Sustainable Building

Guidance Document

Version 2.1 - October 2025

Table of Contents

1. Introduction

This document includes information on how the Sustainable Building Policy is applied to projects, when decisions need to be made, details on specific sustainability targets and requirements, and supporting information to assist project teams in producing building projects that align with City expectations and desired outcomes.

The Sustainable Building Guidance Document is removed from the Council-approved Sustainable Building Policy (The Policy) so that it is more adaptable. This document will continue to be updated and augmented based on evolving City needs, lessons learned, and advancement within industry, standards, and codes. Adherence to the Sustainable Building Guidance Document including the Minimum Sustainability Performance Requirements is mandated by The Policy.

These documents can be found on The City of Calgary's Sustainable Infrastructure website here: www.calgary.ca/greenbuildings

Policy Steward Contact Information

The Policy Steward is responsible for managing, proposing updates, and compliance reporting on the Sustainable Building Policy and the Sustainable Building Guidance Document. The Policy Steward will identify applicable sustainability requirements, assess projects for third-party certification, and complete design reviews. Other ways the Policy Steward can support a building project include RFP creation/evaluation, funding support, attending project meetings, etc.

Inquiries related to the Sustainable Building Policy can be sent to sbp@calgary.ca.

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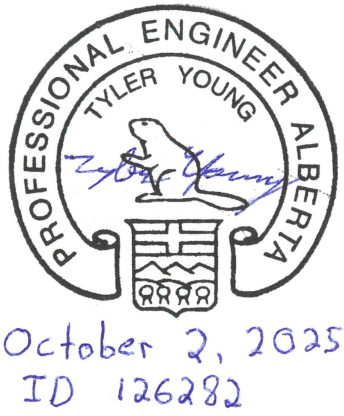

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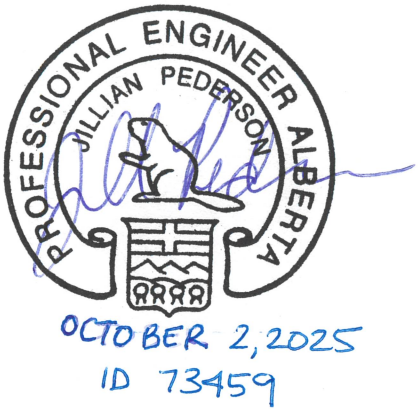

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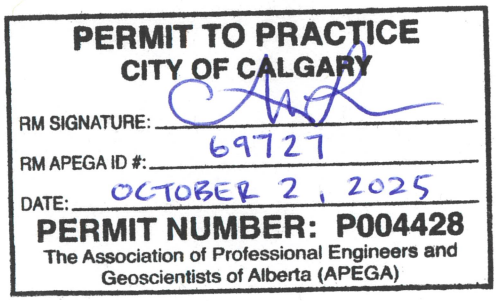

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Scope of this Document

This document is a resource that provides a starting point for City Project Sponsors, Project Planners, and Project Managers, responsible for planning and delivering building projects, to set sustainability objectives for their projects. The information within this document is purposefully general, allowing for flexibility and adaptability to the various types of building projects delivered or funded by The City.

In this document, you will find:

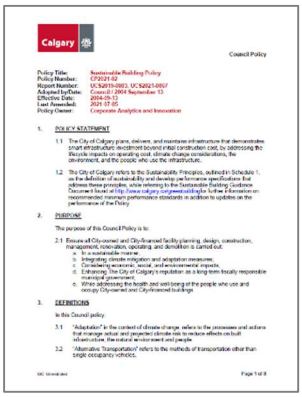
- A description of the key pre-project actions for the Project Sponsors, Project Planners and Project Managers in collaboration with the Policy Steward for the setting of sustainability targets for delivery.
- Details on the Minimum Sustainability Performance Requirements to be reviewed for all capital projects where the Sustainable Building Policy applies. The document discusses the performance targets, rationale, and alignment with Council's Strategic Direction, City Policies and City Strategies.
- Guidance on the selection of appropriate sustainable building certification systems.
- Templates and guidance for scopes of work for key consulting team members including Building Energy Consultant, Commissioning Provider, Sustainable Building Consultant, and Whole Building Life Cycle Assessment (included as a separate appendices).

Relationship to other Documents

The City of Calgary Sustainable Building Policy works in tandem with the Sustainable Building Guidance Document to support the development of sustainable infrastructure projects by The City. The Policy defines the applicability, roles and responsibilities, and the sustainability principles behind sustainable building. The Sustainable Building Guidance Document defines the Minimum Sustainability Performance Requirements and provides guidance as to their application for project teams. Within the appendices of the Sustainable Building Guidance Document, additional resources are provided to support project teams in achieving their sustainability goals.

The Sustainable Building Policy aligns with other City of Calgary policies, procedures, and guidelines for building development including, but not limited to: Design Guidelines for City of Calgary Funded Buildings and the City of Calgary Corporate Project Management Framework. The Sustainable Building Policy aligns with The City of *Calgary Climate Strategy – Pathways to 2050*, Environmental Policy and Council's Strategic Direction.

Sustainable Building Policy


Calgary

Council Policy

1. POLICY STATEMENT

2. PURPOSE

3. DEFINITIONS

Sustainable Building Guidance Document

Target Audience

The successful delivery of sustainable buildings by The City of Calgary necessitates an integrated process where members of the project team come together with a shared purpose and understanding of the goals for sustainability. The following planning and project team members play critical roles in the sustainable building process. Some of the key roles and responsibilities include:

Project Sponsor

As the individual who is accountable for guiding the project mandate, the Project Sponsor is responsible for reviewing and approving the sustainability requirements in alignment with the project goals. In partnership with the Policy Steward and Project Planners, the Sponsor will ensure that sustainability requirements are agreed upon with the Policy Steward and approved in the Project Charter and defined in the Owner's Project Requirements (OPR).

Project Planner

The Project Planner works with the Project Sponsor to develop the project mandate. In partnership with the Policy Steward and Project Sponsor, the Project Planners will ensure that sustainability requirements are included in the Project Charter and are budgeted for accordingly.

Project Manager

The Project Manager is responsible, working closely with the Policy Steward and Project Team, to define appropriate sustainability strategies to meet targets and requirements for sustainability. Once strategies are developed, the PM ensures that the strategies are on track to meet the requirements by measuring against the targets and documenting throughout the project to fully realize the goals with technical support from the Policy Steward.

Project Team

The consulting and contracting partners that perform the project work are responsible for the development and execution of detailed strategies and deliverables to achieve the defined sustainability requirements for the project. Consultants should follow the guidance for each Minimum Sustainability Performance Requirement as well as descriptions of the deliverables required that are provided in this document.

2. Sustainable Building Process

The successful delivery of building projects that align with the Sustainable Building Policy is a collective effort of the Project Sponsor, Project Planner, Project Manager, Project Team, and Policy Steward. This section outlines the key roles and responsibilities of these contributors over the course of a project. This represents a typical process, and variations may exist between different project delivery models. Civic Partner projects often have varying delivery models, but similar to below, sustainability objectives need to be incorporated into the budgeting process and funding agreement.

Pre-project (Stage 1 and 2 – Assess and Plan)

- Project Planner contact Policy Steward to provide notification of project.
- Policy Steward, with the Project Sponsor and Project Planner, review and agree upon the Minimum Sustainability Performance Requirements applicable for the project and set relevant green building certification requirements, if appropriate. LEED Gold is the recommended certification requirement for new construction projects, but this may be amended based on project specifics.
- Project Sponsor signs off on the agreed upon sustainability objectives through the Project Charter, Scope of Work, and/or Portfolio Recommendations.
- Project Sponsor and Project Planners ensure sustainability objectives are appropriately incorporated into the budgeting process.

