PREREQUISITES & CREDITS INFORMATIONS

INTEGRATIVE PROCESS

INTEGRATIVE PROCESS

INTENT

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

REQUIREMENTS

Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses described below to inform the owner's project requirements (OPR), basis of design (BOD), design documents, and construction documents. Energy-Related Systems

DISCOVERY

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

· Site conditions. Assess shading, exterior lighting, hardscape, landscaping, and adjacent site conditions.

· Massing and orientation. Assess how massing and orientation affect HVAC sizing, energy consumption, lighting, and renewable energy opportunities.

· Basic envelope attributes. Assess insulation values, window-to-wall ratios, glazing characteristics, shading, and window operability.

· Lighting levels. Assess interior surface reflectance values and lighting levels in occupied spaces.

· Thermal comfort ranges. Assess thermal comfort range options.

· Plug and process load needs. Assess reducing plug and process loads through programmatic solutions (e.g., equipment and purchasing policies, layout options).

· Programmatic and operational parameters. Assess multifunctioning spaces, operating schedules, space allotment per person, teleworking, reduction of building area, and anticipated operations and maintenance.

IMPLEMENTATION

Document how the above analysis informed design and building form decisions in the project's OPR and BOD and the eventual design of the project, including the following, as applicable:

· Building and site program.

· Building form and geometry.

· Building envelope and façade treatments on different orientations.

· Elimination and/or significant downsizing of building systems (e.g., HVAC, lighting, controls, Exterior materials, interior finishes, and functional program elements); and

· Other systems.

AND

Water-Related Systems

DISCOVERY

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

· Indoor water demand. Assess flow and flush fixture design case demand volumes, calculated in accordance with WE Prerequisite Indoor Water-Use Reduction.

· Outdoor water demand. Assess landscape irrigation design case demand volume calculated in accordance with WE Credit Outdoor Water-Use Reduction.

· Process water demand. Assess kitchen, laundry, cooling tower, and other equipment demand volumes, as applicable.

· Supply sources. Assess all potential nonpotable water supply source volumes, such as on-site rainwater and graywater, municipally supplied nonpotable water, and HVAC equipment condensate.

IMPLEMENTATION

Document how the above analysis informed building and site design decisions in the project's OPR and BOD. Dem- onstrate how at least one on-site nonpotable water supply source was used to reduce the burden on municipal supply or wastewater treatment systems by contributing to at least two of the water demand components listed above.

Demonstrate how the analysis informed the design of the project, including the following, as applicable:

· Plumbing systems;

· Sewage conveyance and/or on-site treatment systems;

· Rainwater quantity and quality management systems;

· Landscaping, irrigation, and site elements;

· Roofing systems and/or building form and geometry; and

· Other systems.

LOCATION AND TRANSPORTATION (LT)

LT Credit: SURROUNDING DENSITY AND DIVERSE USES

INTENT

To conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. To promote walkability, and transportation efficiency and reduce vehicle distance traveled. To improve public health by encouraging daily physical activity.

REQUIREMENTS

OPTION 1. SURROUNDING DENSITY (2–3 POINTS BD+C EXCEPT CORE AND SHELL, 2-4 POINTS CORE AND SHELL).

Locate on a site whose surrounding existing density within a 1/4-mile (400-meter) radius of the project boundary meets the values in Table 1. Use either the "separate residential and nonresidential densities" or the "combined density" values.

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

Combined Density	Separate Residential and Nonresidential Densities		Points BD+C (except Core and Shell)	Points BD+C (Core and Shell)
Square feet per acre of buildable land	Residential Density (DU/acre)	Nonresidential Density (FAR)		
22,000	7	0.5	2	2
35,000	12	0.8	3	4

TABLE 1B. Points for average density within 400 meters of project (SI units)

Combined Density	Separate Residential and Nonresidential Densities		Points BD+C (except Core and Shell)	Points BD+C (Core and Shell)
Square meters per hectare of buildable land	Residential Density (DU/hectare)	Nonresidential Density (FAR)		
5 050	17.5	0.5	2	2
8 035	30	0.8	3	4

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

OPTION 2. DIVERSE USES (1–2 POINTS)

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

The following restrictions apply.

· A use counts as only one type (e.g., a retail store may be counted only once even if it sells products in several categories).

· No more than two uses in each use type may be counted (e.g., if five restaurants are within walking distance, only two may be counted).

· The counted uses must represent at least three of the five categories, exclusive of the building's primary use.

POTENTIAL TECHNOLOGIES & STRATEGIES

Locate the project where the average combined density is greater than 5,050 square meters per hectare of buildable land.

PROJECT COMPLIANCE

Total building area (sqm)	313,700
Total buildable land (ha)	38.35
Sqm per ha of buildable land	8,179.92

LT Credit: REDUCED PARKING FOOTPRINT

INTENT

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

REQUIREMENTS

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

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

Case 1. Baseline Location

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

Case 2. Dense and/or Transit-Served Location

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

FOR ALL PROJECTS

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

For projects that use pooled parking, calculate compliance using the project's share of the pooled parking.
Provide preferred parking for carpools for 5% of the total parking spaces after reductions are made from the base ratios. Preferred parking is not required if no off-street parking is provided.
Mixed-use projects should determine the percentage reduction by first aggregating the parking amount of each use (as specified by the base ratios) and then determining the percentage reduction from the aggregated parking amount.
Do not count parking spaces for fleet and inventory vehicles unless these vehicles are regularly used by employees for commuting as well as business purposes.

