The City of Mississauga's Corporate Green Building Standard Quick Reference Guide

1. Energy and Climate Change

1.1. Energy and Emissions Performance

Requirements		
Office Building		
Level 1	**Level 2**	**Level 3**
EUI: 110 kWh/m^2/year **TEDI:** 55 kWh/m^2/year **GHGI:** 15 kgCO2e/m^2/year	**EUI:** 90 kWh/m^2/year **TEDI:** 35 kWh/m^2/year **GHGI:** 10 kgCO2e/m^2/year	**EUI:** 60 kWh/m^2/year **TEDI:** 15 kWh/m^2/year **GHGI:** 5 kgCO2e/m^2/year
Fire Hall		
Level 1	**Level 2**	**Level 3**
EUI: 105 kWh/m2/year **TEDI:** 75 kWh/m2/year **GHGI:** 11 kgCO2e/m2/year	**EUI:** 80 kWh/m2/year **TEDI:** 60 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year	**EUI:** 60 kWh/m2/year **TEDI:** 30 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Library		
Level 1	**Level 2**	**Level 3**
EUI: 140 kWh/m2/year **TEDI:** 50 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 110 kWh/m2/year **TEDI:** 40 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year	**EUI:** 60 kWh/m2/year **TEDI:** 25 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Rec Centre		
Level 1	**Level 2**	**Level 3**
EUI: 160 kWh/m2/year **TEDI:** 45 kWh/m2/year **GHGI:** 20 kgCO2e/m2/year	**EUI:** 140 kWh/m2/year **TEDI:** 35 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 70 kWh/m2/year **TEDI:** 15 kWh/m2/year **GHGI:** 5 kgCO2e/m2/year
Transit Station		
Level 1	**Level 2**	**Level 3**
EUI: 230 kWh/m2/year **TEDI:** 100 kWh/m2/year **GHGI:** 25 kgCO2e/m2/year	**EUI:** 180 kWh/m2/year **TEDI:** 50 kWh/m2/year **GHGI:** 15 kgCO2e/m2/year	**EUI:** 150 kWh/m2/year **TEDI:** 15 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year
Transit Repair Station		
Level 1	**Level 2**	**Level 3**
EUI: 300 kWh/m2/year **TEDI:** 120 kWh/m2/year **GHGI:** 38 kgCO2e/m2/year	**EUI:** 280 kWh/m2/year **TEDI:** 100 kWh/m2/year **GHGI:** 35 kgCO2e/m2/year	**EUI:** 130 kWh/m2/year **TEDI:** 20 kWh/m2/year **GHGI:** 10 kgCO2e/m2/year
Ice Rink		
Level 1	**Level 2**	**Level 3**
EUI: 380 kWh/m2/year **GHGI:** 46 kgCO2e/m2/year	**EUI:** 335 kWh/m2/year **GHGI:** 38 kgCO2e/m2/year	**EUI:** 200 kWh/m2/year **GHGI:** 17 kgCO2e/m2/year
Swimming Pool[1]		
Level 1	**Level 2**	**Level 3**
EUI: 3,700 kWh/m2/year **GHGI:** 560 kgCO2e/m2/year	**EUI:** 2700 kWh/m2/year **GHGI:** 350 kgCO2e/m2/year	**EUI:** 1800 kWh/m2/year **GHGI:** 90 kgCO2e/m2/year

[1] All target metrics for swimming pools are normalized on the basis of pool water surface area and not gross floor area.

