

# Sustainable Building Rating Systems Crosswalk to the Guiding Principles

## LEED® and the GUIDING PRINCIPLES FOR FEDERAL LEADERSHIP IN HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS

**Integrated Design.** Use a collaborative, integrated planning and design process that

- Initiates and maintains an integrated project team in all stages of a project's planning and delivery;
- Establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals; and, ensures incorporation of these goals throughout the design and lifecycle of the building; and,
- Considers all stages of the building's lifecycle, including deconstruction.

*Applicable LEED Requirements: n/a*

**Commissioning.** Employ total building commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include a designated commissioning authority, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.

*Applicable LEED Requirements:*

### **NC, CI, CS Prerequisite 1**

#### **Requirements**

The following commissioning process activities shall be completed by the commissioning team, in accordance with the LEED-NC 2.2 Reference Guide.

- 1) Designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the completion of the commissioning process activities.
  - a) The CxA shall have documented commissioning authority experience in at least two building projects.
  - b) The individual serving as the CxA shall be independent of the project's design and construction management, though they may be employees of the firms providing those services. The CxA may be a qualified employee or consultant of the Owner.
  - c) The CxA shall report results, findings and recommendations directly to the Owner.
  - d) For projects smaller than 50,000 gross square feet, the CxA may include qualified persons on the design or construction teams who have the required experience.
- 2) The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.
- 3) Develop and incorporate commissioning requirements into the construction documents.
- 4) Develop and implement a commissioning plan.
- 5) Verify the installation and performance of the systems to be commissioned.
- 6) Complete a summary commissioning report.

Commissioning process activities shall be completed for the following energy-related systems, at a minimum:

- Heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls
- Lighting and daylighting controls
- Domestic hot water systems
- Renewable energy systems (wind, solar etc.)

### **EB Prerequisite 1**

#### **Requirements**

Verify and ensure that fundamental building elements and systems are installed, calibrated and operating as intended so they can deliver functional and efficient performance. Carry out a comprehensive existing building commissioning including the following procedures:

1. Develop a comprehensive building operation plan that meets the requirements of current building usage, and addresses the heating system, cooling system, humidity control system, lighting system, safety systems and the building automation controls.
2. Prepare a commissioning plan for carrying out the testing of all building systems to verify that they are working according to the specifications of the building operation plan.
3. Implement the commissioning plan documenting all the results.
4. Repair or upgrade all systems components that are found to be not working according to the specifications of the building operation plan.
5. Re-test all building components that required repairs or upgrades to verify that they are working according to the specifications of the building operation plan.

OR

Submit a 1- to 5-Year Plan for continuous improvement of these aspects of commissioning requirements 1-5 until all aspects are completed. During the implementation of the continuous improvement plan, demonstrate continuous improvement on a yearly basis until all aspects are completed. All low-cost and no-cost measures must be implemented in the first two years of the implementation program.

### **NC, CS EA credit 3**

#### **Requirements**

Implement, or have a contract in place to implement, the following additional commissioning process activities in addition to the requirements of EA Prerequisite 1 and in accordance with the LEED-NC 2.2 Reference Guide:

1. Prior to the start of the construction documents phase, designate an independent Commissioning Authority (CxA) to lead, review, and oversee the completion of all commissioning process activities. The CxA shall, at a minimum, perform Tasks 2, 3 and 6. Other team members may perform Tasks 4 and 5.
  - a. The CxA shall have documented commissioning authority experience in at least two building projects.
  - b. The individual serving as the CxA shall be—
    - i. independent of the work of design and construction;
    - ii. not an employee of the design firm, though they may be contracted through them;
    - iii. not an employee of, or contracted through, a contractor or construction manager holding construction contracts; and
    - iv. (can be) a qualified employee or consultant of the Owner.
  - c. The CxA shall report results, findings and recommendations directly to the Owner.
  - d. This requirement has no deviation for project size.
2. The CxA shall conduct, at a minimum, one commissioning design review of the Owner's Project Requirements (OPR), Basis of Design (BOD), and design documents prior to mid-construction documents phase and back-check the review comments in the subsequent design submission.
3. The CxA shall review contractor submittals applicable to systems being commissioned for compliance with the OPR and BOD. This review shall be concurrent with A/E reviews and submitted to the design team and the Owner.
4. Develop a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.
5. Verify that the requirements for training operating personnel and building occupants are completed.
6. Assure the involvement by the CxA in reviewing building operation within 10 months after substantial completion with O&M staff and occupants. Include a plan for resolution of outstanding commissioning-related issues.

### **CI EA credit 2**

#### **Requirements**

In addition to the Fundamental Commissioning prerequisite, implement or have a contract in place to implement the following additional commissioning process activities:

1. Designate an individual as the Commissioning Authority, independent of the firms represented on the design and construction team, to lead the commissioning design review activities prior to the end of Design Development.
2. Conduct a review of the tenant space's energy-related systems contractor submittals.
3. Develop a single manual that contains the information required for re-commissioning the tenant space's energy related systems.
4. Verify that the requirements for training operating personnel and tenant space occupants are completed. Have a contract in place to review tenant space operation with O&M staff and occupants including a plan for resolution of outstanding commissioning-related issues 8 to 10 months after final acceptance.

**Energy Efficiency.** Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the Energy Star® targets for new construction and major renovation where applicable. For new construction, reduce the energy cost budget by 30 percent compared to the baseline building performance rating per the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 baseline.

*Applicable LEED Requirements:*

**NC EA credit 1**

**Requirements**

Select one of the three compliance path options described below. Project teams documenting achievement using any of the three options are assumed to be in compliance with EA Prerequisite 2.

OPTION 1 — WHOLE BUILDING ENERGY SIMULATION (1–10 Points)

Demonstrate a percentage improvement in the proposed building performance rating compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2004 (without amendments) by a whole building project simulation using the Building Performance Rating Method in Appendix G of the Standard. The minimum energy cost savings percentage for each point threshold is as follows:

New Buildings	Existing Building Renovations	Points
10.5%	3.5%	1
14%	7%	2
17.5%	10.5%	3
21%	14%	4
24.5%	17.5%	5
28%	21%	6
31.5%	24.5%	7
35%	28%	8
38.5%	31.5%	9
42%	35%	10

Appendix G of Standard 90.1-2004 requires that the energy analysis done for the Building Performance Rating Method include ALL of the energy costs within and associated with the building project. To achieve points using this credit, the proposed design—

- must comply with the mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4) in Standard 90.1-2004 (without amendments);
- must include all the energy costs within and associated with the building project; and
- must be compared against a baseline building that complies with Appendix G to Standard 90.1-2004 (without amendments). The default process energy cost is 25% of the total energy cost for the baseline building. For buildings where the process energy cost is less than 25% of the baseline building energy cost, the LEED submittal must include supporting documentation substantiating that process energy inputs are appropriate.

For the purpose of this analysis, process energy is considered to include, but is not limited to, office and general miscellaneous equipment, computers, elevators and escalators, kitchen cooking and refrigeration, laundry washing and drying, lighting exempt from the lighting power allowance (e.g. lighting integral to medical equipment) and other (e.g. waterfall pumps). Regulated (non-process) energy includes lighting (such as for the interior, parking garage, surface parking, façade, or building grounds, except as noted above), HVAC (such as for space heating, space cooling, fans, pumps, toilet exhaust, parking garage ventilation, kitchen hood exhaust, etc.), and service water heating for domestic or space heating purposes.

For EA Credit 1, process loads shall be identical for both the baseline building performance rating and for the proposed building performance rating. However, project teams may follow the Exceptional Calculation Method (ASHRAE 90.1-2004 G2.5) to document measures that reduce process loads. Documentation of process load energy savings shall include a list of the assumptions made for both the base and proposed design, and theoretical or empirical information supporting these assumptions.

OR

#### OPTION 2 — PRESCRIPTIVE COMPLIANCE PATH (4 Points)

Comply with the prescriptive measures of the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004. The following restrictions apply:

- Buildings must be under 20,000 square feet
- Buildings must be office occupancy
- Project teams must fully comply with all applicable criteria as established in the Advanced Energy Design Guide for the climate zone in which the building is located

OR

#### OPTION 3 — PRESCRIPTIVE COMPLIANCE PATH (1 Point)

Comply with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections: 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, and 1.14 Networked Computer Monitor Control. The following restrictions apply:

- Project teams must fully comply with all applicable criteria as established in Advanced Buildings Benchmark for the climate zone in which the building is located.

### **CS EA credit 1**

*\*Option 1 is identical to NC.*

#### OPTION 2 — PRESCRIPTIVE COMPLIANCE PATH (3 Points possible)

Comply with the ASHRAE Advanced Energy Design Guide for Small Office Buildings recommendations. Project teams must fully comply with all applicable criteria as established in the ASHRAE Advanced Energy Design Guide for Small Office Buildings for the climate zone in which the building is located. It should be noted that this compliance path may only be used for office buildings up to 20,000 ft<sup>2</sup>.

