



# **LEED v4 for INTERIOR DESIGN AND CONSTRUCTION**

*Includes:*

*LEED ID+C: Commercial Interiors*

*LEED ID+C: Retail*

*LEED ID+C: Hospitality*

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## CREDIT: INTEGRATIVE PROCESS

ID&C

### 2 points

This credit applies to

- Commercial Interiors
- Retail
- Hospitality

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

#### Site Selection and Energy-Related Systems (1 point)

Starting in predesign and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses described below to inform the owner's project requirements (OPR), basis of design (BOD), design documents, and construction documents. Conduct analyses in site selection and energy-related systems (1 point).

#### Site Selection:

**Discovery:** Before site selection, analyze project goals to identify and select the building site that will provide the most opportunities and fewest barriers for the tenant improvement project. Assess at least two potential locations or base building options, taking into consideration at least the following:

- *Building site attributes.* Assess the base building's location and site design characteristics.
- *Transportation.* Assess the tenant occupants' transportation needs for commuting to and from the site, including convenient access to alternative transportation that meets occupants' needs.
- *Building features.* Assess the base building's envelope, mechanical and electrical systems that will affect tenant space (e.g., controls, HVAC, plumbing fixtures, renewable energy supply), adaptability to future needs, and resilience in the event of disaster or infrastructure failure.
- *Occupants' well-being.* Assess the base building's ability to provide daylight and views, indoor air quality, and other indoor environmental quality characteristics.

**Implementation:** Document how the above analysis informed selection of a building site for the project's tenant improvement and informed the OPR and BOD and site selection for the interior design project, including the following, as applicable:

- suitability of the base building for meeting project goals relative to the building's site attributes;
- suitability of the base building site location for meeting daily occupants' commuting needs;
- suitability of the base building mechanical and electrical systems for meeting project goals;

- capability of the tenant space for meeting the project goals related to indoor environmental quality and occupant well-being; and
- other systems.

Commit to the establishment and use of ongoing feedback mechanisms that provide information about tenant space performance and occupants' satisfaction. Provide documentation of methods planned to gather feedback on occupants' satisfaction.

### Energy-Related Systems

**Discovery:** Perform a preliminary energy analysis before the completion of schematic design that explores how to reduce energy loads for the interior design project and accomplish related sustainability goals by questioning default assumptions and testing options. Assess at least two potential options associated with each of the following in terms of project and human performance:

- *Basic envelope attributes.* Insulation values, window-to-wall ratios, glazing characteristics, shading, window operability.
- *Programmatic and operational parameters.* Multifunctioning spaces, operating schedules, space allotment per person, teleworking, reducing building area, ongoing operations and maintenance issues.
- *Lighting levels.* Interior surface reflectance values and lighting levels in occupied spaces.
- *Thermal comfort ranges.* Assess thermal comfort range options.
- *Plug and process load needs.* Reducing plug and process loads through programmatic solutions such as equipment and purchasing policies or layout options.

**Implementation:** Document how the above analysis informed interior design decisions in the project's OPR and BOC and the interior design of the project, including the following, as applicable:

- building envelope and façade conditions;
- elimination and/or significant downsizing of building systems (e.g., HVAC, lighting, controls, exterior materials, interior finishes, functional program elements);
- methods planned to gather feedback on energy performance and occupants' satisfaction during operations.; and
- other systems.

Project teams may also choose Option 1 for an additional point.

### Option 1. Water-Related Systems (1 point)

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

- *Fixture and fitting water demand.* Assess flow and flush fixture demand volumes, calculated in accordance with WE Prerequisite Water-Use Reduction.
- *Process water demand.* Assess kitchen, laundry, cooling tower, and other equipment demand volumes, as applicable.
- *Supply sources.* Assess all potential nonpotable water supply source volumes, such as on-site rainwater and graywater, municipally supplied nonpotable water, and HVAC equipment condensate.

**Implementation:** Document how the above analysis informed interior design decisions in the OPR and BOD. Demonstrate how at least one on-site nonpotable water supply source was used to reduce the burden on municipal supply and/or wastewater treatment systems by contributing to the water demand components listed above. Demonstrate how the analysis informed the interior design and systems affected by the project, as applicable, for the following:

- plumbing systems;
- sewage conveyance and/or on-site treatment systems;
- process water systems;
- methods planned to gather feedback on the performance and efficiency of water-related systems during operations; and
- other systems.

# LOCATION AND TRANSPORTATION (LT)

## LT CREDIT: LEED FOR NEIGHBORHOOD DEVELOPMENT LOCATION

ID&C

**8-18 points**

This credit applies to

- Commercial Interiors (8-18 points)
- Hospitality (8-18 points)
- Retail (8-18 points)

**Intent**

To avoid development on inappropriate sites. To reduce vehicles miles traveled. To enhance livability and improve human health by encouraging daily physical activity.

**Requirements**

**CI, RETAIL, HOSPITALITY**

Locate the project in within the boundary of a development certified under LEED for Neighborhood Development (Stage 2 or Stage 3 under the Pilot or 2009 rating systems, Certified Plan or Certified Project under the LEED v4 rating system). :

Projects attempting this credit are not eligible to earn points under other Location and Transportation credits.

**Table 1. Points for LEED ND location.**

Certification level	Points ID&C
Certified	8
Silver	10
Gold	12
Platinum	18



## LT CREDIT: SURROUNDING DENSITY AND DIVERSE USES

ID&C

### 1–8 points

This credit applies to

- Commercial Interiors (1–8 points)
- Retail (1–8 points)
- Hospitality (1–8 points)

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

#### Option 1. Surrounding Density (3–6 points ID&C)

Locate on a site whose surrounding existing density within a ¼-mile (400-meter) radius of the project boundary meets the values in Table 1. Use either the “separate residential and nonresidential densities” or the “combined density” values.

**Table 1a. Points for average density within 1/4 mile of project (imperial units)**

Combined density	Separate residential and nonresidential densities		Points ID&C
Square feet per acre of buildable land	Residential density (DU/acre)	Nonresidential density (FAR)	
22,000	7	0.5	3
35,000	12	0.8	6

**Table 1b. Points for average density within 400 meters of project (metric units)**

Combined density	Separate residential and nonresidential densities		Points ID&C
Square meters per hectare of buildable land	Residential density (DU/hectare)	Nonresidential density (FAR)	
5,050	17.5	0.5	3
8,035	30	0.8	6

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

AND/OR

**Option 2. Diverse Uses (1–2 points)**

Construct or renovate a building or a space within a building such that the building's main entrance is within a ½-mile (800-meter) walking distance of the main entrance of four to seven (1 point) or eight or more (2 points) existing and publicly available diverse uses (listed in Appendix 1).

The following restrictions apply.

- A use counts as only one type (e.g., a retail store may be counted only once even if it sells products in several categories).
- No more than two uses in each use type may be counted (e.g. if five restaurants are within walking distance, only two may be counted).
- The counted uses must represent at least three of the five categories, exclusive of the building's primary use.

## LT CREDIT: ACCESS TO QUALITY TRANSIT

ID&C

### 1–7 points

This credit applies to

- Commercial Interiors (1–7 points)
- Hospitality (1–7 points)
- Retail (1–7 points)

### Intent

To encourage development in locations shown to have multimodal transportation choices or otherwise reduced motor vehicle use, thereby reducing greenhouse gas emissions, air pollution, and other environmental and public health harms associated with motor vehicle use.

### Requirements

#### CI, HOSPITALITY, RETAIL-CI

Locate any *functional entry* of the project within a ¼-mile (400-meter) *walking distance* of existing or planned bus, *streetcar*, or *rideshare stops*, or within a ½-mile (800-meter) walking distance of existing or planned *bus rapid transit* stops, light or heavy rail stations, commuter rail stations, or commuter ferry terminals. The transit service at those stops and stations in aggregate must meet the minimums listed in Tables 1 and 2. Planned stops and stations may count if they are sited, funded, and under construction by the date of the certificate of occupancy and are complete within 24 months of that date.

Both weekday and weekend trip minimums must be met.

- Qualifying transit routes must have paired route service (service in opposite directions).
- For each qualifying transit route, only trips in one direction are counted towards the threshold.
- If a qualifying transit route has multiple stops within the required walking distance, only trips from one stop are counted towards the threshold.

**Table 1. Minimum daily transit service for projects with multiple transit types (bus, *streetcar*, rail, or ferry)**

Weekday trips	Weekend trips	Points ID&C
72	40	2
144	108	5
360	216	7

**Table 2. Minimum daily transit service for projects with commuter rail or ferry service only**

Weekday trips	Weekend trips	Points (all projects)
24	6	1
40	8	2
60	12	3

Projects served by two or more transit routes such that no one route provides more than 60% of the documented levels may earn one additional point, up to the maximum number of points.

If *existing* transit service is temporarily rerouted outside the required distances for less than two years, the project may meet the requirements, provided the local transit agency has committed to restoring the routes with service at or above the prior level.

### **All Options**

For all options, provide dedicated walking or bicycling lanes toward the transit lines. The lanes must extend from the school building to at least the end of the school property and may not have any barriers (e.g., fences). School grounds may be enclosed with fences during class hours for security purposes, provided the fences are open before and after class hours for traveling students, faculty, and staff.

## LT CREDIT: BICYCLE FACILITIES

ID&C

### 1 point

This credit applies to

- Commercial Interiors (1 point)
- Hospitality (1 point)
- Retail (1 point)

### Intent

To promote bicycling and transportation efficiency and reduce vehicle distance traveled. To improve public health by encouraging utilitarian and recreational physical activity.

### Requirements

#### CI, HOSPITALITY

#### **Bicycle Network**

Locate the space in a building such that a *functional entry* and/or the bicycle storage is within a 200-yard (180-meter) *walking distance* or *bicycling distance* of a *bicycle network* that connects to at least one of the following:

- at least diverse 10 uses (see Appendix 1); or
- a *bus rapid transit* stop, light or heavy rail station, commuter rail station, or ferry terminal.

All destinations must be within a 3-miles (4800-meter) bicycling distance of the project boundary.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within one year of that date.

#### **Bicycle Storage and Shower Rooms**

Provide *short-term bicycle storage* for at least 2.5% or more of all peak visitors, but no fewer than two storage spaces per project.

Provide *long-term bicycle storage* for at least 5% of regular building occupants but no fewer than 2 spaces per project in addition to the short-term bicycle spaces.

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

*Short-term bicycle storage* must be within 100 feet (30 meters) walking distance of any main entrance. *Long-term bicycle storage* must be within 100 feet (30 meters) walking distance of any *functional entry*.

Bicycle storage capacity may not be double-counted: storage that is fully allocated to the occupants of nonproject facilities cannot also serve project occupants.

#### RETAIL-CI

#### **Bicycle Network**

Design or locate the *project* such that a *functional entry* and/or bicycle storage is within a 200-yard (180-meter) *walking distance* or *bicycling distance* of a *bicycle network* that connects to at least one of the following:

- at least 10 diverse uses (see Appendix 1); or

- a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal. All destinations must be within a 3-mile (4800-meter) bicycling distance of the project boundary.

Planned bicycle trails or lanes may be counted if they are fully funded by the date of the certificate of occupancy and are scheduled for completion within one year of that date.

### **Bicycle Storage and Shower Rooms**

Provide two *short-term bicycle storage* spaces for every 5,000 square feet (465 square meters), but no fewer than two storage spaces per tenant space.

Provide *long-term bicycle storage* for at least 5% of regular building occupants, but no fewer than two storage spaces per building in addition to the short-term bicycle storage spaces.

*Short-term bicycle storage* must be within 100 feet (30 meters) walking distance of any main entrance. *Long-term bicycle storage* must be within 100 feet (30 meters) walking distance of any *functional entry*.

Bicycle storage capacity may not be double-counted: storage that is fully allocated to the occupants of nonproject facilities cannot also serve project occupants.

Provide a bicycle maintenance program for employees or bicycle route assistance for employees and customers. Route assistance must be provided in a manner easily accessible to both employees and customers.

For projects that are part of a master plan development only If bicycle storage has been provided by the development in which the project is located, determine the number of spaces that may be attributed to the project by dividing the floor area of the retail project by the total floor area of the development (buildings only) and multiplying the percentage result by the total number of spaces. If this number does not meet the credit requirement, the project must provide additional bicycle storage.

## LT CREDIT: REDUCED PARKING FOOTPRINT

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Hospitality (1–2 points)
- Retail (1–2 points)

### Intent

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

### Requirements

#### CI, HOSPITALITY, RETAIL

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

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

#### Case 1. Baseline Location

Projects that have not earned points under LT Credit Surrounding Density and Diverse Uses or LT Credit Access to Quality Transit must achieve a 20% (1 point) or 40% (2 points ID&C) reduction from the base ratios.

#### Case 2. Dense and/or Transit-Served Location

Projects earning 1 or more points under either LT Credit Surrounding Density and Diverse Uses or LT Credit Access to Quality Transit must achieve a 40% (1 point) or 60% (2 points) reduction from the base ratios.

#### For All Projects

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

For projects that use pooled parking, calculate compliance using the project's share of the pooled parking.

