

Greening Government Strategy: *Real Property Guidance*

Centre for Greening Government



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1 Policy Context

This document is intended to guide all custodial departments and agencies¹ (hereinafter referred to as “departments”) subject to the Greening Government Strategy. The Greening Government Strategy and therefore the requirements in this guidance applies to Crown-owned buildings, new construction, build-to-lease projects, major renovation/retrofits and refit projects.

Its purpose is to provide government-wide guidance on the implementation and on the reporting of the real property commitments in the Greening Government Strategy in order to achieve low-carbon, resilient and environmentally sustainable real property operations.

2 Real Property Holdings Decarbonisation

2.1 Carbon Neutral Portfolio Strategy

Consistent with the Greening Government Strategy², all departments must develop a Carbon Neutral Portfolio Strategy to create a pathway to the complete decarbonisation of departmental real property holdings. The approach taken should follow a 3 step process:

1. Optimize real property portfolio holdings to meet future program needs
 - Assess current and future program and space requirements
 - Triage the portfolio to make efficient use of space in all types of real property and divest of surplus assets
 - Consider the environmental impact of new assets based on geographic location when considering present and future program and space requirements
 - Use shared facilities and improve integration within the federal government and in communities and cities where the federal government operates
2. Optimize the management and energy efficiency of buildings retained
 - Continuously monitor and take action to improve the efficiency of building operations and building systems
3. Fuel switch to low carbon sources of energy

The following elements should be included in the Carbon Neutral Portfolio Strategy:

- Analysis of current GHG emissions from departmental real property holdings;
- A series of measures to reduce emissions and their associated reduction in tonnes of CO₂e and the percentage of total departmental emissions it represents;
- The opportunities, limitations, and cost associated with each option;
- A proposed timeline to achieve Carbon Neutrality

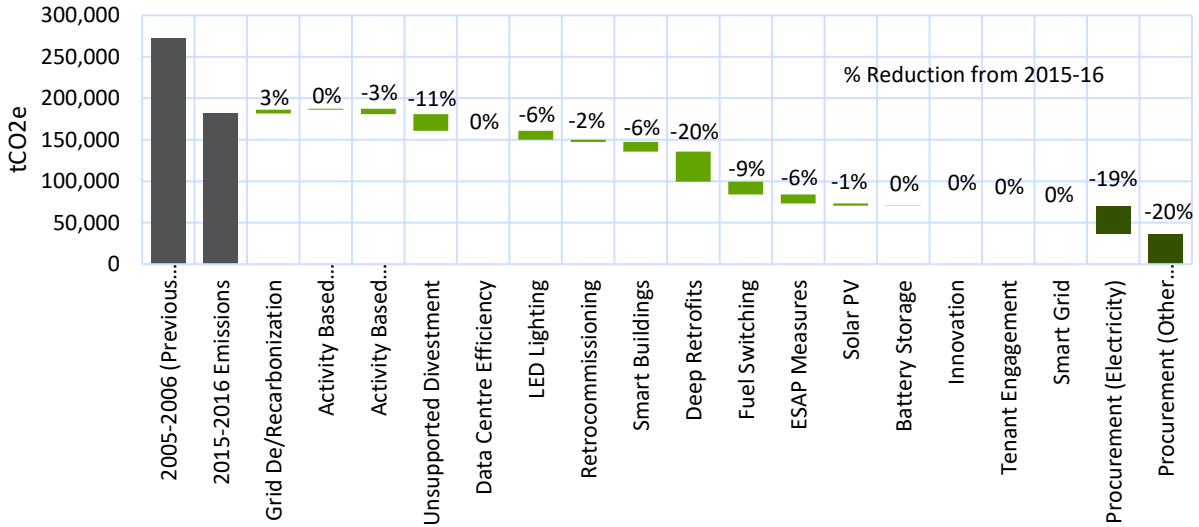
¹ Departments and Agencies are listed in Annex A

² Greening Government Strategy Requirement: “*Departments emitting the most GHGs will undertake a strategic evaluation of their real property portfolios to determine the most cost effective pathway to achieve low carbon operations and meet the government’s targets.*”

Departmental Carbon Neutral Strategies should be peer-reviewed and include input from the Real Property Green Solutions Team that is chaired by the Treasury Board Secretariat of Canada (TBS) Centre for Greening Government (CGG) and supported by expert real property departments.

The Carbon Neutral Portfolio Strategy should contain a waterfall diagram as show in Figure 1.

