Sustainable Building

Guidance Document

Version 2.0 - January 2024

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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. Where applicable based on project scope, 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/greenbuilding

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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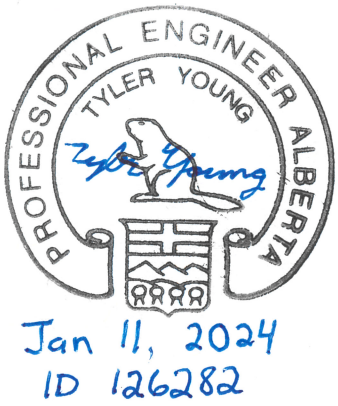

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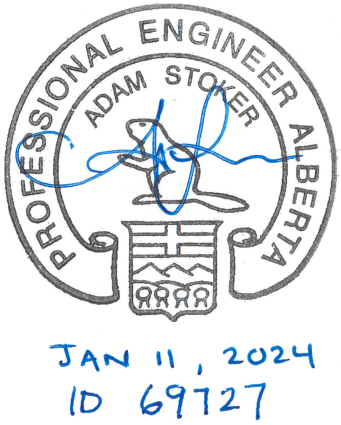

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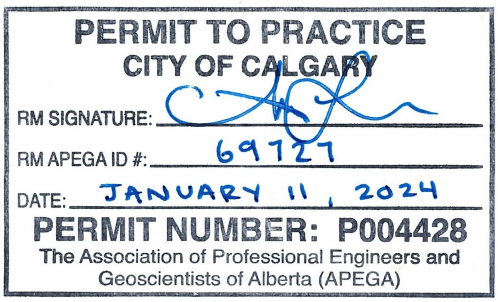


Scope of this Document

This document is a job-aid 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:

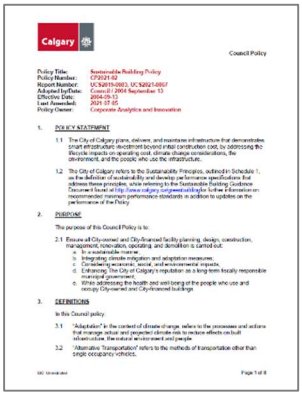
- A description of the key pre-project actions for the Project Sponsors, Project Planners and Project Managers in collaboration with The Policy Steward for the setting of sustainability targets for delivery.
- Details on the Minimum Sustainability Performance Requirements to be reviewed for all capital 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 Sustainable Building Consultant, Building Energy Consultant, and Commissioning Authority (included as a separate appendix).

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

Policy Title: Sustainable Building Policy
Policy Number: CP2021-02
Report Number: UCS2019-0853, UCS2021-0857
Adopted by/Date: Council / 2004 September 13
Effective Date: 2004-09-13
Last Amended: 2021-07-01
Policy Owner: Corporate Analytics and Innovation

1. POLICY STATEMENT

1.1 The City of Calgary plans, delivers, and maintains infrastructure that demonstrates smart infrastructure investment beyond initial construction cost, by addressing the lifecycle impacts on operating cost, climate change considerations, the environment, and the people who use the infrastructure.

1.2 The City of Calgary refers to the Sustainability Principles, outlined in Schedule 1, as the definition of sustainability and develop performance specifications that address these principles, while referring to the Sustainable Building Guidance Document found at http://www.calgary.ca/greenbuilding for further information on recommended minimum performance standards in addition to updates on the performance of the Policy.

2. PURPOSE

The purpose of this Council Policy is to:

2.1 Ensure all City-owned and City-financed facility planning, design, construction, management, renovation, operating, and demolition is carried out:
a. In a sustainable manner;
b. Integrating climate mitigation and adaptation measures;
c. Considering economic, social, and environmental impacts;
d. Enhancing The City of Calgary's reputation as a long-term fiscally responsible municipal government;
e. While addressing the health and well being of the people who use and occupy City-owned and City-financed buildings

3. DEFINITIONS

In this Council policy:

3.1 "Adaptation" in the context of climate change, refers to the processes and actions that manage actual and projected climate risk to reduce effects on built infrastructure, the natural environment and people.