Provide preferred parking for carpools for 5% of the total parking spaces after reductions are made from the base ratios. Preferred parking is not required if no off-street parking is provided.

Mixed-use projects should determine the percentage reduction by first aggregating the parking amount of each use (as specified by the base ratios) and then determining the percentage reduction from the aggregated parking amount.

Do not count parking spaces for fleet and inventory vehicles unless these vehicles are regularly used by employees for commuting as well as business purposes.

# SUSTAINABLE SITES (SS)



# WATER EFFICIENCY (WE)

## WE PREREQUISITE: INDOOR WATER USE REDUCTION Required

### ID&C

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### Intent

To reduce indoor water consumption.

### Requirements

#### CI, CI-RETAIL, CI-HOSPITALITY

#### Building Water Use

For the fixtures and fittings listed in Table 1, as applicable to the project scope, reduce aggregate water consumption by 20% from the baseline. Base calculations on the volumes and flow rates shown in Table 1.

All newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling must be WaterSense labeled (or a local equivalent for projects outside the U.S.).

Projects where fixtures or fixture fittings are not within the tenant spaces are exempt from this prerequisite.

**Table 1. Baseline water consumption of fixtures and fittings**

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

\* WaterSense label available for this product type  
 gpf = gallons per flush  
 gpm = gallons per minute  
 psi = pounds per square inch

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

**Appliance and Process Water Use**

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

**Table 2. Standards for appliances**

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

gpm = gallons per minute

lpm = liters per minute

**Table 3. Standards for processes**

<i>Process</i>	<i>Requirement</i>
Heat rejection and cooling	No once-through cooling with potable water for any equipment or appliances that reject heat
Cooling towers and evaporative condensers	Equip with <ul style="list-style-type: none"> <li>• makeup water meters</li> <li>• conductivity controllers and overflow alarms</li> <li>• efficient drift eliminators that reduce drift to maximum of 0.002% of recirculated water volume for counterflow towers and 0.005% of recirculated water flow for cross-flow towers</li> </ul>

Retail and Hospitality Only

In addition, water-consuming appliances, equipment, and processes must meet the requirements listed in Tables 4 and 5.

**Table 4. Standards for appliances**

<i>Kitchen equipment</i>		<i>Requirement (IP units)</i>	<i>Requirement (SI units)</i>
Dishwasher	Undercounter	≤ 1.6 gal/rack	≤ 6.0 liters/rack
	Stationary, single tank, door	≤ 1.4 gal/rack	≤ 5.3 liters/rack
	Single tank, conveyor	≤ 1.0 gal/rack	≤ 3.8 liters/rack
	Multiple tank, conveyor	≤ 0.9 gal/rack	≤ 3.4liters/rack
	Flight machine	≤ 180 gal/hour	≤ 680 liters/hour
Food steamer	batch	≤ 6 gal/hour/pan	≤ 23 liters/hour/pan
	Cook-to-order	≤ 10 gal/hour/pan	≤ 38 liters/hour/pan
Combination oven,	Countertop or stand	≤ 3.5 gal/hour/pan	≤ 13 liters/hour/pan
	Roll-in	≤ 3.5 gal/hour/pan	≤ 13 liters/hour/pan

**Table 5. Process requirements**

Discharge water temperature tempering	<p>Where local requirements limit discharge temperature of fluids into drainage system, use tempering device that runs water only when equipment discharges hot water</p> <p>OR</p> <p>Provide thermal recovery heat exchanger that cools drained discharge water below code-required maximum discharge temperatures while simultaneously preheating inlet makeup water</p> <p>OR</p> <p>If fluid is steam condensate, return it to boiler</p>
Venturi-type flow-through vacuum generators or aspirators	Use no device that generates vacuum by means of water flow through device into drain

# WE CREDIT: INDOOR WATER USE REDUCTION

ID&C

## 2–12 points

This credit applies to

- Commercial Interiors (2–12 points)
- Retail (2–12 points)
- Hospitality (2–12 points)

### Intent

To reduce indoor water consumption.

### Requirements

#### CI, CI-RETAIL, CI-HOSPITALITY

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

**Table 1. Points for reducing water use**

Percentage reduction	Points (ID&C)	Points (CI Retail)	Points (CI Hospitality)
25%	2	2	2
30%	4	4	4
35%	6	6	6
40%	8	8	8
45%	10	10	10
50%	12	--	11

#### Retail and Hospitality only

Meet the percentage reduction requirements above.

AND

**Appliance and Process Water.** Install equipment within the project scope that meets the minimum requirements in Table 2, 3, 4, or 5. One point is awarded for meeting all applicable requirements in any one table. All applicable equipment listed in each table must meet the standard.

Schools, Retail, and Healthcare projects can earn a second point for meeting the requirements of two tables.

#### **Table 2. Compliant commercial washing machines**

To use Table 2, the project must process at least 120,000 lbs (57 606 kg) of laundry per year.

<i>Washing machine</i>	<i>Requirement (IP units)</i>	<i>Requirement (SI units)</i>
On-premise, minimum capacity 2,400 lbs (1 088 kg) per 8-hour shift	Maximum 1.8 gals per pound *	Maximum 7 liters per 0.45 kilograms *

\* Based on equal quantities of heavy, medium, and light soil laundry.

**Table 3. Standards for commercial kitchen equipment**

To use Table 3, the project must serve at least 100 meals per day of operation. All process and appliance equipment listed in the category of kitchen equipment and present on the project must comply with the standards.

<i>Kitchen equipment</i>		<i>Requirement (IP units)</i>	<i>Requirement (SI units)</i>
Dishwasher	Undercounter	ENERGY STAR	ENERGY STAR or performance equivalent
	Stationary, single tank, door	ENERGY STAR	ENERGY STAR or performance equivalent
	Single tank, conveyor	ENERGY STAR	ENERGY STAR or performance equivalent
	Multiple tank, conveyor	ENERGY STAR	ENERGY STAR or performance equivalent
	Flight machine	ENERGY STAR	ENERGY STAR or performance equivalent
Food steamer	Batch (no drain connection)	≤ 2 gal/hour/pan including condensate cooling water	≤ 7.5 liters/hour/pan including condensate cooling water
	Cook-to-order (with drain connection)	≤ 5 gal/hour/pan including condensate cooling water	≤ 19 liters/hour/pan including condensate cooling water
Combination oven,	Countertop or stand	≤ 1.5 gal/hour/pan including condensate cooling water	≤ 5.7 liters/hour/pan including condensate cooling water
	Roll-in	≤ 1.5 gal/hour/pan including condensate cooling water	≤ 5.7 liters/hour/pan including condensate cooling water
Food waste disposer	Disposer	3-8 gpm, full load condition, 10 minute automatic shutoff; or 1 gpm, no-load condition	11–30 lpm, full load condition, 10-min automatic shutoff; or 43.8 lpm, no-load condition
	Scrap collector	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water

	Pulper	Maximum 2 gpm makeup water	Maximum 7.6 lpm makeup water
	Strainer basket	No additional water usage	No additional water usage

gpm = gallons per minute

gph = gallons per hour

lpm = liters per minute

lph = liters per hour

**Table 4. Compliant laboratory and medical equipment**

To use Table 4, the project must be a medical or laboratory facility.

<i>Lab equipment</i>	<i>Requirement (IP units)</i>	<i>Requirement (SI units)</i>
Reverse-osmosis water purifier	75% recovery	75% recovery
Steam sterilizer	For 60-inch sterilizer, 6.3 gal/U.S. tray For 48-inch sterilizer, 7.5 gal/U.S. tray	For 1520-mm sterilizer, 28.5 liters/DIN tray For 1220-mm sterilizer, 28.35 liters/DIN tray
Sterile process washer	0.35 gal/U.S. tray	1.3 liters/DIN tray
X-ray processor, 150 mm or more in any dimension	Film processor water recycling unit	
Digital imager, all sizes	No water use	

**Table 5. Compliant municipal steam systems**

To use Table 5, the project must be connected to a municipal or district steam system that does not allow the return of steam condensate.

<i>Steam system</i>	<i>Standard</i>
Steam condensate disposal	Cool municipally supplied steam condensate (no return) to drainage system with heat recovery system or reclaimed water
OR	
Reclaim and use steam condensate	100% recovery and reuse

# ENERGY AND ATMOSPHERE

## EA PREREQUISITE: FUNDAMENTAL COMMISSIONING AND VERIFICATION Required

### ID&C

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

#### **Commissioning Process Scope**

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

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

- Develop the OPR.
- Develop a BOD.

The commissioning authority (CxA) must do the following:

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

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

#### **Commissioning Authority**

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

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

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

**Current Facilities Requirements and Operations and Maintenance Plan**

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

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

Commercial interiors projects are responsible for completing the above tasks for all systems and equipment included in their scope, including items furnished by the base building, but modified or relocated as part of tenant fit-out. Information such as sequences of operations, schedules, equipment setpoints, and outside air requirements for tenant equipment and spaces must be coordinated with base building requirements.



## **EA PREREQUISITE: MINIMUM ENERGY PERFORMANCE Required**

### **ID&C**

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### **Intent**

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

### **Requirements**

#### **CI, RETAIL, HOSPITALITY**

##### **Option 1. Tenant-Level Energy Simulation**

Demonstrate a 3% improvement in the proposed performance rating compared with the baseline performance rating for portions of the building within the tenant's scope of work. Calculate the baseline according to ANSI/ASHRAE/IESNA Standard 90.1–2010, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), using a simulation model for all tenant project energy use.

Projects must meet the minimum percentage savings before application of renewable energy systems.

The proposed design must meet the following criteria:

- compliance with the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata, or a USGBC–approved equivalent standard for projects outside the U.S.);
- inclusion of all energy consumption and costs within and associated with the tenant project; and
- comparison against a baseline tenant project that complies with Standard 90.1–2010, Appendix G, with errata but without addenda (or a USGBC-approved equivalent standard outside the U.S.).

Exception: the baseline project envelope must be modeled according to Table G3.1(5) (baseline), Sections a–e, and not Section f.

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

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

#### **Retail only**

For Option 1, Tenant-Level Energy Simulation, process loads for retail may include refrigeration equipment, cooking and food preparation, clothes washing, and other major support appliances.. Many of the industry standard baseline conditions for commercial kitchen equipment and refrigeration are defined in Appendix 3, Tables 1–4. No additional documentation is necessary to substantiate these predefined baseline systems as industry standard.

OR

**Option 2. Prescriptive Compliance**

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

- Reduce connected lighting power density by 5% below ASHRAE 90.1-2010 using the space-by-space method or by applying the whole-building lighting power allowance to the entire tenant space.
- Install ENERGY STAR appliances, office equipment, electronics, and commercial food service equipment (HVAC, lighting, and building envelope products are excluded) for 50% (by rated-power) of the total ENERGY STAR eligible products in the project. Projects outside the U.S. may use a performance equivalent to ENERGY STAR.

## **EA PREREQUISITE: FUNDAMENTAL REFRIGERANT MANAGEMENT Required**

### **ID&C**

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### **Intent**

To reduce stratospheric ozone depletion.

### **Requirements**

#### **CI, RETAIL, HOSPITALITY**

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

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

## EA CREDIT: ENHANCED COMMISSIONING

ID&C

### 4-5 points

This credit applies to

- Commercial Interiors (4-5 points)
- Retail (4-5 points)
- Hospitality (4-5 points)

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

#### Option 1. Enhanced Commissioning (4 points)

Projects must complete the following commissioning process (CxP) activities for mechanical, electrical, domestic hot water, and renewable energy systems and assemblies in accordance with ASHRAE Guideline 0–2005 and ASHRAE Guideline 1.1–2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality, and durability.

- Review contractor submittals.
- Include systems manual requirements in construction documents.
- Include operator and occupant training requirements in construction documents.
- Verify systems manual updates and delivery.
- Verify operator and occupant training delivery and effectiveness.
- Verify seasonal testing.
- Review building operations 10 months after substantial completion.
- Develop an on-going commissioning plan.

OR

#### Option 2. Monitoring-Based Commissioning (5 points)

Achieve Option 1.

Develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of energy- and water-consuming systems.

Include the procedures and measurement points in the commissioning plan. Address the following:

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

- planning for repairs needed to maintain performance;
- the frequency of analyses in the first year of occupancy (at least quarterly);

Update the systems manual with any modifications or new settings, and give the reason for any modifications from the original design.

## EA CREDIT: OPTIMIZE ENERGY PERFORMANCE

ID&C

### 1–25 points

This credit applies to

- Commercial Interiors (1–25 points)
- Retail (1–25 points)
- Hospitality(1–25 points)

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

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

Select one of the options below.

#### **Option 1. Tenant-Level Energy Simulation (1–25 points)**

Analyze efficiency measures during the design process and account for the results in design decision-making. Analysis can include energy simulation of efficiency opportunities, energy simulation analyses for similar projects, or published data from energy analyses performed for similar projects (such as AEDGs).

Analyze efficiency measures focused on load reduction and HVAC-related strategies; passive measures are acceptable. Project the potential energy savings and cost implications for all affected systems.