Deliverables		
Level 1	**Level 2**	**Level 3**
Site Plan Approval (SPA) Energy Model Documentation Requirements: • Energy Model Report summarizing key modelling inputs, outputs and assumptions • Working Energy Model Simulation Files • Mechanical and Electrical Design Brief • Related supporting drawings and calculations done external from the energy modelling software (for example, thermal bridging calculations) As-Built Energy Model Documentation Requirements: • Updated Energy Model Report • Working Energy Model Simulation Files • Mechanical and Electrical Design Brief • Modelling Notes: General, Building Level, Plant Level, System Level, Occupancy and Minimum Outdoor Air Rates, Warnings and Errors • Take-off Calculations (Modeller's external calculations to support the model inputs). If applicable, calculation for model work-arounds, exceptions, process energy savings, renewable energy systems, district energy systems, or other required calculations. • Zoning Diagrams • Outdoor Air Calculation Spreadsheets • Architectural Drawings and Specifications (issued for construction/as-built) • Mechanical Drawings and Specifications (issued for construction/as-built) • Electrical Drawings and Specifications (issued for construction/as-built)		

1.2. Building Commissioning

Level 1 – Requirements	Level 2 – Requirements
Monitoring-based Commissioning: Develop monitoring-based procedures and identify points to be measured and evaluated to assess performance of the major energy-consuming systems representing more than 10% of the building's total energy use (at a minimum heating, cooling, lighting, fans, and pumps). • Commissioning Plan that includes the following: - Roles and responsibilities - Preliminary commissioning schedule - Identify seasonal/deferred testing and post construction verification phase requirements - Final construction documents (i.e. Issued for Construction drawings and specifications) - Energy modeling assumptions such as hours of use, occupancy, occupant behaviour, plug and process loads - For each major energy-consuming systems: - Measurement requirements (BAS points, sub-meters, testing devices - Key performance metric to be used to evaluate performance and the requirement - Frequency of analyses after substantial completion and in the warranty period (at least quarterly) - Functional performance checklists/scripts - Test procedures/execution/TAB requirements • Commissioning Report that includes the following: - Owner's Project Requirements - Basis of Design - Documents review log at various stages - As-Built drawings - Reviewed equipment shop drawings - As-Built control drawings - Reviewed contractor/manufacturer start-up reports and test procedures/execution - Reviewed test, adjust, and balance (TAB) reports - Completed functional performance checklists/scripts - Analysed data and confirmation of performance for each major energy-consuming system - Issues and deficiencies log - Repairs (if needed) to maintain performance • Incorporation of commissioning requirements into the construction tender documents must be confirmed • A current facilities requirements and operations and maintenance plan that contains the information necessary to operate the building efficiently must be prepared and maintained	**Level 1 +** • Systems Operation Manual that can used for the purposes of informing facilities staff, current or potential service contractors, and facility occupants for operating and maintaining a facility's systems. It shall include the following: - A general facility description and plot plan with the location of major use areas and equipment identified - A description of each major energy-consuming system, including location, pictures (as needed), key performance metrics/benchmarks to evaluate performance, and follow-up requirements - Control settings for each major energy-consuming system, including setpoints, schedules, energy efficiency features, and seasonal changeover procedures - Best practice maintenance requirements - An on-going commissioning plan
Level 1 – Deliverables • Commissioning Plan • Commissioning Report • Current Facilities Requirements and Operations and Maintenance Plan	**Level 2 – Deliverables** **Level 1 +** • System Operation Manual
	Level 3 – Requirements **Level 2 +** LEED BC+C v4 credit Envelope Commissioning (Option 2). Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's thermal envelope, in addition to reporting the mechanical and electrical systems and assemblies in accordance with ASHRAE Guideline 0–2005 and the National Institute of Building Sciences (NIBS) Guideline 3–2012, Exterior Enclosure Technical Requirements for the Commissioning Process, as they relate to energy, water, indoor environmental quality, and durability.
	Level 3 – Deliverables **Level 2 +** • Incorporation of building envelope commissioning documentation for the deliverables identified in Levels 1 and 2 Requirements as per LEED BC+C v4 credit Envelope Commissioning (Option 2)