(Note: the envelope, lighting and HVAC & SWH requirements vary by climate. For each climate there is a table that lists recommended levels for each “system”.)

#### **Envelope Performance: (1 point possible)**

Install envelope systems which comply with all the envelope recommendations in the ASHRAE Advanced Energy Design Guide for Small Office Buildings table for the climate zone in which the building is located.

#### **Lighting Systems: (1 additional point possible)**

Install lighting systems which comply with all the lighting recommendations in the ASHRAE Advanced Energy Design Guide for Small Office Buildings table for the climate zone in which the building is located.

All such systems shall be included in systems commissioned under EA P1, Fundamental Building Systems Commissioning.

**HVAC and Service Water Heater Systems: (1 additional point possible)**

Install HVAC and Service Water Heating (SWH) systems which comply with all the HVAC & SWH recommendations in the ASHRAE Advanced Energy Design Guide for Small Office Buildings table for the climate zone in which the building is located.

All such systems shall be included in systems commissioned under EA P1, Fundamental Building Systems Commissioning.

OR

**OPTION 3 — PRESCRIPTIVE COMPLIANCE PATH (1 Point)**

Comply with the Basic Criteria and Prescriptive Measures of the NBI Advanced Buildings Benchmark™ Version 1.1 with the exception of the following sections: 1.1 Design Certification, 1.2 Construction Certification, 1.3 Operations Certification, 1.4 Energy Code Compliance, 1.7 Monitoring and Trend-logging, 1.11 Indoor Air Quality, 1.13 Refrigeration Equipment Efficiency Requirements, 1.14 Networked Computer Monitor Control, and 2.3 Cool Roofs and EcoRoofs (Zones 1 through 5). The following restrictions apply:

- Project teams must fully comply with all applicable criteria as established in Advanced Buildings Benchmark for the climate zone in which the building is located.
- Project teams must show compliance with all applicable criteria for all systems that are part of the core and shell work.

**CI EA credits 1.1 through 1.4**

**Requirements for 1.1 (3 points)**

Reduce connected lighting power density below that allowed by ASHRAE/IESNA Standard 90.1-2004\* using either the Space-by-Space Method or by applying the whole building lighting power allowance to the entire tenant space.

Option A. Reduce lighting power density to 15% below the standard (1 point)

OR

Option B. Reduce lighting power density to 25% below the standard. (2 points)

OR

Option C. Reduce lighting power density to 35% below the standard. (3 points)

**Requirements for 1.2 (1 point)**

Install daylight responsive controls in all regularly occupied spaces within 15 feet of windows and under skylights.

**Requirements for 1.3 (2 points)**

**OPTION A**

Implement one or both of the following strategies:

- **Equipment Efficiency: (1 point)**  
Install HVAC systems which comply with the efficiency requirements outlined in the New Buildings Institute, Inc.’s publication “Advanced Buildings: Energy Benchmark for High Performance Buildings (E-Benchmark)” prescriptive criteria for mechanical equipment efficiency requirements, sections 2.4 (less ASHRAE standard 55), 2.5, and 2.6.
- **Appropriate Zoning and Controls: (1 point)**  
Zone tenant fit out of spaces to meet the following requirements:
  - Every Solar Exposure must have a separate control zone
  - Interior spaces must be separately zoned
  - Private offices and specialty occupancies (conference rooms, kitchens, etc.) must have active controls capable of sensing space use and modulating HVAC system in response to space demand

**OPTION B**

Reduce design energy cost compared to the energy cost budget for regulated energy components described in the requirements of ASHRAE/IESNA Standard 90.1- 2004.

- Demonstrate that HVAC system component performance criteria used for tenant space are 15% better than a system that is in minimum compliance with ASHRAE/IESNA Standard 90.1-2004. (1 point)

OR

- Demonstrate that HVAC system component performance criteria used for tenant space are 30% better than a system that is in minimum compliance with ASHRAE/IESNA Standard 90.1-20014. (2 points)

**Requirements for 1.4 (2 points)**

For all ENERGYSTAR® eligible equipment and appliances installed in the project, including appliances, office equipment, electronics, and commercial food service equipment (but excluding HVAC, lighting, and building envelope products):

- 70%, by rated-power, of ENERGYSTAR eligible equipment and appliances shall be ENERGYSTAR-rated (1 point);

OR

- 90%, by rated-power, of ENERGY STAR eligible equipment and appliances shall be ENERGYSTAR-rated (2 points).

**EB EA credit 1**

**Requirements**

Demonstrate the EPA ENERGY STAR energy performance rating that the building has achieved. Utilize ENERGY STAR'S Portfolio Manager tool for building types addressed by ENERGY STAR,

OR

For building types not addressed by ENERGY STAR, demonstrate the ENERGY STAR equivalent rating for the building energy use, calculated using the alternate method described in the LEED-EB Reference Guide.

ENERGY STAR Rating	LEED-EB Points		ENERGY STAR Rating	LEED-EB Points
63	1		83	6
67	2		87	7
71	3		91	8
75	4		95	9
79	5		99	10

**Measurement and Verification.** In accordance with DOE guidelines issued under section 103 of the Energy Policy Act of 2005 (EPAct), install building level utility meters in new major construction and renovation projects to track and continuously optimize performance. Compare actual performance data from the first year of operation with the energy design target. After one year of occupancy, measure all new major installations using the Energy Star® Benchmarking Tool for building and space types covered by Energy Star®. Enter data and lessons learned from sustainable buildings into the High Performance Buildings Database. ([www.eere.energy.gov/femp/highperformance/index.cfm](http://www.eere.energy.gov/femp/highperformance/index.cfm))

***Applicable LEED Requirements:***

**NC EAc5**

**Requirements**

- Develop and implement a Measurement & Verification (M&V) Plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2), or Option B: Energy Conservation Measure Isolation, as specified in the *International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003*.
- The M&V period shall cover a period of no less than one year of post-construction occupancy.

**CI EAc3**

**Requirements**

- CASE A: For those projects with an area that constitute less than 75% of the total building area:
  - Install sub-metering equipment to measure and record energy uses within the tenant space. (1 point.)
  - Negotiate a lease where energy costs are paid by the tenant and not included in the base rent. (1 point)
- OR
- CASE B: For those projects with an area that constitutes 75% or more of the total building area, install continuous metering equipment for the following end-uses: (2 points)
  - Lighting systems and controls
  - Constant and variable motor loads
  - Variable frequency drive (VFD) operation
  - Chiller efficiency at variable loads (kW/ton)
  - Cooling load
  - Air and water economizer and heat recovery cycles
  - Air distribution static pressures and ventilation air volumes
  - Boiler efficiencies
  - Building-related process energy systems and equipment
  - Indoor water riser and outdoor irrigation systems

Develop a Measurement & Verification plan that incorporates the monitoring information from the above end-uses and is consistent with Option B, C or D of the 2001 *International Performance Measurement & Verification Protocol (IPMVP) Volume I: Concepts and Options for Determining Energy and Water Savings*.

**EB EA c5.1–5.3**

**Requirements**

Have in place over the performance period continuous metering for the following items: (Up to 3 points can be earned — one point is earned for each four actions implemented/maintained)

- Lighting systems and controls.
- Separate building electric meters that allow aggregation of all process electric loads (Process electric loads are defined in the LEED-EB Reference Guide).

- Separate building natural gas meters that allow aggregation of all process natural gas loads (Process natural gas loads are defined in the LEED-EB Reference Guide).
- Separate meters that allow aggregation of all indoor occupants' related water use for required fixtures.
- Separate meters that allow aggregation of all indoor process water use (Process water uses are defined in the LEED-EB Reference Guide).
- Separate meters that allow aggregation of all outdoor irrigation water use.
- Chilled water system efficiency at variable loads (kW/ton) or cooling loads (for non-chilled water systems).
- Cooling load.
- Air and water economizer and heat recovery cycle operation.
- Boiler efficiencies.
- Building specific process energy systems and equipment efficiency.
- Constant and variable motor loads.
- Variable frequency drive (VFD) operation.
- Air distribution, static pressure and ventilation air volumes.

For each item metered, prepare, implement and maintain a program for using the data gathered to improve building performance over time.

### **CS EA c5**

#### **Requirements**

- Provide the necessary infrastructure within the base building design to facilitate metering building electricity and tenant electrical end-uses as appropriate.
- Develop a building M&V Plan consistent with Option D: Calibrated Simulation (Savings Estimation Method that documents for future tenants the means to measure and minimize energy consumption.. The documentation is to include 1) a description of the infrastructure design, 2) existing meter locations, 3) existing meter specifications, 4) 1-line electrical schematics identifying end-use circuits, 5) guidelines for carrying out tenant sub-metering.

**Indoor Water.** Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992 fixture performance requirements.

*Applicable LEED Requirements:*

**NC & CS WEc3 (2 points)**

**Requirements**

Employ strategies that in aggregate use 20% (1 point) or 30% (2 points) less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements. Calculations are based on estimated occupant usage and shall include only the following fixtures (as applicable to the building): water closets, urinals, lavatory faucets, showers and kitchen sinks.