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

**Table 1. Points for percentage improvement in energy performance**

<i>Interior construction</i>	<i>Points</i>
4%	4
5%	6
6%	8
7%	10
8%	11
9%	12
10%	13
11%	14
12%	15
13%	16

14%	17
15%	18
16%	19
17%	20
18%	21
20%	22
22%	23
24%	24
28%	25

#### Retail only

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

- *Appliances and equipment.* For appliances and equipment not covered in Appendix 3, Tables 1–4 indicate hourly energy use for proposed and budget equipment, along with estimated daily use hours. Use the total estimated appliance/equipment energy use in the energy simulation model as a plug load. Reduced use time (schedule change) is not a category of energy improvement in this credit. ENERGY STAR ratings and evaluations are a valid basis for performing this calculation.
- *Display lighting.* For display lighting, use the space by space method of determining allowed lighting power under ANSI/ASHRAE/IESNA Standard 90.1–2010, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), to determine the appropriate baseline for both the general building space and the display lighting.
- *Refrigeration.* For hard-wired refrigeration loads, model the effect of energy performance improvements with a simulation program designed to account for refrigeration equipment.

#### Option 2. Prescriptive Compliance (1–16 points)

Use any combination of the strategies in any or all of the categories below.

For base building systems that serve the project, as well as any applicable improvements that are part of the project, implement and document compliance with the applicable recommendations and standards (except for measurement and verification) in Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate ASHRAE 50% Advanced Energy Design Guide and climate zone. For projects outside the U.S., consult ASHRAE/ASHRAE/IESNA Standard 90.1–2010, Appendixes B and D, to determine the appropriate climate zone.

#### Building Envelope (2–4 points)

- Building Envelope, Opaque (2 points)  
Comply with the recommendations in ASHRAE 50% Advanced Energy Design Guide for all roofs, walls, floors, slabs, doors, vestibules, and continuous air barriers.
- Building Envelope, Glazing (2 points)

Comply with the recommendations in ASHRAE 50% Advanced Energy Design Guide for all vertical fenestration.

**HVAC Systems (4 points)**

- HVAC Equipment Efficiency (2 points)  
For all base building HVAC systems that serve the project, comply with the recommendations in ASHRAE 50% Advanced Energy Design Guide.
- HVAC Zoning and Controls (2 points)  
For the tenant fit-out of spaces, provide a separate control zone for each solar exposure and interior space. Provide controls capable of sensing space conditions and modulating the HVAC system in response to space demand for all private offices and other enclosed spaces (e.g., conference rooms, classrooms).

**Interior Lighting Power (1–4 points)**

- Lighting Power Density (1–4 points)  
Reduce connected lighting power density below that allowed by ASHRAE/IESNA Standard 90.1–2010, either using the space-by-space method or applying the whole-building lighting power allowance to the entire tenant space. Points are awarded according to Table 2.

**Table 2. Points for percentage reduction in lighting power density**

Percentage below standard LPD	Points
10%	1
15%	2
20%	3
25%	4

**Interior Lighting Controls (1–2 points)**

- Daylighting Controls (1 point)  
Install daylight-responsive controls in all regularly occupied daylit spaces within 15 feet (4.5 meters) of windows and under skylights for at least 25% of the connected lighting load. Daylight controls must switch or dim electric lights in response to daylight illumination in the space.
- Occupancy Sensor Lighting Controls (1 point)  
Install occupancy sensors for at least 75% of the connected lighting load.

**Equipment and Appliances (1–2 points)**

- ENERGY STAR Equipment and Appliances (1–2 points)  
Install ENERGY STAR appliances, office equipment, electronics, and commercial food service equipment (HVAC, lighting, and building envelope products are excluded from this credit) or performance equivalent for projects outside the U.S.. Calculate their percentage of the total (by rated-power) ENERGY STAR–eligible products in the project. Points are awarded according to Table 3.

**Table 3. Points for installing ENERGY STAR equipment and appliances**



<i>Percentage of ENERGY STAR products</i>	<i>Points</i>
70%	1
90%	2

Retail only

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

## EA CREDIT: ADVANCED ENERGY METERING

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1-2 points)
- Retail (1-2 points)
- Hospitality (1-2 points)

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

#### **Option 1. Metering** (1 point)

Install new or use existing tenant-level energy meters to provide tenant-level data representing total tenant energy consumption (electricity, natural gas, chilled water, steam, fuel oil, propane, biomass, etc.). Utility-owned meters are acceptable.

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

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

#### **Option 2. Advanced Metering** (2 points)

Install *advanced energy metering* for the following:

- all energy sources used in the tenant space; and
- any individual energy end uses that represent 10% or more of the total annual consumption of the tenant space.

The advanced energy metering must have the following characteristics.

- Meters must be permanently installed, record at intervals of one hour or less, and transmit data to a remote location.
- Electricity meters must record both consumption and demand. Whole-building electricity meters should record the power factor, if appropriate.
- The data collection system must use a local area network, building automation system, wireless network, or comparable communication infrastructure.
- The system must be capable of storing all meter data for at least 18 months.
- The data must be remotely accessible.
- All meters in the system must be capable of reporting hourly, daily, monthly, and annual energy use.

## EA CREDIT: RENEWABLE ENERGY PRODUCTION

ID&C

### 1–3 points

This credit applies to

- Commercial Interiors (1–3 points)
- Retail (1–3 points)
- Hospitality (1–3 points)

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

Use tenant renewable energy systems to offset the project's energy cost. Calculate the project's percentage of renewable energy by the following equation:

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

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

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

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

Credit is based on the percentage of ownership or percentage use assigned in the lease agreement. Points are awarded according to Table 2.

**Table 2. Points for renewable energy**

<i>Percentage renewable energy</i>	<i>Points (CI, Retail CI, Hospitality)</i>
1%	1
3%	2
5%	3

## EA CREDIT: ENHANCED REFRIGERANT MANAGEMENT

ID&C

**1 point**

This credit applies to

- Commercial Interiors (1 point)
- Retail (1 point)
- Hospitality (1 point)

**Intent**

To reduce ozone depletion and support early compliance with the Montreal Protocol while minimizing direct contributions to climate change.

**Requirements**

### CI, HOSPITALITY, HEALTHCARE

#### **Option 1. No Refrigerants or Low-Impact Refrigerants (1 point)**

Do not use refrigerants, or use only refrigerants (naturally occurring or synthetic) that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50.

OR

#### **Option 2. Calculation of Refrigerant Impact (1 point)**

Select refrigerants that are used in heating, ventilating, air-conditioning, and refrigeration (HVAC&R) equipment to minimize or eliminate the emission of compounds that contribute to ozone depletion and climate change. The combination of all new and existing base building and tenant HVAC&R equipment that serve the project must comply with the following formula:

IP units	SI units
$\frac{LCGW}{P} + \frac{LCOD}{P} \times 10^5 \leq 100$	$\frac{LCGW}{P} + \frac{LCOD}{P} \times 10^5 \leq 13$
<b>Calculation definitions for LCGWP + LCODP x 10<sup>5</sup> ≤ 100 (IP units)</b>	<b>Calculation definitions for LCGWP + LCODP x 10<sup>5</sup> ≤ 13 (SI units)</b>
LCODP = [ODPr x (Lr x Life +Mr) x Rc]/Life	LCODP = [ODPr x (Lr x Life +Mr) x Rc]/Life
LCGWP = [GWPr x (Lr x Life +Mr) x Rc]/Life	LCGWP = [GWPr x (Lr x Life +Mr) x Rc]/Life
LCODP: Lifecycle Ozone Depletion Potential (lb CFC 11/Ton-Year)	LCODP: Lifecycle Ozone Depletion Potential (kg CFC 11/(kW/year))
LCGWP: Lifecycle Direct Global Warming Potential (lb CO <sub>2</sub> /Ton-Year)	LCGWP: Lifecycle Direct Global Warming Potential (kg CO <sub>2</sub> /kW-year)
GWPr: Global Warming Potential of Refrigerant (0 to 12,000 lb CO <sub>2</sub> /lbr)	GWPr: Global Warming Potential of Refrigerant (0 to 12,000 kg CO <sub>2</sub> /kg r)
ODPr: Ozone Depletion Potential of Refrigerant	ODPr: Ozone Depletion Potential of Refrigerant

(0 to 0.2 lb CFC 11/lbr)	(0 to 0.2 kg CFC 11/kg r)
Lr: Refrigerant Leakage Rate (2.0%)	Lr: Refrigerant Leakage Rate (2.0%)
Mr: End-of-life Refrigerant Loss (10%)	Mr: End-of-life Refrigerant Loss (10%)
Rc: Refrigerant Charge (0.5 to 5.0 lbs of refrigerant per ton of gross AHRI rated cooling capacity)	Rc: Refrigerant Charge (0.065 to 0.65 kg of refrigerant per kW of AHRI rated or Eurovent Certified cooling capacity)
Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)	Life: Equipment Life (10 years; default based on equipment type, unless otherwise demonstrated)

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

IP units	≤	SI units
$\frac{\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}}{Q_{total}} \leq 100$	≤	$\frac{\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}}{Q_{total}} \leq 13$

Calculation definitions for [ $\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}$ ] / $Q_{total}$ ≤ 100 (IP units)	Calculation definitions for [ $\sum (LCGWP + LCODP \times 10^5) \times Q_{unit}$ ] / $Q_{total}$ ≤ 13 (SI units)
Qunit = Gross AHRI rated cooling capacity of an individual HVAC or refrigeration unit (Tons)	Qunit = Eurovent Certified cooling capacity of an individual HVAC or refrigeration unit (kW)
Qtotal = Total gross AHRI rated cooling capacity of all HVAC or refrigeration	Qtotal = Total Eurovent Certified cooling capacity of all HVAC or refrigeration (kW)

### RETAIL CI

Meet Option 1 or 2 for all HVAC systems.

Stores with commercial refrigeration systems must comply with the following.

- Use only non-ozone-depleting refrigerants.
- Select equipment with an average HFC refrigerant charge of no more than 1.75 pounds of refrigerant per 1,000 Btu/h ( 2.72 kg of refrigerant per kW) total evaporator cooling load.
- Demonstrate a predicted store-wide annual refrigerant emissions rate of no more than 15%. Conduct leak testing using the procedures in GreenChill's best practices guideline for leak tightness at installation.

Alternatively, stores with commercial refrigeration systems may provide proof of attainment of EPA GreenChill's silver-level store certification for newly constructed stores.

## EA CREDIT: GREEN POWER AND CARBON OFFSETS

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Retail (1–2 points)
- Hospitality (1–2 points)

### Intent

To encourage the reduction of greenhouse gas emissions through the use of grid-source, renewable energy technologies and carbon mitigation projects.

### Requirements

#### CI, RETAIL, HOSPITALITY, HEALTHCARE

Engage in a contract for qualified resources that have come online since January 1, 2005, for a minimum of five years, to be delivered at least annually. The contract must specify the provision of at least 50% or 100% of the project's energy from green power, carbon offsets, or renewable energy certificates (RECs).

Green power and RECs must be Green-e Energy certified or the equivalent. RECs can only be used to mitigate the effects of Scope 2, electricity use.

Carbon offsets may be used to mitigate Scope 1 or Scope 2 emissions on a metric ton of carbon dioxide–equivalent basis and must be Green-e Climate certified, or the equivalent.

For U.S. projects, the offsets must be from greenhouse gas emissions reduction projects within the U.S.

Determine the percentage of green power or offsets based on the quantity of energy consumed, not the cost. Points are awarded according to Table 1.

**Table 1. Points for energy from green power or carbon offsets**

<i>Percentage of total energy addressed by green power, RECs and/or offsets</i>	<i>Points</i>
50%	1
100%	2

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

# MATERIALS AND RESOURCES (MR)

## MR PREREQUISITE: STORAGE AND COLLECTION OF RECYCLABLES Required

### ID&C

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### Intent

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

### Requirements

#### CI, HOSPITALITY CI

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

#### RETAIL CI

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

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



## **MR PREREQUISITE: CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING**

### **Required**

#### **ID&C**

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

#### **Intent**

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

#### **Requirements**

##### **CI, RETAIL CI, HOSPITALITY CI**

Develop and implement a construction and demolition waste management plan:

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

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

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

## **MR CREDIT: LONG-TERM COMMITMENT**

ID&C

**1 point**

This credit applies to

- Commercial Interiors (1 point)
- Retail (1 point)
- Hospitality (1 point)

### **Intent**

To encourage choices that will conserve resources and reduce environmental harm from materials manufacturing and transport for tenants' relocation.

### **Requirements**

#### **CI, RETAIL CI, HOSPITALITY CI**

The occupant or tenant must commit to remain in the same location for at least 10 years.

## MR CREDIT: INTERIORS LIFE-CYCLE IMPACT REDUCTION

ID&C

### 1-5 points

This credit applies to

- Commercial Interiors (1-4 points)
- Retail (1-5 points)
- Hospitality (1-4 points)

### Intent

To encourage adaptive reuse and optimize the environmental performance of products and materials.

### Requirements

#### CI, RETAIL CI, HOSPITALITY CI

##### **Option 1. Interior Reuse (2 points)**

Reuse or salvage interior nonstructural elements for at least 50% of the surface area. Hazardous materials that are remediated as a part of the project must be excluded from the calculation.