Figure 1: Waterfall diagram: Crown owned office buildings Carbon Neutral Portfolio Strategy (PSPC 2017)



2.2 Low Carbon Implementation Plan

Following the establishment of a Carbon Neutral Portfolio Strategy, departments should subsequently develop, in coordination with investment strategies, capital plans and asset renewal timelines, an implementation plan to achieve the outcomes outlined in their carbon neutral strategy.

This implementation plan should outline in detail the investments the department plans to make, on a facility by facility basis, towards meeting or surpassing the Government of Canada’s GHG emissions reductions goals of 40% by 2030 and 80% by 2050.

The low carbon implementation plan is expected to influence the contents of other departmental real property instruments such as asset management and building management plans.

2.3 Low Carbon Construction and Major Renovation Projects

Achieving the government's GHG reduction target of 80% GHG emissions reduction, and eventual carbon neutrality for real property portfolio holdings requires that all new construction and major renovations projects address decarbonisation. The consequence of not using the decarbonisation opportunity presented by major projects will be stranded assets that will subsequently need major capital investment. The Government of Canada's real property holdings vary widely in characteristics, function and location. An outcome based approach has been adopted which focuses on decarbonisation rather than prescriptive energy performance metrics. The following section describes the expected approach departments should undertake to meet this outcome.

All new construction projects and major renovations are expected to be ZERO Carbon

- Financial justification must be provided if Net Zero Carbon is not proposed
- Additionally, a future pathway to Net Zero Carbon must be provided (that is the project must be Net Zero Carbon Ready)

Base requirements for projects other than new construction and major renovations:

- Construction value < 26 percent of Assessed Value: All energy and building code requirements (for the scope of the work).
- Construction value 26 - 50 percent of Assessed Value: Shall have energy performance for the building undergoing renovation that exceeds the standard reference design of the most current National Energy Code of Canada for Buildings (NECB).
- Construction value > 50 percent of Assessed Value: Triggers new construction and major renovation requirements.
- Assessed value based on replacement costs.

Project Initiation Phase

Stage	Requirements	Intent
Project Inception	<p>A GHG reduction feasibility study must be conducted as part of the investment analysis review (IAR) process.</p> <p>Consideration must be given to projects in campus environments to ensure that they support the overall goals of the site. For example, where the evolution of district energy systems may impose requirements.</p>	<p>Inform decision makers on the GHG impact of the different design options. Benefits include:</p> <ul style="list-style-type: none"> • Better defined scope, appropriate funding allocation for greening measures, and • An improved understanding of design phase deliverables and more realistic and robust schedule. • Minimizing overall energy use and GHG emissions of the project based on the energy types and sources selected <p>Note: Emissions from energy derived from central heating plants must be included in the analysis.</p>
Project Design	<p>All new construction projects will use an integrated design process (IDP) or other form of project delivery that can produce the comparable results.</p>	<p>IDP provides a holistic framework where all stakeholders (e.g., clients, procurement specialists, design professionals, service providers and general contractors) work together to come up with an optimal design to meet key project requirements such as maximisation of GHG reduction.</p> <p>Ensure that the pathway to zero carbon operation is prioritized at the design phase. Explanations of IDP can be found at the following links:</p> <p>https://www.nrcan.gc.ca/energy/efficiency/buildings/20673 https://www.canadianarchitect.com/features/an-integrated-design-process-idp/</p>

Note departments have a high degree of latitude in designing a zero carbon building, however basic energy performance requirements for the building envelope must be met to ensure efficient operation and to control operating costs.

Minimum Building Envelope Performance Standards

Building Type	Requirement	Intent
<p><u>New Office Buildings</u></p> <p>Maximum Thermal Energy Demand Intensity (TEDI)³</p>	<p>Maximum recommended TEDI⁴ requirements by climate zones for new office space in kWh/m²/year are defined as:</p> <ul style="list-style-type: none"> • Zone 4 : 25 kWh/m²/year • Zone 5 : 30 kWh/m²/year • Zone 6 : 35 kWh/m²/year • Zone 7 : 40 kWh/m²/year • Zone 8 : 45 kWh/m²/year 	<p>Optimizing performance of building envelope based on the specific climate zone ensures the basic energy demand of the building is minimized before options for energy efficient systems and renewable energy are considered.</p> <p>GHG emissions from a building are determined by the characteristics of the building envelope, the energy efficiency of HVAC systems and renewable energy use.</p> <p><u>The approach prescribed provides building designers the flexibility to cost effectively reduce GHG emissions. Through an optimal combination of efficient building envelope design, HVAC systems selection and low carbon fuel sources designers can optimize cost vs performance.</u></p> <p><i>For example, electrification of space heating is seen as a pathway to decarbonisation. In this situation the designed thermal load of the building should permit the optimal use of heat pump solutions.</i></p>
<p><u>All Other Buildings</u></p>	<p>All other buildings' envelope performance must be built to be 30 % better than the most recent NECB.</p> <p>Note: As further building science information becomes available through the development of future building codes, and voluntary standards it is the intent to add TEDI criteria for other building architypes.</p>	<p><i>For example, electrification of space heating is seen as a pathway to decarbonisation. In this situation the designed thermal load of the building should permit the optimal use of heat pump solutions.</i></p>