3.2 "Alternative Transportation" refers to the methods of transportation other than single occupancy vehicles.

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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 Sponsors

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 Planners

The Project Planners 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 Managers

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 on each of 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 Planners, 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 – Identify and Assess)

- Project Planners contact Policy Steward to provide notification of project.
- Policy Steward, with the Project Sponsor and Project Planners review and agree upon the Minimum Sustainability Performance Requirements applicable for the project, review and discuss relevant green building certification systems and set certification requirements, if appropriate.
- Project Sponsor signs off on the agreed upon Sustainability Objectives through the Project Charter, Scope of Work, and Portfolio Recommendations.
- Project Sponsor and Project Planners ensure sustainability objectives are appropriately incorporated into the budgeting process.

Project Initiation and Project Planning (Stage 3 – Plan and 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 strategies to meet the targets into the Owner's Project Requirements.
- Once Project Team is on-boarded, Sustainability Objectives are validated with the Policy Steward.
- 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 goals.
- 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 Execution (Stage 4 - Execute)

- 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 - Evaluate)

- Project Manager and Policy Steward confirms the completion of commissioning processes and ensures project handover documentation for sustainability is provided from the Project Team to the Facility Operator and Policy Steward.
- Project Sponsor, Project Manager, and Policy Steward confirm and record the final project results with respect to the Sustainability objectives 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 from industry standards, using 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 MSPR is 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 confirmation that buildings are designed and constructed to 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. Over 80 City of Calgary capital projects have been certified under the Leadership in Energy and Environmental Design (LEED) rating system or other green building certification programs while under the guidance of the Sustainable Building Policy. Building off the MSPRs discussed below, the majority of new projects will be well positioned to achieve LEED v4 Gold certification or equivalent. 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 Sponsor may decide that the delivery of a net zero or a net zero ready building is desired for their project. The Policy Steward can support early planning and provide guidance on what this would involve during Stage 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 Planners, 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 2017 or 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 and Electric Vehicle Ready: 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	Design the facility to address the key climate hazards which include extreme heat, severe storms and short duration high intensity rainfall, wildfire smoke, and river flooding (when applicable).
Commissioning	Complete enhanced commissioning for the major energy consuming systems, energy generation systems, and the building envelope.
Indoor Water Use Reduction	Achieve a minimum designed non-process plumbing fixture water savings of 35% above the defined baseline in LEED v4 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, promotes biodiversity, and is accessible for facility occupant / visitor use.
Multimodal Accessibility	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 Management	Divert at least 80% of non-hazardous construction and demolition waste 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.
- Encourage occupant comfort, provide access, and maintain social wellbeing in design and operations.
- Design for resiliency 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 declaration of a Climate Emergency on November 15, 2021, and the subsequent 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.

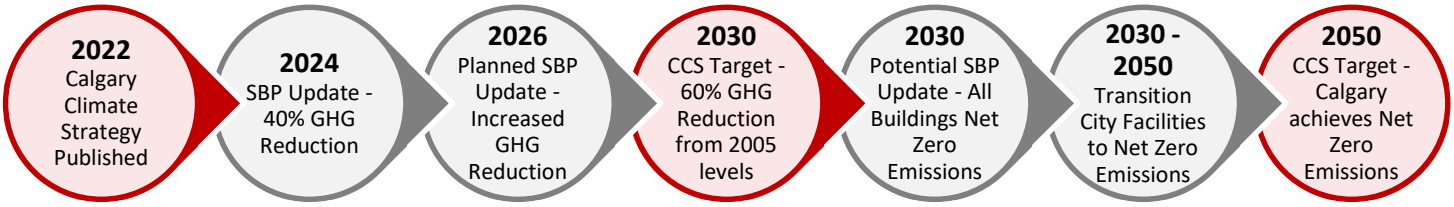

Figure 1: Alignment of Sustainable Building Policy (SBP) with Calgary Climate Strategy (CCS)

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 refrigerants' environmental impact, acknowledging that certain allowable 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) 2017 or 2020 baseline. To support the transition plan established in the Calgary Climate Strategy and to provide service line owner's 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 2030 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.