Project Initiation and Project Planning (Stage 3 –Design)

- Project Manager reviews approved sustainability objectives with the Policy Steward.
- Project Manager and Policy Steward identify the applicable consultant scopes of work (included as appendices). Policy Steward supports the Project Manager in the procurement of project consultants for sustainability related disciplines.
- Policy Steward supports the Project Manager in incorporating sustainability requirements and strategies into the Owner's Project Requirements.
- Project Team reviews sustainability objectives and validates their feasibility for the project.
- Policy Steward supports the Project Team through the design process with guidance on Minimum Sustainability Performance Requirements and other aspects of the project sustainability strategies.
- Policy Steward reviews and provides feedback on design milestone submissions to review the metrics and ensure the project remains on track to meet the requirements and goals.
- Policy Steward supports the Project Team and green building consultants through the certification process (where applicable) and liaises with certification bodies on behalf of The City.

Project Execution (Stage 4 - Build)

- Policy Steward supports the Project Manager in the procurement of project contractors.
- Policy Steward reviews and provides feedback on construction sustainability plans, commissioning plans, regular construction reporting, and major commissioning reports and deliverables.
- Policy Steward supports the Project Team and green building consultants through the certification process (where applicable) and liaise with certification bodies on behalf of The City.

Project Closing (Stage 5 – Occupy/Operate)

- Project Manager and Policy Steward confirm the completion of the commissioning process and ensure project handover documentation for sustainability requirements is received from the Project Team.
- Project Sponsor, Project Manager, and Policy Steward confirm and record the final project results with respect to the sustainability requirements for the project.

3. Minimum Sustainability Performance Requirements

The Minimum Sustainability Performance Requirements (MSPRs) were developed to establish clear sustainability objectives that are consistent and directly aligned with Council's Strategic Direction and other City policies and objectives. They are intended to provide clarity during project planning and delivery while ensuring The City invests in sustainable practices that provide best long-term value for The City. The MSPR's are required to be met regardless of green building certification requirements.

This document is intended to provide the Project Sponsor, the Policy Steward, the Project Planners, the Project Manager and the rest of the Project Team with a list of MSPRs and supporting guidance to help meet the intent of The City of Calgary's Sustainable Building Policy. The MSPRs were developed using industry standards, past project experience, and internal and external subject matter experts and working groups.

Special circumstances and project scope may prevent Project Teams from achieving one or more MSPR. Project Sponsors are to contact a Policy Steward during Stage 1 or 2, as defined by The City of Calgary's Stage Gate Process, for support identifying applicable MSPRs for each project. MSPRs are to be signed off prior to Stage 3 by the Project Sponsor and the Policy Steward. If it is later determined the achievement of any of the MSPRs are not feasible the MSPRs can be adjusted with sign-off from the Project Sponsor and the Policy Steward.

Green Building Certification provides value to The City of Calgary through third-party verification, by confirming buildings are designed and constructed to industry defined sustainability standards. The green building certification industry continues to evolve, and numerous worthwhile certification programs exist in the market. The building type and project scope will dictate which, if any, certification program is most appropriate for each specific building project. The Sustainable Building Policy has resulted in the certification of over 80 City of Calgary capital projects, primarily under the Leadership in Energy and Environmental Design (LEED) rating. Building off the MSPRs discussed below, the majority of new projects will be well positioned to achieve LEED Gold certification or equivalent, subsequently LEED Gold is the recommended certification target for new construction projects, and all LEED projects should follow the split review process. The Project Sponsor and the Policy Steward will review applicable certification programs and determine appropriate certification targets during Stage 1 and 2.

In alignment with the *Calgary Climate Strategy - Pathways to 2050*, the Project Sponsor may decide to pursue a net-zero carbon building or one designed to be net-zero capable in the future. The Policy Steward will support early planning and provide guidance on the requirements of this approach during Stages 1 and 2.

Minimum Sustainability Performance Requirements Checklist

The following checklist provides a high-level summary of the MSPRs for all building projects. Further details on requirements and guidance are outlined later in this document. Requirements may vary by project type and may be reviewed on a case-by-case basis with the Policy Steward, the Project Sponsor, and the Project Planner/Manager, during project scoping.

Topic	Requirement Summary
Carbon and Energy	Facility Performance: Achieve a minimum savings of at least 40% against the National Energy Code for Buildings (NECB) 2020 for GHG emissions, energy cost, and energy use.
	Reporting Metrics: Report on key energy performance metrics including EUI, GHGI, TEDI, and CEDI. Also, complete a whole-building life cycle assessment to report on embodied carbon.
	Solar Photovoltaic Ready and Electric Vehicle Capable: Design the facility to include provisions for the future installation of a PV system and EV charging stations.
	Refrigerant Management: Use either low-impact refrigerants or no refrigerants.
Climate Adaptation	Complete a Climate Risk Assessment for the project in conformance with The City's Climate Risk Assessment Framework. Design the facility and site to address climate hazards: extreme heat, increased average temperatures, severe storms, high winds, short duration high intensity rainfall, heavy snowfall, drought, wildfire smoke, and river flooding.
Commissioning	Complete enhanced commissioning for the major energy consuming systems, energy generation systems, and the building envelope.
Indoor Water Use Reduction	Achieve a minimum non-process plumbing fixture water savings of 35% compared to a defined baseline and do not exceed maximum flow/flush fixture rates.
Sustainable Sites	Stormwater Management: Manage stormwater on-site using green stormwater infrastructure.
	Sustainable Landscaping: Design landscaping in a manner that reduces potable water use, is drought tolerant, promotes biodiversity, and is accessible for facility occupant / visitor use.
Multimodal Access	Design the site providing priority access to pedestrians, cyclists, and public transit users. Also, ensure these groups can access the facility in a dignified and safe manner.
Waste Diversion	Divert at least 80% of non-hazardous construction waste and demolition material from landfill.
Healthy Indoor Environment	Select low-emitting materials and implement an indoor air quality management plan for project construction.

Carbon and Energy

Sustainability Principle Alignment

- Optimize for energy efficiency and conservation, specifically through passive design, thereby reducing and avoiding GHG emissions.
- Address occupant comfort, provide access, and maintain social wellbeing in design and operations.
- Design for resilience to changing economic, social, and environmental conditions.
- Select sites that have access to alternative transportation and consider the impact of site selection on the environment, people, and the building.

Rationale

Calgary's commitment to a sustainable future is unwavering. Following the Calgary City Council's approval of the *Calgary Climate Strategy – Pathways to 2050* on July 5, 2022, The City has set ambitious goals: achieving net zero emissions by 2050 and cutting emissions by 60% from 2005 levels by 2030. To achieve these goals, reducing greenhouse gas (GHG) emissions and energy consumption in buildings is paramount. The requirements not only decrease The City's utility expenses but also safeguard it against future price fluctuations and carbon-related costs, ensuring robust economic resilience.

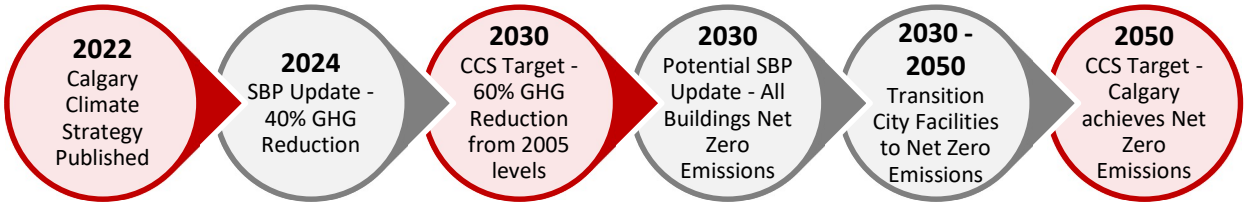


Figure 1: Alignment of Sustainable Building Policy (SBP) with Calgary Climate Strategy (CCS)

The City recognizes that an evolving global climate and market dynamics creates the need for strong strategic planning, including the selection of requirements focused on future resilience. Embracing technologies like solar photovoltaics (PV) and electric vehicles (EV) not only prepares the city for future challenges but also reduces the need for costly retrofits, enhancing resilience against fluctuating utility rates and carbon-related expenses.