³ TEDI refers to the annual heat demand from a building's envelope, ventilation and mechanical systems, after accounting for all passive heat gains and losses.

⁴ These numbers will be updated as further building science information becomes available.

Rationale to be submitted to the Treasury Board Secretariat if a zero carbon project is not proposed

Action	Requirement	Intent
<p>Life Cycle Cost Analysis Requirements</p>	<p><u>A justification not to construct a zero carbon building must be based on the results of a life cycle cost analysis.</u></p> <p>A minimum 25 year lifecycle cost analysis based on capital plus operations and maintenance expenses, and employee productivity is required which must include:</p> <ol style="list-style-type: none"> 1. Building envelope performance 2. HVAC systems including refit costs to renewable energy systems 3. Costs of energy sources including those from central heating plants; and 4. Canadian backstop carbon tax price 5. Employee productivity and wellness impacts <p>Notes:</p> <ul style="list-style-type: none"> • The present day costs should be used including: regional energy rates, maintenance costs and general inflation • Note: Emissions from energy derived from central heating plants must be disclosed. 	<p>The base assumption is that the best value to the crown will be to construct or to retrofit to zero carbon operational performance. The alternative of further future refits is expected to incur increased life cycle costs.</p> <p>Funding and resource constraints dictate that building stranded assets must be avoided.</p> <p>The 25-year timeframe is not intended to be a hard upper limit to the LCC analysis. Additional opportunities may be identified if an analysis is extended a few years beyond that minimum timeframe.</p>

Additionally, departments are expected to follow the approach outlined in their Low Carbon Implementation plan for projects other than new construction and major renovations.

2.4 Low Carbon Operations

Optimizing and maintaining the performance of existing buildings is core to low carbon operations. Departments are expected to continually monitor and assess the performance of their real property portfolios.

Monitoring, Benchmarking and Reporting

Category	Requirement	Intent
Energy Metering and Monitoring	<p>At least 80% of a department's energy consumption must be metered at the building level. Sub-metering should be used in the highest energy consuming and GHG emitting buildings.</p> <p>Departments must implement an energy monitoring approach which tracks building performance, enables energy data aggregation, and enhances both the granularity and accuracy of energy data reporting.</p>	<p>Obtain better data and more insights into building and portfolio energy performance which will allow departments to make more evidence-based investment decisions and demonstrate progress.</p>
Carbon and Energy Use Intensity	<p>Departments must monitor weather normalized energy use intensity (EUI) and carbon use intensity (CUI) for metered buildings.</p>	<p>NRCan RETScreen Expert software is recommended for this purpose https://www.nrcan.gc.ca/energy/software-tools/7465</p>
Benchmarking	<p>Benchmark against buildings of similar function (i.e. warehouse, office building, etc.) and track performance over time.</p>	<p>Assess and understand building performance in comparison with similar buildings in same climate zone and monitor performance over time.</p>

To maintain the performance of new, renovated buildings and to optimize the performance of existing buildings, departments are required to implement measures to optimise building performance.