**CI WEc1 (2 points)**

**Requirements**

Based on tenant occupancy requirements, employ strategies that in aggregate use 20% (1 point) or 30% (2 points) less water than the water use baseline calculated for the tenant space (not including irrigation) after meeting Energy Policy Act of 1992 fixture performance requirements.

**EB WEc3**

**Requirements**

Have in place over the performance period strategies and systems that in aggregate produce a reduction of fixture potable water use from the calculated fixture water usage baseline established in WE Prerequisite 1. If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses), the water use reduction achievements can be demonstrated for WE 3.1 with calculations. At least one meter for the overall building water use is required and metering for cooling towers and other process water use encouraged but not required. To earn WE 3.2, measured fixture water use demonstrating required level of efficiency must be provided.

- WE 3.1: 10% reduction in fixture water use from the baseline. (1 point)
- WE 3.2: 20% reduction in fixture water use from the baseline. (1 point)

**Outdoor Water.** Use water efficient landscape and irrigation strategies, including water reuse and recycling, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). Employ design and construction strategies that reduce storm water runoff and polluted site water runoff.

*Applicable LEED Requirements:*

**NC & CS Wec1.1**

**Requirements**

Reduce potable water consumption for irrigation by 50% from a calculated mid-summer baseline case. Reductions shall be attributed to any combination of the following items:

- Plant species factor
- Irrigation efficiency
- Use of captured rainwater
- Use of recycled wastewater

Use of water treated and conveyed by a public agency specifically for non-potable uses

**EB Wec1.1**

**Requirements**

Use high-efficiency irrigation technology, captured rain/recycled site water, or landscaping and other techniques to reduce potable water consumption for irrigation in comparison to conventional means of irrigation. If the building does not have separate metering for each water use (fixture use, process use, irrigation and other uses), the water use reduction achievements can be demonstrated with calculations. At least one meter for the overall building water use is required and metering for cooling towers and other process water use is encouraged but not required. In urban settings, where there is no lawn, credits can be earned by reducing the use of potable water for watering any roof/courtyard garden space or outdoor planters.

- WE Credit 1.1: 50% reduction in potable water use for irrigation over conventional means of irrigation. (1 point)

**CI SSc1**

**Requirements**

Locate the tenant space in a building that has in place two or more of the following characteristics at time of submittal:

Option G. Water Efficient Irrigation: Reduced Potable Water Consumption: (½ point)

A building that employs high-efficiency irrigation technology, OR uses captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means.

**Ventilation and Thermal Comfort.** Meet the current ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality.

*Applicable LEED Requirements:*

**EQc2 (essentially the same for all 4 Rating Systems)**

**Requirements**

FOR MECHANICALLY VENTILATED SPACES

- Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2004 as determined by EQ Prerequisite 1.

FOR NATURALLY VENTILATED SPACES

Design natural ventilation systems for occupied spaces to meet the recommendations set forth in the Carbon Trust “Good Practice Guide 237” [1998]. Determine that natural ventilation is an effective strategy for the project by following the flow diagram process shown in Figure 1.18 of the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual 10: 2005, Natural ventilation in non-domestic buildings.

AND

- Use diagrams and calculations to show that the design of the natural ventilation systems meets the recommendations set forth in the CIBSE Applications Manual 10: 2005, Natural ventilation in non-domestic buildings.

OR

- Use a macroscopic, multi-zone, analytic model to predict that room-by-room airflows will effectively naturally ventilate, defined as providing the minimum ventilation rates required by ASHRAE 62.1-2004 Chapter 6, for at least 90% of occupied spaces.
- The core and shell buildings that are designed to be naturally ventilated must provide the capability for the tenant build-out to meet the requirements of this credit.

**EQ c7.1 (essentially the same for all 4 Rating Systems)**

**Requirements**

Design HVAC systems and the building envelope to meet the requirements of ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy. Demonstrate design compliance in accordance with the Section 6.1.1 Documentation.

**Moisture Control.** Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage and mold contamination.

*Applicable LEED Requirements: n/a*

**Daylighting.** Achieve a minimum of daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks. Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.

*Applicable LEED Requirements:*

### NC EQc8.1

#### **Requirements**

##### OPTION 1 — CALCULATION

Achieve a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas. The glazing factor is calculated as follows:

$$\text{Glazing Factor} = \frac{\text{Window Area [SF]}}{\text{Floor Area [SF]}} \times \text{Window Geometry Factor} \times \frac{\text{Actual } T_{\text{vis}}}{\text{Minimum } T_{\text{vis}}} \times \text{Window Height Factor}$$

OR

##### OPTION 2 — SIMULATION

Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 footcandles has been achieved in a minimum of 75% of all regularly occupied areas. Modeling must demonstrate 25 horizontal footcandles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.

OR

##### OPTION 3 — MEASUREMENT

Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of all regularly occupied areas. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans.

### CS EQc8.1

*\*Options 1, 2 and 3 are same as NC EQc8.1 (above).*

##### OPTION 4 – PRESCRIPTIVE

Use a combination of side-lighting and top-lighting to achieve a total Daylighting Zone (that floor area meeting the following requirements) that is at least 75% of all the regularly occupied spaces.

Sidelighting Daylight Zone:

- Achieve a product of the visible light transmittance (VLT) and window to floor area ratio (WFR) of daylight zone between the values of 0.150 and 0.180. Window area included in the calculation must be of the portion of the window at least 2'-6" above the floor.
- $0.150 < \text{VLT} \times \text{WFR} < 0.180$
- Ceiling should not obstruct a line in section that joins the window-head to a line on the floor that is parallel to the plane of the window and is, in distance from the plane of the glass as measured perpendicular to the plane of the glass, two times the height of the window head above the floor.

- Provide sunlight redirection and/or glare control devices to ensure daylight effectiveness.

Toplighting Daylight Zone:

- The daylight zone under a skylight is the outline of the opening beneath the skylight, plus in each direction the lesser of: 70% of the ceiling height, one half of the distance to the edge of the nearest skylight, or the distance to any permanent opaque partition (if transparent show VLT) which is farther away than 70% of the distance between the top of the partition and the ceiling. See diagram below.
- Achieve a skylight roof coverage that is between 3% and 6% of the roof area with a minimum 0.5 visible light transmittance (VLT) for the skylights.
- The distance between the skylights shall not be more than 1.4 times the ceiling height
- Skylight diffuser with a measured haze value of greater than 90% when tested according to ASTM D1003. Avoid direct line of sight to skylight diffuser.

Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

### **CI EQc8.1**

#### **Requirements**

For at least 75% of all regularly occupied areas:

Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetrations)

OR

Using a computer simulation model, achieve at least 25 footcandles.

AND

Provide daylight redirection and/or glare control devices to ensure daylight effectiveness.

Exceptions for areas where tasks would be hindered by the use of daylight will be considered on their merits.

### **EB EQc8.2**

#### **Requirements**

Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetration) in space occupied for critical visual tasks, not including copy rooms, storage areas, mechanical, laundry and other low-occupancy support areas. Exceptions include those spaces where tasks would be hindered by the use of daylight or where accomplishing the specific tasks within a space would be enhanced by the direct penetration of sunlight. Provide glare control for all windows where direct penetration of sunlight would interfere with normal occupant activities.

Achievement of a 2% daylight factor in:

- IEQ Credit 8.2: 75% of all spaces occupied for critical visual tasks. (2 points)

**Low-Emitting Materials.** Specify materials and products with low pollutant emissions, including adhesives, sealants, paints, carpet systems, and furnishings.

***Applicable LEED Requirements:***

**NC & CS EQc4**

**Requirements for 4.1**

All adhesives and sealants used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the following reference standards:

- Adhesives, Sealants and Sealant Primers: South Coast Air Quality Management District (SCAQMD) Rule #1168. VOC limits correspond to an effective date of July 1, 2005 and rule amendment date of January 7, 2005.
- Aerosol Adhesives: Green Seal Standard for Commercial Adhesives GS-36 requirements in effect on 10/19/00.

**Requirements for 4.2**

Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the following criteria:

- Architectural paints, coatings and primers applied to interior walls and ceilings: Do not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, First Edition, May 20, 1993.
  - Flats: 50 g/L
  - Non-Flats: 150 g/L
- Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates: Do not exceed the VOC content limit of 250 g/L established in Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997.
- Clear wood finishes, floor coatings, stains, and shellacs applied to interior elements: Do not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
  - Clear wood finishes: varnish 350 g/L; lacquer 550 g/L
  - Floor coatings: 100 g/L
  - Sealers: waterproofing sealers 250 g/L; sanding sealers 275 g/L; all other sealers 200 g/L
  - Shellacs: Clear 730 g/L; pigmented 550 g/L
  - Stains: 250 g/L

**Requirements for 4.3**

All carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program. All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program. All carpet adhesive shall meet the requirements of EQ Credit 4.1: VOC limit of 50 g/L.