Additionally, Calgary is vigilant about the environmental impact of refrigerants, acknowledging that certain refrigerants contribute to ozone depletion and global warming. The City is committed to responsible refrigerant management to mitigate these effects.

Looking forward, Calgary anticipates a shift toward addressing embodied emissions in buildings. Establishing a foundational understanding of embodied carbon in city projects is a proactive step, paving the way for impactful climate action in the construction sector. In addition, The City recognizes that the establishment of performance targets and requirements is evolving. To help prepare for the creation of future targets, The City understands the importance of using and collecting information on performance metrics such as energy use intensity (EUI), greenhouse gas intensity (GHGI), thermal energy demand intensity (TEDI) and cooling energy demand intensity (CEDI).

Requirements

Facility Performance

To support the Calgary Climate Strategy, minimum reduction targets of 40% have been set for GHG emissions, energy costs and energy consumption from a National Energy Code for Buildings (NECB) 2020 baseline. To support the transition plan established in the Calgary Climate Strategy and to provide service line owners and Business Units with options that are more aggressive than the minimum target, the following stepped target objectives have been established. Project Sponsors and Project Planners shall work with the Policy Steward to establish a performance objective path for each project. To meet 2050 targets, it is expected that future updates to this document will include increasingly stringent energy performance and emissions reductions requirements.

For building types including, but not limited to, administration, data centre, fire station, mixed-use, police station, recreation centre, vehicle maintenance/storage, warehouse, and Civic Partner Facilities, the following targets apply:

Table 1: Energy and GHG Performance Improvement Levels from NECB Baseline

Target Level	GHG Emissions[†]	Energy Cost	Energy Consumption
Minimum Requirement	**40%**	**40%**	**40%**
Low Carbon Aligns with the Calgary Climate Strategy objective to reduce GHG emissions below 2005 levels by 60% by 2030.	**60%**	**60%**	**60%**
Net Zero Carbon Achieves net zero carbon via The City of Calgary's green electricity contract.	**"Low Carbon" targets and full electrification**		
Net Zero Carbon On-Site Aligns with the Calgary Climate Strategy objective of net zero by 2050.	**Achieving on-site operational carbon neutrality**		

[†] GHG Emission Reductions exclude contributions from The City of Calgary's green electricity contract.

Interior Renovation and Other Building Projects

- Requirements will be determined based on the extent of the renovation scope. The SBP stewards will review the scope and provide project-specific requirements to the design team.
- At a minimum, projects must:
    - Achieve a 40% or greater improvement in Lighting Power Density (LPD) compared to the NECB 2020 Part 4 lighting baseline (if lighting upgrades are included in scope).
    - Explore high performing energy conservation measures as appropriate to the project scope.

Reporting Metrics

The project team shall calculate the following metrics for all projects, set benchmarks with the Policy Steward and City Project Manager and provide a report indicating the performance.

- Embodied Carbon
- Energy Use Intensity (EUI)
- Greenhouse Gas Emissions Intensity (GHGI)
- Thermal Energy Demand Intensity (TEDI)
- Cooling Energy Demand Intensity (CEDI)

For the Embodied Carbon reporting, projects shall conduct a cradle-to-grave life-cycle assessment to quantify embodied carbon emissions, determine how the proposed design compares to a baseline, and identify low- and no-cost opportunities (e.g., alternate insulation) to minimize these emissions through building design and materials selection. The methodology outlined in the most recent version of the Canada Green Building Council's Zero Carbon Building Standard shall be followed. Ensure this assessment is part of the project scope.

For the building performance reporting including, EUI, GHGI, TEDI and CEDI, the design team shall work with the Policy Steward and City PM to set project benchmarks to maximize building performance and minimize emissions. Setting, working with, and reporting on these benchmarks is intended to prepare The City of Calgary for future performance target updates. While meeting these benchmarks is currently aspirational, the reporting of the metrics is mandatory.

Solar Photovoltaic Ready and Electric Vehicle Capable

The building shall be designed to accommodate the future installation of solar photovoltaic (PV) systems. Electrical and structural capacity must be provided for the full roof area, where feasible, rather than only a partial area. The structural design shall include an allowance of at least 0.5 kPa to account for the additional load from a solar PV system, wind loads, associated snow drift, and live load for maintenance.

All parking areas shall be designed to be EV Capable. Electrical capacity and spare conduit(s) with pull wires shall be provided to the general parking area (conduit to each stall is not required). Space shall be reserved in the electrical panel, and transformer capacity considered, to enable the future installation of Level 2 electric vehicle chargers for at least 10% of parking spaces. Where block heaters are provided, the associated conduit shall be sized to also accommodate the future installation of Level 2 EV chargers for a minimum of 10% of total parking.

For indoor parking, electrical capacity and spare conduit(s) with pull wires shall be provided to the general parking area (conduit to each stall is not required). Space shall be reserved in the electrical panel to support the future installation of Level 1 EV chargers for the remaining 90% of parking spaces.

Refrigerant Management

Do not use refrigerants with an ozone depletion potential (ODP) greater than 0 or a global warming potential (GWP) greater than 50. Alternatively, calculate and comply with a facility weighted average impact per the guidance section.

Guidance

Facility Performance

Improving the energy efficiency of City buildings reduces the corporation's greenhouse gas emissions, lowers operating costs, and shrinks its overall carbon footprint. This is a high priority Minimum Sustainability Performance Requirement that directly aligns with the Calgary Climate Strategy. Project Sponsors have the option to work with the Policy Steward to select a performance level target that exceeds the minimum requirement. Provided options

are shown in Table 1 above and align with the emissions targets set in the Calgary Climate Strategy and demonstrate a potential performance target transition plan from today to 2050. Achieving carbon and energy optimization should be prioritized in the following order:

- Energy conservation: maximize passive design and use energy only when needed.
- Energy efficiency: the utilization and selection of efficient equipment and technology.
- Renewable and on-site energy generation.
- Renewable Energy Credits (RECs).
- Carbon offsets.

Energy conservation measures (ECMs) to be evaluated include, but are not limited to, the following (if in scope):

- Energy education opportunities influencing occupant behaviour.
- Consider both mitigation and climate adaptation measures when optimizing the building form. These include massing, solar orientation and exposure, window-to-wall ratio, heating-cooling balance, natural windbreaks, wind tunnelling, shading, etc.
- Building envelope (effective R and U-values including thermal bridging, infiltration mitigation, alternate construction methods and materials, etc.).
- As air-leakage testing becomes more common in the industry, consider strategies to improve building airtightness as a way to demonstrate performance beyond the minimum requirements. Ensure correct conversion factors are used between the model and testing results.
- Passive HVAC strategies (passive solar, natural ventilation, solar chimneys, thermal mass, etc.).
- HVAC systems (equipment setbacks, occupancy sensors, equipment efficiency ratings, variable frequency drives, heat recovery, dedicated outdoor air systems, re-use of waste heat, centralized heating / cooling plants, fuel-switching, connecting to district plants, heat pumps, improved sequences of operation, etc.).
- Domestic hot water (water setpoints, equipment efficiency ratings, water conservation approaches, on-demand hot water, pre-heat strategies etc.).
- Efficient lighting (including LED technologies, daylight harvesting strategies, occupancy / vacancy and daylight sensors, after-hours shutoff sweep, etc.).
- Plug-loads (smart power bars, scheduled after-hours shut-off, efficient equipment, etc.). Note that while energy savings from plug loads may not be admissible for certifications or code compliance, they can be counted toward SBP targets.
- On-site energy generation (solar PV, solar thermal, solar pre-heat, wind, cogeneration, trigeneration, geothermal, geo-exchange, energy storage, etc.).