For Calgary Housing Company projects: reduction targets are consistent with other CHC funding source targets: Minimum 16% GHG, energy, and energy cost reduction from an NECB 2017 baseline.

For interior renovation and other projects: achieve a lighting power density improvement of 40% or better than an NECB 2017 Part 4 Lighting baseline (if lighting is in scope) and evaluate additional energy conservation measures as applicable 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 and Electric Vehicle Ready

Evaluate if a roof roof-mounted, ground-mounted, or building-integrated photovoltaic array is most suitable for the project to meet the PV ready requirement. 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.

For all parking areas, provide spare electrical conduit(s) with pull wires to the general parking area (conduit to each stall is not necessary). Ensure there is space provided in the electrical panel, while considering transformer size for the potential future installation of Level 2 electric vehicle chargers in the parking area, for at least 10% of parking spaces. If block heaters are already provided to parking stalls, size the associated conduit such that it can accommodate the future installation of Level 2 electric vehicle charging stations at these stalls, for at least 10% of parking spaces.

For indoor parking, provide spare electrical conduit(s) with pull wires to the general parking area (conduit to each stall is not necessary) and provide space in an electrical panel for the potential future installation of Level 1 electric vehicle chargers in the parking area, 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

Reducing a buildings carbon footprint and improving the energy performance of City buildings helps achieve utility savings and reduces the corporation's greenhouse gas emissions. This is a high priority Minimum Sustainability Performance Requirement that directly aligns with the Council declared Climate Emergency and Council approved 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 the 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 will become more prominent with NECB 2020, consider increasing building airtightness to show higher performance against the minimum required. 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, re-use of waste heat, centralized heating / cooling plants, fuel- switching, dedicated outdoor air systems, interaction of systems, heat pumps, and 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 it may be inadmissible to take energy savings on plug loads for LEED v4 or code compliance.
- 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 a "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 2017 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.

For projects defined by The Policy as an "Interior Renovation" or "Other Building Project", project scope will dictate available ECM opportunities. Projects under these categories may or may not have an energy model included in scope. If lighting is in scope, these projects are to achieve an energy savings of 40% above an NECB 2017 Division B Part 4 Lighting baseline.

For project scopes that include the completion of an energy model, it is strongly recommended that the Sustainable Building Guidance Document Appendix B: Consultant Scopes 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 additional calculations following the methodology for the LEED v4 credit Building Life-Cycle Impact Reduction, if the credit is pursued.

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 and Electric Vehicle Ready

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 roofs where appropriately sloped, with orientation to maximize solar potential. Standing seam 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 LEED v4 credit Enhanced Refrigerant Management. 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 v4 Building Design + Construction Enhanced Refrigerant Management 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 B: Consultant Scopes 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 LEED v4 Building Life-Cycle Impact Reduction, 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 and Electrical Vehicle Ready

Provide the City Project Manager and the Policy Steward infrastructure design details, parameters and assumptions that will allow for the install 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 get around. When infrastructure is damaged or constrained, critical services that we rely on can be disrupted, causing harm to Calgarians. We must integrate appropriate climate resilience measures into all aspects of the built environment to ensure our city's infrastructure can withstand the impacts of climate change.

Requirement

Assess climate risk and resilience as directed by the Climate Adaptation Team. Incorporate, at a minimum, the design strategies presented in the Requirements section below. These requirements address the climate hazards that have been identified as consistently high risk for building projects in Calgary. The additional design strategies presented in the Guidance section below are not mandatory, however, it is recommended that Project Teams consider their applicability to further address climate hazards on projects.

Extreme Heat

- Design mechanical and building envelope systems (e.g., cooling 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 and comfortable spaces by limiting overheating. 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 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 this 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 dust spot efficiency of 80% (MERV 13) based on ASHRAE 52.2.

River Flooding (applicable to projects located within the 1:100 Flood Hazard Area)

- The lowest floor's lowest horizontal structural member must be a minimum of 1 meter above the design flood elevation.
- Locate heating, ventilation, and air conditioning (HVAC) equipment, switchgear and service panels, electrical transformers, server rooms and communication systems a minimum of 1 meter above the 1:100 design flood elevation.
- All sewer connections must include sewer backflow preventers at the point of entry into the building on the main discharge sewer line.

