) on the site within ten years of planting. Install vegetated planters. Plants must be in place at the time of occupancy permit and cannot include artificial turf. Provide shade with structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines. Provide shade with architectural devices or structures. If the device or structure is a roof, it shall have an aged solar reflectance (SR) value of at least 0.28.
- Provide shade with vegetated structures. Use paving materials with an initial solar reflectance (SR) value of at least 0.33; use an open-grid pavement system (at least 50% unbound).
- High-Reflectance Roof: Use roofing materials with an aged SRI equal to or greater than the values in Table 1. If aged SRI is unavailable, the roofing material shall have an initial SRI equal to or greater than the values in Table 1. Roof area that consists of functional, usable spaces (such as helipads, recreation courts, and similar amenity areas) may meet the requirements of nonroof measures. Functional roof area excludes areas covered by mechanical equipment, solar energy panels, skylights, and other appurtenances.

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

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

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

4.7. Light Pollution Reduction

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

Table 3 - Maximum percentage of total lumens emitted above horizontal by lighting zone

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

Light Trespass: Do not exceed the following vertical illuminances at the lighting boundary. Calculation points may be no more than 1.5 meters apart. Vertical illuminances must be calculated on vertical planes running parallel to the lighting boundary, with the normal to each plane oriented toward the property and perpendicular to the lighting boundary, extending from grade level to 10 meters above the height of the highest luminaire.

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

MLO lighting zone	Vertical illuminance
LZ0	0.05 fc (0.5 lux)
LZ1	0.05 fc (0.5 lux)
LZ2	0.10 fc (1 lux)
LZ3	0.20 fc (2 lux)
LZ4	0.60 fc (6 lux)

FC = footcandle.

Internally Illuminated Exterior Signage: Do not exceed a luminance of 200 cd/m² (nits) during night-time hours and 2000 cd/m² (nits) during daytime hours.

5. WATER EFFICIENCY (WE)

5.1. Outdoor Water Use Reduction

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

- No Irrigation Required: Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.
- Reduced Irrigation: Reduce the project's landscape water requirement by at least 30% from the calculated baseline for the site's peak watering month.

5.2. Indoor Water Use Reduction

For the fixtures and fittings listed in Table 5, as applicable to the project scope, reduce aggregate water consumption by 20% from the baseline. Base calculations on the volumes and flow rates are shown in Table 1. All newly installed toilets, urinals, private lavatory faucets, and showerheads eligible for labelling must be WaterSense labelled (or a local equivalent for projects outside the U.S.)

Table 5 - Baseline water consumption of fixtures and fittings

<i>Fixture or fitting</i>	<i>Baseline (SI units)</i>
Toilet (water closet)*	6 lpf
Urinal*	3.8 lpf
Public lavatory (restroom) faucet	1.9 lpm at 415 kPa, all others except private applications
Private lavatory faucets	8.3 lpm at 415 kPa
Kitchen faucet (excluding faucets used exclusively for filling operations)	8.3 lpm at 415 kPa
Showerhead*	9.5 lpm at 550 kPa per shower stall

lpf = liters per flush
lpm = liters per minute
kPa = kilopascals

5.3. Building-Level Water Metering

Install permanent water meters that measure the total potable water use for the building and associated grounds. Meter data must be compiled into monthly and annual summaries; meter readings can be manual or automated. Commit to sharing with USGBC the resulting whole-project water usage data for five years beginning on the date the project accepts LEED certification or typical occupancy, whichever comes first. This commitment must continue for five years or until the building changes ownership or lessee.

5.4. Outdoor Water Use Reduction

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

- Option 1. No Irrigation Required: Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period.
- Option 2. Reduced Irrigation: Reduce the project's landscape water requirement (LWR) by at least 50% from the calculated baseline for the site's peak watering month. Reductions must first be achieved through plant species selection and irrigation

system efficiency. Additional reductions beyond 30% may be achieved using efficient, alternative water sources and intelligent scheduling technologies.

5.5. Indoor Water Use Reduction

Alternative water sources can earn additional potable water savings above the prerequisite level. Include fixtures and fittings necessary to meet the needs of the occupants. Some of these fittings and fixtures may be outside the tenant's space.

Suppose the project will have a washing machine, kitchen and laboratory equipment and steam systems. In that case, all the water should meet the minimum local requirements for local reuse and recovery.

5.6. Optimise Process Water Use

Process Water Use: To conserve low-cost potable water resources for mechanical processes while controlling corrosion and scale in the condenser water system.