POTENTIAL TECHNOLOGIES & STRATEGIES

Provide parking capacity that is a percentage reduction below the base ratios recommended by the Parking Consultants Council

PROJECT COMPLIANCE

- The Project YIN HWA SHOES LASTS VIETNAM
  Gross floor area: 5,907 m2
  ⇨ Base ratios of Manufacturing = 141 spaces.
- In this project, Total provided capacity = 6 spaces
  ⇨ Parking reduction = (141-6)/141 * 100 = 95.7 %
  ⇨ Achieved: 95.7 % reduction from the base ratios.

In addition, Project team will provide carpool parking: 02 spaces => Accounting for 33.3 % of the total parking spaces used for this project => meet the requirements.

LT Credit: GREEN VEHICLES

INTENT

To reduce pollution by promoting alternatives to conventionally fueled automobiles.

REQUIREMENTS

Designate 5% of all parking spaces used by the project as preferred parking for green vehicles. Clearly identify and enforce for sole use by green vehicles. Distribute preferred parking spaces proportionally among various parking sections (e.g., between short-term and long-term spaces).
Green vehicles must achieve a minimum green score of 45 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide (or local equivalent for projects outside the U.S.).
A discounted parking rate of at least 20% for green vehicles is an acceptable substitute for preferred parking spaces. The discounted rate must be publicly posted at the entrance of the parking area and permanently available to every qualifying vehicle.

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

OPTION 1. ELECTRIC VEHICLE CHARGING

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

The EVSE must:

· Provide a Level 2 charging capacity (208 – 240 volts) or greater.

· Comply with the relevant regional or local standard for electrical connectors, such as SAE Surface Vehicle

Recommended Practice J1772, SAE Electric Vehicle Conductive Charge Coupler or IEC 62196 of the International Electrotechnical Commission for projects outside the U.S.

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

OPTION 2. LIQUID, GAS, OR BATTERY FACILITIES

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Provide designate 5% of all parking spaces used by the project as preferred parking for green vehicles. Clearly identify and enforce for sole use by green vehicles. Distribute preferred parking spaces proportionally among various parking sections and install electrical vehicle supply equipment (EVSE) in 2% of all parking spaces used by the project. Clearly identify and reserve these spaces for the sole use by plug-in electric vehicles.

PROJECT COMPLIANCE

Total provided capacity: 6 spaces.

- Total Green Vehicle parking: 2 spaces
- Project team will provide parking space for green vehicles: 2 spaces for Green Vehicle and 2 spaces for Plug in EVSE.

Project team will install electrical vehicle supply equipment (EVSE) in 2 parking spaces (33.3 % of all parking spaces).

In addition to EVSE, will be designed in compliance with:

- Level 2 charging capacity (208 – 240 volts)
- Connect ethernet to well manage in being networked and be capable of time-of-use to encourage off-peak charging.

- Comply with local standard for electrical connectors.

SUSTAINABLE SITES (SS)

SS Prerequisite: CONSTRUCTION ACTIVITY POLLUTION PREVENTION

INTENT

To reduce pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust.

REQUIREMENTS

Create and implement an erosion and sedimentation control plan for all construction activities associated with the project. The plan must conform to the erosion and sedimentation requirements of the 2012 U.S. Environmental

Protection Agency (EPA) Construction General Permit (CGP) or local equivalent, whichever is more stringent.

Projects must apply the CGP regardless of size. The plan must describe the measures implemented.

POTENTIAL TECHNOLOGIES & STRATEGIES

• The Erosion and sedimentation control plan (ESC) Plan.

• Monthly report:

PROJECT COMPLIANCE

- Inspection logs

- All documents (reports and evidence) of previous months completed.

- Construction drawings describing the erosion and sedimentation control measures implemented on the site

SS Credit: SITE ASSESSMENT

INTENT

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

REQUIREMENTS

Complete and document a site survey or assessment 1 that includes the following information:

· Topography: Contour mapping, unique topographic features, slope stability risks.

· Hydrology: Flood hazard areas, delineated wetlands, lakes, streams, shorelines, rainwater collection and reuse opportunities, TR-55 initial water storage capacity of the site (or local equivalent for projects outside the U.S.).

· Climate: Solar exposure, heat island effect potential, seasonal sun angles, prevailing winds, monthly precipitation and temperature ranges.

· Vegetation.: Primary vegetation types of greenfield area, significant tree mapping, threatened or endangered species, unique habitat, invasive plant species.

· Soils: Natural Resources Conservation Service soils delineation, U.S. Department of Agriculture prime farmland, healthy soils, previous development, disturbed soils (local equivalent standards may be used for projects outside the U.S.).

· Human use. Views, adjacent transportation infrastructure, adjacent properties, construction materials with existing recycle or reuse potential.

· Human health effects. Proximity of vulnerable populations, adjacent physical activity opportunities, proximity to major sources of air pollution.