Guidance

As noted above, the additional design strategies presented in the Guidance section are not mandatory. However, it is recommended that project teams consider their applicability to further address climate hazards on projects. Further guidance for project teams looking to understand the top climate hazards in the region is available in the Climate Projections for Calgary report. While not an exhaustive list, the following examples of climate risk reduction strategies related to climate hazards in Calgary may provide a useful reference for project teams.

Extreme Heat

- Passive cooling strategies should be considered in the design of the building such as strategic shading, window placement, window tinting, tree planting, airflow considerations, strategically placed vegetation, albedo-increasing colour selection, use of prevailing winds in cooling.
- Improved levels of envelope insulation and air tightness reduce susceptibility to extreme temperature shifts.
- Install appropriate blinds, sunshades, overhangs or external solar shading and leverage landscaping and tree placement on south and west sides to reduce solar gain during summer months. Reduce window-wall (glazing ratio) ratios especially on south and west sides.
- Install high performance glazing including one or more of the following features: triple-glazed, low solar heat gain coefficient coatings, photochromic glass, inert gas fill, insulated frames, and low-conductivity edge seals.
- Install high albedo hardscaping designed to reflect more sunlight and reduce absorption of heat.
- Design mechanical systems to be expandable including allowances for extra space e.g., piping, coils, or 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.

Severe Storms and Short Duration High Intensity Rainfall

- Establish a robust moisture management design, including rain screening, foundation moisture barriers, careful placement of air intakes, envelope junctions to allow for drainage and drying, robust air barrier with external insulation, strategies to reduce thermal bridging and condensation potential.
- Select high performance water, mold, and hail-resistant building envelope materials and improve damp proofing of exterior foundation walls.
- Install moisture sensors that detect water and/or water vapor in vulnerable areas: elevator pits and machine rooms, mechanical and electrical rooms, 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).
- Design entryways with covers to reduce moisture ingress.
- Protect and secure outdoor/roof-mounted equipment from high winds, snow, and hail.
- Connect critical area lighting and all essential services to backup power designed to 2050s temperature projections.
- Avoid locating electrical rooms below grade.

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

- Development located outside of the 1:100 regulatory 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 designing to flood levels that meet the 1:200 Flood Inundation Area (i.e., an estimated 20% increase in peak flow).
- Consider providing flood vents on lower level of buildings to alleviate pressure and excessive lateral loads on exterior walls in the event of flooding.
- If appropriate, include hardening mixture in foundation concrete mixes to decrease water penetration.
- Building materials below ground should be capable of withstanding direct and prolonged contact with flood waters without sustaining significant damage and be resistant to mold.
- The building's automation systems should allow remote access and management.
- Reverse-grade (drive-down) driveways should have a peak elevation 0.3m above the adjacent street grade, to prevent floodwater or stormwater from entering the garage or lower levels during an extreme storm.
- Avoid placing occupied spaces in basements for buildings located in areas inundated during a 1:100 flood.
- Consider setting the elevator homing level (typically ground/main floor) above design flood levels.
- 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.

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.
- Encourage occupant comfort, provide access, and maintain social wellbeing in design and operations.
- Design for resiliency 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 LEED v4 reference manual.

Guidance

Commissioning requirements are referenced in relation to LEED v4 as this is the standard The City is most familiar with. Commissioning activities are to be completed to a LEED v4 standard even if the project is not pursuing LEED certification.