- Step 1. Identify water subsystems: Eligible subsystems may include boilers, humidification systems, or other subsystems using process water representing at least 10% of total regulated building water use. Water used for cooling is not eligible. Consider the minimum required quality of makeup water for water subsystems.
- Step 2. Identify sources of recycled alternative water: Identify recycled alternative water sources that could be used to meet process water subsystem demand. Alternative water sources include municipally supplied reclaimed wastewater ("purple pipe" water), greywater, rainwater, stormwater, treated seawater, water recovered from condensate, foundation dewatering water, treated blowdown from process water, reverse osmosis reject water, and other recycled water sources. Well water, groundwater, and naturally occurring surface bodies (such as streams, lakes, or rivers) do not contribute to recycled alternative water sources.
- Step 3. Calculate subsystem water use: Calculate the water use of subsystems using manufacturer information and anticipated operating conditions.
- ✓ The subsystem must represent at least 10% of total building-regulated water use annually. Total building water includes all indoor water consumption associated with the project in the design case and excludes outdoor landscape water use.
- ✓ Calculate subsystem water use each month; identify the month with the highest water demand.
- Step 4. Calculate the quantity of recycled alternative water sources: Calculate the number of alternative water sources available for reuse each month. Address the cistern storage capacity for on-site alternative water systems. For municipally supplied alternative water systems, demonstrate that the municipality has approved to supply of the volume of recycled water required by the project.
- Step 5. Select an alternative water source to meet subsystem demand: Confirm that the alternative water source is sufficient to meet at least 20% of water subsystem demand during the month with the highest water demand. If the alternative water is used for multiple applications—for example, boilers, flush fixtures, and landscape irrigation—a sufficient quantity must be available to meet the demands of all uses. Teams cannot apply the same alternative water to multiple credits unless the recycled alternative water source has sufficient volume to cover all the uses (e.g., boilers, irrigation, plus toilet-flushing demand). Confirm that the alternative water source is of sufficient quality to meet the intended use or treatment alternative water source.
- ✓ Minimum requirements for makeup water quality vary by subsystem.
- ✓ When selecting alternative water sources, first target the uses that require minor treatment.
- ✓ Treat alternative water sources to be of sufficient quality for intended end use as needed.

5.7. Water Metering

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

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

6. ENERGY AND ATMOSPHERE (EA)

6.1. Fundamental Commissioning and Verification

Commissioning Authority (CxA) Qualifications: By the end of the design development phase, engage a commissioning authority with the following qualifications.

- The CxA must have documented commissioning process experience on at least two building projects with a similar scope of work. The experience must extend from the early design phase through at least ten months of occupancy;
- The CxA may be a qualified employee of the owner, an independent consultant, or an employee of the design or construction firm who is not part of the project's design or construction team or a disinterested subcontractor of the design or construction team.
- For projects smaller than 1 860 square meters, the CxA may be a qualified design or construction team member. In all cases, the CxA must report his or her findings directly to the owner.
- The commissioning authority must do the following:
 - ✓ Review the OPR, BOD, and project design.
 - ✓ Develop and implement a CxA plan.
 - ✓ Confirm incorporation of CxA requirements into the construction documents.
 - ✓ Develop construction checklists.
 - ✓ Develop a system test procedure.
 - ✓ Verify system test execution.
 - ✓ Maintain an issues and benefits log throughout the Cx process.
 - ✓ Prepare a final Cx process report.
 - ✓ Document all findings and recommendations and report directly to the owner throughout the process.

Current Facilities Requirements and Operations and Maintenance Plan: Prepare and maintain a current facilities requirements and maintenance plan containing the information necessary to operate the building efficiently. The plan must include the following:

- ✓ a sequence of operations for the building;
- ✓ the building occupancy schedule;
- ✓ equipment run-time schedules;
- ✓ setpoints for all HVAC equipment;
- ✓ set lighting levels throughout the building;
- ✓ minimum outside air requirements;
- ✓ any changes in schedules or setpoints for different seasons, days of the week, and times of day;
- ✓ a systems narrative describing the mechanical and electrical systems and equipment; a preventive maintenance plan for building equipment described in the systems narrative; and
- ✓ a commissioning program includes periodic commissioning requirements, ongoing commissioning tasks, and continuous tasks for critical facilities.

6.2. Minimum Energy Performance

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

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

6.3. Building-Level Energy Metering

Install new or use existing building-level energy meters or submeters that can be aggregated to provide building-level data representing total energy consumption (electricity, natural gas, chilled water, steam, fuel oil, propane, biomass, and others). Utility-owned meters capable of aggregating building-level resource use are acceptable. Commit to sharing with USGBC the resulting energy consumption data and electrical demand data (if metered) for five years beginning on the date the project accepts LEED certification. At a minimum, energy consumption must be tracked at one-month intervals, and this commitment must carry forward for five years or until the building changes ownership or lessee.

6.4. Fundamental Refrigerant Management

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

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

6.5. Enhanced Commissioning

Complete the following commissioning (CxP) activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies. Include all enhanced commissioning tasks in the OPR and BOD. The commissioning authority must do the following:

- Review contractor submittals.
- Verify the inclusion of systems manual requirements in construction documents.
- Verify the inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations ten months after substantial completion.
- Develop an ongoing commissioning plan.