AND/OR

##### **Option 2. Furniture Reuse (1 point)**

Reuse, salvage, or refurbish furniture and furnishings for at least 30% of the total furniture and furnishings cost.

AND/OR

##### **Option 3. Design for Flexibility (1 point ID&C, 2 points Retail CI)**

Conduct an integrative planning process to increase the useful life of the project space. Increase project space flexibility, ease of adaptive use, and recycling of building materials while considering differential durability and premature obsolescence over building design life and individual component service lives. Use at least three of the following strategies.

- Install accessible systems (floor or ceiling) for at least 50% of the project floor area to allow for flexible use of space and access to systems (under floor distribution systems) not entangled with other building systems.
- Design at least 50% of interior nonstructural walls, ceilings, and floors to be movable or demountable.
- Ensure that at least 50%, by cost, of nonstructural materials have integral labels (radio frequency identification, engraving, embossing, or other permanent marking) containing information on material origin, properties, date of manufacture, in compliance with Canadian Standards Association CSA Z782-06 Guideline for Design for Disassembly and Adaptability in Buildings.
- Include in at least one major component or systems purchase contract a clause specifying sub-contractor, vendor, or on site take back system.
- Ensure that at least 50% of nonstructural materials, by cost, are reusable or recyclable, as defined by the Federal Trade Commission Guide for Use of Environmental Marketing Claims, 260.7(d).

- Implement flexible power distribution (i.e., plug-and-play) systems for at least 50% of the project floor area so that lighting, data, voice, and other systems can be easily reconfigured and repurposed.

Implement a flexible lighting control system with plug and play components such as wall controls, sensors, and dimming ballasts for a minimum of 50% of the lighting load. The system shall allow for reconfiguring and repurposing of luminaires and controls without rewiring such as having the capability to group and assign luminaires into zones and change those zones as needed. Also, the system shall be flexible so that as a space changes functions, the lighting levels can change to suit the needs of the space without rewiring or removing or adding luminaires.

## **MR CREDIT: BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION— ENVIRONMENTAL PRODUCT DECLARATIONS**

ID&C

### **1 points**

This credit applies to

- Commercial Interiors (2 point)
- Retail (2 point)
- Hospitality (2 point)

### **Intent**

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

### **Requirements**

#### **CI, RETAIL, HOSPITALITY**

Achieve one or more of the options below, for a maximum of 2 points.

#### **Option 1. Environmental Product Declaration (EPD) (1 point)**

Use at least 20 different permanently installed products sourced from at least five different manufacturers that meet one of the disclosure criteria below.

- Product-specific declaration.
  - Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope are valued as one quarter (1/4) of a product for the purposes of credit achievement calculation.
- Environmental Product Declarations which conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
  - Industry-wide (generic) EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator are valued as one half (1/2) of a product for purposes of credit achievement calculation.
  - Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator are valued as one whole product for purposes of credit achievement calculation.
- USGBC approved program – Products that comply with other USGBC approved environmental product declaration frameworks.

#### **Option 2. Multi-Attribute Optimization (1 point)**

Use products that comply with one of the criteria below for 50%, by cost, of the total value of permanently installed products in the project. Products will be valued as below.

- Third party certified products that demonstrate impact reduction below industry average in at least three of the following categories are valued at 100% of their cost for credit achievement calculations.
  - global warming potential (greenhouse gases), in CO<sub>2</sub>e;
  - depletion of the stratospheric ozone layer, in kg CFC-11;
  - acidification of land and water sources, in moles H<sup>+</sup> or kg SO<sub>2</sub>;
  - eutrophication, in kg nitrogen or kg phosphate;
  - formation of tropospheric ozone, in kg NO<sub>x</sub> or kg ethene; and

depletion of nonrenewable energy resources, in MJ.

- USGBC approved program -- Products that comply with other USGBC approved multi-attribute frameworks.

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

Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

For all options

Meet the requirements of the credit above and include furniture and furnishings within the project's scope of work.

## MR CREDIT: BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION – SOURCING OF RAW MATERIALS

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Retail (1–2 points)
- Hospitality (1–2 points)

### Intent

To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

### Requirements

#### CI, RETAIL CI, HOSPITALITY CI

#### **Option 1. Raw Material Source and Extraction Reporting (1 point)**

Use at least 20 different permanently installed products from at least five different manufacturers that have publicly released a report from their raw material suppliers which include raw material supplier extraction locations, a commitment to long-term ecologically responsible land use, a commitment to reducing environmental harms from extraction and/or manufacturing processes, and a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria

- Products sourced from manufacturers with self-declared reports are valued as one half (1/2) of a product for credit achievement.
- Third-party verified corporate sustainability reports (CSR) which include environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain, are valued as one whole product for credit achievement calculation. Acceptable CSR frameworks include the following:
  - **Global Reporting Initiative (GRI) Sustainability Report**
  - **Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises**
  - **U.N. Global Compact: Communication of Progress**
  - **ISO 26000: 2010 Guidance on Social Responsibility**
  - **USGBC approved program:** Other USGBC approved programs meeting the CSR criteria.

#### **Option 2. Leadership Extraction Practices (1 point)**

Use products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project.

- *Extended producer responsibility.* Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility. Products meeting extended producer responsibility criteria are valued at 50% of their cost for the purposes of credit achievement calculation.
- *Bio-based materials.* Bio-based products must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country.

Exclude hide products, such as leather and other animal skin material. Products meeting bio-based materials criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

- *Wood products.* Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *Materials reuse.* Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *Recycled content.* Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
- *USGBC approved program.* Other USGBC approved programs meeting leadership extraction criteria.

For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost. For credit achievement calculation, the base contributing cost of individual products compliant with multiple responsible extraction criteria is not permitted to exceed 100% its total actual cost (before regional multipliers) and double counting of single product components compliant with multiple responsible extraction criteria is not permitted and in no case is a product permitted to contribute more than 200% of its total actual cost.

Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

For all options

Meet the requirements of the credit above and include furniture and furnishings within the project's scope of work.



## MR CREDIT: BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION – MATERIAL INGREDIENTS

ID&C

### 1-2 points

This credit applies to

- Commercial Interiors (1-2 points)
- Retail (1-2 points)
- Hospitality (1-2 points)

### Intent

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

### Requirements

#### CI, RETAIL CI, HOSPITALITY CI

#### **Option 1. Material Ingredient Reporting (1 point)**

Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm).

- *Manufacturer Inventory.* The manufacturer has published complete content inventory for the product following these guidelines:
  - A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN)
  - Materials defined as trade secret or intellectual property may withhold the name and/or CASRN but must disclose role, amount and GreenScreen benchmark, as defined in GreenScreen v1.2.
- *Health Product Declaration.* The end use product has a published, complete Health Product Declaration with full disclosure of known hazards in compliance with the Health Product Declaration open Standard.
- *Cradle to Cradle.* The end use product has been certified at the Cradle to Cradle v2 Basic level or Cradle to Cradle v3 Bronze level.
- *USGBC approved program.* Other USGBC approved programs meeting the material ingredient reporting criteria.

AND/OR

#### **Option 2: Material Ingredient Optimization (1 point)**

Use products that document their material ingredient optimization using the paths below for at least 25%, by cost, of the total value of permanently installed products in the project.

- *GreenScreen v1.2 Benchmark.* Products that have fully inventoried chemical ingredients to 100 ppm that have no Benchmark 1 hazards:
  - If any ingredients are assessed with the GreenScreen List Translator, value these products at 100% of cost.

- If all ingredients are have undergone a full GreenScreen Assessment, value these products at 150% of cost.
- *Cradle to Cradle Certified*. End use products are certified Cradle to Cradle. Products will be valued as follows:
  - Cradle to Cradle v2 Gold: 100% of cost
  - Cradle to Cradle v2 Platinum: 150% of cost
  - Cradle to Cradle v3 Silver: 100% of cost
  - Cradle to Cradle v3 Gold or Platinum: 150% of cost
- *International Alternative Compliance Path – REACH Optimization*. End use products and materials that do not contain substances that meet REACH criteria for substances of very high concern. If the product contains no ingredients listed on the REACH Authorization or Candidate list, value at 100% of cost.
- *USGBC approved program*. Products that comply with USGBC approved building product optimization criteria.

AND/OR

**Option 3: Product Manufacturer Supply Chain Optimization (1 point)**

Use building products for at least 25%, by cost, of the total value of permanently installed products in the project that:

- Are sourced from product manufacturers who engage in validated and robust safety, health, hazard, and risk programs which at a minimum document at least 99% (by weight) of the ingredients used to make the building product or building material, and
- Are sourced from product manufacturers with independent third party verification of their supply chain that at a minimum verifies:
  - Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation
  - Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of chemical ingredients
  - Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients
  - Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients
  - Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain
  - Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain

Products meeting Option 3 criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

For credit achievement calculation of options 2 and 3, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at 200% of their base contributing cost. For credit achievement calculation, the value of individual products compliant with either option 2 or 3 can be combined to reach the 25% threshold but products compliant with both option 2 and 3 may only be counted once.

Structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

For all options

Meet the requirements of the credit above and include furniture and furnishings within the project’s scope of work.

## MR CREDIT: CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Retail (1–2 points)
- Hospitality (1–2 points)

### Intent

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

### Requirements

#### CI, RETAIL CI, HOSPITALITY CI

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

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

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

#### Option 1. Diversion (1–2 points)

##### **Path 1. Divert 50% and Three Material Streams (1 point)**

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

OR

##### **Path 2. Divert 75% and Four Material Streams (2 points)**

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

OR

#### Option 2. Reduction of Total Waste Material (2 points)

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

# INDOOR ENVIRONMENTAL QUALITY (EQ)

## EQ PREREQUISITE: MINIMUM INDOOR AIR QUALITY PERFORMANCE Required

ID&C

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

Meet the requirements for both ventilation and monitoring.

#### Ventilation

##### **Mechanically Ventilated Spaces**

For mechanically ventilated spaces (and for mixed-mode systems when the mechanical ventilation is activated), choose one of the following cases.

##### **Case 1. Systems Able to Meet Required Outdoor Airflow Rates**

###### **Option 1. ASHRAE Standard 62.1–2010**

Determine the minimum outdoor air intake flow for mechanical ventilation systems using the ventilation rate procedure from ASHRAE 62.1–2010 or a local equivalent, whichever is more stringent and meet the minimum requirements of ASHRAE Standard 62.1–2010, Sections 4–7, Ventilation for Acceptable Indoor Air Quality (with errata), or a local equivalent, whichever is more stringent.

###### **Option 2. CEN Standards EN 15251–2007 and EN 13779–2007**

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

##### **Case 2. Systems Unable to Meet Required Outdoor Airflow Rates**

If meeting the outdoor airflow rates in Case 1 is not feasible because of the physical constraints of the existing ventilation system, complete an engineering assessment of the system's maximum outdoor air delivery rate. Supply the maximum possible to reach the minimum setpoint in Case 1 and not less than 10 cubic feet per minute (5 liters per second) of outdoor air per person.

#### **Naturally Ventilated Spaces**

For naturally ventilated spaces (and for mixed-mode systems when the mechanical ventilation is inactivated), determine the minimum outdoor air opening and space configuration requirements using the natural ventilation procedure from ASHRAE Standard 62.1–2010 or a local equivalent, whichever is more

stringent. Confirm that natural ventilation is an effective strategy for the project by following the flow diagram in the Chartered Institution of Building Services Engineers (CIBSE) Applications Manual AM10, March 2005, Natural Ventilation in Nondomestic Buildings, Figure 2.8 and meet the requirements of ASHRAE Standard 62.1–2010, Section 4, or a local equivalent, whichever is more stringent.

### **All Spaces**

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

### **Monitoring**

#### **Case 1. Mechanically Ventilated Spaces**

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

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

#### **Case 2. Naturally Ventilated Spaces**

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

- Provide a direct exhaust airflow measurement device capable of measuring the exhaust airflow with an accuracy of  $\pm 10\%$  of the design minimum exhaust airflow rate. An alarm must indicate when airflow values vary by 15% or more from the exhaust airflow setpoint.
- Provide automatic indication devices on all natural ventilation openings intended to meet the minimum opening requirements. An alarm must indicate when any one of the openings is closed during occupied hours.
- Monitor carbon dioxide (CO<sub>2</sub>) concentrations within each thermal zone. CO<sub>2</sub> monitors must be between 3 and 6 feet (900 and 1 800 millimeters) above the floor and within the thermal zone. CO<sub>2</sub> monitors must have an audible or visual indicator or alert the building automation system if the sensed CO<sub>2</sub> concentration exceeds the setpoint by more than 10%. Calculate appropriate CO<sub>2</sub> setpoints by using the methods in ASHRAE 62.1–2010, Appendix C.

## **EQ PREREQUISITE: ENVIRONMENTAL TOBACCO SMOKE CONTROL Required**

ID&C

This prerequisite applies to

- Commercial Interiors
- Retail
- Hospitality

### **Intent**

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

### **Requirements**

#### **CI, RETAIL, HOSPITALITY**

Locate the project in a building that prohibits smoking by all occupants and users both inside the building and outside the building except in designated smoking areas located at least 25 feet (7.5 meters) from all entries, outdoor air intakes, and operable windows. Also prohibit smoking outside the property line in spaces used for business purposes.