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

The commissioning authority should be an independent third-party consultant. It is recommended that the City Project Manager use the Sustainable Building Guidance Document Appendix C: Consultant Scopes of Work: Commissioning Authority 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 v4 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.
- Encourage the integration of green stormwater infrastructure.
- Design for resiliency 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 baseline consumption defined by the LEED v4 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 water use reduction per the LEED v4 Indoor Water Use Reduction prerequisite and credit. 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

Sustainable Sites

Sustainability Principle Alignment

- Reduce potable water use through conservation and efficiency measures.
- Encourage the integration of green stormwater infrastructure.
- Maintain and improve biodiversity.
- Select sites that have access to alternative transportation and consider the impact of site selection on the environment, people, and the building.
- Design for resiliency 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

Use green stormwater infrastructure to manage stormwater onsite. The total runoff volume of rainwater must be managed through infiltration, evapotranspiration, or capture and reuse. Satisfy one of the following two compliance options, from the LEED credit "Rainwater Management":

Option 1 - Percentile of Rainfall Events (LEED v4.1):

- Path 2 – 90th Percentile:
  In a manner best replicating natural site hydrology processes, manage on site the runoff from the developed site for the 90th percentile of regional or local rainfall events using green stormwater infrastructure.
- Path 3 – Zero Lot Line Projects Only – 80th Percentile:
  In a manner best replicating natural site hydrology processes, manage on site the runoff from the developed site for the 80th percentile of regional or local rainfall events, using green stormwater infrastructure.

Option 2 - Natural Land Cover Conditions (LEED v4):

- Manage on site the annual increase in runoff from the natural land cover condition to the post-development condition.

Design the site for climate adaptation to reduce the risk and consequences of flooding and extreme rainfall events using the 2050s projected rainfall as outlined in the guidance section.

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.

Guidance

Stormwater Management

Option 1 - Percentile of Rainfall Events (LEED v4.1):

- Follow the Percentile of Rainfall Events guidance. The 90th and 80th percentile rainfall events represent a precipitation depth which 90 and 80 percent of all rainfall events for a period of record do not exceed. A generally acceptable period of record is 20 years.

Option 2 - Natural Land Cover Conditions (LEED v4):

- Determine natural site conditions that existed prior to any site development. Design the site in a manner that manages stormwater onsite equal to or better than what existed prior to human development.

City of Calgary Stormwater Management Requirements and Green Stormwater Infrastructure:

Consultants working on projects in Calgary should review and familiarize themselves with all Development Approvals and Permits requirements.

The City of Calgary's Low Impact Development webpage contains important information regarding the design, construction, inspection, and operation and maintenance of Source Control Practices. Source Control Practices (SCP) that should be evaluated as part of green stormwater infrastructure design include:

- Bioretention
- Bioswale
- Absorbent landscape
- Green roof
- Stormwater capture and reuse
- Rainwater harvesting
- Permeable pavements

Review site drainage plans with a climate adjusted intensity-duration-frequency (IDF) curve or climate adjusted rainfall volumes. Design onsite stormwater systems to 2050s projected extreme rainfall and IDF curves. Updated IDF curves and rainfall volumes can be provided by a Policy Steward and are available on the updated Sustainable Building Policy website.

Sustainable Landscaping

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

- 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. Consider stormwater capture and re-use technology for irrigation when feasible. Recommendations on irrigation are further detailed on The City's irrigation setup and maintenance tips website.
- 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.
- 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.
- Consider Installing Vegetation Providing Year-round Benefits: Installing vegetation with larger tree canopies providing habit in winter, coniferous vegetation that remains green in winter or vegetation with other winter interest provides biodiversity and aesthetic benefit to users, visitors, and nature throughout the year.
- Support Local Fauna: Ensure selected vegetation supports biodiversity and provides habitat, food, or otherwise supports local animals, birds, and insects/pollinators.
- 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, transpiration rate 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 growth and to improve stormwater management.

Refer to the Calgary Parks 2022 Development Guidelines and Standard Specifications: Landscape Construction and the Drought Resilience Plan for more information.

Deliverables

Stormwater Management

- Calculations demonstrating compliance with the above requirements shall be submitted to the City Project Manager and the Policy Steward.

Sustainable Landscaping

- A description of the proposed approach to comply with the above requirements in the project Owner's Requirements, or in another form of project design documentation such as the schematic design report.
- Landscape, Irrigation and Civil drawings to the City Project Manager 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 Accessibility

Sustainability Principle Alignment

- Encourage 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 resiliency to changing economic, social, and environmental conditions.