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

SS Credit: HEAT ISLAND REDUCTION

INTENT

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

REQUIREMENTS

Choose one of the following options:

OPTION 1. NONROOF AND ROOF (2 POINTS EXCEPT HEALTHCARE, 1 POINT HEALTHCARE)

Meet the following criterion:

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

Alternatively, an SRI and SR weighted average approach may be used to calculate compliance.

Use any combination of the following strategies.

Nonroof Measures

· Use the existing plant material or install plants that provide shade over paving areas (including playgrounds) on the site within 10 years of planting. Install vegetated planters. Plants must be in place at the time of occupancy permit and cannot include artificial turf.

· Provide shade with structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.

· Provide shade with architectural devices or structures that have a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation.

Provide shade with vegetated structures.

· Use paving materials with a three-year aged solar reflectance (SR) value of at least 0.28. If three-year aged value information is not available, use materials with an initial SR of at least 0.33 at installation.

· Use an open-grid pavement system (at least 50% unbound).

High-Reflectance Roof

Use roofing materials that have an SRI equal to or greater than the values in Table 1. Meet the three-year aged SRI value. If three-year aged value information is not available, use materials that meet the initial SRI value.

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

	Slope	Initial SRI	3-year aged SRI
Low-sloped roof	≤ 2:12	82	64
Steep-sloped roof	> 2:12	39	32

Vegetated Roof

Install a vegetated roof.

OR

OPTION 2. PARKING UNDER COVER (1 POINT)

Place a minimum of 75% of parking spaces under cover. Any roof used to shade or cover parking must (1) have a three-year aged SRI of at least 32 (if three-year aged value information is not available, use materials with an initial

SRI of at least 39 at installation), (2) be a vegetated roof, or (3) be covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.

POTENTIAL TECHNOLOGIES & STRATEGIES

Provide shading for all parking spaces

PROJECT COMPLIANCE

Total of car parking spaces under cover: 6 spaces (100%)

Roof materials of Parking:

- Steel Roof (Dong A steel, off-white color) – SRI = 93

=> To reduce heat islands to minimize impacts on microclimates and human and wildlife habitats.

WATER EFFICIENCY (WE)

WE Prerequisite: OUTDOOR WATER USE REDUCTION

INTENT

To reduce outdoor water consumption.

REQUIREMENTS

Reduce outdoor water use through one of the following options. No vegetated surfaces, such as permeable or impermeable pavement, should be excluded from the landscape area calculations. Athletic fields and playgrounds (if vegetated) and food gardens may be included or excluded at the project team's discretion.

OPTION 1. NO IRRIGATION REQUIRED

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

OR

OPTION 2. REDUCED IRRIGATION

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

POTENTIAL TECHNOLOGIES & STRATEGIES

The same as WE Credit: Outdoor Water Use Reduction

PROJECT COMPLIANCE

The same as WE Credit: Outdoor Water Use Reduction

WE Prerequisite: INDOOR WATER USE REDUCTION

INTENT

To reduce indoor water consumption.

REQUIREMENTS

Building Water Use

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

TABLE 1. Baseline water consumption of fixtures and fittings

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

*WaterSense label available for this product type
gpf = gallons per flush gpm = gallons per minute psi = pounds per square inch
lpf = liters per flush lpm = liters per minute kPa = kilopascals

Appliance and Process Water Use

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

TABLE 2. Standards for appliances

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

gpm = gallons per minute lpm = liters per minute

TABLE 3. Standards for processes

Process	Requirement
Heat rejection and cooling	No once-through cooling with potable water for any equipment or appliances that reject heat
Cooling towers and evaporative condensers	Equip with • makeup water meters • conductivity controllers and overflow alarms • efficient drift eliminators that reduce drift to maximum of 0.002% of recirculated water volume for counterflow towers and 0.005% of recirculated water flow for cross-flow towers

gpm = gallons per minute lpm = liters per minute

POTENTIAL TECHNOLOGIES & STRATEGIES

The same as WE Credit: Indoor Water Use Reduction

PROJECT COMPLIANCE

The same as WE Credit: Indoor Water Use Reduction

WE Prerequisite: BUILDING-LEVEL WATER METERING

INTENT

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

REQUIREMENTS

Building Water Use

Install permanent water meters that measure the total potable water use for the building and associated grounds.

Meter data must be compiled into monthly and annual summaries; meter readings can be manual or automated.

Commit to sharing with USGBC the resulting whole-project water usage data for a five-year period beginning on the date the project accepts LEED certification or typical occupancy, whichever comes first. This commitment must carry forward for five years or until the building changes ownership or lessee.

WE Credit: OUTDOOR WATER USE REDUCTION

INTENT

To reduce outdoor water consumption.

REQUIREMENTS

Reduce outdoor water use through one of the following options. No vegetated surfaces, such as permeable or impermeable pavement, should be excluded from landscape area calculations. Athletic fields and playgrounds (if vegetated) and food gardens may be included or excluded at the project team's discretion.