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

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

## EQ CREDIT: ENHANCED INDOOR AIR QUALITY STRATEGIES

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Retail (1–3 points)
- Hospitality (1–2 points)

### Intent

To promote occupants' comfort, well-being, and productivity by improving indoor air quality.

### Requirements

#### CI, RETAIL, HOSPITALITY

#### Option 1. Enhanced IAQ Strategies (1 point)

Comply with the following requirements, as applicable.

Mechanically ventilated spaces:

- A. entryway systems;
- B. interior cross-contamination prevention; and
- C. filtration.

Naturally ventilated spaces:

- A. entryway systems; and
- D. natural ventilation design calculations.

Mixed-mode systems:

- A. entryway systems;
- B. interior cross-contamination prevention;
- C. filtration;
- D. natural ventilation design calculations; and
- E. mixed-mode design calculations.

#### **A. Entryway Systems**

Install permanent entryway systems at least 10 feet (3 meters) long in the primary direction of travel to capture dirt and particulates entering the building at regularly used exterior entrances. Acceptable entryway systems include permanently installed grates, grilles, slotted systems that allow for cleaning underneath, rollout mats, and any other materials manufactured as entryway systems with equivalent or better performance. Maintain all on a weekly basis.

#### **B. Interior Cross-Contamination Prevention**

Sufficiently exhaust each space where hazardous gases or chemicals may be present or used (e.g., garages, housekeeping and laundry areas, copying and printing rooms), using the exhaust rates determined in EQ Prerequisite Minimum Indoor Air Quality Performance or a minimum of 0.50 cfm per square foot (2.54 l/s per square meter), to create negative pressure with respect to adjacent spaces when the doors to the room are closed. For each of these spaces, provide self-closing doors and deck-to-deck partitions or a hard-lid ceiling.

#### **C. Filtration**

Each ventilation system that supplies outdoor air to occupied spaces must have particle filters or air-cleaning devices that meet one of the following filtration media requirements:

- minimum efficiency reporting value (MERV) of 13 or higher, in accordance with ASHRAE Standard 52.2–2007; or
- Class F7 or higher as defined by CEN Standard EN 779–2002, Particulate Air Filters for General Ventilation, Determination of the Filtration Performance.

Replace all air filtration media after completion of construction and before occupancy.

**D. Natural Ventilation Design Calculations**

Demonstrate that the system design for occupied spaces employs the appropriate strategies in Chartered Institution of Building Services Engineers (CIBSE) Applications Manual AM10, March 2005, Natural Ventilation in Non-Domestic Buildings, Section 2.4.

**E. Mixed-Mode Design Calculations**

Demonstrate that the system design for occupied spaces complies with CIBSE Applications Manual 13–2000, Mixed Mode Ventilation.

**Option 2. Additional Enhanced IAQ Strategies (1 point ID&C, 2 points Retail CI)**

Comply with the following requirements, as applicable.

Mechanically ventilated spaces (select one):

- A. exterior contamination prevention;
- B. increased ventilation;
- C. carbon dioxide monitoring; or
- D. additional source control and monitoring.

Naturally ventilated spaces (select one):

- A. exterior contamination prevention;
- D. additional source control and monitoring; or
- E. natural ventilation room by room calculations.

Mixed-mode systems (select one):

- A. exterior contamination prevention;
- B. increased ventilation;
- D. additional source control and monitoring; or
- E. natural ventilation room-by-room calculations.

**A. Exterior Contamination Prevention**

Design the project to minimize and control the entry of pollutants into the building. Ensure through the results of computational fluid dynamics modeling, Gaussian dispersion analyses, wind tunnel modeling, or tracer gas modeling that outdoor air contaminant concentrations at outdoor air intakes are below the thresholds listed in Table 1 (or local equivalent for projects outside the U.S., whichever is more stringent).

Table 1. Maximum concentrations of pollutants at outdoor air intakes

Pollutants	Maximum concentration	Standard
Those regulated by National Ambient Air Quality Standards (NAAQS)	Allowable annual average OR 8-hour or 24-hour average where an annual standard does not exist OR Rolling 3-month average	National Ambient Air Quality Standards (NAAQS)

**B. Increased Ventilation**



Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates as determined in EQ Prerequisite Minimum Indoor Air Quality Performance.

**C. Carbon Dioxide Monitoring**

Monitor CO<sub>2</sub> concentrations within all densely occupied spaces. CO<sub>2</sub> monitors must be between 3 and 6 feet (900 and 1 800 millimeters) above the floor. CO<sub>2</sub> monitors must have an audible or visual indicator or alert the building automation system if the sensed CO<sub>2</sub> concentration exceeds the setpoint by more than 10%. Calculate appropriate CO<sub>2</sub> setpoints using methods in ASHRAE 62.1–2010, Appendix C.

**D. Additional Source Control and Monitoring**

For spaces where air contaminants are likely, evaluate potential sources of additional air contaminants besides CO<sub>2</sub>. Develop and implement a materials-handling plan to reduce the likelihood of contaminant release. Install monitoring systems with sensors designed to detect the specific contaminants. An alarm must indicate any unusual or unsafe conditions.

**E. Natural Ventilation Room-by-Room Calculations**

Follow CIBSE AM10, Section 4, Design Calculations, to predict that room-by-room airflows will provide effective natural ventilation.

## EQ CREDIT: LOW-EMITTING MATERIALS

ID&C

### 1–3 points

This credit applies to

- Commercial Interiors (1–3 points)
- Retail (1–3 points)
- Hospitality (1–3 points)

### Intent

To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

### Requirements

#### CI, RETAIL, HOSPITALITY

This credit includes requirements for product manufacturing as well as project teams. It covers volatile organic compound (VOC) emissions into indoor air and the VOC content of materials, as well as the testing methods by which indoor VOC emissions are determined. Different materials must meet different requirements to be considered compliant for this credit. The building interior and exterior are organized in seven categories, each with different thresholds of compliance. The building interior is defined as everything within the waterproofing membrane. The building exterior is defined as everything outside and inclusive of the primary and secondary weatherproofing system, such as waterproofing membranes and air- and water-resistive barrier materials.

#### Option 1. Product Category Calculations

Achieve the threshold level of compliance with emissions and content standards for the number of product categories listed in Table 2.

**Table 1. Thresholds of compliance with emissions and content standards for 7 categories of materials**

Category	Threshold	Emissions and content requirements
Interior paints and coatings applied on site	At least 90%, by volume, for emissions; 100% for VOC content	<ul style="list-style-type: none"> <li>• General Emissions Evaluation for paints and coatings applied to walls, floors, and ceilings</li> <li>• VOC content requirements for wet applied products</li> </ul>
Interior adhesives and sealants applied on site (including flooring adhesive)	At least 90%, by volume, for emissions; 100% for VOC content	<ul style="list-style-type: none"> <li>• General Emissions Evaluation</li> <li>• VOC content requirements for wet applied products</li> </ul>
Flooring	100%	General Emissions Evaluation
Composite wood	100% not covered by other categories	Composite Wood Evaluation
Ceilings, walls, thermal, and acoustic insulation	100%	<ul style="list-style-type: none"> <li>• General Emissions Evaluation</li> </ul>
Furniture (include in calculations if part of scope of work)	At least 90%, by cost	Furniture Evaluation

**Table 2. Points for number of compliant categories of products**

Compliant categories	Points
3	1
5	2
6	3

### Option 2. Budget Calculation Method

If some products in a category do not meet the criteria, project teams may use the budget calculation method (Table 3).

**Table 3. Points for percentage compliance, under budget calculation method**

Percentage of total	Points
≥ 50% and < 70%	1
≥ 70% and < 90%	2
≥ 90%	3

The budget method organizes the building interior into six assemblies:

- flooring;
- ceilings;
- walls;
- thermal and acoustic insulation;
- furniture; and

Include furniture in the calculations if it is part of the scope of work. Walls, ceilings, and flooring are defined as building interior products; each layer of the assembly, including paints, coatings, adhesives, and sealants, must be evaluated for compliance. Insulation is tracked separately.

Determine the total percentage of compliant materials according to Equation 1.

#### Equation 1. Total percentage compliance

Total % compliant for projects without furniture =	$\frac{(\% \text{ compliant walls} + \% \text{ compliant ceilings} + \% \text{ compliant flooring} + \% \text{ compliant insulation})}{4}$	
Total % compliant for projects with furniture =	$\frac{(\% \text{ compliant walls} + \% \text{ compliant ceilings} + \% \text{ compliant flooring} + \% \text{ compliant insulation}) + (\% \text{ compliant furniture})}{5}$	

#### Equation 2. System percentage compliant

Flooring, walls, ceilings, insulation % compliant =	$\frac{(\text{compliant surface area of layer 1} + \text{compliant surface area of layer 2} + \text{compliant surface area of layer 3} + \dots)}{\text{total surface area of layer 1} + \text{total surface area of layer 2} + \text{total surface area of layer 3} + \dots}$	X 100
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#### Equation 3. Furniture systems compliant, using ANSI/BIFMA evaluation

% compliant for furniture =	$\frac{0.5 \times \text{cost compliant with §7.6.1 of ANSI/BIFMA e3-2011} + \text{cost compliant with §7.6.2 of ANSI/BIFMA e3-2011}}{\text{total furniture cost}}$	X 100
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Calculate surface area of assembly layers based on the manufacturer's documentation for application.

If 90% of an assembly meets the criteria, the system counts as 100% compliant. If less than 50% of an assembly meets the criteria, the assembly counts as 0% compliant.

Manufacturers' claims. Both first-party and third-party statements of product compliance must follow the guidelines in CDPH SM V1.1–2010, Section 8. Organizations that certify manufacturers' claims must be accredited under ISO Guide 65.

Laboratory requirements. Laboratories that conduct the tests specified in this credit must be accredited under ISO/IEC 17025 for the test methods they use.

### **Emissions and Content Requirements**

To demonstrate compliance, a product or layer must meet all of the following requirements, as applicable.

*Inherently nonemitting sources.* Products that are inherently nonemitting sources of VOCs (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) are considered fully compliant without any VOC emissions testing if they do not include integral organic-based surface coatings, binders, or sealants.

*General emissions evaluation.* Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1–2010, using the applicable exposure scenario. The default scenario is the private office scenario. The manufacturer's or third-party certification must state the exposure scenario used to determine compliance. Claims of compliance for wet-applied products must state the amount applied in mass per surface area.

Manufacturers' claims of compliance with the above requirements must also state the range of total VOCs after 14 days (336 hours), measured as specified in the CDPH Standard Method v1.1:

- 0.5 mg/m<sup>3</sup> or less;
- between 0.5 and 5.0 mg/m<sup>3</sup>; or
- 5.0 mg/m<sup>3</sup> or more.

Projects outside the U.S. may use products tested and deemed compliant in accordance with either (1) the CDPH standard method (2010) or (2) the German AgBB Testing and Evaluation Scheme (2010). Test products either with (1) the CDPH Standard Method (2010), (2) the German AgBB Testing and Evaluation Scheme (2010), (3) ISO 16000-3: 2010, ISO 16000-6: 2011, ISO 16000-9: 2006, ISO 16000-11:2006 either in conjunction with AgBB, or with French legislation on VOC emission class labeling, or (4) the DIBt testing method (2010). If the applied testing method does not specify testing details for a product group for which the CDPH standard method does provide details, use the specifications in the CDPH standard method. U.S. projects must follow the CDPH standard method.

*Additional VOC content requirements for wet-applied products.* In addition to meeting the general requirements for VOC emissions (above), on-site wet-applied products must not contain excessive levels of VOCs, for the health of the installers and other tradesworkers who are exposed to these products. To demonstrate compliance, a product or layer must meet the following requirements, as applicable. Disclosure of VOC content must be made by the manufacturer. Any testing must follow the test method specified in the applicable regulation.

- All paints and coatings wet-applied on site must meet the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.
- All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005, Adhesive and Sealant Applications, as analyzed by the methods specified in Rule 1168. The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.
- For projects outside the U.S., all paints, coatings, adhesives, and sealants wet-applied on site must either meet the technical requirements of the above regulations, or comply with applicable national VOC control regulations, such as the European Decopaint Directive (2004/42/EC), the

Canadian VOC Concentration Limits for Architectural Coatings, or the Hong Kong Air Pollution Control (VOC) Regulation.

- If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
- If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
- For projects in North America, methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

*Composite Wood Evaluation.* Composite wood, as defined by the California Air Resources Board, Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, must be documented to have low formaldehyde emissions that meet the California Air Resources Board ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde resins.

Salvaged and reused architectural millwork more than one year old at the time of occupancy is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

*Furniture evaluation.* New furniture and furnishing items must be tested in accordance with ANSI/BIFMA Standard Method M7.1–2011. Comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach. Model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate. USGBC-approved equivalent testing methodologies and contaminant thresholds are also acceptable. For classroom furniture, use the standard school classroom model in CDPH Standard Method v1.1. Documentation submitted for furniture must indicate the modeling scenario used to determine compliance.