Develop monitoring-based procedures and identify points to be measured and evaluated to assess the performance of energy- and water-consuming systems. Include the procedures and measurement points in the commissioning plan. Address the following:

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

Update the systems manually with any modifications or new settings and explain any modifications from the original design. Complete the following commissioning process

(CxP) activities for the building's thermal envelope following ASHRAE Guideline 0–2013 and ASTM E2947-16: Standard Guide for Building Enclosure Commissioning, as they relate to energy, air and water tightness, indoor environmental quality, and durability.

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

- Review contractor submittals.
- Verify the inclusion of systems manual requirements in construction documents for enclosure systems.
- For speciality enclosure systems with controls and automation:
- Verify the inclusion of operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations ten months after substantial completion.
- Develop an ongoing enclosure commissioning plan for maintenance, renewal, and revitalisation cycles.

6.6. Optimise Energy Performance

Analyse efficiency measures during the design process and account for the design decision-making results. Use energy simulation of efficiency opportunities, past energy simulation analyses for similar buildings, or published data (e.g., Advanced Energy Design Guides) from analyses for similar buildings. Analyse efficiency measures, focusing on load reduction and HVAC-related strategies (passive measures are acceptable) appropriate for the facility. Project potential energy savings and holistic project cost implications for all affected systems.

Energy Performance Compliance: Demonstrate a Performance Cost Index (PCI)¹ below the Performance Cost Index Target (PCIt). The required PCI shall be calculated using an area-weighted average of the building types.

- Calculate the PCI, PCIt, and percentage improvement using cost and greenhouse gas (GHG) emissions metrics. The GHG emission factors for each energy source serving the building must be identical for the baseline and proposed building models.

6.7. Advanced Energy Metering

Install **advanced energy metering** for the following:

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

Advanced energy metering must have the following characteristics.

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

6.8. Grid Harmonization

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

- Participate in an existing demand response (DR) program and complete the following activities. Design a system capable of real-time, fully-automated DR based on external initiation by a DR Program Provider. Semi-automated DR may be utilised in practice.
- Enrol in a minimum one-year DR participation amount contractual commitment with a qualified DR program provider, with the intention of multiyear renewal, for at least 10% of the annual on-peak electricity demand. On-peak demand is determined under EA Prerequisite Minimum Energy Performance, and the on-peak demand may vary based on the utility climate and pricing structures.
- Develop a comprehensive plan for meeting the contractual commitment during a DR event.
- Include the DR processes in the scope of work for the commissioning authority, including participation in at least one full test of the DR plan.
- Include the DR program and any installed technologies in the building systems manual or the current facilities requirements and operations and maintenance plan if the project is not pursuing EA credit Enhanced Commissioning.
- Initiate at least one full test of the DR plan.

6.9. Renewable Energy

Use on-site renewable energy systems or procure renewable energy from offsite sources for all or a portion of the building's annual energy use. Choose one or more strategies for renewable energy procurement from the categories below.

- Tier 1: On-site renewable energy generation
- Tier 2: New offsite renewable energy
 - ✓ Offsite renewable electricity is produced by a generation asset(s) built within the last five years or contracted to be operational within two years of building occupancy.
 - ✓ Green-e Energy certification or equivalent is required for the one-time purchase and delivery of the Energy Attribute Certificate (EAC) of more than 100% of the project's annual electricity use.
- Tier 3: Offsite renewable energy
 - ✓ Offsite renewable electricity that is Green-e Energy certified or equivalent or captured bio-methane

The default contract length for renewable energy procurement is ten years, and contract lengths of less than ten years may be pro-rated. For Tier 2, the generation asset(s) age is assessed at the beginning of the contract, and the generation asset(s) retain this attribute for the initial contract or lease term. Renewable electricity projects must generate offsite renewable energy in the same country or region where the LEED project is located. Methane capture in the form of biogas that is both captured and used on-site may qualify as a Tier 1 renewable energy resource.

6.10. Enhanced Refrigerant Management

Do not use refrigerants or use only refrigerants (naturally occurring or synthetic) that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50. Alternatively, the refrigerant must comply with the USGBC-approved equivalent. Develop and implement a refrigerant management plan that addresses leak detection, system retrofit, and end-of-life disposal for all HVAC&R systems containing more than 225 grams of refrigerant.