Rationale

Planning and developing infrastructure with improved multimodal access is intended to maximize site and building accessibility 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 accessibility 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 accessibility. 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.
- Limiting the number of parking stalls: Where possible, encourage the use of alternate transportation by reducing the amount of parking available.

Deliverables

Include multimodal accessibility requirements in the project's Owner's Project Requirements. In the project schematic design report, include a section discussing how multimodal accessibility 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 Management

Sustainability Principle Alignment

- Design for resiliency 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 waste from landfill to be recycled, composted, or otherwise reused. Create and follow a construction waste management plan for all projects.

For projects pursuing LEED certification, satisfy the specific requirements for LEED v4 credit “Construction and Demolition Waste Management” Option 1. Diversion, Path 2. Divert 80% and Four Material Streams or Option 2. Reduction of Total Waste Material.

Guidance

A construction waste management plan should be created by the project’s General Contractor and followed throughout the construction process. Waste 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 Waste 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

- Optimize for energy efficiency and conservation, specifically through passive design, thereby reducing and avoiding GHG emissions.
- Encourage 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

The following requirements were adapted from the LEED v4.1 rating system. Volatile Organic Compound (VOC) emissions evaluation and VOC content requirements. Use low-emitting building materials within the building that meet the following requirements:

- At least 75% of all paints and coatings meet the VOC emissions evaluation.
- At least 75% of all adhesives and sealants meet the VOC emissions evaluation.
- 100% of all paints, coatings, adhesives, and sealants meet the VOC content requirements.
- At least 90% of all flooring meets the VOC emissions evaluation.
- At least 75% of all wall panels meet the VOC emissions evaluation.
- At least 90% of all ceilings meet the VOC emissions evaluation.
- At least 75% of all insulation meets the VOC emissions evaluation.
- At least 75% of all furniture in the project scope of work meets the furniture emissions evaluation.
- At least 75% of all composite wood meets the Formaldehyde emissions evaluation.

In addition to the incorporation of low emitting materials, the prime contractor shall develop and implement an Indoor Air Quality (IAQ) management plan for the project.

Guidance

Calculations for paints, coatings, adhesives, and sealants can be conducted by volume or surface area. Calculations for flooring, wall panels, ceilings, insulation, and composite wood can be conducted by cost or surface area. Calculations for furniture must be completed by cost. For all categories, inherently non-emitting materials are deemed to comply with the requirements. To demonstrate compliance with the VOC content requirements for paints, coatings, adhesives, and sealants; a VOC content budget approach is permitted.

The IAQ 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 LEED v4/4.1 credit Construction Indoor Air Quality Management Plan.

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 an IAQ management plan outlining how the contractor will maintain good indoor air quality. The prime contractor shall also provide construction photos demonstrating compliance with the IAQ 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-Design
    - Sustainability objectives with applicable MSPRs, certification requirements and Climate Adaptation measures are agreed to with the Policy Steward and included in Project Brief
- Schematic Design
    - Preliminary Energy Modeling Report with parametric analysis that assess various design options prioritizing passive strategies first
    - Description of climate adaptation measures included in the design
    - Description of indoor water use reduction strategy
    - Discussion on multi-modal transportation strategy
    - Description of approach to landscaping
    - Discussion of stormwater management approach
    - Green building certification strategy (if applicable)
- Design Development
    - Updated Energy Modeling Report, including analysis of specific design options that meet all targets
    - Preliminary Embodied Carbon/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)
    - Memo describing compliance with the Sustainability Objectives and Climate Adaptation measures
- Contract Documents
    - Final Energy Modeling Report and all deliverables, including reporting requirements
    - Updated Embodied Carbon/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
- Prior to Construction
    - Construction IAQ plan (by contractor)
    - Construction Waste Management plan (by contractor)
    - All design phase documentation for green building certification (by consultant)
- During Construction
    - Regular sustainability performance reporting:
        - Construction Waste Management status
        - Indoor Air Quality 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 Waste 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)

5. References

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Appendix A: Consultant Scope of Work – Sustainable Building Consultant

Appendix B: Consultant Scope of Work – Building Energy Consultant

Appendix C: Consultant Scope of Work – Commissioning Authority

Appendix D: Green Building Certification Summary