1.3. On-Site Renewables

Level 1	Level 2	Level 3
Requirements		
Designed to accommodate future installations of rooftop PV, including but not limited to structural capability to support rooftop PV, space available for future electrical equipment in electrical room, etc.	**Level 1 +** On-site renewable energy devices to offset 5% of building annual energy consumption	**Level 1 +** On-site renewable energy devices to offset 100% of building annual energy consumption
Deliverables		
• Solar-ready provisions clearly identified in all applicable design documentation, and co-ordinated between the various design disciplines (electrical, structural, etc.)	• All applicable documentation to facilitate the design, installation, operation and maintenance of the renewable energy system (drawings, specifications, maintenance manuals, etc.) • Supporting renewable energy analysis calculations to demonstrate that the 5% requirement has been met	• All applicable documentation to facilitate the design, installation, operation and maintenance of the renewable energy system (drawings, specifications, maintenance manuals, etc.) • Supporting renewable energy analysis calculations to demonstrate that net zero energy has been met

1.4. Air Tightness

Levels 1, 2 and 3
Requirements
Conduct a whole-building air leakage test to improve the quality and air tightness of the building envelope.
Deliverables
At 50% Construction Documents stage: • Executed contract with an airtightness testing provider • Line of air barrier system shown on drawings and indicative details • Airtightness testing plan describing the project's approach to achieving the air tightness target, proposed testing procedure, and related quality assurance and quality control activities At project completion: • Completed airtightness testing report • If results are below target, report shall include practical steps to identify areas of significant air leakage and improve air tightness for the project, as well as documentation of potential strategies can be used to improve airtightness on future projects

1.5. Metering and Benchmarking

Levels 1, 2 and 3	
Requirements	
Metering	Install electricity and/or thermal sub-meters for all energy end-uses that represent more than 10% of the building's total energy consumption. All major process loads such as pools and ice rinks shall be sub-metered separately.
Benchmarking	Register the building on ENERGY STAR Portfolio Manager and co-ordinate with the City of Mississauga Energy Management Team to establish the process for ongoing reporting and benchmarking.
Deliverables	
Metering	• Provision of electricity and thermal sub-meters clearly indicated on electrical and mechanical single-line diagrams • A metering plan listing all meters along with type, energy source metered, diagrams, and/or references to design documentation
Benchmarking	• Create an account on ENERGY STAR Portfolio Manager for the building, including provision of key building input characteristics such as gross floor area, identification of multiple space uses, etc. and turn over access to the City upon project completion

1.6. Resilience Performance Requirements

Level 1	Level 2	Level 3
Requirements		
Provide 72 hours of back-up power and thermal energy to a central refuge area and to essential building systems as per the City of Toronto's Minimum Backup Power Guidelines for MURBs. Combustion-based or battery-based systems both permitted.	**Level 1 +** Only a non-combustion-based system using battery storage or other non-combustion forms of back-up generation is permitted.	N/A
Deliverables		
• A narrative describing the project's approach to resilience, with the back-up power source/quantity of fuel to be verified post construction.	Same as Level 1	N/A

Note: *The application of Resilience Performance Requirements may be waived for select building types. Applicants should confer with City of Mississauga staff to confirm if requirements apply to their project.*

2. Materials

2.1. Low-impact Materials

Level 1	Level 2	Level 3
Requirements		
• Minimum 20% cement replacement in concrete (pre-consumer recycled content using waste fly ash or slag) and/or minimum 20% GHG reductions in concrete using low-emissions alternatives • Min. 50% post consumer recycled content in rebar • Min. 50% post consumer recycled content in structural steel, metal decks • All flooring products must meet FloorScore • Meet SCAQMD Low/No VOCs for all interior paints, coatings, adhesives, and sealants, as per ASHRAE 189.1 • Min. 25% FSC Wood • No urea-formaldehyde	**Level 1 +** • Min. 75% post consumer recycled content in rebar • Min. 80% post consumer recycled content in structural steel, metal decks • Min. of 20 Environmental Product Declarations (EPDs), as per LEED MR: Building Product Disclosure and Optimization • Min. 75% FSC Wood	Meet the Materials Petal of the Living Building Challenge.
Deliverables		
• Product documentation demonstrating that requirements have been met, including manufacturer's data, Material Safety Data Sheets (MSDS), third-party certification, or screenshots from relevant programs	**Level 1 +** • Verified EPDs that conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle-to-gate scope, • The EPD must also identify the declaration holder, EPD program operator, and third-party reviewers	• Documentation of compliance with the Living Building Challenge's Materials Petal