7. MATERIALS AND RESOURCES (MR)

7.1. Storage and Collection of Recyclables

Provide dedicated areas accessible to waste hauliers and building occupants to collect and store recyclable materials for the entire building. Take appropriate measures for the safe collection, storage, and disposal of two of the following: batteries, mercury-containing lamps, and electronic waste;

7.2. Building Life-Cycle Impact Reduction

Conduct a cradle-to-grave life-cycle assessment of the project's structure and enclosure. Select at least three of the environmental impact categories. Demonstrate reduced environmental effects during initial project decision-making by reusing existing building resources or demonstrating a reduction in materials use through life-cycle assessment. Follow the standard process of performing a regular whole-building life cycle assessment. In general, this can be broken down into:

- 1) Define the goal and scope of the assessment,
- 2) Collect information about materials and scenarios,
- 3) Perform calculations for impacts using reliable LCA assessment tools,
- 4) Understand and interpret results, and
- 5) Document process and produce detailed assessment reports

The system boundary of the analysis must include a cradle-to-grave scope (module A-D). However, some sub-module gaps may exist due to the materials or dataset chosen and design optimisations attempted for the project. Sub-module gaps are allowed so long as the system boundary in total encompasses a cradle-to-grave assessment. The required modules for a compliant whole building life-cycle analysis include the following:

- Product stage: include modules A1-A3.
- Construction process: include at least module A4.
- Use Stage: Include at least one module from B1-B5.
- End of life stage: Include at least one module from C1-C4.

For projects demonstrating impact reductions compared to a baseline: The LCA software or tool used for the baseline and proposed design must be the same, with the same modules and impact categories evaluated.

Note that LCA software or tools must have ISO-14044-compliant data sets and conform to ISO 21931-2017 and EN 15978:2011, and their data must meet the requirements of ISO 21930-2017 and EN 15804. Typically, the software tool providers will document that they meet these criteria in the LCA output report.

7.3. Environmental Product Declarations

Environmental Product Declaration (EPD): Use at least 20 different permanently installed products sourced from at least five manufacturers that meet one of the disclosure criteria below. Life-cycle assessment and environmental product declarations:

- Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 with at least a cradle-to-gate scope are valued as one whole product for credit achievement calculation.
- Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA by ISO 14071. Products with product-specific internal EPDs that conform to ISO 14025, EN 15804 or ISO 21930 and have at least a cradle-to-gate scope are valued as one whole product for credit achievement calculation.
- Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognised as a participant by the program operator. Products with industry-wide EPDs, which conform to ISO

14025, EN 15804 or ISO 21930 and have at least a cradle-to-gate scope, are valued as one whole product for credit achievement calculation.

7.4. Sourcing of Raw Materials

Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below:

- Extended producer responsibility. Products purchased from a manufacturer that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
- Bio-based materials. Bio-based products and materials other than wood must be tested using ISO 16620-2. Exclude hide products, such as leather and other animal skin material.
- Wood products. Wood products must be certified by the USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for credit achievement calculation.
- Materials reuse. Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 200% of their cost for credit achievement calculation.
- Recycled content. Products meeting recycled content criteria are valued at 100% of their cost for credit achievement calculation.

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

7.5. Material Ingredients

Use products that have a compliant material ingredient report or action plan. Use at least five permanently installed products sourced from three different manufacturers. Products are valued according to the table below

Table 6 – Material ingredient specification.

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

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

7.6. Construction and Demolition Waste Management

All projects must develop and implement a construction and demolition waste management plan:

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

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

8. INDOOR ENVIRONMENTAL QUALITY (EQ)

8.1. Minimum Indoor Air Quality Performance

Provide outdoor air monitors for all mechanical ventilation systems with outdoor air intake flow more significant than 472 L/s. The monitoring device must measure the minimum outdoor air intake flow and the design minimum outdoor air intake flow with an accuracy of $\pm 10\%$. An alarm must indicate when the outdoor airflow value varies by 15% or more from the setpoint.

Provide a direct exhaust airflow measurement device capable of measuring the exhaust airflow. This device must measure the exhaust airflow with an accuracy of $\pm 10\%$ of the design minimum exhaust airflow rate. An alarm must indicate when airflow values vary by 15% or more from the exhaust airflow setpoint.

8.2. Environmental Tobacco Smoke Control

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

8.3. Enhanced Indoor Air Quality Strategies

Promote occupants' comfort, well-being, and productivity by improving indoor air quality: Need to comply with these strategies:

- Strategy 1. Entryway Systems Install permanent entryway systems at least 3 meters long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances. Sound entryway systems include permanently installed grates, grilles, slotted systems that allow for cleaning underneath, rollout mats, and any other materials manufactured as entryway systems with equivalent or better performance. Maintain all every week.
- Strategy 2. Interior Cross-Contamination Prevention: Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g., garages, housekeeping and laundry areas, copying and printing rooms), using the exhaust rates or a minimum of 2.54 l/s per square meter, to create negative pressure concerning adjacent spaces when the doors to the room are closed. Provide each space with self-closing doors, deck-to-deck partitions, or a hard-lid ceiling.
- Strategy 3. Filtration of Outdoor Air: Each ventilation system that supplies outdoor air to occupied spaces must have particle filters or air-cleaning devices that meet one of the following filtration media requirements—minimum efficiency reporting value (MERV) of 13 or higher.
- Strategy 4. Operable Windows: 75% of the regularly occupied spaces have operable windows providing outdoor air access.
- Strategy 5. Carbon Dioxide Monitoring: Monitor CO₂ concentrations within all densely occupied spaces. CO₂ monitors must be between 900 and 1 800 millimetres above the floor. CO₂ monitors must have an audible or visual indicator or alert the building automation system if the sensed CO₂ concentration exceeds the setpoint by more than 10%.
- Strategy 6. Additional Source Control and Monitoring: For spaces where air contaminants are likely, evaluate potential sources of additional air contaminants besides CO₂. Develop and implement a materials-handling plan to reduce the likelihood of contaminant release. Install monitoring systems with sensors designed to detect specific contaminants. An alarm must indicate any unusual or unsafe conditions.