Project types defined by The Policy as “New Construction” or “Addition or Major Renovation” are to follow the Building Energy Performance Compliance Path of the NECB Part 8. This compliance path requires the creation and submission of an energy model to comply with the NECB. The energy model is a valuable tool that is expected to be used to evaluate and select alternative ECMs during the early concept development stages of the design process. By conducting this analysis early in design, it allows for greater utilization of cost-effective passive and active strategies to achieve desired goals and objectives.

It is acknowledged that the NECB has limitations in terms of its modeling assumptions. The Policy Steward will consider exceptions on a case-by-case basis if the project seeks to take savings that are potentially not permitted by NECB modeling standards. Example case: the proposed building uses an air-source or ground-source central heat pump to supply heating and cooling and comparing against an NECB 2020 baseline. Table 8.4.4.7-B can be used for reference building system selection, instead of section 8.4.4.13. As section 8.4.4.13, in some cases, specifies using heat pumps instead of other standard heating systems in the reference building. This ensures the project is comparing the proposed system against a current typical City of Calgary building system.

The City of Calgary has committed to procuring offsite renewable electricity through The City's Green Electricity Contract. This contract helps The City work towards the emissions targets identified in the Calgary Climate Strategy. Performance Level 3 – Net Zero Carbon provides project teams a path to net zero operational carbon through the electrification of the building.

Given the unique constraints effecting affordable housing projects, it is recommended that these projects achieve at least a 25% reduction in greenhouse gas (GHG) emissions, energy consumption, and energy costs relative to Tier 1 of NECB 2020. Alternatively, projects may demonstrate a minimum 20% reduction in GHG emissions, energy consumption, and energy cost relative to Tier 1 of the National Building Code (NBC) 2020. These targets align with performance thresholds in funding and financing programs for affordable housing projects.

For projects defined by the Policy as "Interior Renovation" or "Other Building Project", the project scope will determine the applicable energy conservation measure (ECM) opportunities. These projects may or may not include an energy model within their scope. In such cases, the Policy Steward shall work with the Project Team to establish an energy efficiency strategy, which will serve as the performance targets and requirements for that specific project.

For project scopes that include the completion of an energy model, it is strongly recommended that the Sustainable Building Guidance Document Appendix: Consultant Scope of Work: Building Energy Consultant be followed. Energy model summary reports shall be shared with the Policy Steward throughout the project.

Reporting Metrics

The Embodied Carbon reporting should follow the current Zero Carbon Building Design Standard for calculation methodology. For projects pursuing LEED certification, provide the required calculations in accordance with the methodology specified in the applicable version of LEED for the relevant credit.

Future iterations of the MSPR's may include additional energy targets such as Embodied Carbon, Energy Use Intensity (EUI), Greenhouse Gas Emissions Intensity (GHGI), Thermal Energy Demand Intensity (TEDI) and Cooling Energy Demand Intensity (CEDI). To help inform decision making on potential future targets, project teams are to work with the Policy Steward to set benchmarks and report those metrics in the energy modeling report, if in scope.

BC Housing's publication, Guide to Low Thermal Energy Demand for Large Buildings, can be used as a reference for TEDI reduction strategies.

Consider registering the project with BenchmarkYYC to measure and track the year-over-year energy performance of the building.

Solar Photovoltaic Ready and Electric Vehicle Capable

Evaluate if a roof-mounted, ground-mounted, or building-integrated photovoltaic array is most suitable for the project to meet the PV ready requirement. This requirement applies to all areas within the project's overall boundary that the Project Team has identified as feasible for solar PV. One of the primary requirements is for the site to have a roof, ground, or building area that is not shaded by neighboring trees or structures. Contact a Policy Steward for help evaluating a project's suitability. Projects identified as feasible candidates for solar PV shall follow the guidance section below and provide at a minimum sufficient structural capacity, for roof mounted systems, and electrical and city network rough-ins.

At a minimum, evaluate and design for the following considerations:

Electrical

- Provide appropriately sized spare electrical conduit(s) with pull wires from the roof-mounted, ground-mounted, or building-integrated location to the electrical room for a future PV system. The electrical engineer shall size the conduit for the future PV system based on the available and approximate PV system size that will fit within this area.
- Reserve space in an appropriate electrical panel for future solar interconnection.
- Reserve space outside or in the electrical room for future inverters, transformers, and any other equipment needed for a future PV system.
- Provide a City network connection to the planned inverter location.
- Consider allotting space for future battery storage units if the PV system size will produce electricity exceeding demand. These could be interior or exterior batteries.
- For facilities with City fleet parking, consider providing spare electrical conduit(s) with pull wires to the general parking area, as well as capacity in an electrical panel for future installation of Level 2 electric vehicle chargers for 100% of the fleet vehicles.

Structural

- If required, locate permanent rooftop fall arrest systems along perimeter areas to maximize roof area available for solar PV panels.
- Design the building with an allowance of 0.5 kPa structural capacity to accommodate the additional load from a solar PV system, wind loads, associated snow drift and live load for maintenance.
- Design a durable roof and avoid roofs that are easily damaged by weight or foot traffic.
- Provide rigid board with a minimum of 10mm thickness under the roofing materials to support the roofing membrane.
- Select a roof product with an anticipated life-expectancy that aligns with or exceeds the anticipated PV system service life of 25+ years.
- Consider standing seam metal roofs where appropriately sloped, with orientation to maximize solar potential. Standing seam metal roofs can provide reduced solar installation costs through savings on the panel mounting systems.

Mechanical

- Group mechanical equipment, exhaust, flue pipes, penthouses, and other obstructions away from more beneficial solar potential locations to maximize unobstructed open roof space.
- If including interior electrical equipment, such as inverters or transformers, consider additional cooling.
- If battery storage is included, provide the required ventilation for the battery storage room.

Refrigerant Management

Follow the requirements and guidance of the most recent version of LEED for the applicable credit. The intent of this requirement is to reduce or eliminate atmospheric ozone depletion and global warming impact caused by project refrigerants. If pursuing the alternate approach of a weighted average impact calculation, follow the methodology described in the LEED referenced guide for the applicable credit.

Deliverables

Facility Performance

All energy modeling summary reports and NECB compliance documentation is to be submitted to the City Project Manager and the Policy Steward. See the Sustainable Building Guidance Document Appendix: Consultant Scope of Work: Building Energy Consultant document for a more detailed description on scope and deliverables. “Interior

Renovation" projects that include lighting in scope are to submit lighting calculations to the City Project Manager and the Policy Steward.

Reporting Metrics

Project teams must provide an embodied carbon or life cycle assessment report to be submitted to the City Project Manager and the Policy Steward. The report must use the Zero Carbon Building Standard (current version) Embodied Carbon Reporting Template, meet the documentation requirements of the most recent LEED credit, or follow another format approved in advance by the Policy Steward.

Energy Use Intensity (EUI), Greenhouse Gas Emissions Intensity (GHGI), Thermal Energy Demand Intensity (TEDI) and Cooling Energy Demand Intensity (CEDI) and any other relevant metrics are to be submitted to the Policy Steward, if energy modeling is in scope. The metrics shall be reported in all energy modeling summary reports for both current and 2050s temperature projections.

Solar Photovoltaic Ready and Electrical Vehicle Capable

Provide the City Project Manager and the Policy Steward infrastructure design details, parameters and assumptions that will allow for the installation of a future solar PV system and electrical vehicle charging stations, if not already included in scope. Details shall be clearly indicated on design and record drawings.

Refrigerant Management

Provide to the City Project Manager and the Policy Steward: Refrigerant product datasheets for used refrigerants. If the calculation method was used, provide calculations demonstrating GWP and ODP of project refrigerant.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Climate Resilience, Economic Resilience)
- Calgary Climate Strategy – Pathways to 2050
- Calgary Environment Strategy
- Calgary Corporate Energy Plan (2016-2026)

Climate Adaptation

Sustainability Principle Alignment

- Design for resilience to changing economic, social, and environmental conditions.

Rationale

Infrastructure is the backbone of a city; it supports where we live and work and how we move around. When infrastructure is damaged or becomes unsafe or inaccessible, critical services become disrupted. We must integrate appropriate climate resilience measures within all aspects of planning, design, and operation of our built environment to ensure City infrastructure assets can withstand and respond to the impacts of climate change.