**Requirements for 4.4**

Composite wood and agrifiber products used on the interior of the building (defined as inside of the weatherproofing system) shall contain no added urea-formaldehyde resins. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.

Composite wood and agrifiber products are defined as: particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates and door cores. Materials considered fit-out, furniture, and equipment (FF&E) are not considered base building elements and are not included.

**CI EQc4**

Credits 4.1 through 4.4 are essentially the same as NC and CS. CI has a credit for low-emitting furniture as well, which follows (and is labeled EQc4.5).

## Requirements

All systems furniture and seating\* introduced into the project space that has been manufactured, refurbished or refinished within one year prior to occupancy must meet one of the requirements below.

Option A: Greenguard Indoor Air Quality Certified

OR

Option B: Calculated indoor air concentrations that are less than or equal to those established in Table 1 for furniture systems and seating determined by a procedure based on the U.S. Environmental Protection Agency's Environmental Technology Verification (ETV) Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes (September 1999) testing protocol conducted in an independent air quality testing laboratory.

**Table 1.** Indoor Air Concentrations

Chemical Contaminant	Emission Limits Systems Furniture	Emission Limits Seating
TVOC	0.5 mg/m <sup>3</sup>	0.25 mg/m <sup>3</sup>
Formaldehyde	50 parts per billion	25 parts per billion
Total Aldehydes	100 parts per billion	50 parts per billion
4 - Phenylcyclohexene (4-PCH)	0.0065 mg/m <sup>3</sup>	0.00325 mg/m <sup>3</sup>

## **EB MRc3**

### Requirements

Optimize use of air quality compliant materials inside the building to reduce the emissions from materials used in the building. Points are awarded for the existence of product purchasing policies for the building and site addressing the requirements of this credit and documentation of purchasing during the performance period in conformance with those policies, as described below. Subsequent re-certification is tied to both policies and purchasing performance, as described below. At a minimum, these policies must include the following product groups: paint and coatings, adhesives, sealants, carpet, composite panels, and agrifiber products. The building materials covered include any building materials covered by a.-e. below that are used for improvements, including upgrades, retrofits, renovations or modifications, inside the building.

One point shall be awarded, up to a maximum of 2 points, for each 45% of annual purchases calculated on a cost basis that conform with one of the following sustainability criteria:

1. Adhesives and sealants with a VOC content less than the current VOC content limits of South Coast Air Quality Management District (SCAQMD) Rule #1168, or sealants used as fillers that meet or exceed the requirements of the Bay Area Air Quality Management District Regulation 8, Rule 51.

OR

2. Paints and coatings with VOC emissions that do not exceed the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.

OR

3. Carpet that meets the requirements of the CRI Green Label Plus Carpet Testing Program.

OR

4. Carpet cushion that meets the requirements of the CRI Green Label Testing Program.

OR

5. Composite panels and agrifiber products that contain no added urea-formaldehyde resins.

**Protect Indoor Air Quality during Construction.** Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor’s National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 1995. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.

***Applicable LEED Requirements:***

**NC, CI & CS EQc3.1**

**Requirements**

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.
- Protect stored on-site or installed absorptive materials from moisture damage.
- If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all filtration media immediately prior to occupancy.

**NC & CI EQc3.2 (CS does not have this point)**

**Requirements**

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase as follows:

**OPTION 1 — Flush-Out**

- After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.  
OR
- If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cu.ft. of outdoor air per sq.ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm/sq.ft. of outside air or the design minimum outside air rate determined in EQ Prerequisite 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu.ft./sq.ft. of outside air has been delivered to the space.

OR

**OPTION 2 — Air Testing**

- Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the Reference Guide.
- Demonstrate that the contaminant maximum concentrations listed below are not exceeded.

CONTAMINANT	MAXIMUM CONCENTRATION
Formaldehyde	50 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter
* 4-Phenylcyclohexene (4-PCH)	6.5 micrograms per cubic meter
Carbon Monoxide (CO)	9 part per million and no greater than 2 parts per million above outdoor levels

\* This test is only required if carpets and fabrics with styrene butadiene rubber (SBR) latex backing material are installed as part of the base building systems.

- For each sampling point where the maximum concentration limits are exceeded conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test.
- The air sample testing shall be conducted as follows:
  - 1) All measurements shall be conducted prior to occupancy, but during normal occupied hours, and with the building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
  - 2) The building shall have all interior finishes installed, including but not limited to millwork, doors, paint, carpet and acoustic tiles. Non-fixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
  - 3) The number of sampling locations will vary depending upon the size of the building and number of ventilation systems. For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq.ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation and greatest presumed source strength.
  - 4) Air samples shall be collected between 3 feet and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum 4-hour period.

### **EB EQc3**

#### **Requirements**

Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and occupancy phases of the building as follows:

- During construction, meet or exceed the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings Under Construction, 1995, Chapter 3.
- Protect stored on-site or installed absorptive materials from moisture damage.
- If air handlers must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grill, as determined by ASHRAE 52.2-1999.
- Replace all filtration media immediately prior to occupancy.
- Remove contaminants that may be remaining at the end of the construction period.
  - Conduct a minimum two-week building flush-out with new filtration media with 100% outside air after construction ends and prior to occupancy of the affected space. After the flush-out, replace the filtration media with new media, except for filters solely processing outside air.
- OR
  - After construction ends conduct a baseline indoor air quality testing procedure for the affected space in the building that demonstrates that the concentration levels for the chemical air contaminants are below specified levels. For each sampling point where the maximum concentration limits are exceeded conduct a partial building flush-out, for a minimum of two weeks, then retest the specific parameter(s) that were exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met.

The air sample testing shall be conducted as follows:

- Air samples collected for every 25,000 square feet, or for each contiguous floor area, whichever is greater.
- Measurements conducted with the building ventilation system starting at normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout duration of the air testing.
- Building shall be fully finished and unoccupied. Furniture can be included in the testing if desired but it is not required.
- Test with time weight values of four hours with data logging.
- When re-testing non-complying building areas, take samples from the same locations as in first test.
- Copies of the IAQ testing results should describe the contaminant sampling and analytical methods, the locations and duration of contaminant samples, the field sampling log sheets and laboratory analytical data, and the methods and results utilized to determine that the ventilation system was started at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode through the duration of the air testing.

**Recycled Content.** For EPA-designated products, use products meeting or exceeding EPA's recycled content recommendations. For other products, use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project.

#### **NC, CS & CI MRc4**

##### **Requirements**

Use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (1 point) or 20% (2 points) (based on cost) of the total value of the materials in the project.

The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

Mechanical, electrical and plumbing components and specialty items such as elevators shall not be included in this calculation. Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

Recycled content shall be defined in accordance with the International Organization of Standards document, *ISO 14021—Environmental labels and declarations—Self-declared environmental claims (Type II environmental labeling)*.

#### **EB MRc2**

##### **Requirements**

Maintain a sustainable purchasing program covering at least office paper, office equipment, furniture, furnishings and building materials for use in the building and on the site. A template calculator will be provided for LEED-EB MR Credit 2.1–2.5. One point (up to a maximum of five) will be awarded for each 10% of total purchases over the performance period (on a dollar basis) that achieve at least one of the following sustainability criteria:

- Contains at least 70% salvaged material from off site or outside the organization.
- Contains at least 70% salvaged from on site through an internal organization materials & equipment reuse program.
- **Contains at least 10% post-consumer or 20% post-industrial material.**
- Contains at least 50% rapidly renewable materials.
- Is Forest Stewardship Council (FSC) certified wood.
- Contains at least 50% materials harvested and processed or extracted and processed within 500 miles of the project.

Note: In calculating the percentage of purchases over the performance period conforming to the requirements, each purchase can only receive credit against a single requirement (i.e., a purchase that contains both 10% post-consumer recycled content and is harvested within 500 miles of the project counts only once in this calculation).

**Biobased Content.** For USDA-designated products, use products meeting or exceeding USDA’s biobased content recommendations. For other products, use biobased products made from rapidly renewable resources and certified sustainable wood products.

**NC, CI, CS MRc6**

**Requirements**

Use rapidly renewable building materials and products (made from plants that are typically harvested within a ten-year cycle or shorter) for 2.5% of the total value of all building materials and products used in the project, based on cost.

**NC, CI, CS MRc7**

**Requirements**

Use a minimum of 50% of wood-based materials and products, which are certified in accordance with the Forest Stewardship Council’s (FSC) Principles and Criteria, for wood building components. These components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes.

Only include materials permanently installed in the project. Furniture may be included, providing it is included consistently in MR Credits 3–7.

**EB MRc2**

(see above under Recycled Content for full text of EB MRc2)

**Construction Waste.** During a project's planning stage, identify local recycling and salvage operations that could process site related waste. Program the design to recycle or salvage at least 50 percent construction, demolition and land clearing waste, excluding soil, where markets or on-site recycling opportunities exist.