8.4. Low-Emitting Materials

Use materials on the building interior (everything within the waterproofing membrane) that meet the criteria below.

- **Paints and Coatings:** At least 75% of all paints and coatings meet the Volatile Organic Compounds (VOC) emissions evaluation by volume or surface area. The paints and coatings product category includes all interior paints and coatings wet-applied on-site. Exclude foamed-in-place and sprayed insulation (included in the Insulation category).
- **Adhesives and Sealant:** At least 75% of all adhesives and sealants meet the VOC emissions evaluation by volume or surface area. The adhesives and sealants product category includes all interior adhesives and sealants wet-applied on-site.
- **Flooring:** At least 90% of all flooring, by cost or surface area, meets the VOC emissions evaluation OR inherently non-emitting sources criteria OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), raised flooring, wall base, underlayments, and other floor coverings. Exclude subflooring (include subflooring in the composite wood category, if applicable). Exclude wet-applied products applied on the floor (include in the paints and coatings category).
- **Wall panels:** At least 75% of all wall panels, by cost or surface area, meet the VOC emissions evaluation, OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall panelling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, interior and exterior doors, wall frames, interior and exterior windows, and window treatments. Exclude cabinetry (include built-in cabinetry in the composite wood category and free-standing cabinetry in the furniture category) and vertical structural elements (include structural elements such as structural panels or structural composite wood in the composite wood category, if applicable).
- **Ceilings:** At least 90% of all ceilings, by cost or surface area, meet the VOC emissions evaluation, inherently non-emitting sources criteria, or salvaged and reused materials criteria. The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights. Exclude overhead structural elements (include structural elements in the composite wood category, if applicable).
- **Insulation:** At least 75% of all insulation meets the VOC emissions evaluation by cost or surface area. The insulation product category includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in-place, loose-fill, blown, and sprayed insulation. Exclude insulation for HVAC ducts and plumbing piping from the credit. Insulation for HVAC ducts may be included at the project team's discretion.
- **Furniture:** At least 75% of all furniture in the project scope of work, by cost, meets the furniture emissions evaluation, OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The furniture product category includes all seating, desks and tables, filing/storage, free-standing cabinetry, workspaces, and furnishing items purchased for the project. Exclude office accessories from the credit.
- **Composite Wood:** At least 75% of all composite wood, by cost or surface area, meets the Formaldehyde emissions evaluation OR salvaged and reused materials criteria. The composite wood product category includes all particleboard, medium-density fiberboard (medium density and thin), hardwood plywood with veneer, composite or combination core, and wood structural panels or structural wood products. Exclude products covered in the flooring, ceiling, wall panels, or furniture material categories from this category.

Table 7 - CAM emission values.

Limite di emissione (µg/m³) a 28 giorni	
Benzene	1 (per ogni sostanza)
Tricloroetilene (triellina)	
di-2-etilseftalato (DEHP)	
Dibutylftalato (DBP)	
COV totali	1500
Formaldeide	<60
Acetaldeide	<300
Toluene	<450
Tetracloroetilene	<350
Xilene	<300
1,2,4-Trimetilbenzene	<1500
1,4-diclorobenzene	<90
Etilbenzene	<1000
2-Butossietanolo	<1500
Stirene	<350

8.5. Construction Indoor Air Quality Management Plan

Develop and implement an indoor air quality (IAQ) management plan for the construction and preoccupancy phases of the building. The plan must address all of the following.

- During construction, meet or exceed all applicable recommended control measures for Occupied Buildings under Construction.
- Protect absorptive materials stored on-site and installed from moisture damage.
- Do not operate permanently installed air-handling equipment during construction unless filtration media with a minimum efficiency reporting value (MERV) of 8, as defined by ISO 16890-2016, Particulate Air Filters for General Ventilation, Determination of the Filtration Performance), are installed at each return air grille and return or transfer duct inlet opening such that there is no bypass around the filtration media. Immediately before occupancy, replace all filtration media with the final design filtration media installed under the manufacturer's recommendations.
- Prohibit smoking inside and within 7.5 meters of the building openings during construction. Smoking includes tobacco smoke, smoke produced from the combustion of cannabis and controlled substances and the emissions produced by electronic smoking devices.