Requirement

Assess climate risk and resilience as directed by the Climate Risk Assessment Framework. Project Teams must undertake a Climate Risk and Resilience Assessment (CRRA) or a Climate Risk Screening Assessment (CRSA) depending on the project requirements outlined within the Climate Risk Assessment Framework and Process Guide. Completing this requirement supports the assessment requirements of the LEED Integrative Process, Planning, and Assessments Prerequisite IPp1: Climate Resilience Assessment.

Incorporate, at a minimum, the Required Strategies below, which address climate hazards identified as high risk for Calgary. These strategies align with and compliment the Design Guidelines for City of Calgary Funded Buildings (2020) and other City of Calgary and Civic Partner design requirements.

Extreme Heat and Increased Average Temperatures

- Design mechanical and building envelope systems to accommodate future climate design conditions ensuring that those systems can maintain safe and comfortable indoor conditions throughout the life of the building. Projects shall use design parameters representing 2050s temperature projections or those representing a 2°C warming above baseline climate change scenario.
- For regularly occupied buildings without mechanical cooling, provide safe, high quality, and comfortable spaces by limiting overheating through design. Ensure that the interior temperature of spaces without mechanical cooling does not exceed 80% acceptability limits for naturally conditioned spaces as defined in ASHRAE 55 (current) for more than 20 hours in summer months for buildings with vulnerable populations, or 200 hours for all other building types. Conduct passive cooling analysis to verify performance is achieved for current and 2050s temperature projections.

Severe Storms and Short Duration High Intensity Rainfall

- Design building envelope components and assemblies to withstand hail impact. Provide rigid board with a minimum of 10mm thickness under roofing materials.
- Design building and site stormwater management systems to accommodate 2050s rainfall projections. Further details on site requirements are provided in the Sustainable Sites section of this document.

Wildfire Smoke

- For air handling units serving regularly occupied areas, provide air filters with a minimum efficiency reporting value of 80% (MERV 13) based on ASHRAE 52.2.

River Flooding (applicable to projects located within the Flood Hazard Area)

- The first floor of the building must be constructed at or above the designated flood elevation (or at least 0.3 meters above the highest grade existing on the street abutting the site for projects in an overland flow area).
- All electrical and mechanical equipment within a building must be located at or above the designated flood elevation (or at least 0.3 meters above the highest grade existing on the street abutting the site for projects in an overland flow area).

- All sewer connections must include sewer backflow preventers at the point of entry into the building on the main discharge sewer line.

Drought

- Landscape design to be of drought tolerant, native, and adaptive species plantings, with no areas of exposed soil. Further details on landscape requirements are provided in the Sustainable Sites section of this document.
- Deep foundations and foundation wall system design and material selection to consider resilience to contraction and decreased integrity of soil material and backfill under 2050's projected drought conditions.
- Deep and shallow utilities design and material selection to consider resilience to contraction and decreased integrity of soil material and backfill under 2050's projected drought conditions.

Guidance

The climate resilient design strategies presented here are not mandatory, however, it is recommended that project teams consider their applicability to address climate hazards on projects. The following is not an exhaustive list, and teams are advised to refer to the resilience recommendations resulting from the Climate Risk Assessment process for the project.

Extreme Heat and Increased Average Temperatures

- Design a high performance, thermally broken envelope with a robust air barrier, high R-value external insulation, and minimal fastening points and penetrations.
- Design to consider high performance envelope strategies including window-to-wall ratios, glazed area size, placement, coating, U-value, internal and external shading, insulation, air tightness, and installation methods.
- Exterior design to consider use of vegetation, natural airflow patterns, and high albedo hardscape and roofing materials to reduce ambient heat island effect.
- Install high performance glazing characterized by one or more of the following features: triple-glazed, low solar heat gain coefficient coatings, photochromic glass, inert gas fill, insulated frames, low-conductivity edge seals.
- Design mechanical systems to allow for expansion or alteration e.g., piping, coils, ductwork.
- Mechanical cooling systems serving regularly occupied spaces (including dwelling units) should be able to maintain temperatures at or below 26°C with less than 100 unmet cooling hours per year.
- Design mechanical systems serving indoor aquatics/pools to manage increased humidity levels and prevent moisture within HVAC and electrical equipment.

Severe Storms and Short Duration High Intensity Rainfall

- Design for robust moisture management throughout the envelope and roof systems, including considerations for drainage, foundation moisture barriers, protection of air intakes, and placement of exterior openings and penetrations.
- Install moisture sensors to detect water and/or water vapour in vulnerable areas: elevator pits and machine rooms, mechanical and electrical rooms, within HVAC and electrical equipment, and in underground parkades.
- Install overflow scuppers and secondary overflow drainage system as additional drainage options from roof (after regular roof drains and back-up roof drains).
- Reverse-grade (drive-down) driveways should have a peak elevation 0.3 meters above the adjacent street grade, to prevent stormwater from entering the garage or lower levels during an extreme storm.

Wildfire Smoke

- Consider designing mechanical systems to accommodate temporary installation of higher performance air filters (e.g., MERV 16) during instances of poor outdoor air quality. Air systems which service areas of refuge should have dedicated supply and be designed so air systems can continue pressurizing spaces during a smoke event.

River Flooding

- The designated flood elevation means the theoretical level, indicated on the Floodway/Flood Fringe Maps, to which water would rise in the event of a flood of a magnitude likely to occur once in one hundred years.
- The Flood Hazard Area consists of the floodway (river channel and adjacent lands that provide a pathway for flood waters), flood fringe (lands that would be inundated by floodwater), and overland flow area (lands inundated by shallow overland floodwater) in a once in one hundred year flood.
- Development located outside of the Flood Hazard Area but within the 1:200 Flood Inundation Area should consider incorporating the flood resilient measures noted in the Requirement section above.
- Consider providing flood relief ports in below grade levels of buildings to alleviate pressure and excessive lateral loads on exterior walls in the event of flooding.
- Specify foundation concrete mix designs to withstand water penetration.
- Below grade materials should be capable of withstanding direct and prolonged contact with flood waters without sustaining significant damage and be resistant to mold.
- Consider setting the elevator homing level (typically ground/main floor) above designated flood elevation.
- Consider a sump-pump with a back-up power source installed in the lower levels of the building.
- Consider water alarms installed in basements to alert of any water back-ups.

Projects pursuing LEED certification are encouraged to pursue Sustainable Sites Credit SSc4 Enhanced Resilient Site Design for the project, by incorporating bet practices for at least two high priority hazards: Drought, Extreme Heat, Flooding, Hail, Winter Storms.

Deliverables

In the project schematic design report, include a section discussing how the basis of design will address the mitigation of key climate risks. If a schematic design report is not included in the project scope, provide an alternative form of documentation from the coordinating professional of record.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Climate Resilience)
- Calgary Climate Strategy – Pathways to 2050
- Calgary Environment Strategy
- Calgary Flood Resilience Plan
- Calgary Drought Resilience Plan
- Calgary Stormwater Management Strategy

Commissioning

Sustainability Principle Alignment

- Optimize for energy efficiency and conservation, specifically through passive design, thereby reducing and avoiding GHG emissions.
- Address occupant comfort, provide access, and maintain social wellbeing in design and operations.
- Design for resilience to changing economic, social, and environmental conditions.

Rationale

Commissioning of building systems is necessary to ensure that they operate as intended and that The City is getting full value on the infrastructure it has invested in. When buildings are not properly commissioned, building systems can use significantly more energy than they were designed to, they can incur increased maintenance costs, and they may need early lifecycle replacements. This applies to building energy consuming systems and the building envelope.

Requirement

Complete enhanced commissioning for the major energy-consuming systems, energy generation systems and the building envelope as per the Fundamental Commissioning prerequisite and Enhanced Commissioning credit defined in the most recent version LEED reference manual.