2.2. Embodied Carbon Footprint

Level 1	Level 2	Level 3
Requirements		
Conduct a Life Cycle Assessment (LCA) and report carbon footprint as the LCA impact measure 'global warming potential' (GWP) in kilograms of carbon dioxide equivalent (CO_2e). The LCA report must also identify: • The LCA software that was used to make the calculation • The components of the building that are included in the calculation All suppliers used for the project must comply with the City of Mississauga Supplier Code of Conduct.	**Level 1 +** Conduct a Triple Bottom Line (TBL) Cost Benefit Analysis for the building that looks at the impacts of the building including Financial, Environmental, and Social impacts.	**Levels 1 and 2 +** Offset 100% of all embodied carbon using a one-time purchase of carbon offsets as eligible by the CaGBC ZCB standard.

Deliverables		
• A description of LCA assumptions, scope, and analysis process for baseline building and proposed building, as per LEED NC-v4 MR: Building Life-Cycle Impact Reduction • An LCA report showing outputs of proposed building with percentage change from baseline building for all impact indicators, and highlighting GWP • A narrative addressing specific strategies employed by the project team to reduce carbon footprint • A declaration that all suppliers used for the project must complied with the City of Mississauga Supplier Code of Conduct	**Level 1 +** • TBL Cost Benefit Analysis report	**Level 2 +** • Draft calculation showing target carbon offset threshold, as per LEED NC-v4 EA: Green Power and Carbon Offsets • Purchase contract or letter of commitment from a CaGBC eligible carbon offset program for targeted carbon offset threshold

2.3. Ozone Depleting Compounds

Level 1	Level 2	Level 3
Requirements		
Calculate and report HVAC&R equipment refrigerant emissions associated with project. The combination of all new and existing building HVAC&R equipment that serves the project must comply with the following formula: LCGWP + LCODP × 10^5 ≤ 13.	**Level 1 +** • Zero HCFCs • Zero halons • Report GWP and ODP as part of the Carbon Footprint requirement	**Levels 1 and 2 +** Zero refrigerants, or only naturally occurring/synthetic refrigerants that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50 are permitted.
Deliverables		
• Draft calculations for LEED NC-v4 EA: Enhanced Refrigerant Management	**Level 1 +** • A declaration that no HCFCs were used on the project • A declaration that no halons were used on the project • An LCA report indicating GWP and ODP	**Same as Levels 1 and 2**

3. Transportation Performance Requirements

3.1. Electric Vehicle Infrastructure

Level 1	Level 2	Level 3
Requirements		
Design the building to provide 20% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include at least two regular electrical outlets for electric bicycle charging in bike storage area(s).	Design the building to provide 25% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include at least two regular electrical outlets for electric bicycle charging in bike storage area(s).	Design the building to provide 30% of parking spaces with electric vehicle supply equipment (EVSE) of Level 2 or higher. The remaining parking spaces must be designed to permit future EVSE installation (i.e. EV-ready). Include one regular electrical outlet for every four bike spaces for electric bicycle charging in bike storage area(s).
Deliverables		
• Project parking statistics including number of current and future EVSE spaces • Parking or site plan notations indicating location of current and future EVSE spaces • Photos of EVSE signage or pavement markings • Site plan notations indicating location of outlets for electric bicycles	Same as Level 1	Same as Levels 1 and 2