#### **NC, CS, CI MRc2.1**

##### **Intent**

Divert construction, demolition and land-clearing debris from disposal in landfills and incinerators. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

##### **Requirements**

Recycle and/or salvage at least 50% of non-hazardous construction and demolition debris. Develop and implement a construction waste management plan that, at a minimum, identifies the materials to be diverted from disposal and whether the materials will be sorted on-site or co-mingled. Excavated soil and land-clearing debris do not contribute to this credit. Calculations can be done by weight or volume, but must be consistent throughout.

#### **EB MRc1**

##### **Intent**

Divert construction, demolition and land-clearing debris from landfill and incineration disposal. Redirect recyclable recovered resources back to the manufacturing process. Redirect reusable materials to appropriate sites.

##### **Requirements**

Develop and implement a Waste Management Policy covering any future building retrofit, renovation or modification on the site. Quantify diversions of construction, demolition and land-clearing debris from landfill and incineration disposal by weight or volume.

- MR Credit 1.1: Divert at least 50% of construction, demolition and land-clearing waste from landfill and incineration disposal. (1 point)

**Ozone Depleting Compounds.** Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account life cycle impacts.

#### **NC, CS EAc4**

##### **Requirements**

OPTION 1: Do not use refrigerants.

OR

OPTION 2

Select refrigerants and HVAC&R that minimize or eliminate the emission of compounds that contribute to ozone depletion and global warming. The base building HVAC&R equipment shall comply with the following formula, which sets a maximum threshold for the combined contributions to ozone depletion and global warming potential:

$$LCGWP + LCODP \times 10^5 \leq 100$$

Where:

$$LCODP = [ODPr \times (Lr \times \text{Life} + Mr) \times Rc] / \text{Life}$$

$$LCGWP = [GWPr \times (Lr \times \text{Life} + Mr) \times Rc] / \text{Life}$$

LCODP: Lifecycle Ozone Depletion Potential (lbCFC11/Ton-Year)

LCGWP: Lifecycle Direct Global Warming Potential (lbCO<sub>2</sub>/Ton-Year)

GWPr: Global Warming Potential of Refrigerant (0 to 12,000 lbCO<sub>2</sub>/lbr)

ODPr: Ozone Depletion Potential of Refrigerant (0 to 0.2 lbCFC11/lbr)

Lr: Refrigerant Leakage Rate (0.5% to 2.0%; default of 2% unless otherwise demonstrated)

Mr: End-of-life Refrigerant Loss (2% to 10%; default of 10% unless otherwise demonstrated)

Rc: Refrigerant Charge (0.5 to 5.0 lbs of refrigerant per ton of cooling capacity)

Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)

For multiple types of equipment, a weighted average of all base building level HVAC&R equipment shall be applied using the following formula:

$$[ \sum (LCGWP + LCODP \times 10^5) \times Q_{\text{unit}} ] / Q_{\text{total}} \leq 100$$

Where:

Q<sub>unit</sub> = Cooling capacity of an individual HVAC or refrigeration unit (Tons)

Q<sub>total</sub> = Total cooling capacity of all HVAC or refrigeration

Small HVAC units (defined as containing less than 0.5 lbs of refrigerant), and other equipment such as standard refrigerators, small water coolers, and any other cooling equipment that contains less than 0.5 lbs of refrigerant, are not considered part of the “base building” system and are not subject to the requirements of this credit.

AND

Do not install fire suppression systems that contain ozone-depleting substances (CFCs, HCFCs or Halons).

#### **EB EAc4**

##### **Requirements**

###### **Option A**

- Do not operate base building HVAC, refrigeration or fire suppression systems that contain CFCs, HCFCs or Halons.

###### **Option B**

- Do not operate fire suppression systems that contain CFCs, HCFCs or halons,

AND

- Reduce emissions of refrigerants from base building HVAC and refrigeration systems to less than 3% of charge per year over the performance period using EPA Clean Air Act, Title VI, Rule 608 procedures governing refrigerant management and reporting and reduce the leakage over the remainder of unit life to below 25%.

\*Key

LEED Rating Systems

NC- New Construction  
EB- Existing Buildings  
CI- Commercial Interiors  
CS- Core and Shell

LEED Credits

EA- Energy and Atmosphere  
WE- Water Efficiency  
SS- Site Selection  
EQ- Indoor Environmental Quality  
MR- Materials and Resources



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LEED Credits*	GUIDING PRINCIPLES FOR FEDERAL LEADERSHIP IN HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS
<b>I. Employ Integrated Design Principles</b>	
None	<p><b>Integrated Design.</b> Use a collaborative, integrated planning and design process that</p> <ul style="list-style-type: none"> <li>• Initiates and maintains an integrated project team in all stages of a project’s planning and delivery;</li> <li>• Establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals; and, ensures incorporation of these goals throughout the design and lifecycle of the building; and,</li> <li>• Considers all stages of the building’s lifecycle, including deconstruction.</li> </ul>
<p><b>EA prereq. 1 for all</b></p> <p><b>NC EA c3</b></p> <p><b>CI EA c2</b></p> <p><b>CS EA c3</b></p>	<p><b>Commissioning.</b> Employ total building commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include a designated commissioning authority, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.</p>
<b>II. Optimize Energy Performance</b>	
<p><b>EA credit 1 for all rating systems</b></p>	<p><b>Energy Efficiency.</b> Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the Energy Star® targets for new construction and major renovation where applicable. For new construction, reduce the energy cost budget by 30 percent compared to the baseline building performance rating per the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 baseline.</p>
<p><b>NC EA c5</b></p> <p><b>CI EA c3</b></p> <p><b>EB EA c5.1-5.3</b></p> <p><b>CS EA c5</b></p>	<p><b>Measurement and Verification.</b> In accordance with DOE guidelines issued under section 103 of the Energy Policy Act of 2005 (EPAct), install building level utility meters in new major construction and renovation projects to track and continuously optimize performance. Compare actual performance data from the first year of operation with the energy design target. After one year of occupancy, measure all new major installations using the Energy Star® Benchmarking Tool for building and space types covered by Energy Star®. Enter data and lessons learned from sustainable buildings into the High Performance Buildings Database.</p> <p>(<a href="http://www.eere.energy.gov/femp/highperformance/index.cfm">www.eere.energy.gov/femp/highperformance/index.cfm</a>)</p>

<b>III. Protect and Conserve Water</b>	
<b>NC WEc3</b> <b>CI WEc1</b> <b>EB WEc3</b> <b>CS WEc3</b>	<b>Indoor Water.</b> Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992 fixture performance requirements.
<b>NC WEc2</b> <b>EB WEc2</b> <b>CS WEc2</b> <b>CI SSc1</b>	<b>Outdoor Water.</b> Use water efficient landscape and irrigation strategies, including water reuse and recycling, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). Employ design and construction strategies that reduce storm water runoff and polluted site water runoff.
<b>IV. Enhance Indoor Environmental Quality</b>	
<b>EQ credits 2 and 7.1 for all rating systems</b>	<b>Ventilation and Thermal Comfort.</b> Meet the current ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality.
<b>None</b>	<b>Moisture Control.</b> Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage and mold contamination.
<b>EQ credit 8.1 for all rating systems</b>	<b>Daylighting.</b> Achieve a minimum of daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks. Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.
<b>EQc4 for NC, CI and CS</b>  <b>EB MRc3</b>	<b>Low-Emitting Materials.</b> Specify materials and products with low pollutant emissions, including adhesives, sealants, paints, carpet systems, and furnishings.
<b>EQc3 for all rating systems</b>	<b>Protect Indoor Air Quality during Construction.</b> Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor's National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 1995. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent. After occupancy, continue flush-out as necessary to minimize exposure to contaminants from new building materials.

<b>V. Reduce Environmental Impact of Materials</b>	
<b>MRc4 for NC, CI and CS</b> <b>EB MRc2</b>	<b>Recycled Content.</b> For EPA-designated products, use products meeting or exceeding EPA's recycled content recommendations. For other products, use materials with recycled content such that the sum of post-consumer recycled content plus one-half of the pre-consumer content constitutes at least 10% (based on cost) of the total value of the materials in the project.
<b>MR credits 6 &amp; 7 for NC, CI and CS</b> <b>EB MRc2</b>	<b>Biobased Content.</b> For USDA-designated products, use products meeting or exceeding USDA's biobased content recommendations. For other products, use biobased products made from rapidly renewable resources and certified sustainable wood products.
<b>MR credit 2 for NC, CI and CS</b> <b>EB MRc1</b>	<b>Construction Waste.</b> During a project's planning stage, identify local recycling and salvage operations that could process site related waste. Program the design to recycle or salvage at least 50 percent construction, demolition and land clearing waste, excluding soil, where markets or on-site recycling opportunities exist.
<b>EA credit 4 for NC, CS, EB</b>	<b>Ozone Depleting Compounds.</b> Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990, or equivalent overall air quality benefits that take into account life cycle impacts.