Guidance

Commissioning requirements are referenced in relation to LEED as this is the standard The City has the most experience with. Commissioning activities are to be completed to a LEED standard even if the project is not pursuing LEED certification.

A commissioning provider should be appointed to coordinate and complete commissioning activities. The commissioning provider is responsible for hiring any additional commissioning agents required to complete the commissioning of building systems.

The commissioning provider should be an independent third-party consultant. It is recommended that the City Project Manager use the Sustainable Building Guidance Document Appendix: Consultant Scope of Work: Commissioning Provider document.

The following systems, if in scope, should be included in enhanced commissioning (some systems are beyond LEED requirements):

- Mechanical (HVAC, DHW, plumbing),
- Electrical (lighting, electrical including service and distribution),
- Renewable energy systems,
- Building envelope, including air leakage-requirements,
- Controls for all the above, and
- Other project-specific systems, such as arena refrigeration systems, aquatic systems, data centre equipment, security systems, power generation systems, etc.

Deliverables

Deliverables defined in the LEED Fundamental and Enhanced Commissioning prerequisite and credit are to be submitted to the City Project Manager and the Policy Steward.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Climate Resilience, Economic Resilience)
- Calgary Climate Strategy – Pathways to 2050
- Calgary Environment Strategy
- Calgary Corporate Energy Plan (2016-2026)

Indoor Water Use Reduction

Sustainability Principle Alignment

- Optimize for energy efficiency and conservation, specifically through passive design, thereby reducing and avoiding GHG emissions.
- Reduce potable water use through conservation and efficiency measures.
- Design for resilience to changing economic, social, and environmental conditions.

Rationale

As Calgary continues to grow so does the demand for safe reliable water. This continued growth is unsustainable and puts pressure on Calgary's water resources. This resource must be conserved so Calgary can continue to provide clean water for future generations.

In addition to the consumption of the water utility itself, the treatment and distribution of potable water around the city is one of The City of Calgary's largest electricity consumers which costs taxpayers millions of dollars annually. Reducing potable water consumption conserves water and energy resources and delays the need for infrastructure expansion.

Requirement

The following requirements were adapted from the LEED rating system. For non-process plumbing fixtures, achieve a minimum overall indoor water use savings of 35% in comparison to a fixture and fitting baseline consumption defined by the applicable or most recent LEED rating system.

Do not install plumbing fixtures exceeding the following flow/flush rates:

- Water closets = 4.8 L / flush
- Urinals = 0.5 L / flush
- Lavatory faucets = 1.9 L / min
- Kitchen faucets = 5.7 L / min
- Showers = 5.7 L / min

For process equipment:

- All dish washers and clothes washers shall be Energy Star rated.
- Do not use once-through cooling with potable water for any equipment or appliances that reject heat.

Guidance

Calculate the water use reduction per the LEED rating system prerequisite and credit for indoor water use fixtures and fittings. Consider the use of sensor / motion controls for all water closets, urinals, and lavatory faucets. Evaluate battery operated or hard-wired sensors considering the impact on capital and operating costs.

If considering the use of waterless urinals be sure to discuss their use with the building operations team prior to including them in design. If incorporating waterless urinals, be sure to design appropriately and consider locating urinals downstream of lavatory faucet drains and providing appropriately sloped drainage pipes, etc.

Where appropriate, provide water bottle refill stations to reduce the use of disposable water bottles. This includes all water fountain locations at a minimum.

Deliverables

Submit water fixture product data sheets and completed water use calculations demonstrating compliance with the above requirements to the City Project Manager and the Policy Steward.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Climate Resilience)
- Calgary Climate Strategy – Pathways to 2050
- Calgary Environment Strategy

Sustainability Principle Alignment

- Reduce potable water use through conservation and efficiency measures.
- Encourage the integration of green stormwater infrastructure.
- Maintain and improve biodiversity.
- Design for resilience to changing economic, social, and environmental conditions.

Rationale

Stormwater Management has become an increasingly important priority for The City of Calgary. Heavy rain and flooding have been identified as one of Calgary's high risk climate hazards. Well planned stormwater management helps reduce the burden on The City's stormwater infrastructure, protects properties, transportation corridors, our rivers, and our streams.

Native, drought tolerant and climate adapted landscaping aligns with existing City objectives by supporting local biodiversity, conserving potable water resources, and supporting the wellbeing of building users and citizens through access to nature. When low impact development principles are integrated, landscaping can also be an effective asset to help manage stormwater.

Requirement

Stormwater Management

Retain the runoff from typical rainfall events on-site. The rainwater volume must be retained (e.g., through infiltration, evapotranspiration, or collection and reuse) using low-impact development (LID) and green infrastructure (GI) practices. Satisfy one of the following two compliance options:

Option 1 - Percentile of Rainfall Events

- In a manner best replicating natural site hydrology processes, retain the runoff from the 90th percentile rainfall event on-site.

Option 2 - Natural Land Cover Conditions

- Calculate the difference between the annual runoff volume under the proposed design conditions and the annual runoff volume under natural land cover conditions that existed prior to any disturbance. Retain on-site the increase in runoff volume.

Demonstrate that the site stormwater management systems meet all stormwater management requirements for both current and future (2050s) projected climate conditions.

Sustainable Landscaping

Design facility landscaping in a manner that reduces or eliminates potable water consumption for irrigation, manages stormwater on site, minimizes maintenance, encourages biodiversity, and provides access to natural areas for those that use City facilities. At minimum, projects will:

- Reduce the project's irrigation water requirement by at least 50% from the site's annual theoretical irrigation requirement (as per methodology defined in LEED).
- Only incorporate vegetation that is native and adaptive to the project's ecoregion and is resistant to drought, hail, and damage from winter storms.
- Only incorporate soils that are not sourced from prime farmland or greenfield sites and contain no sphagnum peat moss amendments.

Guidance

Stormwater Management

Option 1 - Percentile of Rainfall Events

- The 90th percentile rain event refers to a rainfall amount that is greater than or equal to 90% of all recorded rainfall events over a given period. In other words, only 10% of rain events are heavier than this threshold. Project teams are required to calculate the 90th percentile rainfall event based on a daily rainfall amounts over a minimum 30-year period.

Option 2 - Natural Land Cover Conditions

- This approach may be useful for sites with unique natural land hydrology or limited infiltration. Natural land cover refers to the original vegetation and soil conditions that existed in an area before any development or human activities altered the landscape. Unlike Option 1, specific percentile events are not required for this option. Project teams must use a full range of hydrologic rainfall events over a 10-year period or develop an average representative rainfall year for use in calculating annual runoff volumes.

Teams must calculate the runoff volume using the modified rational method, the Technical Release 55 (TR-55) method, Natural Resources Conservation Service method, the Storm Water Management Model (SWMM), or other runoff methodologies as approved by the Policy Steward. Zero lot line projects (where the building footprint aligns or nearly aligns with the site limits) or other projects with site conditions that constrain on-site stormwater retention should contact the Policy Steward to establish appropriate stormwater management goals.

These requirements are in addition to the standard stormwater management requirements (stemming from the Stormwater Bylaw and other regulations) that apply to all projects within The City of Calgary. Review stormwater designs with a climate adjusted intensity-duration-frequency (IDF) curve or climate adjusted rainfall volumes. Design site stormwater systems to 2050s projected extreme rainfall and IDF curves. Updated IDF curves and rainfall volumes can be provided by a Policy Steward.

Low-impact development and green infrastructure strategies to be considered include:

- Rain gardens and bioretention gardens
- Soil cells / soil vaults
- Vegetated swales
- Exfiltration trenches
- Rainwater harvesting
- Permeable pavement

Sustainable Landscaping

Project teams must either eliminate the need for permanent irrigation or design landscaping and irrigation systems to reduce irrigation water requirement by at least 50% from the site's annual theoretical irrigation requirement (TIR). Reductions can be achieved through plant species selection, irrigation system efficiency, and alternative water sources. Reductions must be demonstrated as per the TIR methodology outlined by the U.S. Environmental Protection Agency.