Salvaged and reused furniture more than one year old at the time of use is considered compliant, provided it meets the requirements for any site-applied paints, coatings, adhesives, and sealants.

## **EQ CREDIT: CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN**

ID&C

**1 point**

This credit applies to

- Commercial Interiors (1 point)
- Retail (1 point)
- Hospitality (1 point)

### **Intent**

To promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.

### **Requirements**

#### **CI, RETAIL, HOSPITALITY**

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

During construction, meet or exceed all applicable recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.

Protect absorptive materials stored on-site and installed from moisture damage.

Do not operate permanently installed air-handling equipment during construction unless filtration media with a minimum efficiency reporting value (MERV) of 8, as determined by ASHRAE 52.2–2007, with errata (or equivalent filtration media class of F5 or higher, as defined by CEN Standard EN 779–2002, Particulate Air Filters for General Ventilation, Determination of the Filtration Performance), are installed at each return air grille and return or transfer duct inlet opening such that there is no bypass around the filtration media. Immediately before occupancy, replace all filtration media with the final design filtration media, installed in accordance with the manufacturer's recommendations.

Prohibit the use of tobacco products inside the building and within 25 feet (7.5 meters) of the building entrance during construction.

## EQ CREDIT: INDOOR AIR QUALITY ASSESSMENT

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Retail (1–2 points)
- Hospitality (1–2 points)

### Intent

To establish better quality indoor air in the building after construction and during occupancy.

### Requirements

#### CI, RETAIL, HOSPITALITY

Select one of the following two options, to be implemented after construction ends and the building has been completely cleaned. All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished. The options cannot be combined.

#### **Option 1. Flush-Out (1 point)**

##### **Path 1. Before Occupancy**

Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot (4 267 140 liters per second of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%.

OR

##### **Path 2. During Occupancy**

If occupancy is desired before the flush-out is completed, the space may be occupied only after delivery of a minimum of 3,500 cubic feet of outdoor air per square foot (1 066 260 liters per second of outdoor air per square meter) of gross floor area while maintaining an internal temperature of at least 60°F (15°C) and no higher than 80°F (27°C) and relative humidity no higher than 60%..

Once the space is occupied, it must be ventilated at a minimum rate of 0.30 cubic foot per minute (cfm) per square foot of outdoor air (1.5 liters of outside air per second per square meter) or the design minimum outdoor air rate determined in EQ Prerequisite Minimum Indoor Air Quality Performance, whichever is greater. During each day of the flush-out period, ventilation must begin at least three hours before occupancy and continue during occupancy. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outdoor air (4 270 cubic meters of outdoor air per square meter) has been delivered to the space.

OR

#### **Option 2. Air Testing (2 points)**

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing using protocols consistent with the methods listed in Table 1 for all occupied spaces. Use current versions of ASTM standard methods, EPA compendium methods, or ISO methods, as indicated. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use. Retail projects may conduct the testing within 14 days of occupancy.

Demonstrate that contaminants do not exceed the concentration levels listed in Table 1.

Table 1. Maximum concentration levels, by contaminant and testing method

<b>Contaminant</b>	<b>Maximum concentration</b>	<b>Maximum concentration (Healthcare only)</b>	<b>ASTM and U.S. EPA methods</b>	<b>ISO method</b>
Formaldehyde	27 ppb	16.3 ppb	ASTM D5197; EPA TO-11 or EPA Compendium Method IP-6	ISO 16000-3
Particulates (PM10 for all buildings; PM2.5 for buildings in EPA nonattainment areas, or local equivalent)	PM10: 50 micrograms per cubic meter PM2.5: 15 micrograms per cubic meter	20 micrograms per cubic meter	EPA Compendium Method IP-10	ISO 7708
Ozone (for buildings in EPA nonattainment areas <sup>17</sup> )	0.075 ppm	0.075 ppm	ASTM D5149 - 02	ISO 13964
Total volatile organic compounds (TVOCs)	500 micrograms per cubic meter	200 micrograms per cubic meter	EPA TO-1, TO-15, TO-17, or EPA Compendium Method IP-1	ISO 16000-6
Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde	CDPH Standard Method v1.1–2010, Allowable Concentrations, Table 4-1	CDPH Standard Method v1.1–2010, Allowable Concentrations, Table 4-1	ASTM D5197; EPA TO-1, TO-15, TO-17	ISO 16000-3, 16000-6
Carbon monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	9 ppm; no more than 2 ppm above outdoor levels	EPA Compendium Method IP-3	ISO 4224

ppb = parts per billion; ppm = parts per million; µg/cm = micrograms per cubic meter

Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the test.

For each sampling point where the concentration exceeds the limit, take corrective action and retest for the noncompliant contaminants at the same sampling points. Repeat until all requirements are met.



## EQ CREDIT: THERMAL COMFORT

ID&C

### 1 point

This credit applies to

- Commercial Interiors (1 point)
- Retail (1 point)
- Hospitality (1 point)

### Intent

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

### Requirements

Meet the requirements for both thermal comfort design and thermal comfort control.

### Thermal Comfort Design

#### CI, RETAIL, HOSPITALITY

#### **Option 1. ASHRAE Standard 55-2010**

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

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

OR

#### **Option 2. ISO and CEN Standards**

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

- ISO 7730:2005, Ergonomics of the Thermal Environment, analytical determination and interpretation of thermal comfort, using calculation of the PMV and PPD indices and local thermal comfort criteria; and
- CEN Standard EN 15251:2007, Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings, addressing indoor air quality, thermal environment, lighting, and acoustics, Section A2.

### Thermal Comfort Control

#### CI, RETAIL, HOSPITALITY

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

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

#### Hospitality only

Guest rooms are assumed to provide adequate thermal comfort controls and are therefore not included in the credit calculations.

Retail only

Meet the above requirements for at least 50% of the individual occupant spaces in office and administrative areas.

## EQ CREDIT: INTERIOR LIGHTING

ID&C

### 1–2 points

This credit applies to

- Commercial Interiors (1–2 points)
- Retail (2 points)
- Hospitality (1–2 points)

### Intent

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

### Requirements

#### CI, HOSPITALITY

Select one or both of the following two options.

#### **Option 1. Lighting Control (1 point)**

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

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

- Have in place multizone control systems that enable occupants to adjust the lighting to meet group needs and preferences, with at least three lighting levels or scenes (on, off, midlevel).
- Lighting for any presentation or projection wall must be separately controlled.
- Switches or manual controls must be located in the same space as the controlled luminaires. A person operating the controls must have a direct line of sight to the controlled luminaires.

#### Hospitality only

Guest rooms are assumed to provide adequate lighting controls and are therefore not included in the credit calculations.

AND/OR

#### **Option 2. Lighting Quality (1 point)**

Choose four of the following strategies.

- A. For all regularly occupied spaces, use light fixtures with a luminance of less than 2,500cd/m<sup>2</sup> between 45 and 90 degrees from nadir.  
Exceptions include wallwash fixtures properly aimed at walls, as specified by manufacturer's data, indirect uplighting fixtures, provided there is no view down into these uplights from a regularly occupied space above, and any other specific applications (i.e. adjustable fixtures).
- B. For the entire project, use light sources with a CRI of 80 or higher. Exceptions include lamps or fixtures specifically designed to provide colored lighting for effect, site lighting, or other special use.
- C. For at least 75% of the total connected lighting load, use light sources that have a rated life (or L70 for LED sources) of at least 24,000 hours (at 3-hour per start, if applicable).
- D. Use direct-only overhead lighting for 25% or less of the total connected lighting load for all regularly occupied spaces.
- E. For at least 90% of the regularly occupied floor area, meet or exceed the following thresholds for area-weighted average surface reflectance: 85% for ceilings, 60% for walls, and 25% for floors.

- F. If furniture is included in the scope of work, select furniture finishes to meet or exceed the following thresholds for area-weighted average surface reflectance: 45% for work surfaces, and 50% for movable partitions.
- G. For at least 75% of the regularly occupied floor area, meet an average ratio of wall surface illuminance (excluding fenestration) to average work plane (or surface, if defined) illuminance that does not exceed 1:10. Must also meet strategy E, strategy F, or demonstrate area-weighted surface reflectance of at least 60% for walls.
- H. For at least 75% of the regularly occupied floor area, meet an average ratio of ceiling illuminance (excluding fenestration) to work surface illuminance that does not exceed 1:10. Must also meet option E, option F, or demonstrate area-weighted surface reflectance of at least 85% for ceilings.

#### **RETAIL C1**

For at least 90% of the individual occupant spaces in office and administrative areas, provide individual lighting controls.

In sales areas, provide controls that can reduce the ambient light levels to a midlevel (30% to 70% of the maximum illumination level not including daylight contributions).

## EQ CREDIT: DAYLIGHT

ID&C

### 1–3 points

This credit applies to

- Commercial Interiors (1–3 points)
- Retail (1–3 points)
- Hospitality (1–3 points)

### Intent

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

### Requirements

#### CI, RETAIL, HOSPITALITY

Provide manual or automatic (with manual override) glare-control devices for all regularly occupied spaces.

Select one of the following three options.

#### **Option 1. Simulation: Spatial Daylight Autonomy and Annual Sunlight Exposure (2–3 points)**

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

**Table 1. Points for daylit floor area: Spatial daylight autonomy**

<i>CI, Retail, Hospitality</i>	
<i>sDA (for regularly occupied floor area)</i>	
	<i>Points</i>
55%	2
75%	3

AND

Demonstrate through annual computer simulations that annual sunlight exposure<sub>1000,250</sub> (ASE<sub>1000,250</sub>) of no more than 10% is achieved. Use the regularly occupied floor area that is daylit per the sDA<sub>300/50%</sub> simulations.

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

Include any permanent interior obstructions and moveable furniture and partitions.

OR

#### **Option 2. Simulation: Illuminance Calculations (1–2 points)**

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

**Table 2. Points for daylit floor area: Illuminance calculation**

<i>CI, Retail, Hospitality</i>	
<i>Percentage of regularly occupied floor area</i>	<i>Points</i>
75%	1
90%	2

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

- Use typical meteorological year data, or an equivalent, for the nearest available weather station.
- Select one day within 15 days of September 21 and one day within 15 days of March 21 that represent the clearest sky condition.
- Use the average of the hourly value for the two selected days.

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

Include any permanent interior obstructions and moveable furniture and partitions.

OR

**Option 3. Measurement (2-3 points)**

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

**Table 3. Points for daylit floor area: Measurement**

<i>CI, Retail, Hospitality</i>	
<i>Percentage of regularly occupied floor area</i>	<i>Points</i>
75	2
90	3

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

- Measure at appropriate work plane height during any hour between 9 a.m. and 3 p.m.
- Take one measurement in any regularly occupied month, and take a second as indicated in Table 4.
- For spaces larger than 150 square feet (14 square meters), take measurements on a maximum 10foot (3 meter) square grid.
- For spaces 150 square feet (14 square meters) or smaller, take measurements on a maximum 3 foot (900 millimeters) square grid.

**Table 4. Timing of measurements for illuminance**

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

August	December-April
September	December-January, May-June
October	February-June
November	March-July
December	April-August

## EQ CREDIT: QUALITY VIEWS

ID&C

### 1 point

This credit applies to

- Commercial Interiors (1 point)
- Retail (1 point)
- Hospitality (1 point)

### Intent

To give building occupants a connection to the natural outdoor environment by providing quality views.

### Requirements

#### **CI, RETAIL, HOSPITALITY,**

Achieve a direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area. View glazing in the contributing area must provide a clear image of the exterior, not obstructed by frits, fibers, patterned glazing, or added tints that distort color balance.

Additionally, 75% of all regularly occupied floor area must have at least two of the following four kinds of views:

- multiple lines of sight to vision glazing in different directions at least 90 degrees apart;
- views that include at least two of the following: (1) flora, fauna, or sky; (2) movement; and (3) objects at least 25 feet (7.5 meters) from the exterior of the glazing;
- unobstructed views located within the distance of three times the head height of the vision glazing; and
- views with a view factor of 3 or greater, as defined in "Windows and Offices; A Study of Office Worker Performance and the Indoor Environment."

Include in the calculations any permanent interior obstructions. Movable furniture and partitions may be excluded.

Views into interior atria may be used to meet up to 30% of the required area.

Include any permanent interior obstructions and moveable furniture and partitions.



## EQ CREDIT: ACOUSTIC PERFORMANCE

ID&C

### 2 points

This credit applies to

- Commercial Interiors (2 points)
- Hospitality (2 points)

### Intent

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

### Requirements

#### CI, HOSPITALITY

For all occupied spaces, meet the following requirements, as applicable, for HVAC background noise, sound isolation, reverberation time, and sound reinforcement and masking.

#### **HVAC Background Noise**

Achieve maximum background noise levels from heating, ventilating, and air conditioning (HVAC) systems per 2011 ASHRAE Handbook, HVAC Applications, Chapter 48, Table 1; AHRI Standard 885-2008, Table 15; or a local equivalent. Calculate or measure sound levels.