OPTION 1. NO IRRIGATION REQUIRED (2 POINTS EXCEPT HEALTHCARE,
1 POINT HEALTHCARE)

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

OR

OPTION 2. REDUCED IRRIGATION (2 POINTS EXCEPT HEALTHCARE, 1 POINT HEALTHCARE)

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

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

TABLE 1. Points for reducing irrigation water

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Perform a soil/climate analysis to determine appropriate plant material and design the landscape with native or adapted plants to reduce or eliminate irrigation requirements. Use treated water from STP tank as alternative water source to reduce water demand for irrigation.

PROJECT COMPLIANCE

- Landscape water requirement: 15,244 l/month
- Alternative water source from STP tank: 31 m3/day
- Percentage reduction: 100 %

=> Don't need potable water for irrigation

=> To promote landscape designs which incorporate native species and limit the use of domestic water for irrigation.

WE Credit: INDOOR WATER USE REDUCTION

INTENT

To reduce indoor water consumption.

REQUIREMENTS

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

TABLE 1. Points for reducing water use		
Percentage reduction	**Points (BD+C)**	**Points (Schools, Retail, Hospitality, Healthcare)**
25%	1	1
30%	2	2
35%	3	3
40%	4	4
45%	5	5
50%	6	–

POTENTIAL TECHNOLOGIES & STRATEGIES

Water Sense-certified fixtures and fixture fittings should be used where available. Use high-efficiency fixtures (e.g., water closets and urinals).

PROJECT COMPLIANCE

Water use reduction: 52.84 %

- Water closet (RIGEL W3-R-WO9030S): Dual Flush 2.5 LPF / 3.5 LPF
- Lavatory Faucet (RIGEL R-UH904BP-G): 1.5 LPM
- Urinal (RIGEL W3-R-TP817310): 0.5 LPF

WE Credit: WATER METERING

INTENT

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

REQUIREMENTS

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

· Irrigation. Meter water systems serving at least 80% of the irrigated landscaped area. Calculate the percentage of irrigated landscape area served as the total metered irrigated landscape area divided by the total irrigated landscape area. Landscape areas fully covered with xeriscaping or native vegetation that requires no routine irrigation may be excluded from the calculation.

· Indoor plumbing fixtures and fittings. Meter water systems serving at least 80% of the indoor fixtures and fitting described in WE Prerequisite Indoor Water Use Reduction, either directly or by deducting all other measured water use from the measured total water consumption of the building and grounds.

· Domestic hot water. Meter water use of at least 80% of the installed domestic hot water heating capacity (including both tanks and on-demand heaters).

· Boiler with aggregate projected annual water use of 100,000 gallons (378 500 liters) or more, or boiler of more than 500,000 BtuH (150 kW). A single makeup meter may record flows for multiple boilers.

· Reclaimed water. Meter reclaimed water, regardless of rate. A reclaimed water system with a makeup water connection must also be metered so that the true reclaimed water component can be determined.

· Other process water. Meter at least 80% of expected daily water consumption for process end uses, such as humidification systems, dishwashers, clothes washers, pools, and other subsystems using process water.

POTENTIAL TECHNOLOGIES & STRATEGIES

Perform plumping analysis to determine location of water meter and design the plumbing system, additional water savings by tracking water consumption.

PROJECT COMPLIANCE

Install permanent water meters for

- 01 main water meter: connect to Municipal water supply system from Industrial Park.
- 01 water meter for indoor plumbing fixtures and fittings: connect to Input-water pipe of sanitary fixture Supply System of Factory.
- 01 water meter for indoor plumbing fixtures and fittings: connect to Input-water pipe of sanitary fixture Supply System of Office.
- 01 water meter for irrigation: connect to Input-water pipe for irrigation system.

ENERGY AND ATMOSPHERE (EA)

EA Prerequisite: FUNDAMENTAL COMMISSIONING OF BUILDING ENERGY SYSTEMS

INTENT

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

REQUIREMENTS

Commissioning Process Scope

Complete the following commissioning (Cx) process activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies, in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1–2007 for HVAC&R Systems, as they relate to energy, water, indoor environmental quality, and durability.

Requirements for exterior enclosures are limited to inclusion in the owner's project requirements (OPR) and basis of design (BOD), as well as the review of the OPR, BOD and project design. NIBS Guideline 3-2012 for Exterior Enclosures provides additional guidance.

- Develop the OPR,
- Develop a BOD

The commissioning authority (CxA) must do the following:

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

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

Commissioning Authority

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

- The CxA must have documented commissioning process experience on at least two building projects with a similar scope of work. The experience must extend from early design phase through at least 10 months of occupancy.
- The CxA may be a qualified employee of the owner, an independent consultant, or an employee of the design or construction firm who is not part of the project's design or construction team, or a disinterested subcontractor of the design or construction team.
    - For projects smaller than 20,000 square feet (1 860 square meters), the CxA may be a qualified member of the design or construction team in all cases, the CxA must report his or her findings directly to the owner.

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

Current Facilities Requirements and Operations and Maintenance Plan

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Engage a CxA as early as possible in the design process. Determine the owner's project requirements, develop and maintain a commissioning plan for use during design and construction and incorporate commissioning requirements in bid documents. Assemble the commissioning team, and prior to

occupancy verify the performance of energy consuming systems. Complete the commissioning reports with recommendations prior to accepting the commissioned systems.