Strategies to achieve sustainable landscaping requirements can include but are not limited to the following:

- Install Drought-Tolerant and Native Vegetation: Drought-tolerant and native plants are more capable of surviving in Calgary's dry climate without the need for added irrigation. This practice can reduce water use, water utility costs, capital cost (if irrigation systems are no longer required), and maintenance fees while improving local biodiversity benefits. Refer to the Parks website for a list of preferred trees.

- Eliminate Spray Irrigation and Use Smart Irrigation (if irrigation is required): Drip irrigation or soaker hoses should be utilized if irrigation is required for water efficiency. Consider smart irrigation using moisture sensors with automatic or timed controllers adjusting the schedule to only water in evenings or early mornings.
- Stormwater Management Through Site Grading and Green Stormwater Infrastructure: Design site landscaping in such a way that rainwater is transported to planter beds and vegetation through site grading and green stormwater infrastructure. Consider the use of rain barrels if appropriate for the project type. This approach can reduce irrigation needs, support healthier and visually appealing vegetation, and help retain stormwater onsite to lessen impacts on downstream City infrastructure, rivers, and streams.
- Preserve Existing Trees: When feasible, preserve and protect existing trees. Mature trees provide many benefits including stormwater management, promoting biodiversity, reducing heat island effect, and providing enjoyable spaces for facility users. Follow the requirements and guidance provided in the City's Tree Protection Plan.
- Support Local Fauna: Ensure selected vegetation supports biodiversity and provides habitat, food, or otherwise supports local animals, birds, and insects/pollinators. Providing diversity in species, diversity in vegetation type (tree, shrub, or ground cover), and providing flowering plants will improve biodiversity.
- Minimize or Eliminate Sod / Turf Grass: Reduce the use of sod / turf grass except for use-specific applications such as sports and playing fields. Limiting the use of sod / turf grass and prioritizing other vegetation, including native grasses and ground-coverage, such as mulch and crushed rock, can reduce water use, reduce maintenance, improve overall year-round aesthetics, and promote biodiversity.
- Design landscaping to reduce urban heat effects on site and in buildings: Leverage landscaping to help reduce the overall urban heat island effects on the site. Consider landscape design, plant size, leaf area density, and canopy at maturity. Reducing heat island effect can help reduce heat gain within the building.
- Use landscaping to help reduce solar heat gain in buildings: The placement and selection of trees can have a significant impact on the overall heat gain within a building. Placing deciduous trees on the south and west side of buildings that provide shading in summer, but allow for heat gain in winter, and can contribute to reducing the energy demand and emission from a buildings HVAC system.
- Consider the use of soil cells to support healthy flora and to improve stormwater management.

Refer to the Calgary Parks and Open Spaces Development Guidelines and Standard Specifications: Landscape Construction and The City of Calgary Drought Resilience Plan for more information.

Bird-Friendly Design

Incorporating bird-collision deterrence into site and building design helps protect biodiversity by preventing avoidable harm to migratory and local bird populations.

- Consider specifying glass with a maximum threat factor of 30, as defined in the American Bird Conservancy's Threat Factor Database. This is especially critical for glass within 15 meter of grade level, within 6 meters of a green roof, or in other locations that may present special risk to birds (e.g., glass in railings, balustrades, overhangs, or canopies).

Refer to the City's Bird-Friendly Design Guidelines for more information.

Deliverables

Stormwater Management

- Preliminary sizing and layout of the site stormwater management features (based on project-specific hydrology) should be completed during project planning and summarized in the pre-design report.

- Calculations demonstrating compliance with the stormwater retention requirements shall be competed during design development and included in the Design Development report and updated at the completion of construction documents.

Sustainable Landscaping

- A description of the sustainable landscaping strategies proposed for the project is to be included in the schematic design report, or in another form of project design documentation.
- A letter from Landscape Architect confirming that the proposed vegetation is native or adaptive to the ecoregion, drought resilient, and resistant to damage from hail and winter storms is to be submitted at the conclusion of design development.
- Calculations demonstrating compliance with the irrigation water reduction requirements shall be competed during construction documents and submitted to the Project Management and Policy Steward.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Climate Resilience)
- Calgary Climate Strategy – Pathways to 2050
- Calgary Environment Strategy
- Calgary Stormwater Management Strategy
- Calgary Drought Resilience Plan

Multimodal Access

Sustainability Principle Alignment

- Address occupant comfort, provide access, and maintain social wellbeing in design and operations.
- Select sites that have access to alternative transportation and consider the impact of site selection on the environment, people, and the building.
- Design for resilience to changing economic, social, and environmental conditions.

Rationale

Planning and developing infrastructure with improved multimodal access is intended to maximize site and building access for Calgarians using low carbon forms of transportation. Prioritizing transportation alternatives that reduce greenhouse gas emissions and the burden on City infrastructure reduces the need for costly infrastructure buildouts and can increase vibrancy in an area by encouraging pedestrian and cyclist traffic. Multimodal access also promotes an active and healthy lifestyle for Calgarians by encouraging walking and cycling.

Requirement

Design site access in a manner that prioritizes pedestrians, cyclists, and public transit users. Ensure these groups can access the site and facility in a convenient, efficient, and safe manner.

Guidance

Projects with landscaping, hardscaping, site works, interior layout and/or building access points in scope can best utilize multimodal access. Available approaches to satisfying this MSPR may be limited depending on existing site conditions, existing transportation networks and the project scope.

Strategies to achieve this requirement may include, but are not limited to:

- Facility Entrance Location: Where possible, locate primary entrances or access pathways in locations that provide convenience from transit stops or pedestrian / cycle corridors adjacent to or near the project site.
- Pedestrian Accommodating Parking Lots: Where possible, design sites in a manner that avoids or minimizes pedestrian traffic through parking lots but does not detour pedestrians around large parking areas. If pedestrians must pass through a parking lot or other automobile-orientated area to access the building, ensure a visually distinct and continuous pedestrian pathway is provided through or around the area to promote safe and comfortable pedestrian passage.
- Pedestrian, Cyclist and Automobile Separation: Where possible, provide clear separation between pedestrian and cyclist spaces and automobile spaces to reduce audible, visual, vehicle exhaust and safety impacts on pedestrians and cyclists. This can be achieved using barriers such as trees, bicycle parking, vegetation, other landscaping, etc.
- Shower Facilities: Where possible, providing change rooms and showers for pedestrians and cyclists accessing the site.
- Bicycle Storage and Maintenance: Where possible, provide short-term and long-term bicycle storage within walking distance of a main entrance and consider including a permanent and secure bicycle repair station.
- Limiting the number of parking stalls: Where possible, encourage the use of alternate transportation by reducing the amount of parking available.
- Parking Fees: Consider implementing a daily, monthly, or annual parking fee.
- Transportation Demand Assessment: Consider assessing the number of vehicle miles traveled and carbon emissions associated with the regular building occupants' travel to and from the building.

Deliverables

Include multimodal access requirements in the project's Owner's Project Requirements. In the project schematic design report, include a section discussing how multimodal access was considered and achieved.

If a schematic design report is not included in the project scope provide another form of design documentation from the coordinating professional of record confirming how multimodal access was included in the design.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Climate Resilience)
- Calgary Climate Strategy – Pathways to 2050
- City of Calgary Council Policy TP010 – Pedestrian Policy
- City of Calgary Council Policy TP011 – Bicycle Policy
- City of Calgary Council Policy TP021 – Complete Streets Policy
- Calgary Transportation Plan

Waste Diversion

Sustainability Principle Alignment

- Design for resilience to changing economic, social, and environmental conditions.
- Divert waste from landfills during construction, occupancy, and demolition.