8.6. Indoor Air Quality Assessment

The following paths must be implemented after construction ends and the building has been thoroughly cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and significant VOC punch list items must be finished.

- Install new filtration media and perform a building flush-out by supplying a total air volume of 4 267 140 litres of outdoor air per square meter of gross floor area while maintaining an internal temperature of at least 15°C and no higher than 27°C and relative humidity no higher than 60%.
- Suppose occupancy is desired before the flush-out is completed. In that case, the space may be occupied only after delivery of a minimum of 1 066 260 litres of outdoor air per square meter of gross floor area while maintaining an internal temperature of at least 15°C and no higher than 27°C and relative humidity no above 60%.
- Once the space is occupied, it must be ventilated at a minimum rate of 1.5 litres per second per square meter of outside air or the design minimum outdoor air rate. During each day of the flush-out period, ventilation must begin at least three hours before occupancy and continue during occupancy. These conditions must be maintained until 4 270 litres of outdoor air per square meter has been delivered to the space.

Design HVAC systems and the building envelope to meet the requirements of Thermal Comfort Conditions for Human Occupancy or a local equivalent.:

- Provide thermal comfort controls for at least 50% of occupant spaces. Provide group thermal comfort controls for all shared multi-occupant spaces.
- Thermal comfort controls allow occupants, whether in individual spaces or shared multi-occupant spaces, to adjust at least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

Table 8 - CAM indoor emission limits.

Limite di emissione ($\mu\text{g}/\text{m}^3$) a 28 giorni	
Benzene	1 (per ogni sostanza)
Tricloroetilene (trielina)	
di-2-etilesilftalato (DEHP)	
Dibutylftalato (DBP)	
COV totali	1000
Formaldeide	<10
Acetaldeide	<200
Toluene	<300
Tetracloroetilene	<250
Xilene	<200
1,2,4-Trimetilbenzene	<1000
1,4-diclorobenzene	<60
Etilbenzene	<750
2-Butossietanolo	<1000
Stirene	<250

8.7. Thermal Comfort

Promote occupants' productivity, comfort, and well-being by providing high-quality lighting. Provide thermal comfort controls for at least 50% of occupant spaces. Provide group thermal comfort controls for all shared multi-occupant spaces. The thermal transmittance must be less than $0.09 \text{ W}/\text{m}^2\text{K}$ for vertical opaque walls and less than $0.16 \text{ W}/\text{m}^2\text{K}$ for horizontal and inclined opaque walls. Thermal comfort controls allow occupants, whether in individual spaces or shared multi-occupant spaces, to adjust at least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

Table 9 - CAM materials specifications for thermic and acoustic issues.

Materiale	Contenuto cumulativo di materiale recuperato, riciclato ovvero sottoprodotti
Cellulosa (Gli altri materiali di origine legnosa rispondono ai requisiti di cui al criterio "2.5.6-Prodotti legnosi").	80%
Lana di vetro	60%
Lana di roccia	15%
Vetro cellulare	60%
Fibre in poliestere ⁷	50% (per gli isolanti composti da fibre di poliestere e materiale rinnovabile, tale percentuale minima può essere del 20% se il contenuto di materiale da fonte rinnovabile è almeno pari all'85% del peso totale del prodotto. Secondo la norma UNI EN ISO 14021 i materiali rinnovabili sono composti da biomasse provenienti da una fonte vivente e che può essere continuamente reintegrata.)
Polistirene espanso sinterizzato (di cui quantità minima di riciclato 10%)	15%
Polistirene espanso estruso (di cui quantità minima di riciclato 5%)	10%
Poliuretano espanso rigido	2%
Poliuretano espanso flessibile	20%
Agglomerato di poliuretano	70%
Agglomerato di gomma	60%
Fibre tessili	60%

8.8. Interior Lighting

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

- Glare Control: Use light fixtures with a luminance of fewer than 7,000 candelas per square meter (cd/m)² between 45 and 90 degrees from the nadir. Alternatively, achieve a Unified Glare Rating (UGR) rating of <19 using software modelling calculations of the designed lighting. Exceptions include wall wash fixtures aimed adequately at walls, as specified by manufacturer's data, indirect uplighting fixtures, provided there is no view down into these uplights from a regularly occupied space above, and any other specific applications (i.e. adjustable fixtures).
- Colour Rendering: Use light sources with a Color Rendering Index (CRI) of at least 90. Use light sources with a Color Fidelity Index greater than or equal to 78 and a gamut index between 97 and 110.
- Lighting Control: Provide dimmable or multilevel lighting for 90% of occupant spaces.
- Surface Reflectivity: For at least 90% of regularly occupied spaces, use interior finishes with a surface reflectance greater than 80% for ceilings and 55% for walls. If included in the project scope, use furniture finishes with a surface reflectance greater or equal to 45% for work surfaces and 50% for movable partitions.