Owners are encouraged to seek out qualified individuals to lead the commissioning process. Qualified individuals are identified as those who possess a high level of experience in the following areas:

• Energy systems design, installation and operation

• Commissioning planning and process management

• Hands-on field experience with energy systems performance, interaction, start-up, balancing, testing, troubleshooting, operation and maintenance procedures

• Energy systems automation control knowledge

Owners are encouraged to consider including water-using systems, building envelope systems, and other systems in the scope of the commissioning plan as appropriate. The building envelope is an important component of a facility that impacts energy consumption, occupant comfort and indoor air quality. While this prerequisite does not require building envelope commissioning, an owner can achieve significant financial savings and reduce risk of poor indoor air quality by including it in the commissioning process.

The LEED Reference Guide for Green Building Design and Construction, v4 Edition provides guidance on the rigor expected for this prerequisite for the following:

• Owner's project requirements

• Basis of design

• Commissioning plan

• Commissioning specification

• Performance verification documentation

• Commissioning report

PROJECT COMPLIANCE

Complete the commissioning process for mechanical, electrical, and plumbing systems.

EA Prerequisite: MINIMUM ENERGY PERFORMANCE

INTENT

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

REQUIREMENTS

OPTION 1. WHOLE BUILDING ENERGY SIMULATION

Demonstrate an improvement of 5% for new construction, 3% for major renovations, or 2% for core and shell projects in the proposed building performance rating compared with the performance rating. Calculate the baseline building performance according to ANSI/ASHRAE/IESNA Standard 90.1–2010,

Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), using a simulation model.

Projects must meet the minimum percentage savings before taking credit for renewable energy systems. The proposed design must meet the following criteria:

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

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

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

OR

OPTION 2. PRESCRIPTIVE COMPLIANCE PATH: ASHRAE 50% ADVANCD ENERGY DESIGN GUIDE

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

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

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

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

OPTION 3. PRESCRIPTIVE COMPLIANCE: ADVANCED BUILDING™ CORE PERFORMANCE™ GUIDE

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

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

3.5 Supply Air Temperature Reset (VAV)

3.9 Premium Economizer Performance

3.10 Variable Speed Control

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

Note: Healthcare, Warehouse or Laboratory projects are ineligible for Option 3.

DATA CENTERS

Whole-Building Energy Simulation

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

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

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

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

The proposed design must meet the following criteria:

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

- comparison against a baseline building that complies with ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), and data center modeling guidelines.

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

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

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

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Design the building envelope and systems to meet baseline requirements. Use a computer simulation model to assess the energy performance and identify the most cost-effective energy efficiency measures. Quantify energy performance compared with a baseline building.

PROJECT COMPLIANCE

The project complies with Option 1: Whole building energy simulation and achieved an energy cost saving of 16.2 %. The total predicted annual energy consumption for project is 2,655,300 kWh of electricity.

EA Prerequisite: BUILDING-LEVEL ENERGY METERING

INTENT

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

REQUIREMENTS

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

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Perform electrical source analysis to determine location of power meter and design the electrical system, additional energy savings by tracking building-level energy use.

PROJECT COMPLIANCE

Install one main power meter which connect to power supply system from Industrial Park

EA Prerequisite: FUNDAMENTAL REFRIGERANT MANAGEMENT

INTENT

To reduce stratospheric ozone depletion.

REQUIREMENTS

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Specify new HVAC equipment in the building that uses no CFC-based refrigerants.

PROJECT COMPLIANCE

The LEED Form states that there are no CFC-based refrigerants serving the project building.

EA Credit: OPTIMIZE ENERGY PERFORMANCE

INTENT

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

REQUIREMENTS

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

Choose one of the options below.

OPTION 1. WHOLE-BUILDING ENERGY SIMULATION (1–18 points except Schools and Healthcare, 1–16 points Schools, 1–20 points Healthcare)

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

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

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

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

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

RETAIL ONLY

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

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

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

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

OPTION 2. PRESCRIPTIVE COMPLIANCE: ASHRAE ADVANCED ENERGY DESIGN GUIDE (1–6 points)

To be eligible for Option 2, projects must use Option 2 in EA Prerequisite Minimum Energy Performance.

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

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

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

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

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

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

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

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

ASHRAE 50% Advanced Energy Design Guide for Large Hospitals

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

RETAIL ONLY

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

DATA CENTERS

Whole-Building Energy Simulation

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

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Design the building envelope and systems to maximize energy performance. Use a computer simulation model to assess the energy performance and identify the most cost-effective energy efficiency measures. Quantify energy performance compared with a baseline building.

PROJECT COMPLIANCE

The project complies with Option 1: Whole building energy simulation and achieved an energy cost saving of 16.2 %. The total predicted annual energy consumption for project is 2,655,300 kWh of electricity.

EA Credit: RENEWABLE ENERGY PRODUCTION

INTENT

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

REQUIREMENTS

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

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

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

The use of solar gardens or community renewable energy systems is allowed if both of the following requirements are met.

- The project owns the system or has signed a lease agreement for a period of at least 10 years.
- The system is located with the same utility service area as the facility claiming the use.

Credit is based on the percentage of ownership or percentage of use assigned in the lease agreement. Points are awarded according to Table 1.