Rationale

Waste diversion from the landfill conserves finite and costly landfill space, reduces risks to the environment and water table, and reduces methane (a potent greenhouse gas) and other emissions from landfill operations. Recycling, composting and the reuse of materials can help reduce the need to manufacture or import new materials, conserving resources. Composting can also reduce the quantity of fertilizer production which is often an energy intensive process.

Requirement

During construction and demolition work, divert at least 80% of non-hazardous materials from landfill to be recycled, composted, or otherwise reused. Create and follow a Construction and Demolition Materials Management Plan for all projects.

For projects pursuing LEED certification, follow the requirements and guidance of the most recent version of LEED for the applicable credit.

Guidance

A Construction and Demolition Materials Management Plan should be created by the project's General Contractor and followed throughout the construction process. Material tracking and reporting is the responsibility of the General Contractor.

Waste includes all non-hazardous construction and demolishing materials including packaging waste from materials brought to site. Consider working with material and product suppliers that deliver materials to site with reusable packaging that can be taken-back by the manufacturer for reuse.

Deliverables

A Construction and Demolition Materials Management Plan is to be created and submitted by the General Contractor to the City Project Manager and the Policy Steward prior to the start of construction.

Waste diversion tracking sheets identifying overall diversion rates, and that break out each shipment / delivery with associated material streams, diversion rates and diversion destinations shall also be provided to the City Project Manager and the Policy Steward.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Economic Resilience)
- Calgary Climate Strategy – Pathways to 2050
- Calgary Environment Strategy

Sustainability Principle Alignment

- Design for resilience to changing economic, social, and environmental conditions
- Address occupant comfort, provide access, and maintain social wellbeing in design and operations.

Rationale

The selection of low-emitting building materials can reduce the concentrations of chemical contaminants within the indoor environment and protect the health, productivity, and comfort of contractors and building occupants. Improved indoor air quality practices during construction supports a safe and healthy environment for the construction team as well as future occupants. Managing indoor air quality during construction also protects building HVAC equipment from excessive dust, debris, and contaminants during building start-up.

Requirement

Specify and install permanently installed low-emitting building materials within the building that meet the following requirements:

- At least 90% of all paints and coatings meet the volatile organic compounds (VOC) emissions evaluation.
- At least 90% of all flooring meets the VOC emissions evaluation.
- At least 90% of all ceilings meet the VOC emissions evaluation.
- At least 80% of all adhesives and sealants meet the VOC emissions evaluation.
- At least 80% of all walls meet the VOC emissions evaluation.
- At least 80% of all insulation meets the VOC emissions evaluation.
- At least 80% of all composite wood meets the formaldehyde emissions evaluation.
- At least 80% of all furniture in the project scope of work meets the furniture emissions evaluation or VOC emissions evaluation criteria.

In addition to the incorporation of low-emitting materials, the prime contractor shall develop and implement a Construction Management Plan for the project with practices that address all the following:

- Prohibits smoking except in designated smoking areas
- Protects workers from extreme heat
- Keeps contaminants out of the HVAC system
- Keeps sources of contaminants out of the building
- Prevents circulation of contaminated air
- Housekeeping to maintain a clean jobsite
- Sequencing construction activities to reduce air quality problems

For projects pursuing LEED certification, follow the requirements and guidance of the most recent version of LEED for the applicable credit.

Guidance

Calculations for paints and coatings can be conducted by volume, cost, or surface area. Calculations for adhesives, and sealants can be conducted by volume or cost. Calculations for flooring, walls, ceilings, insulation, and composite wood can be conducted by cost or surface area. Calculations for furniture must be completed by cost, area, or number of units. For all categories, inherently non-emitting, salvaged or reused materials are deemed to comply with the requirements.

The Construction Management Plan should align with the approach and considerations identified in the Sheet Metal and Air Conditioning National Contractors Association (SMACNA)'s IAQ Guidelines for Occupied Buildings

Under Construction, 2007 (chapter 3) and Occupational Health and Safety Act (OSHA) prevention guidance for preventing heat-related illness.

Deliverables

Project construction documents shall include requirements for low-emitting materials. At outset of the project, the Policy Steward may identify the requirement for the contractor to report on one or more of the relevant material categories to demonstrate compliance.

Prior to construction, the prime contractor shall develop and submit a Construction Management Plan outlining how the contractor will maintain good indoor air quality. The prime contractor shall also provide construction photos demonstrating compliance with the Construction Management Plan taken intermittently throughout construction.

Supporting Council Priorities, City Policies and City Strategies

- Resilient Calgary: Council's Strategic Direction 2023-2026 (Social Resilience)
- City of Calgary Administration Policy HR-037 – Health and Wellness Policy

4. Schedule of Sustainability Deliverables

This section is intended to outline sustainability deliverables over the full stage gate process or the project execution phase for projects that don't follow The City's stage gate procedure. These reflect the key deliverables associated with the Minimum Sustainability Performance Requirements (MSPRs). Projects pursuing LEED or other green building certification will include additional deliverables.

- Pre-Project
    - Sustainability objectives with applicable MSPRs, certification requirements and Climate Adaptation measures are agreed to with the Policy Steward and included in the Project Brief/Pre-Design report
    - Preliminary sizing and layout of the site stormwater management features (based on project-specific hydrology) should be completed during project planning and summarized in the pre-design report
    - Climate Risk and Resilience Assessment (CRRA) or Climate Risk Screening Assessment (CRSA) report for projects completing this work as part of planning
- Schematic Design
    - Narrative within the Schematic Design report discussing how building massing and orientation was considered to positively impact the achievement of sustainability goals.
    - Narratives within the Schematic Design report that describe the project-specific strategies that will be incorporated to achieve the requirements for climate resilience, indoor water use reduction, multimodal access, stormwater management, and sustainable landscape.
    - Preliminary Energy Modeling Report with parametric analysis that assess various design options prioritizing passive strategies first
    - Green building certification strategy (if applicable)
    - SBP Compliance Workplan (refer to Appendix: Consultant Scope of Work: Sustainable Building Consultant)
- Design Development
    - Updated Energy Modeling Report, including analysis of specific design options that meet target
    - Preliminary Whole Building Life Cycle Assessment report
    - Draft Commissioning Plan and commissioning agent design reviews
    - Refined details on stormwater management with performance calculations
    - Indoor water use reduction performance calculations
    - Refrigerant management strategy and calculations (if applicable)
    - Updated green building certification strategy (if applicable)
    - SBP Compliance Workplan update
    -
- Contract Documents
    - Final Energy Modeling Report and all deliverables, including reporting requirements
    - Updated Whole Building Life Cycle Assessment report
    - Landscape and Irrigation Drawings and specifications to meet requirements
    - Details on stormwater management infrastructure and updated performance calculations
    - Low-emitting Materials Requirements captured in contract documents
    - Contract documents identifying water efficiency fixtures
    - Refrigerant specifications identified on contract documents
    - Final Commissioning Plan
    - SBP Compliance Workplan update

- Prior to Construction
    - Construction Management Plan (by contractor)
    - Construction and Demolition Materials Management Plan (by contractor)
    - All design phase documentation for green building certification (by consultant)
- During Construction
    - Regular sustainability performance reporting:
        - Construction and Demolition Materials Management Plan status
        - Construction Management Plan status
        - Low-emitting Materials status
    - Construction Commissioning reports
- Construction Completion
    - Updated Energy Modeling Report, as-built conditions (by consultant)
    - Low-emitting materials reporting
    - Final Construction and Demolition Materials Management numbers
    - Final commissioning report, including post occupancy inspections, and associated documents.
    - All documentation created for green building certification (if in scope) within 12 months of substantial completion (by consultant with input from contractor)
    - Final SBP Compliance Workplan

5. References

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Appendix: Consultant Scope of Work – Building Energy Consultant

Appendix: Consultant Scope of Work – Commissioning Provider

Appendix: Consultant Scope of Work – Sustainable Building Consultant

Appendix: Consultant Scope of Work - Whole Building Life Cycle Assessment

Refer to Other Resources at http://www.calgary.ca/greenbuildings for appendices.