For measurements, use a sound level meter that conforms to ANSI S1.4 for type 1 (precision) or type 2 (general purpose) sound measurement instrumentation, or a local equivalent.

Comply with design criteria for HVAC noise levels resulting from the sound transmission paths listed in ASHRAE 2011 Applications Handbook, Table 6; or a local equivalent.

#### **Sound Transmission**

Meet the composite sound transmission class (STC<sub>C</sub>) ratings listed in Table 1, or local building code, whichever is more stringent..

**Table 1. Maximum composite sound transmission class ratings for adjacent spaces**

Adjacency combinations		STC <sub>C</sub>
Residence (within a multifamily residence), hotel or motel room	Residence, hotel or motel room	55
Residence, hotel or motel room	Common hallway, stairway	50
Residence, hotel or motel room	Retail	60
Retail	Retail	50
Standard office	Standard office	45
Executive office	Executive office	50
Conference room	Conference room	50
Office, conference room	Hallway, stairway	50
Mechanical equipment room	Occupied area	60

#### **Reverberation Time**

Meet the reverberation time requirements in Table 2 (adapted from Table 9.1 in the Performance Measurement Protocols for Commercial Buildings<sup>1</sup>).

<sup>1</sup> Adapted from ASHRAE (2007d), ASA (2008), ANSI (2002), and CEN (2007)

**Table 2. Reverberation time requirements**

Room type	Application	T60 (sec), at 500 Hz, 1000 Hz, and 2000 Hz
Apartment and condominium	—	< 0.6
Hotel/motel	Individual room or suite	< 0.6
	Meeting or banquet room	< 0.8
Office building	Executive or private office	< 0.6
	Conference room	< 0.6
	Teleconference room	< 0.6
	Open-plan office without sound masking	< 0.8
	Open-plan office with sound masking	0.8
Courtroom	Unamplified speech	< 0.7
	Amplified speech	< 1.0
Performing arts space	Drama theaters, concert and recital halls	Varies by application
Laboratories	Testing or research with minimal speech communication	< 1.0
	Extensive phone use and speech communication	< 0.6
Church, mosque, synagogue	General assembly with critical music program	Varies by application
Library		< 1.0
Indoor stadium, gymnasium	Gymnasium and natatorium	< 2.0
	Large-capacity space with speech amplification	< 1.5
Classroom	—	< 0.6

## Sound Reinforcement and Masking Systems

### *Sound Reinforcement*

For all large conference rooms and auditoriums seating more than 50 persons, evaluate whether sound reinforcement and AV playback capabilities are needed.

If needed, the sound reinforcement systems must meet the following criteria:

- Achieve a speech transmission index (STI) of at least 0.60 or common intelligibility scale (CIS) rating of at least 0.77 at representative points within the area of coverage to provide acceptable intelligibility.
- Have a minimum sound level of 70 dBA.
- Maintain sound-level coverage within  $\pm 3$  dB at the 2000 Hz octave band throughout the space.

### *Masking Systems*

For projects that use masking systems, the design levels must not exceed 48 dBA. Ensure that loudspeaker coverage provides uniformity of  $\pm 2$  dBA and that speech spectra are effectively masked.

# INNOVATION (IN)

## IN CREDIT: INNOVATION

ID&C

### 1–5 points

This credit applies to

- Commercial Interiors (1–5 points)
- Retail (1–5 points)
- Hospitality (1–5 points)

### Intent

To encourage projects to achieve exceptional or innovative performance

### Requirements

#### CI, RETAIL, HOSPITALITY

Project teams can use any combination of innovation, pilot, and exemplary performance strategies.

#### **Option 1. Innovation (1 point)**

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

Identify the following:

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

AND/OR

#### **Option 2. Pilot (1 point)**

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

AND/OR

#### **Option 3. Additional Strategies**

- **Innovation (1-3 points)**  
Defined in Option 1 above.
- **Pilot (1-3 points)**  
Meet the requirements of Option 2.
- **Exemplary Performance (1–2 points)**  
Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition. An exemplary performance point is typically earned for achieving double the credit requirements or the next incremental percentage threshold.

## **IN CREDIT: LEED ACCREDITED PROFESSIONAL**

ID&C

**1 point**

This credit applies to

- Commercial Interiors (1 point)
- Retail (1 point)
- Hospitality (1 point)

### **Intent**

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

### **Requirements**

#### **CI, RETAIL CI, HOSPITALITY**

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

# REGIONAL PRIORITY (RP)

## RP CREDIT: REGIONAL PRIORITY

ID&C

**4 points**

This credit applies to

- Commercial Interiors (1-4 points)
- Retail (1-4 points)
- Hospitality (1-4 points)

### Intent

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

### Requirements

#### CI, RETAIL CI, HOSPITALITY

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

One point is awarded for each Regional Priority credit achieved, up to a maximum of four.

# APPENDICES

## APPENDIX 1. USE TYPES AND CATEGORIES

The following table is used for all related Building Design & Construction, Interior Design & Construction, and Neighborhood Development prerequisites and credits. Use types are classified in categories.

<b>Category</b>	<b>Use type</b>
Food retail	Supermarket
	Other food store with produce section
Community-serving retail	Convenience store
	Farmers market
	Hardware store
	Pharmacy
	Other retail
Services	Bank
	Family entertainment venue (e.g., theater, sports)
	Gym, health club, exercise studio
	Hair care
	Laundry, dry cleaner
	Restaurant, café, diner (excluding those with only drive-thru service)
Civic and community facilities	Adult or senior care (licensed)
	Child care (licensed)
	Community or recreation center
	Cultural arts facility (museum, performing arts)
	Education facility (e.g., K—12 school, university, adult education center, vocational school, community college)
	Government office that serves public on-site
	Medical clinic or office that treats patients
	Place of worship
	Police or fire station
	Post office
	Public library
	Public park
	Social services center
Community anchor uses (BD&C and ID&C only)	Commercial office (100 or more full-time equivalent jobs)
	Housing (100 or more dwelling units)

Adapted from Criterion Planners, INDEX neighborhood completeness indicator, 2005.

## APPENDIX 2. DEFAULT OCCUPANCY COUNTS

Because of the speculative nature of core and shell construction, a project team may not know the final occupant count during the LEED certification process.

Core and Shell projects that do not have final occupancy counts must use the default occupancy counts provided here.

Projects that know the tenant occupancy must use the actual numbers, as long as the gross floor area per employee does not exceed the default occupancy numbers; a lower figure for gross floor area per occupant is acceptable.

Default occupancy counts are provided for typical core and shell project types. For circumstances not covered below, provide documentation for comparable buildings' average gross floor area per occupant.

**Table 1. Default Occupancy Numbers**

	Gross square feet per occupant		Gross square meters per occupant	
	Employees	Transients	Employees	Transients
General office	250	0	23	0
Retail, general	550	130	51	12
Retail or service (e.g., financial, auto)	600	130	56	12
Restaurant	435	95	40	9
Grocery store	550	115	51	11
Medical office	225	330	21	31
R&D or laboratory	400	0	37	0
Warehouse, distribution	2,500	0	232	0
Warehouse, storage	20,000	0	1860	0
Hotel	1,500	700	139	65
Educational, daycare	630	105	59	10
Educational, K-12	1,300	140	121	13
Educational, postsecondary	2,100	150	195	14

**Sources:**

ANSI/ASHRAE/IESNA Standard 90.1-2004 (Atlanta, GA, 2004).  
 2001 Uniform Plumbing Code (Los Angeles, CA)  
 California Public Utilities Commission, 2004-2005 Database for Energy Efficiency Resources (DEER) Update Study (2008).  
 California State University, Capital Planning, Design and Construction Section VI, Standards for Campus Development Programs ( Long Beach, CA, 2002).  
 City of Boulder Planning Department, Projecting Future Employment—How Much Space per Person (Boulder, 2002).  
 Metro, 1999 Employment Density Study (Portland, OR 1999).  
 American Hotel and Lodging Association, Lodging Industry Profile Washington, DC, 2008.  
 LEED for Core & Shell Core Committee, personal communication (2003 - 2006).  
 LEED for Retail Core Committee, personal communication (2007)  
 OWP/P, Medical Office Building Project Averages (Chicago, 2008).  
 OWP/P, University Master Plan Projects (Chicago, 2008).  
 U.S. General Services Administration, Childcare Center Design Guide (Washington, DC,2003).

The figures above may be used to determine occupancy for the following credits:

- LT Credit: Bicycle Facilities
- LT Credit: Reduced Parking Footprint
- WE Prerequisite: Indoor Water Use Reduction
- WE Credit: Indoor Water Use Reduction
- EA Prerequisite: Minimum Energy Performance
- EA Credit: Optimized Energy Performance
- EQ Prerequisite: Minimum Indoor Air Quality Performance
- EQ Credit: Enhanced Indoor Air Quality Strategies
- EQ Credit: Thermal Comfort
- EQ Credit: Daylight
- EQ Credit: Quality Views
- EQ Credit: Interior Lighting

The defaults provided above are based on gross floor area per occupant, not net or leasable floor area per occupant. Gross floor area is defined as the sum of all areas on all floors of a building included within the outside faces of the exterior wall, including common areas, mechanical spaces, circulation areas, and all floor penetrations that connect one floor to another. To determine gross floor area, multiply the building footprint (in square feet or square meters) by the number of floors in the building. Projects with underground or structured parking may exclude that area from the calculation.



### APPENDIX 3. RETAIL PROCESS LOAD BASELINES

**Table 1a. Commercial kitchen appliance prescriptive measures and baseline for energy cost budget (IP units)**

Appliance type	Baseline energy usage for energy modeling path				Levels for prescriptive path	
	Fuel	Function	Baseline efficiency	Baseline idle rate	Prescriptive efficiency	Prescriptive idle rate
Broiler, underfired	Gas	Cooking	30%	16,000 Btu/h/ft <sup>2</sup> peak input	35%	12000 Btu/h/ft <sup>2</sup> peak input
combination ovens: steam mode (P = pan capacity)	elec	cooking	40% steam mode	0.37P+4.5 kW	50% steam mode	0.133P+0.6400 kW
combination ovens: steam mode	gas	cooking	20% steam mode	1,210P+35,810 BTU/h	38% steam mode	200P+6,511 BTU/h
combination ovens: convection mode	elec	cooking	65% convection mode	0.1P+1.5 kW	70% convection mode	0.080P+0.4989 kW
combination ovens: convection mode	gas	cooking	35% convection mode	322P+13,563 BTU/h	44% convection mode	150P+5,425 BTU/h
Convection oven, full-size	Elec	Cooking	65%	2.0 kW	71%	1.6 kW
Convection oven, full-size	Gas	Cooking	30%	18000 Btu/h	46%	12000 Btu/h
Convection oven, half-size	Elec	Cooking	65%	1.5 kW	71%	1.0 kW
Conveyor oven > 25-inch belt	Gas	Cooking	20%	70,000 Btu/h	42%	57,000 Btu/h
Conveyor oven < 25-inch belt	Gas	Cooking	20%	45,000 Btu/h	42%	29,000 Btu/h
Fryer	Elec	Cooking	75%	1050 W	80%	1000 W
Fryer	Gas	Cooking	35%	14000 Btu/h	50%	9000 Btu/h
Griddle (based on 3' model)	Elec	Cooking	60%	400 W/ft <sup>2</sup>	70%	320 W/ft <sup>2</sup>
Griddle (based on 3' model)	Gas	Cooking	30%	3500 Btu/h/ft <sup>2</sup>	38%	2650 Btu/h/ft <sup>2</sup>
hot food holding	elec	cooking	na	40 W/ft <sup>3</sup>	na	21.5 V Watts

cabinets (excluding drawer warmers and heated display) $0 < V < 13 \text{ ft}^3$ ( $V$ = volume)						
hot food holding cabinets (excluding drawer warmers and heated display) $13 \leq V < 28 \text{ ft}^3$	elec	cooking	na	40 W/ft <sup>3</sup>	na	2.0 V + 254 Watts
hot food holding cabinets (excluding drawer warmers and heated display) $28 \text{ ft}^3 \leq V$	elec	cooking	na	40 W/ft <sup>3</sup>	na	3.8 V + 203.5 Watts
Large vat fryer	Elec	Cooking	75%	1350 W	80%	1100 W
Large vat fryer	Gas	Cooking	35%	20000 Btu/h	50%	12000 Btu/h
Rack oven, double	Gas	Cooking	30%	65000 Btu/h	50%	35000 Btu/h
Rack oven, single	Gas	Cooking	30%	43000 Btu/h	50%	29000 Btu/h
Range	Elec	Cooking	70%		80%	
Range	Gas	Cooking	35%	—	40% and no standing pilots	—
Steam cooker, batch cooking	Elec	Cooking	26%	200 W/pan	50%	135 W/pan
Steam cooker, batch cooking	Gas	Cooking	15%	2500 Btu/h/pan	38%	2100 Btu/h/pan
Steam cooker, high production or cook to order	Elec	Cooking	26%	330 W/pan	50%	275 W/pan
Steam cooker, high production or cook to	Gas	Cooking	15%	5000 Btu/h/pan	38%	4300 Btu/h/pan