TABLE 1. Points for renewable energy

Percentage renewable energy	Points (All, except Core and Shell))	Points (Core and Shell)
1%	1	1
3%	–	2
5%	2	3
10%	3	–

POTENTIAL TECHNOLOGIES & STRATEGIES

Assess the project for nonpolluting and renewable energy potential including solar, wind, geothermal, low-impact hydro, biomass and bio-gas strategies. When applying these strategies, take advantage of net metering with the local utility.

PROJECT COMPLIANCE

The project complies with Option 1: Whole building energy simulation and project has offset 19.7 % of the total energy cost through renewable energy generated on-site.

MATERIALS AND RESOURCES (MR)

MR Prerequisite: STORAGE AND COLLECTION OF RECYCLABLES

INTENT

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

REQUIREMENTS

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

RETAIL

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Designate an area for recyclable collection and storage that is appropriately sized and located in a convenient area.

Identify local waste handlers and buyers for glass, plastic, metals, office paper, newspaper, cardboard and organic wastes. Instruct occupants on recycling procedures. Consider employing cardboard balers, aluminum can crushers, recycling chutes and other waste management strategies to further enhance the recycling program.

PROJECT COMPLIANCE

Project has provided appropriately sized dedicated areas for the collection and storage of materials for recycling.

MR Prerequisite: CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING

INTENT

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

REQUIREMENTS

Develop and implement a construction and demolition waste management plan:

- Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. approximate a percentage of the overall project waste that these materials represent.
- Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the materials will be taken and how the recycling facility will process the material.

Provide a final report detailing all major waste streams generated, including disposal and diversion rates.

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

POTENTIAL TECHNOLOGIES & STRATEGIES

The same as credit MR Credit: Construction and Demolition Waste Management

PROJECT COMPLIANCE

The same as credit MR Credit: Construction and Demolition Waste Management

MR Credit: CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

INTENT

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

REQUIREMENTS

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

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

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

OPTION 1. DIVERSION (1-2 points)

Path 1. divert 50% and three material streams (1 point)

Divert at least 50% of the total construction and demolition material; diverted materials must include at least three material streams.

OR

Path 2. divert 75% and four material streams (2 points)

Divert at least 75% of the total construction and demolition material; diverted materials must include at least four material streams.

OR

OPTION 2. REDUCTION OF TOTAL WASTE MATERIAL

Do not generate more than 2.5 pounds of construction waste per square foot (12.2 kilograms of waste per square meter) of the building's floor area.

POTENTIAL TECHNOLOGIES & STRATEGIES

Establish goals for diversion from disposal in landfills and incineration facilities and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, paper, metal, brick, concrete, plastic, wood, gypsum. Designate a specific area(s) on the construction site for segregated or comingled collection of recyclable materials, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

PROJECT COMPLIANCE

- Total waste: 264.82 tons
- Total diverted waste: 237.42 tons

=> Total percentage of construction waste diverted from landfill: 89.65 %

The project has diverted 89.65 % of the on-site generated construction waste from landfill.

INDOOR ENVIROMENT QUALITY (IEQ)

IEQ Prerequisite: MINIMUM INDOOR AIR QUALITY PERFORMANCE

INTENT

To contribute to the comfort and well-being of building occupants by establishing minimum standards for indoor air quality (IAQ).

REQUIREMENTS

Meet the requirements for both ventilation and monitoring.

Ventilation

Mechanically ventilated spaces

OPTION 1. ASHRAE STANDARD 62.1–2010

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

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

OPTION 2. CEN STANDARDS EN 15251–2007 AND EN 13779–2007

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

Naturally ventilated spaces

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

All spaces

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

Monitoring

Mechanically ventilated spaces

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

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

Naturally ventilated spaces

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

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

Residential only

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

- Unvented combustion appliances (e.g., decorative logs) are not allowed.

- Carbon monoxide monitors must be installed on each floor of each unit.
- All indoor fireplaces and woodstoves must have solid glass enclosures or doors that seal when closed.
- Any indoor fireplaces and woodstoves that are not closed combustion or power-vented must pass a backdraft potential test to ensure that depressurization of the combustion appliance zone is less than 5 Pa.
- Space- and water-heating equipment that involves combustion must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting) or with power-vented exhaust or located in a detached utility building or open-air facility.
- For projects in high-risk areas for radon, EPA Radon Zone 1 (or local equivalent for project outside the U.S.), design and construct any dwelling unit on levels one through four above grades with radon-resistant construction techniques. Follow the techniques prescribed in EPA Building Radon Out; NFPA 5000, Chapter 49; International Residential Code, Appendix F; CABO, Appendix F; ASTM E1465; or a local equivalent, whichever is most stringent.

POTENTIAL TECHNOLOGIES & STRATEGIES

Design ventilation systems to meet or exceed the minimum outdoor air ventilation rates as described in the ASHRAE standard. Balance the impacts of ventilation rates on energy use and indoor air quality to optimize for energy efficiency and occupant comfort. Use the ASHRAE Standard 62.1-2007 User's Manual (with errata but without addenda 1) for detailed guidance on meeting the referenced requirements.