8.9. Daylight

Provide manual or automatic (with manual override) glare-control devices for all regularly occupied spaces related to daylight. To connect building occupants with the outdoors, reinforce circadian rhythms, and reduce electrical lighting by introducing daylight into the space. Measure illuminance in each regularly occupied space. Achieve illuminance levels between 300 lux and 3,000 lux. Spaces with view-preserving automatic (with manual override) glare-control devices may demonstrate compliance for only the minimum 300 lux illuminance level.

8.10. Quality Views

To connect building occupants to the natural outdoor environment by providing quality views.

- Provide occupants with a view of the outdoor natural or urban environment for 75% of all regularly occupied floor areas. Auditoriums, conference rooms dedicated to video conferencing, and gymnasiums may be excluded. Views into interior atria may be used to meet up to 30% of the required area.
- Views must be through glass with a visible light transmittance (VLT) above 40%. The view must be preserved if the glazing has frits, patterns, or tints. Neutral grey, bronze, and blue-green tints are acceptable.
- Views must include at least one of the following:
 - ✓ nature, urban landmarks, or art; or;
 - ✓ objects at least 7.5 meters from the exterior of the glazing.

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

8.11. Acoustic Performance

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

- HVAC Background Noise: Achieve maximum background noise levels from heating, ventilating, and air conditioning (HVAC) systems per 2015 ASHRAE Handbook-- HVAC Applications, Chapter 48, Table 1; AHRI Standard 885- 2008, Table 15; or a local equivalent.
- Sound Transmission: Categorise all occupied spaces by use and the desired level of acoustic privacy
- Reverberation Time: Meet the reverberation time requirements in the Table below.

Table 10 - Reverberation time requirements

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

Confirm compliance via calculations or measurements in representative rooms or design documentation from someone experienced in acoustics.

9. INNOVATION (IN)

9.1. Innovation

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

- Achieve significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system.
- At least one principal participant of the project team must be a LEED Accredited Professional (AP) with a speciality appropriate for the project.

Annex

Table 11 – Compliance between LEED/CAM requirements and project specifications

LEED Data				CAM	SFA	Project Status	
Type		Nº	Description			Covered	Comments
IP	C	1.1	Integrative Process				Owner's Project Requirements (OPR); Basis of design (BOD); Design documents; Construction documents.
LT	C	2.1	Sensitive Land Protection		X	YES	The land that has been previously studied and developed.
LT	C	2.2	High-Priority Site and Equitable Development			NO	A community benefits approach is needed.
LT	C	2.3	Surrounding Density and Diverse Uses			NO	The average density of the region is needed.
LT	C	2.4	Access to Quality Transit			NO	The transit service at those stops and stations must meet the minimum 72 weekday and 30-weekend trips.
LT	C	2.5	Bicycle Facilities	X		YES	There are motorcycles and bike rack stalls in proportion to the building users.
LT	C	2.6	Reduced Parking Footprint	X		YES	The building itself covers the parking areas serving the building.
LT	C	2.7	Electric Vehicles (EV)			NO	Make 10% of parking spaces or at least six spaces, whichever is greater, EV Ready.
SS	P	3.1	Construction Activity Pollution Prevention	X		YES	Safety and Coordination Plan.
SS	C	3.2	Site Assessment		X	YES	Topography, hydrology, climate, vegetation, soils and human use/health studied.
SS	C	3.3	Protect or Restore Habitat	X			The project does not interfere with the conservation of habitats in the area.
SS	C	3.4	Open Space			NO	No mentions of this area.
SS	C	3.5	Rainwater Management	X		NO	The project does not provide for a specific collection, purification and reuse system.
SS	C	3.6	Heat Island Reduction	X		YES	The area to be allocated to green is equal to at least 60% of the permeable surface identified.

SS	C	3.7	Light Pollution Reduction	X		NO	For verification, please refer to the special reports accompanying plant projects.
WE	P	4.1	Outdoor Water Use Reduction	X		YES	The project foresees that the irrigation of the green areas of the lot takes place with dedicated systems that use non-potable water from wells. It should be noted that the University, in its development programs, has in mind to create the first rain and rainwater recovery plants to be used for permitted purposes.
WE	P	4.2	Indoor Water Use Reduction	X		YES	Several actions were described.
WE	C	4.3	Building-Level Water Metering	X		YES	Safety and Coordination Plan.
WE	C	4.4	Outdoor Water Use Reduction	X		YES	Safety and Coordination Plan.
WE	C	4.5	Indoor Water Use Reduction	X		YES	Safety and Coordination Plan.
WE	C	4.6	Optimise Process Water Use	X		YES	Safety and Coordination Plan.
WE	C	4.7	Water Metering	X		YES	Safety and Coordination Plan.
EA	P	5.1	Fundamental Commissioning and Verification (CxA)			NO	-Review the OPR, BOD, and project design. -Develop and implement a CxA plan. -Confirm incorporation of CxA requirements into the construction documents. -Develop construction checklists. -Develop a system test procedure. -Verify system test execution. -Maintain an issues and benefits log throughout the Cx process. -Prepare a final Cx process report. -Document all findings and recommendations and report directly to the owner.
EA	P	5.2	Minimum Energy Performance			NO	In terms of carbon dioxide equivalents, the total greenhouse gas emissions shall be calculated for the baseline and proposed building performance ratings. The percentage improvement shall be determined using carbon dioxide equivalent emissions.
EA	P	5.3	Building-Level Energy Metering			NO	Electricity, natural gas, chilled water, steam, fuel oil, propane, biomass, and others