Building Performance Improvement			
Category	Requirement	Intent	Tools
Building Re-commissioning	Implement a departmental building recommissioning approach which takes into consideration greatest impact/value for money, portfolio plan, building condition, etc.	<u>Follow the department's low carbon implementation plan</u> to prioritize candidate buildings.	NRCan resources on recommissioning: http://www.nrcan.gc.ca/energy/efficiency/buildings/research/optimization/3793
Smart Buildings	Deploy smart building technology in buildings (where the annual utility spend is typically greater than \$300K) to: <ul style="list-style-type: none"> • Monitor in real-time and continually optimize building performance • Provide automatic fault detection and diagnosis to identify operational inefficiencies • Adjust building operation to reduce energy use • Engage building occupants and encourage them to be a partner in achieving zero carbon and increased energy efficiency (e.g., such as by displaying energy use) 	Provide continuous monitoring of building performance and improve building operations. Obtain better data and more insights into building performance. Maintain savings generated by all building improvement initiatives. <u>Follow the department's low carbon implementation plan</u> to prioritize candidate buildings.	Note: This service is available via PSPC's National Smart Buildings Standing Offer and their project delivery teams. NRCan research groups can provide insights and optimization to building operation. The NRC can also provide support and training. Information about PSPC's Smart Buildings initiative and national standing offer: https://www.tpsgc-pwgsc.gc.ca/biens-property/intelligents-smart/index-eng.html
Energy load demand reduction	Manage energy load demand, and reduce peak electricity demand by employing peak shaving optimized start/shutdown sequences, thermal/electricity storage and other peak shaving	Alleviate pressure on the grid and reduce the need for new generating capacity.	

	methods to limit grid-energy demand during peak hours where beneficial.	Reduce utility costs associated with peak load billing	
Energy Conservation Measures	<p>Conduct energy audit reports to evaluate existing buildings for potential energy conservation measures to reduce utility consumption and greenhouse gas emissions outside of major investments in a building.</p> <p>Leverage available programs (such as from utility companies) and resources to further improve the low-carbon performance of buildings and overall portfolio.</p>	<p>Implement energy efficiency opportunities and use available programs and incentives to improve efficiency of buildings and overall RP portfolio. <u>Follow the department's low carbon implementation plan</u></p>	<p>https://www.nrcan.gc.ca/energy/efficiency/industry/energy-management/20401</p>
Energy Performance Contracts	<p>Leverage the use of Energy Performance Contracts (referred to as the Federal Buildings Initiative) with a view to maximising carbon reductions. Use capital contribution investment that is aligned with departmental capital plans and improves the business case for GHG reduction measures</p> <p>A 25 year total cost of ownership approach should be used to evaluate energy service companies (ESCO) approach compared to other options. Usage of this mechanism should be based on a sound business case and support the department's long term portfolio plan to effectively achieve the governments GHG reduction target.</p>	<p>Achieve GHG reductions in existing buildings with limited or low risk capital expenditure (i.e., where limited capital funds are available to spend on energy/GHG reduction measures)</p> <p><u>Follow the department's low carbon implementation plan</u></p>	<p>https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/oeefiles/pdf/communities-government/buildings/federal/pdf/12-0419%20-%20EPC_e.pdf</p> <p>Note: More information can be obtained by contacting NRCan or PSPC.</p>

2.5 Low Carbon Transportation

The location of government buildings and the provision of facilities should support the decarbonisation of public and private infrastructure. Partnerships should be developed with other departments, levels of government and local communities when developing and implementing real property holdings portfolio strategies

Scope 3 (Indirect) GHG Emissions Reduction		
Category	Requirement	Intent
Low Carbon Commuting	<p>New construction and major retrofit projects shall take into consideration commuting implications. This includes:</p> <ul style="list-style-type: none"> • Considering the location of buildings, • Collaborating with local communities on public transit; and • The inclusion of active commuting infrastructure in federal building projects. <p>Note: Active commuting infrastructure generally includes showers, lockers and bike racks.</p> <p>Encourage employee participation through the development of occupant awareness programs and other initiatives such as smartphone applications for example GoSpaces which:</p> <ul style="list-style-type: none"> • Allows its employees to challenge one another to reduce their environmental footprint from commuting. 	<p>Buildings located closer to where the majority of employees live and provisions for active commuting will encourage employees to walk, bike or use public transit. This can decrease GHG emissions from commuting.</p>

Zero Emission Vehicle (ZEV) Infrastructure

In accordance with the Greening Government Strategy (2017), 75% of new light duty administrative fleet vehicle purchases will be hybrid or zero emission. In support of this target the required electric vehicle supply equipment will need to be installed.

New construction and major renovation projects should include the electrical requirements for installing the required EV infrastructure so as to avoid the need for future upgrades.

Fleet managers should be engaged to discuss the amount and type of infrastructure needed to accommodate the department's fleet.

Furthermore:

- Departments are expected to purchase and install appropriate charging or refuelling infrastructure to meet their operational needs.
- Infrastructure installed for federal fleet cannot be used free of charge for employee or public use.

Encourage economically and environmentally responsible utilisation of ZEV charging/refuelling infrastructure.