\*Key

LEED Rating Systems

NC- New Construction

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CI- Commercial Interiors

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LEED Credits

EA- Energy and Atmosphere

WE- Water Efficiency

SS- Site Selection

EQ- Indoor Environmental Quality

MR- Materials and Resources

**MAPPING THE ENVIRONMENTAL EXECUTIVE OBJECTIVE AND GREEN GLOBES v.1 - 2006**

<p align="center"><b>GUIDING PRINCIPLES FOR FEDERAL LEADERSHIP IN HIGH PERFORMANCE SUSTAINABLE BUILDINGS</b></p>	<p align="center"><b>GREEN GLOBES STANDARDS</b></p>	<p align="center"><b>GREEN GLOBES POINTS</b></p>
<p><b>I. EMPLOY INTEGRATED DESIGN PRINCIPLES</b></p>		
<p><b>Integrated Design</b> Use a collaborative, integrated design process that:</p> <ul style="list-style-type: none"> <li>• Initiates and maintains an integrated project team in all stages of a project's planning and delivery.</li> <li>• Establishes performance goals for siting, energy, water, materials, and indoor environmental quality along with other comprehensive design goals; and, ensures incorporation of these goals throughout the design and lifecycle of the building</li> <li>• Considers all stages of the building's lifecycle, including deconstruction.</li> </ul>	<p><b>Requirements:</b> There is a designated Green Design Coordinator with relevant credentials or experience, and the authority to do the all of the following:</p> <ul style="list-style-type: none"> <li>• Outline the overall green design framework for the project</li> <li>• Communicate the client's/user's intentions to the project team</li> <li>• Develop measurable green design performance requirements</li> <li>• Assist in evaluating responses against the green design objectives</li> </ul> <p>A collaboration session was held during the Project Initiation Stage to discuss sustainable goals and attendees include the Green Design Coordinator, Architect, Mechanical Engineer, Electrical Engineer, Civil Engineer, Owner's Representative, and one representative of each user group. In addition, hold at least two collaboration sessions before the preparation of contract documentation.</p>	<p><b>A.1.1-.1.6</b></p>

	<p>Identify measurable, environmental/ sustainability performance goals during the Project Initiation Stage for the following areas:</p> <ul style="list-style-type: none"><li>• consumption of non-renewable resources</li><li>• energy consumption and greenhouse gas emissions</li><li>• water consumption,</li><li>• emissions and effluents</li><li>• indoor environment</li></ul> <p>A record of decisions and “to do lists” from the collaborative sessions are distributed to the design team. The Green Design Coordinator reports to the client or designated representative following the collaborative sessions.</p> <p>The following assemblies have been selected based on a life cycle assessment of their embodied energy, and green house gas emissions using the ATHENA “Environmental Impact Estimator” or NIST BEES:</p> <ul style="list-style-type: none"><li>• foundation and floor assembly materials</li><li>• structural systems (column and beam or post and beam combinations) and walls,</li><li>• roof assemblies</li><li>• other envelope assembly materials.</li></ul> <p>The service life of major building components is defined based on a life cycle costing of the building materials and assemblies.</p>	<p><b>E.1.1</b> <b>4.5</b></p>
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	<p>State what proportion of the following materials is of standard size and fastened using fastening systems that allow for easy disassembly:</p> <ul style="list-style-type: none"> <li>• Masonry</li> <li>• wood/timber</li> <li>• Insulation</li> <li>• Finishes</li> <li>• Specialty materials</li> <li>• Mechanical</li> <li>• Plumbing and electrical</li> <li>• Others</li> </ul>	
<p><b>Commissioning</b>  Employ total building commissioning practices tailored to the size and complexity of the building and its system components in order to verify performance of building components and systems and help ensure that design requirements are met. This should include a designated commissioning authority, inclusion of commissioning requirements in construction documents, a commissioning plan, verification of the installation and performance of systems to be commissioned, and a commissioning report.</p>	<p><b>Requirements:</b>  There is an independent Commissioning Authority who reports directly to the owner.</p> <p>“Design Intent”, “Basis of Design” and Operational Performance Requirements were documented.</p> <p>“Commissioning Requirements” are included in the Construction Documentation.</p> <p>A Commissioning Plan has been developed, OR for buildings less than 10,000 square feet, a Testing and Balancing report is specified.</p> <p>The installation and performance of systems is verified and a Commissioning Report prepared, OR in buildings less than 10,000 square feet, there is a Testing and Balancing Report.</p>	<p><b>A.3.1</b></p>

	There is a Re-commissioning Manual for future operating staff to assist them in understanding and operating the commissioned systems.	
<b>II. OPTIMIZE ENERGY PERFORMANCE</b>		
<p><b>Energy Efficiency</b>  Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads, other energy demands, and design to earn the Energy Star® targets for new construction and major renovation where applicable. For new construction, reduce the energy cost budget by 30 percent compared to the baseline building performance rating per the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Inc., and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, Energy Standard for Buildings Except Low-Rise Residential. For major renovations, reduce the energy cost budget by 20 percent below pre-renovations 2003 baseline.</p>	<p><b>Requirements:</b></p> <p>Achieve levels of performance better than that of a building that meets the 75% target as defined by the EPA Energy Star Target Finder</p> <p>Energy modeling has been done using a number of runs to evaluate the effects of orientation, overhangs, exterior shading, landscaping and ventilation.</p> <p>The building is located, oriented, and shaded to optimize the effect of microclimatic conditions for heating or cooling.</p> <ul style="list-style-type: none"> <li>• The building is oriented such that the east/west exposure is less than the north/south exposure.</li> <li>• There is a 4-foot external overhang over the southern windows.</li> <li>• There are vertical slats external to the eastern windows to reduce direct sunlight entry early in the morning and the day.</li> </ul> <p>There are wind-mitigating measures (such as siting, orientation of entrances, topographical features, landscape vegetation, berms, fencing, or wind canopies) to reduce the harmful effects</p>	<p><b>C.1.1, C.1.2  C.2.3, 2.5  C.2.7- 2.12  C.2.16-18  C.2. 20  C.3.1-3.6  C.3.8</b></p>