order						
Toaster	Elec	Cooking	—	1.8 kW average operating energy rate	—	1.2 kW average operating energy rate
Ice machine, ice-making head, $H \geq 450$ lb/day	Elec	Ice	6.89 - 0.0011H kWh/100 lb ice	—	$37.72 * H^{0.298}$ kWh/100 lb ice	—
Ice machine, ice-making head, $H \leq 450$ lb/day	Elec	Ice	10.26 – 0.0086H kWh/100 lb ice	—	$37.72 * H^{0.298}$ kWh/100 lb ice	—
Ice machine RCU (w/o remote compressor), $H < 1,000$ lb/day	Elec	Ice	8.85 - .0038H kWh/100lb ice	—	$22.95 * H^{-0.258} + 1.00$ kWh/100 lb ice	—
ice machine RCU (remote condensing unit) $1600 > H \geq 1000$ lb/day	elec	ice	5.10 kWh/100lb ice	na	$22.95 * H^{-0.258} + 1.00$ kWh/100 lb ice	na
ice machine RCU (remote condensing unit) $H \geq 1600$ lb/day	elec	ice	5.10 kWh/100lb ice	na	$-0.00011 * H + 4.60$ kWh/100 lb ice	na
Ice machine self-contained unit, $H < 175$ lb/day	Elec	Ice	18.0 - 0.0469H kWh/100lb ice	—	$48.66 * H^{-0.326} + 0.08$ kWh/100 lb ice	—
Ice machine self-contained unit, $H \geq 175$ lb/day	Elec	Ice	9.80 kWh/100lb ice	—	$48.66 * H^{-0.326} + 0.08$ kWh/100 lb ice	—
Ice machine, water-cooled ice-making head, $H \geq 1436$ lb/day (must be on chilled loop)	Elec	Ice	4.0 kWh/100lb ice	—	3.68 kWh/100lb ice	—
Ice machine,	Elec	Ice	5.58 – 0.0011H	—	5.13 - 0.001H	—

water-cooled ice-making head, 500 lb/day < H > 1436 (must be on chilled loop)			kWh/100lb ice		kWh/100lb ice	
Ice machine, water-cooled ice-making head, H < 500 lb/day (must be on chilled loop)	Elec	Ice	7.80 – 0.0055H kWh/100 lb ice	—	7.02 - 0.0049H kWh/100 lb ice	—
Ice machine water-cooled once-through (open loop)	Elec	Ice	Banned	Banned	Banned	Banned
Ice machine, water-cooled self-contained unit, H < 200 lb/day (must be on chilled loop)	Elec	Ice	11.4 – 0.0190H kWh/100lb ice	—	10.6 - 0.177H kWh/100lb ice	—
Ice machine, water-cooled self-contained unit, H ≥ 200 lb/day (must be on chilled loop)	Elec	Ice	7.6 kWh/100lb ice	—	7.07 kWh/100lb ice	—
Chest freezer, solid or glass door	Elec	Refrig	0.45V + 0.943 kW/day	—	≤ 0.270 V + 0.130 kWh/day	—
Chest refrigerator, solid or glass door	Elec	Refrig	.1V + 2.04 kWh/day	—	≤ 0.125 V + 0.475 kWh/day	—
Glass-door reach-in freezer 0 ≤ V < 15 ft³	Elec	Refrig	.75V + 4.10 kWh/day	—	≤ 0.607 V + 0.893 kWh/day	—
Glass-door	Elec	Refrig	.75V + 4.10	—	≤ 0.733 V –	—

reach-in freezer 15 ≤ V < 30 ft <sup>3</sup>			kWh/day		1.00 kWh/day	
Glass-door reach-in freezer, 30 ≤ V < 50 ft <sup>3</sup>	Elec	Refrig	.75V + 4.10 kWh/day	—	≤ 0.250 V + 13.50 kWh/day	—
Glass-door reach-in freezer, 50 ≤ V ft <sup>3</sup>	Elec	Refrig	.75V + 4.10 kWh/day	—	≤ 0.450 V + 3.50 kWh/day	—
Glass-door reach-in refrigerator, 0 ≤ V < 15 ft <sup>3</sup>	Elec	Refrig	.12V + 3.34 kWh/day	—	≤ 0.118 V + 1.382 kWh/day	—
Glass-door reach-in refrigerator, 15 ≤ V < 30 ft <sup>3</sup>	Elec	Refrig	.12V + 3.34 kWh/day	—	≤ 0.140 V + 1.050 kWh/day	—
Glass-door reach-in refrigerator, 30 ≤ V < 50 ft <sup>3</sup>	Elec	Refrig	.12V + 3.34 kWh/day	—	≤ 0.088 V + 2.625 kWh/day	—
Glass-door reach-in refrigerator, 50 ≤ V ft <sup>3</sup>	Elec	Refrig	.12V + 3.34 kWh/day	—	≤ 0.110 V + 1.500 kWh/day	—
Solid-door reach-in freezer, 0 ≤ V < 15 ft <sup>3</sup>	Elec	Refrig	0.4V + 1.38 kWh/day	—	≤ 0.250 V + 1.25 kWh/day	—
Solid-door reach-in freezer, 15 ≤ V < 30 ft <sup>3</sup>	Elec	Refrig	0.4V + 1.38 kWh/day	—	≤ 0.400 V – 1.000 kWh/day	—
Solid-door reach-in freezer, 30 ≤ V < 50 ft <sup>3</sup>	Elec	Refrig	0.4V + 1.38 kWh/day	—	≤ 0.163 V + 6.125 kWh/day	—
Solid-door reach-in freezer, 50 ≤ V ft <sup>3</sup>	Elec	Refrig	0.4V + 1.38 kWh/day	—	≤ 0.158 V + 6.333 kWh/day	—
Solid-door reach-in refrigerator, 0 ≤ V < 15 ft <sup>3</sup>	Elec	Refrig	.1V + 2.04 kWh/day	—	≤ 0.089 V + 1.411 kWh/day	—
Solid-door reach-in refrigerator,	Elec	Refrig	.1V + 2.04 kWh/day	—	≤ 0.037 V + 2.200 kWh/day	—

15 ≤ V < 30 ft <sup>3</sup>						
Solid-door reach-in refrigerator, 30 ≤ V < 50 ft <sup>3</sup>	Elec	Refrig	.1V + 2.04 kWh/day	—	≤ 0.056 V + 1.635 kWh/day	—
Solid-door reach-in refrigerator, 50 ≤ V ft <sup>3</sup>	Elec	Refrig	.1V + 2.04 kWh/day	—	≤ 0.060 V + 1.416 kWh/day	—
Clothes washer	Gas	Sanitation	1.72 MEF		2.00 MEF	
Door-type dish machine, high temp	Elec	Sanitation	—	1.0 kW	—	.70 kW
Door-type dish machine, low temp	Elec	Sanitation	—	0.6 kW	—	0.6 kW
Multitank rack conveyor dish machine, high temp	Elec	Sanitation	—	2.6 kW	—	2.25 kW
Multitank rack conveyor dish machine, low temp	Elec	Sanitation	—	2.0 kW	—	2.0 kW
Single-tank rack conveyor dish machine, high temp	Elec	Sanitation	—	2.0 kW	—	1.5 kW
Single-tank rack conveyor dish machine, low temp	Elec	Sanitation	—	1.6 kW	—	1.5 kW
Undercounter dish machine, high temp	Elec	Sanitation	—	0.9 kW	—	0.5 kW
Undercounter dish machine, low temp	Elec	Sanitation	—	0.5 kW	—	0.5 kW
The energy efficiency, idle energy rates, and water use requirements, where applicable, are based on the following test methods:						

ASTM F1275 Standard Test Method for Performance of Griddles  
ASTM F1361 Standard Test Method for Performance of Open Deep Fat Fryers  
ASTM F1484 Standard Test Methods for Performance of Steam Cookers  
ASTM F1496 Standard Test Method for Performance of Convection Ovens  
ASTM F1521 Standard Test Methods for Performance of Range Tops  
ASTM F1605 Standard Test Method for Performance of Double-Sided Griddles  
ASTM F1639 Standard Test Method for Performance of Combination Ovens  
ASTM F1695 Standard Test Method for Performance of Underfired Broilers  
ASTM F1696 Standard Test Method for Energy Performance of Single-Rack Hot Water Sanitizing,  
ASTM Door-Type Commercial Dishwashing Machines  
ASTM F1704 Standard Test Method for Capture and Containment Performance of Commercial Kitchen  
Exhaust Ventilation Systems  
ASTM F1817 Standard Test Method for Performance of Conveyor Ovens  
ASTM F1920 Standard Test Method for Energy Performance of Rack Conveyor, Hot Water Sanitizing,  
Commercial Dishwashing Machines  
ASTM F2093 Standard Test Method for Performance of Rack Ovens  
ASTM F2140 Standard Test Method for Performance of Hot Food Holding Cabinets  
ASTM F2144 Standard Test Method for Performance of Large Open Vat Fryers  
ASTM F2324 Standard Test Method for Prerinse Spray Valves  
ASTM F2380 Standard Test Method for Performance of Conveyor Toasters  
ARI 810-2007: Performance Rating of Automatic Commercial Ice Makers  
ANSI/ASHRAE Standard 72–2005: Method of Testing Commercial Refrigerators and Freezers with  
temperature setpoints at 38°F for medium-temp refrigerators, 0°F for low-temp freezers, and -15°F  
for ice cream freezers

**Table 2. Supermarket refrigeration prescriptive measures and baseline for energy cost budget**

Item	Attribute	Prescriptive measure	Baseline
Evaporator	Evaporator fan speed control	Variable-speed evaporator fan	Constant volume, constant operation
	Evaporator design approach temperature	10°F (-12°C)	10°F (-12°C)
Condenser	Air-cooled condenser fan speed control	Variable-speed condenser fan (electronically commutated motors if single phase and less than 1 hp (0.75 kW))	Cycling one-speed fan
	Air-cooled condenser design approach	Floating head pressure, min of 70°F (21°C), 5°F (3°C) drybulb offset	10°F to 15°F (-12°C to -9°C) depending on suction temperature
	Air-cooled condenser fan power	80 Btu/Watt-hr (84.4 kJ/W-hr) at 10°F (-12°C) approach temperature	53 Btu/Watt-hr (55.9 kJ/W-hr) at 10°F (-12°C) approach temperature
	Evaporative condenser fan speed control	Variable-speed condenser fan (electronically commutated motors if single phase and less than 1 hp (0.75 kW))	Cycling one speed fan
	Evaporative condenser design approach temperature	Floating head pressure, min of 70°F (21°C), 9°F (5°C) wetbulb offset	18°F (-13°C) to 25°F (-4°C) based on design wetbulb temperature
	Evaporative condenser fan and pump power	400 Btu/Watt-hr (422.1 kJ/W-hr) at 100°F (38°C) saturated condensing temperature and 70°F(21°C) wetbulb temperature	330 Btu/Watt-hr (348.3 kJ/W-hr) at 100°F (38°C) saturated condensing temperature and 70°F (21°C) wetbulb temperature
Refrigeration system	Suction pressure control	Not addressed	Not addressed
	Condensing temperature control	85°F (30°C), minimum condensing temperature, fixed setpoint	85°F (30°C) minimum condensing temperature, fixed setpoint
	Defrost control	No electrical defrost, hot gas defrost only	Not addressed
Compressor	Compressor capacity modulation	Variable-speed drive trim compressor	Slide valves on screw compressors, multiple compressor racks on reciprocating compressor plants

**Table 3. Walk-in coolers and freezers prescriptive measures and baseline for energy cost budget**

Item	Attribute	Prescriptive measure	Baseline
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Envelope	Freezer insulation	R-46 (R-8.1 in (m <sup>2</sup> -K/W))	R-36 (R-6.34 in (m <sup>2</sup> -K/W))
	Cooler insulation	R-36 (R-6.34 in (m <sup>2</sup> -K/W))	R-20 (R-3.52 in (m <sup>2</sup> -K/W))
	Automatic closer doors	Yes	No
	High-efficiency low- or no-heat reach-in doors	40W/ft (130W/m) of door frame (low temperature), 17W/ft (55W/m) of door frame (medium temperature)	40W/ft (130W/m) of door frame (low temperature), 17W/ft (55W/m) of door frame (medium temperature)
Evaporator	Evaporator fan motor and control	Shaded pole and split phase motors prohibited; use PSC or EMC motors	Constant-speed fan
	Hot gas defrost	No electric defrosting.	Electric defrosting
Condenser	Air-cooled condenser fan motor and control	Shaded pole and split phase motors prohibited; use PSC or EMC motors; add condenser fan controllers	Cycling one-speed fan
	Air Cooled condenser design approach	Floating head pressure controls or ambient subcooling	10°F (-12°C) to 15°F (-9°C) dependent on suction temperature
Lighting	Lighting power density (W/sq.ft.)	0.6 W/sq.ft. (6.5 W/sq. meter)	0.6 W/sq.ft. (6.5 W/sq. meter)

**Table 4. Commercial kitchen ventilation prescriptive measures and baseline for energy cost budget**

Strategies	Prescriptive measure	Baseline
Exhaust rate control	Demand control package	Constant volume