TBS Greening Government Strategy Fleet Guidance:

http://www.gcpedia.gc.ca/wiki/Mobility_and_Fleet

4 Climate Change Adaptation and Resiliency

Departments must identify the infrastructure in their real property holdings that is most at risk because of a changing climate and implement adaptation plans accordingly.

Real Property Holdings Vulnerability Assessment

Action	Requirement	Intent
Portfolio Adaption Implementation Plan	Departments must identify the real property assets that are critical to operations, and are the most at risk due to the changing climate. Portfolio Adaptation actions must be developed and should be based on a vulnerability assessment methodology such as the Engineers Canada's PIEVC Protocol: https://pievc.ca/	Prioritize the adaptation of federal assets that critical to operations and are the most at risk.

Departments must also assess the potential impact of climate change for any new buildings or major retrofits and are to take action to increase their climate resiliency.

Asset Resiliency Measures

Category	Requirement	Intent
Future Climate Norms and Extreme Weather Assessment	Departments must determine the vulnerabilities and mitigation measures relevant to the asset. The assessment would typically be conducted by an infrastructure resilience professional or equivalent, and be based on a vulnerability assessment methodology such as the Engineers Canada's PIEVC Protocol. The assessment should consider a period of 60 years into the future. Impacts from changes in local climate conditions and potential extreme weather events should be assessed, including those related to:	Identify future risks and vulnerabilities related to climate change and build/retrofit to mitigate those risks. Enable continuity of government operations and ensure the

	<p>Temperatures</p> <ul style="list-style-type: none"> • Heating Degree Days, Cooling Degree Days, etc. • Heat and cold extremes <p>Precipitation and Flooding</p> <ul style="list-style-type: none"> • Changes in rain, snow, freezing rain, hail patterns etc. • Changes in sea-level • Flooding (riverine flooding, coastal storm surges) <p>Wind</p> <ul style="list-style-type: none"> • Wind load on structures • Extreme events including tornadoes and hurricanes <p>Slow Onset Hazards</p> <ul style="list-style-type: none"> • Freeze-thaw cycles including permafrost thaw • Drought, including soil movement <p>Other Hazards</p> <ul style="list-style-type: none"> • Increased risk from fire • Infestations/pathogens (consider both effects on human health and infrastructure) <p>Departments should develop contingency plans for infrastructure failure and consider increasing the magnitude of design parameters or safety factors in advance of new climate-resilient building code.</p>	<p>health and well-being of occupants.</p> <p>Ensure climate change adaption is considered at the early stage of building projects.</p>
<p>Design for Resilience and Asset Deterioration</p>	<p>Buildings must be designed to withstand future conditions and extreme weather events such as increased snow load, and slow onset impacts projected to occur within the lifespan of the asset (i.e. increased heat and cold, potential changes to water supply, freeze-thaw cycles).</p> <p>Designs must include measures to address increased deterioration rates due to a changing climate. Maintenance plans should be developed to incorporate expected conditions.</p>	<p>Avoid climate change related damage to assets. Upfront investments in more resilient design can help avoid larger future costs in terms of maintenance, repair and replacement.</p>

	<p>Designs should also consider potential upstream and downstream impacts of proposed resilience solutions within the broader system (e.g., reduction of downstream flooding resulting from raising the bed of a river to allow temporary water storage in a wetland)</p>	
Energy Modeling	<p>Building energy modeling must use climate data based on Environment and Climate Change Canada's projected data (or other suitable sources) for the closest geographic location.</p>	<p>Determine impact of climate change on a building's heating and cooling energy use.</p>
Services Disruption	<p>Infrastructure must be designed to provide resilience to disruption in externally provided resources/services including:</p> <ul style="list-style-type: none"> ○ Thermal resilience (e.g., ability to maintain liveable temperatures – from extreme heat to extreme cold) ○ Extended back-up generation capacity ○ Potable water supply ○ Road and transit access <p>The design process must consider the placement of critical building and IT equipment.</p>	<p>Ensure that the asset is able to endure services disruption to the extent required.</p>

5 Environmental Sustainability

5.1 Water

Departments are to take action to reduce potable water consumption and its associated scope 3 GHG emissions associated with the municipal water supply system and the treatment of waste water.