	<p>of wind such as snow or sand deposition, thermal loss, drafts, or deterioration of the building fabric.</p> <p>Where there is engineered natural ventilation, the indoor temperature and humidity meet ASHRAE Standard 55 criteria on the 1% design cooling day.</p> <p>Glazing has a minimum visible light transmission to solar heat gain coefficient ratio (VLT/SHGC) of 1.55 or higher.</p> <p>The thermal resistance of the building envelope meets requirements of ASHRAE 90.1 OR The thermal resistance of the building envelope exceeds the requirements of ASHRAE 90.1.</p> <p>The building's fenestration system meets or exceeds the ASHRAE 90.1 thermal transmittance factor.</p> <p>Solar Heat Gain Coefficient (SHGC) of the building's fenestration system meets or exceeds ASHRAE 90.1.</p> <p>The following practices are implemented with respect to the air barrier to help assure the integrity of the building envelope:</p> <ul style="list-style-type: none"><li>• There is a continuous building envelope air</li></ul>	
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	<p>barrier membrane joined in an air-tight and flexible manner to adjacent assemblies.</p> <ul style="list-style-type: none"><li>• There is a mock-up of the air barrier system.</li><li>• Whole building testing of air tightness via blower door or whole building pressurization was conducted.</li><li>• Stack effect is controlled by air sealing and compartmentalizing vertical building shafts (stairs, elevators) from the main space.</li></ul> <p>The integrity of the building envelope is optimized using best vapor retarder practices.</p> <ul style="list-style-type: none"><li>• The vapor retarder is installed as required by the type of assembly and the climate region.</li><li>• Calculations have been done to define the location and permeance of the vapor retarder as per <i>ASHRAE Handbook of Fundamentals</i>.</li></ul> <p>OR Dynamic modeling has been done to provide assurance of the effectiveness of the vapor retarder.</p> <p>The following are automatic controls to turn off lights when rooms are unoccupied:</p> <ul style="list-style-type: none"><li>• Lights switch on and off based on automatic time-of-day clock.</li><li>• There are occupancy sensor controls in each room or per 400 square feet of floor space, whichever is smaller.</li></ul> <p>There are the following building controls:</p> <ul style="list-style-type: none"><li>• HVAC controls with time of day scheduling</li></ul>	
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	<p>or temperature setback</p> <ul style="list-style-type: none"><li>• Full Building Automation Systems</li></ul> <p>There are the following automated natural ventilation control mechanisms:</p> <ul style="list-style-type: none"><li>• Automatic operable windows, window treatments or vents provide fresh air directly from outside in response to room and external temperatures.</li><li>• Interlock between the use of operable windows and automated HVAC control avoids wasting energy, for example, by opening a window to cool down a space which is being heated.</li></ul> <p>The building contains the following vertical transport features to conserve energy.</p> <ul style="list-style-type: none"><li>• Capability of shutting down elevators for part of the day.</li><li>• Capability to slow down or stop escalators when detectors indicate no traffic.</li></ul> <p>Lighting power densities are at or below those indicated in ASHRAE Standard 90.1 and BENCHMARK.</p> <p>There is an efficient electric lighting system (T5 or T8 or metal halide) with electronic ballasts, designed to be supplemented with task-lighting.</p> <p>Cooling equipment meets or exceeds the recommended seasonal energy efficiency ratio (SEER) or Energy Efficiency Ratio (EER)</p>	
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	<p>indicated in ASHRAE Standard 90.1.</p> <p>There are measures (such as multiple compressors or modular boilers) to reduce the capacity and operate efficiently at part loads, yet meet the minimum HVAC requirements.</p> <p>The heating equipment meets or exceeds the recommended annual fuel utilization efficiency (AFUE) or Thermal Efficiency for indirect gas-fired heater at the required capacity.</p> <p>For heat pump applications, the heating efficiency meets or exceeds the ASHRAE Standard 90.1 heating seasonal performance factor (HSPF) or the coefficient of performance (COP) for the required capacity.</p> <p>Fan power is improved by the following measures:</p> <ul style="list-style-type: none"><li>• A duct distribution system that has diffusers and registers sized with a full flow pressure drop no greater than 0.01 inch of water column, and noise criteria (NC) of 35 or less; supply and return ductwork sized with a pressure drop no greater than 0.08 inches of water column per 100 lineal feet of duct run</li><li>• Flexible duct work that is limited to 10 ft. or less; limited to connections between duct branches and diffusers, and connections between duct branches and variable air volume terminal units; installed with durable</li></ul>	
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	<p>elbow support when used as an elbow</p> <ul style="list-style-type: none"> <li>• Sealed duct joint and seams are leak-tested at the rated pressure with overall leak rate less than 10%.</li> <li>• There is insulated ductwork for all supply air ductwork; for return ductwork located above insulated ceilings immediately below the roof or in unconditioned spaces; for all outdoor ductwork; for all exhaust and relief air ductwork between the motor-operated damper and penetration of the; along with vapor retardant on the outside of the insulation where condensation is possible.</li> <li>• Motors for fans that are 1 horsepower or more meet National Electric Manufacturers' Association (NEMA) premium efficiency motor guidelines.</li> </ul>	
<p><b>Measurement and Verification.</b> In accordance with DOE guidelines issued under section 103 of the Energy Policy Act of 2005 (EPAct), install building level utility meters in new major construction and renovation projects to track and continuously optimize performance. Compare actual performance data from the first year of operation with the energy design target. After one year of occupancy, measure all new major installations using</p>	<p><b>Requirements:</b></p> <p>There is sub-metering for lighting panels, air handling units, chillers, pumps, hot water heaters, furnaces, and boilers.</p> <p>Provide energy sub-metering for tenants and/or individual cost centres, functions, or equipment which use large amounts of energy</p> <p>The installation and performance of systems is verified and a Commissioning Report prepared,</p>	<p><b>C.2.13</b> <b>GG-EB A.3.11</b></p> <p><b>A.3.1</b> <b>GG-EB A.1.1</b></p>

<p>the Energy Star® Benchmarking Tool for building and space types covered by Energy Star®. Enter data and lessons learned from sustainable buildings into the High Performance Buildings Database. (www.eere.energy.gov/femp/highperformance/index.cfm)</p>	<p>OR in buildings less than 10,000 square feet, there is a Testing and Balancing Report.</p> <p>Achieve levels of performance (based on the submitted total energy bill) better than that of a building that meets the 75% target as defined by the EPA Energy Star Target Finder</p>	
<p><b>III. PROTECT AND CONSERVE WATER</b></p>		
<p><b>Indoor Water.</b> Employ strategies that in aggregate use a minimum of 20 percent less potable water than the indoor water use baseline calculated for the building, after meeting the Energy Policy Act of 1992 fixture performance requirements.</p>	<p><b>Requirements:</b></p> <p>Provide the percentage of water savings (gallons/square foot) achieved by specifying fixtures that exceed the requirements set forth in the Energy Policy Act of 1992.</p> <p>Provide the evidence of meeting the water consumption benchmarks achieved through installed water-conserving features and implementing water-management best practices that exceed the requirements set forth in the Energy Policy Act of 1992.</p> <p>There is sub-metering of high-water use operations and/or occupancies with high usage (such as wet-cooling towers, irrigation, commercial kitchens, laundries, laboratories, sports facilities and DHW boilers). Sub-metered high-water use operations include:</p> <ul style="list-style-type: none"> <li>• Wet-cooling towers</li> <li>• Irrigation</li> </ul>	<p><b>D.1.1</b> <b>GG-EB B.2.1</b> <b>D.2.1, 2.2</b></p>

	<ul style="list-style-type: none"> <li>• Commercial kitchens, laundries, laboratories and sports facilities</li> <li>• DHW Boilers</li> </ul> <p>Where wet cooling towers are used, they have the following features to minimize the consumption of make-up water.</p> <ul style="list-style-type: none"> <li>• Make up water is from stored rain water source</li> <li>• Automatic control (to shut off the unit when the facility is unoccupied such as at night or on weekends, or to operate it concurrently with chillers)</li> <li>• Conductivity probes (to measure the total dissolved solids so as to minimize the blowdown cycle)</li> <li>• Automated blowdown systems (so that blowdown is done only as needed, rather than routinely)</li> <li>• Delimiters (to reduce drift and evaporation)</li> <li>• Water data loggers (to measure water that is not discharged to sewage system, such as water that has evaporated from the cooling tower)</li> </ul>	
<p><b>Outdoor Water.</b> Use water efficient landscape and irrigation strategies to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities). Employ design</p>	<p><b>Requirements:</b>  Trees, shrubs and groundcover are native to the area (as listed in local Plant Society documentation).</p> <p>The landscaping avoids the need for irrigation altogether OR 100% of the irrigation consists of</p>	<p><b>B.4.1</b>  <b>D.2.3- 2.8</b>  <b>D.3.1, 3.2</b>  <b>GG-EB B.2.1.4-5</b></p>

<p>and construction strategies that reduce storm water runoff and polluted site water runoff.</p>	<p>non- potable water.</p> <p>Lawn is avoided or restricted to within 20-feet of buildings and 5-feet of parking, driveways, and walkways.</p> <p>Where potable water is used for irrigation, there is a water-efficient system that uses the following:</p> <ul style="list-style-type: none"><li>• Low-volume, low-angle sprinklers with sprinkler heads that fit the size and shape of the areas to be watered</li><li>• Drip or sub-surface irrigation - alone or in combination with low-volume, low angle sprinkles with sprinkler heads that fit the size and shape of areas to be watered</li><li>• Programmable controllers with adjustable watering scheduling</li><li>• Moisture sensors</li></ul> <p>Landscape plantings (including lawn turf) have “low supplemental watering requirements” based on local references (i.e. a Local or State Plant Society Native Species Planting List).</p> <p>The landscaping avoids lawn. OR Lawn areas are specified only for functional purposes such as a designated picnicking area or playing field.</p> <p>There is a gray water collection, treatment and distribution system.</p>	
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	An on-site black wastewater treatment system and/or composting toilets are specified.	
<b>IV. ENHANCE INDOOR ENVIRONMENTAL QUALITY</b>		
<b>Thermal Comfort.</b> Meet the current ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality.	<p><b>Requirements:</b></p> <p>The building design conforms to the ANSI/ASHRAE 55-2004 Thermal Environmental Conditions for Human Occupancy OR The building achieves Benchmark 1 for thermal comfort using the Center for the Built Environment Occupant Satisfaction Survey.</p> <p>Indicate the size of the thermal control zones:</p> <ul style="list-style-type: none"> <li>• Control zones are no more than 1,000 square feet.</li> <li>• In office areas, there are controls for medium-sized zones such as conference rooms or 4 cubicles.</li> <li>• There are controls for small zones such as a single workstation or a washroom.</li> </ul> <p>Provide sufficient ventilation to obtain acceptable IAQ, in accordance with ASHRAE 62.1-2004</p>	<p><b>G.4.1-4.2</b>  <b>G 1.2</b>  <b>GG-EB E.1.7</b>  <b>GG-Fit-up (CI) F3</b></p>
<b>Moisture Control.</b> Establish and implement a moisture control strategy for controlling moisture flows and condensation to prevent building damage and mold contamination.	<p><b>Requirements:</b></p> <p>There are the following interior measures to control moisture and prevent the growth of fungus, mold, and bacteria on building surfaces and in concealed spaces:</p> <ul style="list-style-type: none"> <li>• Humidity control/cooling equipment</li> </ul>	<p><b>G.2.1,</b>  <b>C.2.12</b>  <b>GG-EB E.1.25</b>  <b>E.4.1-4.2</b></p>