3.2. Bicycle Infrastructure

Level 1	Level 2	Level 3
Requirements		
Short-term bicycle parking for 5% of all peak visitors and/or 10% of occupants, no fewer than 8 spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter.	Short-term bicycle parking for 7% of all peak visitors and/or 15% of occupants, no fewer than 8 spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter.	Short-term bicycle storage for 10% of all peak visitors and/or 20% occupants, no fewer than 12 storage spaces per building. Provide one (1) on-site shower with changing facility for the first 100 regular occupants and 1 additional shower for every 150 regular occupants thereafter. Provide public bicycle repair station at-grade with tools including tire levers, screwdrivers and spanners.
Deliverables		
• Project statistics including number and type of bicycle parking spaces per building • Site plan notations indicating location, number, and type of bicycle parking spaces per building • Site plan notations indicating location and number of shower and change facilities	Same as Level 1	**Levels 1 and 2 +** • Site plan notations indicating location and type of bicycle maintenance facilities

4. Waste Management Performance Requirements

Level 1	Level 2	Level 3
Requirements		
A minimum diversion rate of 75% of the total construction and demolition material must be achieved. Diverted materials must include at least three material streams, e.g. metals, concrete, drywall, wood, plastics, etc.	A minimum diversion rate of 90% of the total construction and demolition material must be achieved. Diverted materials must include at least three or four material streams, e.g. metals, concrete, drywall, wood, plastics, etc.	**Level 2 +** Minimum diversion rates must be achieved as follows: • Metals 99% • Paper and cardboard 99% • Soil and biomass 100% • Rigid foam, carpet, and insulation 95% • All others – combined weighted average 90%
Deliverables		
• Construction and demolition waste management plan • Construction and demolition waste declaration to be provided post construction	Same as Level 1	Same as Levels 1 and 2

5. Water Performance Requirements

5.1. Stormwater Management

Level 1	Level 2	Level 3
Requirements		
Peak Flow Reduction: Achieve 85% reduction of the 100-year post-development flow to pre-development conditions of the site. Runoff Volume Reduction: Retain 80% runoff generated from a minimum of 15 mm depth of a single rainfall event from all site surfaces through infiltration, evapotranspiration, water harvesting and reuse.	Peak Flow Reduction: Achieve 100% reduction of the 100-year post-development flow to pre-development conditions of the site. Runoff Volume Reduction: Retain 100% runoff generated from a minimum of 15 mm depth of rainfall from all site surfaces through infiltration, evapotranspiration, water harvesting and reuse.	**Level 2 +** Incorporate green roof for the remaining roof area (excluding HVAC equipment, service pathways, and rooftop PV).
Deliverables		
• A stormwater management report including rainfall data and volume calculations • Stormwater management plans, details, or cross-sections consistent with report and including topography, landscaping, grading, etc. • A stormwater runoff declaration to be provided post construction	Same as Level 1	**Levels 1 and 2 +** • Site plan notations showing green roof details, including coverage area calculations

5.2. Water Use Intensity

Level 1	Level 2	Level 3
Requirements		
Achieve at least a 20% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve at least a 60% reduction in in all outdoor potable water consumption (irrigation). Where potable water is used for irrigation, provide native, drought-tolerant plants for at least 50% of the landscaped site area (including at-grade landscapes, green roofs and walls).	Achieve at least a 40% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve a 100% reduction in in all outdoor potable water consumption (irrigation). Provide native, drought-tolerant plants for at least 60% of the landscaped site area (including at-grade landscapes, green roofs and walls).	Achieve at least a 60% reduction in potable water consumption for the building (not including irrigation) over the baseline. Achieve a 100% reduction in indoor non-potable water consumption (toilets). Achieve a 100% reduction in in all outdoor potable water consumption (irrigation). Provide native, drought-tolerant plants for 100% of the landscaped site area (including at-grade landscapes, green roofs and walls).
Deliverables		
• Water efficiency declaration to be provided post construction • Landscaping plan showing vegetated areas and potable or non-potable irrigation system • Plant list including common and scientific names, highlighting native, drought-tolerant species	Same as Level 1	**Levels 1 and 2 +** • Record that the Province has been lobbied to allow for the capture and recycling of rainwater and wastewater for use in toilets