Determine the outdoor air opening and space configuration of natural ventilated space in accordance with the natural ventilation procedure from ASHRAE Standard 62.1–2010, analysis the effective strategy for the project by following the flow diagram in the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual AM10, March 2005, Natural Ventilation in Nondomestic Buildings, Figure 2.8.

PROJECT COMPLIANCE

The project complies with:

- Ventilation of Mechanically Ventilated Spaces (Option 1) and Natural Ventilated Spaces,
- Monitoring of Mechanically Ventilated Spaces and Natural Ventilated Spaces.

IEQ Prerequisite: ENVIRONMENTAL TOBACCO SMOKE CONTROL

INTENT

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

REQUIREMENTS

Prohibit smoking inside the building.

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

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

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

Residential only

OPTION 1. NO SMOKING

Meet the requirements above.

OR

OPTION 2. COMPARTMENTALIZATION OF SMOKING AREAS

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

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

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

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

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

- Weather-strip all exterior doors and operable windows in the residential units to minimize leakage from outdoors.
- Weather-strip all doors leading from residential units into common hallways.
- Minimize uncontrolled pathways for the transfer of smoke and other indoor air pollutants between residential units by sealing penetrations in the walls, ceilings, and floors and by sealing vertical

chases (including utility chases, garbage chutes, mail drops, and elevator shafts) adjacent to the units.

- Demonstrate a maximum leakage of 0.23 cubic feet per minute per square foot (1.17 liters per second per square meter) at 50 Pa of enclosure (i.e., all surfaces enclosing the apartment, including exterior and party walls, floors, and ceilings).

POTENTIAL TECHNOLOGIES & STRATEGIES

Prohibit smoking in commercial buildings or effectively control the ventilation air in smoking rooms.

PROJECT COMPLIANCE

- Employees and visitors are allowed to smoke at the dedicated smoking area (nearby Factory restroom).
- The distance between of this smoking area with Nearest window (of Factory) is 8.1 meters.
- And have no entries, outdoor air intakes and operable windows within 7.7m (~25ft) in radius of the above smoking area.

IEQ Credit: THERMAL COMFORT

INTENT

To promote occupants' productivity, comfort, and well-being by providing quality thermal comfort.

REQUIREMENTS

Thermal Comfort Design

OPTION 1. ASHRAE STANDARD 55-2010

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

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

OR

OPTION 2. ISO AND CEN STANDARDS

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

· ISO 7730:2005, Ergonomics of the Thermal Environment, analytical determination and interpretation of thermal comfort, using calculation of the PMV and PPD indices and local thermal comfort criteria; and

· CEN Standard EN 15251:2007, Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings, addressing indoor air quality, thermal environment, lighting, and acoustics, Section A2.

Thermal Comfort Control

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

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata or a local equivalent. Provide individual and group thermal comfort controls.

PROJECT COMPLIANCE

Air conditioning systems are capable of providing internal conditions of dry bulb 24oC ±1oC, relative humidity 65% to maintain the comfort level.

Provided individual thermal comfort controls for 100% individual occupant spaces. Provide group thermal comfort controls for all shared multioccupant spaces. Thermal comfort controls include: individual fans, thermostat.

IEQ Credit: INTERIOR LIGHTING

INTENT

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

REQUIREMENTS

Select one or both of the following two options.

OPTION 1. LIGHTING CONTROL (1 POINT)

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

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

· Have in place multizone control systems that enable occupants to adjust the lighting to meet group needs and preferences, with at least three lighting levels or scenes (on, off, midlevel).

· Lighting for any presentation or projection wall must be separately controlled.

· Switches or manual controls must be located in the same space as the controlled luminaires. A person operating the controls must have a direct line of sight to the controlled luminaires.

AND/OR

OPTION 2. LIGHTING QUALITY (1 POINT)

Choose four of the following strategies.

A. For all regularly occupied spaces, use light fixtures with a luminance of less than 2,500 cd/m 2 between 45 and 90 degrees from nadir.

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

B. For the entire project, use light sources with a CRI of 80 or higher. Exceptions include lamps or fixtures specifically designed to provide colored lighting for effect, site lighting, or other special use.

C. For at least 75% of the total connected lighting load, use light sources that have a rated life (or L70 for LED sources) of at least 24,000 hours (at 3-hour per start, if applicable).

D. Use direct-only overhead lighting for 25% or less of the total connected lighting load for all regularly occupied spaces.

E. For at least 90% of the regularly occupied floor area, meet or exceed the following thresholds for area-weighted average surface reflectance: 85% for ceilings, 60% for walls, and 25% for floors.

F. If furniture is included in the scope of work, select furniture finishes to meet or exceed the following thresholds for area-weighted average surface reflectance: 45% for work surfaces, and 50% for movable partitions.

G. For at least 75% of the regularly occupied floor area, meet a ratio of average wall surface illuminance (excluding fenestration) to average work plane (or surface, if defined) illuminance that does not exceed 1:10. Must also meet strategy E, strategy F, or demonstrate area-weighted surface reflectance of at least 60% for walls.

H. For at least 75% of the regularly occupied floor area, meet a ratio of average ceiling illuminance (excluding fenestration) to work surface illuminance that does not exceed 1:10. Must also meet strategy E, strategy F, or demonstrate area-weighted surface reflectance of at least 85% for ceilings.