	<p>maintains the indoor relative humidity at or below 50% on a 1% design heating day.</p> <ul style="list-style-type: none"><li>• Moisture tolerant materials and finishes are specified in areas which generate a lot of humidity.</li><li>• There are floor drains where fixture or appliance failures may cause plumbing leaks.</li><li>• There is exhaust capable of drawing 25 L/s (50 cfm) in humid areas.</li></ul> <p>The integrity of the building envelope is optimized using best vapor retarder practices:</p> <ul style="list-style-type: none"><li>• The vapor retarder is installed as required by the type of assembly and the climate region.</li><li>• Calculations have been done to define the location and permeance of the vapor retarder as per <i>ASHRAE Handbook of Fundamentals</i> OR</li><li>• Dynamic modeling has been done to provide assurance of the effectiveness of the vapor retarder.</li></ul> <p>Envelope design meets regional best practices to control rain penetration (i.e. there specific measures such as overhangs, flashings, drainage planes that overlap flashing slopes, appropriately located and sized weep-holes)</p> <p>There are measures to control the entry of groundwater (e.g. slope, damp proofing membrane, weeping tiles, granular capillary</p>	
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<p><b>Daylighting.</b> Achieve a minimum daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks. Provide automatic dimming controls and accessible manual, motion and photo-sensor lighting controls, and appropriate glare control.</p>	<p>break and drainage along foundations)</p> <p><b>Requirements:</b> Daylighting is maximized through the following strategies:</p> <ul style="list-style-type: none"> <li>• Integration of the smallest effective aperture value (window-wall ratio x visual light transmission (VLT)) meeting daylight needs, and which falls between 0.15 – 0.30.</li> <li>• Continuous windows located close to the ceiling line to distribute light deeper into the space</li> <li>• Other day-lighting strategies (e.g. light shelves, atria skylights, north-facing clerestories to provide daylight in interior zones).</li> </ul> <p>The building has the following daylight related lighting controls.</p> <ul style="list-style-type: none"> <li>• Separate controls for lighting in areas within 20 ft. of windows</li> <li>• Integrated controls within 20 ft. of N/S window walls or within 8 ft. of a skylight edge to adjust electric lighting to daylighting levels</li> </ul> <p>The following are automatic controls to turn off lights when rooms are unoccupied:</p> <ul style="list-style-type: none"> <li>• Lights switch on and off based on automatic time-of-day clock.</li> <li>• There are occupancy sensor controls in each room or per 400 square feet of floor space, whichever is smaller.</li> </ul> <p>Provide % of primary “leasable” space that</p>	<p><b>C.2.4,</b> <b>C.2.14, C.2.16</b> <b>G.3.1</b> <b>G.3.3</b> <b>G.3.5</b> <b>GG-EB E.1.44, 47,</b> <b>48</b> <b>GG-Fit-up (CI)</b> <b>F4.2</b></p>
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	<p>receives minimum daylight illumination levels of 25 footcandles.</p> <p>There are solar shading devices to enable occupants to control brightness and glare from direct sunlight as needed on south, west and east exposures.</p> <p>There are the following measures to avoid excessive direct or reflected glare:</p> <ul style="list-style-type: none"> <li>• Environments for visual display terminals are uniformly illuminated.</li> <li>• For direct lighting, the average luminance does not exceed the following values for given sharp-cut-off luminaire angles (shown in degrees from the vertical). 850 cd/m<sup>2</sup> at 65° 350 cd/m<sup>2</sup> at 75° 175 cd/m<sup>2</sup> at 85°</li> <li>• Walls are illuminated.</li> <li>• There is adequate distance between the luminaries and the ceiling (these vary with design of the unit).</li> </ul>	
<p><b>Low-Emitting Materials.</b> Specify environmentally preferable adhesives, sealants, paints (undercoatings and topcoats), carpet systems, and furnishings with no or low volatile organic compounds.</p>	<p><b>Requirements:</b> Materials specified are low-VOC emitting and third-party environmentally certified with the following VOC limits:</p> <ul style="list-style-type: none"> <li>• Construction adhesives: the greater of 15% by weight or 200 grams/liter</li> <li>• Sealants and caulks: the greater of 4% by weight or 60 grams/liter</li> </ul>	<p><b>G.2.9 GG-Fit-up (CI) F2.7</b></p>

	<ul style="list-style-type: none"> <li>• Contact adhesives: the greater of 80% by weight or 650 grams/liter</li> <li>• Paints: Interior latex coatings flat 100 grams/liter Non flat 150 grams/liter Interior oil-based 380 grams/liter</li> <li>• Carpets: 50 grams/liter or no carpeting</li> </ul>	
<p><b>Protect Indoor Air Quality during Construction.</b> Follow the recommended approach of the Sheet Metal and Air Conditioning Contractor’s National Association Indoor Air Quality Guidelines for Occupied Buildings under Construction, 1995. After construction and prior to occupancy, conduct a minimum 72-hour flush-out with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent.</p>	<p><b>Requirements:</b> There is a construction/renovation indoor air quality management plan that meets the following requirements:</p> <ul style="list-style-type: none"> <li>• Air contaminants, such as odors or irritants generated during renovations, are controlled by one of the five basic options (i.e. source removal, source modification, air cleaning, dilution ventilation, or exhaust ventilation).</li> <li>• Building materials made of organic matter (e.g. wood, plasterboard) or those that may collect organic matter such as leaves or insects are protected at the construction site and in transit.</li> <li>• Ventilation system components, insulation, and vapor retarders are kept clean, dry, and under cover until they are installed.</li> <li>• The building envelope is weather-tight before installing interior walls, wood floors or ceilings, or HVAC.</li> <li>• The HVAC is not used for heating, cooling or humidity control during construction. (Portable heaters, fans or cooling units may</li> </ul>	<p><b>G.1.5, 1.6</b></p>

	<p>be used).</p> <ul style="list-style-type: none"> <li>• Air-tight covers are installed over diffusers, registers, grilles, and open ducts during construction, and are not removed until major construction is complete.</li> <li>• The building is flushed with 100% outdoor air two weeks before the building is occupied. OR Baseline IAQ testing after construction shows acceptable air quality.</li> <li>• Air filters are changed just before building is occupied.</li> </ul> <p>There Are air filters with a dust-spot rating between 60% and 85% OR a Minimum Efficiency Rating Value (MERV) of 8 for air distributed to occupied spaces.</p>	
<b>V. REDUCE ENVIRONMENTAL IMPACT OF MATERIALS</b>		
<b>Recycled Content.</b> Use Environmental Protection Agency designated products containing the highest percentage of recycled content practicable. Use materials with recycled content such that post-consumer recycled content constitutes at least 5 percent of the total value of the materials in the project or combined post-consumer and half post-industrial recycled content constitutes at least 10 percent.	<p><b>Requirements:</b> State proportion of building materials that contains recycled post-consumer content.</p>	<p><b>E.2.2 GG-Fit-up (CI) D2.1</b></p>
<b>Biobased Content.</b> Use biobased	<b>Requirements:</b>	

<p>products made from rapidly renewable resources, and certified sustainable wood products.</p>	<p>State proportion of materials that are bio-based products (such as green chemicals, insulation, renewable plastics, natural fibers and natural structural materials).</p> <p>State proportion of solid lumber and timber panel products that originates from sustainable sources that are third-party certified by the Sustainable Forestry Initiative (SFI), CSA Sustainable Forest Management (SFM), Forestry Stewardship Council (FSC), or the American Tree Farm System (AFS).</p>	<p><b>E.2.3</b> <b>E.2.4</b> <b>GG-Fit-up (CI)</b> <b>D2.5</b></p>
<p><b>Construction Waste.</b> Recycle or salvage at least 50 percent of construction, demolition and land clearing waste, excluding soil, where markets or on-site recycling opportunities exist.</p>	<p><b>Requirements:</b></p> <p>State what the proportion (by weight) of construction, demolition and renovation waste is diverted from landfill.</p> <p>For every 10,000 square feet of occupied space, there is at least 20 square feet of designated storage space for recyclable waste or 100 square feet for buildings with more than 50,000 square feet of occupied floor space.</p> <p>There is space for a recycling dumpster next to the general waste dumpster.</p>	<p><b>E.5.1-5.3</b> <b>GG-EB C.1.5.-7.</b> <b>GG-Fit-up (CI)</b> <b>D5.2</b></p>
<p><b>Ozone Depleting Compounds.</b> Eliminate the use of ozone depleting compounds during and after construction where alternative environmentally preferable</p>	<p><b>Requirements:</b></p> <p>The building avoids ozone depletion and global warming caused by refrigerants (i.e. There are no refrigerants or only absorption cooling is</p>	<p><b>F.2.1-2.3</b> <b>GG-EB D.2.3.-6.</b></p>

<p>products are available, consistent with the Montreal Protocol and Title VI of the Clean Air Act Amendments of 1990.</p>	<p>used.)</p> <p>Where HFC (hydrofluorocarbon) or HCFC (hydrochlorofluorocarbon) refrigerants are specified, their ozone-depleting potential (ODP) is 0.05 or less.</p> <p>The global warming potential (GWP) of the refrigerant is less than 150.</p>	