EA	P	5.4	Fundamental Refrigerant Management			NO	Do not use chlorofluorocarbon (CFC) or hydro chlorofluorocarbon (HCFC) -based refrigerants in new heating, ventilating, air-conditioning, and refrigeration (HVAC&R) systems.
EA	C	5.5	Enhanced Commissioning			NO	• Review contractor submittals. • Verify the inclusion of systems manual requirements in construction documents. • Verify the inclusion of operator and occupant training requirements in construction documents. • Verify systems manual updates and delivery. • Verify operator and occupant training delivery and effectiveness. • Verify seasonal testing. • Review building operations ten months after substantial completion. • Develop an ongoing commissioning plan.
EA	C	5.6	Optimise Energy Performance	X		YES	Compliance with the standards set by the criterion in question is widely respected
EA	C	5.7	Advanced Energy Metering			NO	Install advanced energy metering for the whole-building energy sources used by the building; any individual energy end uses that represent 10% or more of the total annual consumption of the building.
EA	C	5.8	Grid Harmonization			NO	Design buildings and equipment for participation in demand response programs through load shedding or shifting.
EA	C	5.9	Renewable Energy	X		YES	In any case, the building project in question provides for low-consumption systems and the construction of a photovoltaic system on the roof. For specifications, please refer to the project documents of the technological systems.
EA	C	5.10	Enhanced Refrigerant Management			NO	Do not use refrigerants or use only refrigerants (naturally occurring or synthetic) that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50

MR	P	6.1	Storage and Collection of Recyclables	X		YES	A widespread system of separate waste collection with dedicated containers appropriately marked.
MR	P	6.2	Building Life-Cycle Impact Reduction			NO	Conduct a cradle-to-grave life-cycle assessment of the project's structure and enclosure
MR	P	6.3	Environmental Product Declarations			NO	Environmental Product Declaration (EPD): Use at least 20 different permanently installed products sourced from at least five manufacturers that meet one of the disclosure criteria below.
MR	C	6.4	Sourcing of Raw Materials			NO	Use products sourced from at least three different manufacturers that meet at least one of the responsible sourcing and extraction criteria below: Extended producer responsibility; Bio-based materials; Wood products; Materials reuse; Recycled content.
MR	C	6.5	Material Ingredients			NO	Use products that have a compliant material ingredient report or action plan. Use at least five permanently installed products sourced from three different manufacturers.
MR	C	6.6	Construction and Demolition Waste Management			NO	The demolition products will be treated as demolition waste or delivered to an authorised recovery facility.
EQ	P	7.1	Minimum Indoor Air Quality Performance	X		NO	For the verification, please refer to the specialist reports accompanying plant projects.
EQ	P	7.2	Environmental Tobacco Smoke Control			NO	Prohibit smoking inside the building.
EQ	C	7.3	Enhanced Indoor Air Quality Strategies	X		NO	For the verification, please refer to the specialist reports accompanying plant projects.
EQ	C	7.4	Low-Emitting Materials	X		YES	Use materials on the building interior that meet the criteria below.
EQ	C	7.5	Construction Indoor Air Quality Management Plan	X		NO	The project involves the use of certified products that meet the criterion.
EQ	C	7.6	Indoor Air Quality Assessment	X		NO	Please refer to the specialist reports accompanying the plant projects for verification
EQ	C	7.7	Thermal Comfort	X		YES	Please refer to the specialist reports accompanying the plant projects for verification

EQ	C	7.8	Interior Lighting	X		NO	For verification, please refer to the special reports accompanying plant projects.
EQ	C	7.9	Daylight	X		NO	For verification, please refer to the specialist reports accompanying the plant projects.
EQ	C	7.10	Quality Views			NO	Please refer to the specialist reports accompanying the plant projects for verification.
EQ	C	7.11	Acoustic Performance	X		YES	Please refer to the specialist reports accompanying the plant projects for verification
IN	C	8.10	Innovation			YES	The innovative structural design (innovative connections) of the building.

C: Credit; P: Prerequisite