6. Natural Heritage Performance Requirements

6.1. Erosion and Sediment Control

Level 1	Level 2	Level 3
Requirements		
Follow the Erosion and Sediment Control Guideline for Urban Construction during construction and demolition activities.	Follow the Erosion and Sediment Control Guideline for Urban Construction during construction and demolition activities. Remove 80% of total suspended solids (TSS) on an annual loading basis from all runoff leaving the site based on the post-development level of imperviousness.	N/A
Deliverables		
Notations on plans and drawings • Description of compliance with the Erosion and Sediment Control Guideline for Urban Construction • Erosion and sediment control plan • Site plan notations indicating erosion and sediment control measures implemented	**Level 1 +** • Stormwater runoff declaration to be provided post construction	N/A

6.2. Light Pollution

Level 1	Level 2	Level 3
Requirements		
All exterior fixtures must be Dark Sky compliant, as per the International Dark-Sky Association (IDA). Any rooftop and facade architectural illumination must be directed downward and turned off after facility operating hours. Install an automatic device that reduces the outward spillage of internal light by: a) Reducing the input power to non-emergency lighting fixtures by at least 50 per cent outside of facility operating hours. OR b) Shielding all non-emergency light fixtures outside of facility operating hours.	**Level 1 +** Ensure that any lighting not physically attached to the building is connected to solar PV as a primary source of power.	N/A
Deliverables		
• A lighting list highlighting Dark Sky compliant fixtures • A lighting plan showing boundaries, location of fixtures, and lighting control measures • A lighting controls declaration to be provided post construction	**Level 1 +** • Lighting plan showing solar PV connections	N/A

6.3. Biodiversity

Level 1	Level 2	Level 3
Requirements – Planting		
Provide trees planted in both softscape and hardscape with a minimum soil volume of 15 m^3, 30 m^3, 45 m^3 for small, medium and large-sized trees, respectively. Plant 'shade trees' approximately 6-8 m (20- 27 ft) apart along all street frontages, open space frontages and public walkways, and 8-10m apart for all street frontages, open space frontages and public walkways.	Same as Level 1	Same as Levels 1 and 2
Deliverables – Planting		
• Landscaping plan indicating soil volume, species, and quantity for each planting area	Same as Level 1	Same as Levels 1 and 2
Requirements – Native species		
Provide pollinator-friendly species for at least 10% of the landscaped site area. Ensure that 25% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.	Provide pollinator-friendly species for at least 25% of the landscaped site area. Ensure that 50% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.	Provide pollinator-friendly species for at least 50% of the landscaped site area. Ensure that 100% of all proposed plantings are native species. Avoid the use of all invasive species in landscape design as per the Ontario Invasive Plant Council guidelines.
Deliverables – Native species		
• Plant list including common and scientific names, highlighting native and pollinator-friendly species • Description of compliance with the Ontario Invasive Plant Council guidelines	Same as Level 1	Same as Levels 1 and 2
Requirements – Bird friendly development		
Consult the City of Toronto's Bird Friendly Development Guidelines and provide a summary report demonstrating that the proposed project has considered bird safety.	Level 1 + Treat glass on buildings with a density pattern between 10-28 cm (4 to 11 in) apart for a minimum of the first 10 to 12 m (33-40 ft) above grade. **OR** Mute reflections for a minimum of the first 10-12 m (33-40 ft) portion of a building above grade. Where a green roof is constructed adjacent to glass surfaces, ensure that the glass is treated to a height of at least 12 m (40 ft) above the level of the green roof, to prevent potentially fatal collisions with windows. Where exhaust/ventilation grates cannot be avoided at ground level, design the grates to have a porosity of less than 2	Same as Level 2

	centimetres x 2 centimetres (1inches x 1inches).	
Deliverables – Bird friendly development		
• Narrative describing the project's consideration of bird safety	Level 1 + • Site plan notations showing treated area required, type of treatment, and density/colour of visual markers • Summary table of bird friendly glass treatments for each elevation • Site plan notations highlighting bird friendly grates, where applicable	Same as Level 2