POTENTIAL TECHNOLOGIES & STRATEGIES

Provide individual lighting controls that enable occupants to adjust the lighting to suit their individual tasks and preferences, with at least three lighting levels or scenes (on, off, midlevel).

PROJECT COMPLIANCE

Provide multi lighting levels (on, off, midlevel) for all individual occupant spaces, and multioccupant spaces.

IEQ Credit: DAYLIGHT

INTENT

To connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight into the space.

REQUIREMENTS

Provide manual or automatic (with manual override) glare-control devices for all regularly occupied spaces. Select one of the following three options.

OPTION 1. SIMULATION: SPATIAL DAYLIGHT AUTONOMY AND ANNUAL SUNLIGHT EXPOSURE

Demonstrate through annual computer simulations that spatial daylight autonomy$_{300/50\%}$ (sDA$_{300/50\%}$) of at least 55%, 75%, or 90% is achieved. Use regularly occupied floor area. Healthcare projects should use the perimeter area determined under EQ Credit Quality Views. Points are awarded according to Table 1.

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

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

AND

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

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

OR

OPTION 2. SIMULATION: ILLUMINANCE CALCULATIONS

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

TABLE 2. Points for daylit floor area: Illuminance calculation			
New Construction, Core and Shell, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		**Healthcare**	
Percentage of regularly occupied floor area	**Points**	**Percentage of perimeter floor area**	**Points**
75%	1	75%	1
90%	2	90%	2

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

· Use typical meteorological year data, or an equivalent, for the nearest available weather station.

· Select one day within 15 days of September 21 and one day within 15 days of March 21 that represent the clearest sky condition.

· Use the average of the hourly value for the two selected days.

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

OR

OPTION 3. MEASUREMENT

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

TABLE 3. Points for daylit floor area: Measurement			
New Construction, Core and Shell, Schools, Retail, Data Centers, Warehouses and Distribution Centers, Hospitality		**Healthcare**	
Percentage of regularly occupied floor area	**Points**	**Percentage of perimeter floor area**	
75	2	75	1
90	3	90	2

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

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

· Take one measurement in any regularly occupied month and take a second as indicated in Table 4.

· For spaces larger than 150 square feet (14 square meters), take measurements on a maximum 10 foot (3 meter) square grid.

· For spaces 150 square feet (14 square meters) or smaller, take measurements on a maximum 3 foot (900 millimeters) square grid.

TABLE 4. Timing of measurements for illuminance

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

POTENTIAL TECHNOLOGIES & STRATEGIES

Design the building to maximize interior daylighting. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, exterior and interior permanent shading devices, high-performance glazing, and high-ceiling reflectance values, additionally, automatic photocell-based controls can help to reduce energy use. Predict daylight factors via manual calculations or model daylighting strategies with a physical or computer model to assess footcandle levels and daylight factors achieved.

PROJECT COMPLIANCE

Percentage of regularly occupied area that is natural daylighted: 91.8%

=> To provide for the building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

INNOVATION IN DESIGN (INN)

ID Credit: INNOVATION IN DESIGN

INTENT

To encourage projects to achieve exceptional or innovative performance.

REQUIREMENTS

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

OPTION 1. INNOVATION (1 point)

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

Identify the following:

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

AND/OR

OPTION 2. PILOT (1 point)

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

AND/OR

OPTION 3. ADDITIONAL STATEGIES (3 points)

Innovation (1-3 points)

- Defined in Option 1 above.

Pilot (1-3 points)

- Meet the requirements of Option 2.

Exemplary performance (1–2 points)

- Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition. An exemplary performance point is typically earned for achieving double the credit requirements or the next incremental percentage threshold.

POTENTIAL TECHNOLOGIES & STRATEGIES

Substantially exceed LEED v4 BD+C: NC performance credits. Apply strategies or measures that demonstrate a comprehensive approach and quantifiable environment and/or health benefits.

PROJECT COMPLIANCE

The project achieves exemplary performance for:

- LT credit 6: Reduced Parking Footprint - 95.7 % parking reduction from the base ratios.
- Innovation for: Inn credit 1.2: Education program

ID Credit: LEED ACCREDITED PROFESSIONAL

INTENT

To encourage the team integration required by a LEED project and to streamline the application and certification process.

REQUIREMENTS

At least one principal participant of the project team must be a LEED Accredited Professional (AP) with a specialty appropriate for the project.

POTENTIAL TECHNOLOGIES & STRATEGIES

Educate the project team members about green building design and construction, the LEED.
requirements and application process early in the life of the project. Consider assigning integrated.
design and construction process facilitation to the LEED AP.

PROJECT COMPLIANCE

REGIONAL PRIORITY (RP)

REGIONAL PRIORITY

INTENT

To provide an incentive for the achievement of credits that address geographically specific environmental, social equity, and public health priorities.

REQUIREMENTS

Earn up to four of the six Regional Priority credits. These credits have been identified by the USGBC regional councils and chapters as having additional regional importance for the project's region. A database of Regional Priority credits and their geographic applicability is available on the USGBC website, www.usgbc.org/rpc.