Category	Requirement	Intent
Potable water	<p>Install building-level water meters for 80% of consumption in order to start disclosing total potable water use by 2022.</p> <p>Potable water consumption reduction must be best in class. For example:</p> <ul style="list-style-type: none"> • Deploying water conserving products • Optimize cooling tower operations and eliminate single pass cooling • Use water efficient landscaping strategies (e.g., xeriscaping) as well as water efficient irrigation strategies <p>Use alternative sources of water (e.g., rainwater, greywater) where possible.</p>	<p>Better understand current consumption trends and reduce total potable water consumption.</p> <p>Reduce scope 3 GHG impact associated with potable water consumption.</p> <p>Increase water efficiency of operations.</p> <p>Minimize potable water use for non-potable applications to lessen burden on local water systems.</p> <p>Refer to the US Government “Prioritizing Building Water Meter Applications” web page to assist with departmental building water meter prioritization process: https://energy.gov/eere/femp/prioritizing-building-water-meter-applications</p>
Waste water	<p>Design to reduce/reuse waste water in new construction and major retrofits (e.g., develop greywater or rainwater infrastructure for applications such as toilets, urinals and process water).</p>	<p>Improve the capacity to recycle and reuse water to reduce total water withdrawals.</p> <p>Reduce scope 3 GHG emissions associated with treating waste water.</p>

	Where feasible, consider the use of greywater for landscape watering or disposal of greywater into constructed or existing wetlands.	
Storm water	Employ design and construction strategies that reduce storm water and manage runoff in new construction and major retrofits. Future climate conditions should be used for design purposes.	Reduce strain on municipal infrastructure and incidences of combined sewer overflows that contaminate lakes and rivers when heavy rains occur. Reduce the risk of flooding during extreme weather events.

5.2 Material and Waste

Departments are to take action to reduce the GHG emissions and resource impact associated with the use of material and in the treatment and disposal of waste. The share of total emissions arising from embodied carbon becomes more significant as operational emissions are minimized, steps should therefore be taken to minimize this source of emissions.

Category	Requirement	Intent
Material use and Embodied Carbon	<p>Evaluate the environmental impact of material used. All projects must minimize embodied carbon used in building materials.</p> <p>Projects must conduct a complete life cycle assessment (LCA) of the project.</p> <p>Where relevant data exists, the LCA must address building envelope and structural elements including:</p>	<p>Increase focus on life-cycle assessments in the procurement stage where many of the environmental and carbon impacts take place (extraction, manufacturing, transportation, etc.).</p> <p>Minimize the embodied carbon, the unsustainable consumption of natural resources and the use of hazardous material used in smaller projects and building fit-up projects⁵.</p>

⁵ Fit-up projects refers to the preparation of a building office space to meet new space requirements or to respond to a change in the functional requirement of an organization.

	<ul style="list-style-type: none"> • Footings, foundations, and parking structure • Complete structural wall assemblies (from cladding to interior finishes, including the basement), • Structural floors and ceilings (not including finishes), • Roof assemblies, and stairs construction. <p>Regional specific data shall be sourced where available on the following material categories:</p> <ul style="list-style-type: none"> • Concrete, Steel, Glass, Wood and Plastic <p>All projects shall report the life-cycle equivalent carbon dioxide emissions of building materials.</p> <p>The LCA must take into consideration the full lifespan of the building/project which is being considered.</p>	<p>Resources are available from:</p> <ul style="list-style-type: none"> • The Athena Sustainable Materials Institute: http://www.athenasmi.org/resources/about-lca/ • The International Reference Centre for the Life Cycle of Products, Processes and Services (CIRAIG): http://www.ciraig.org/en/lca.php
<p>Construction, renovation and demolition (CRD) waste</p>	<p>Increase diversion rates to 90% by weight of all CRD waste and strive to achieve 100% by 2030.</p> <p>Departments should have official CRD waste records verified by a third party to ensure transparency.</p> <p>Note: This should already be considered in any building certified LEED, Green Globes/BOMA BEST.</p>	<p>Reduce the volume of CRD waste generated and increase recyclability and reusability of end-of-life building materials and other materials used during construction.</p> <p>Reduce the demand on municipal landfill space to help contribute to the longer lifespan of the existing landfills (i.e., reduce the need for new landfills).</p> <p>Reduce scope 3 GHG impact of CRD waste.</p>

Operational waste	Improve diversion rates to 75% by weight of all non-hazardous operational waste by 2030	<p>Reduce the volume of operational waste generated. Examples of waste categories include paper, cardboard, plastics, glass, metal, wood, food, etc.</p> <p>The focus of this requirement is on diversion and sending less waste to landfill. Reducing the demand on municipal landfill space helps contribute to the longer lifespan of the existing landfills (i.e., reduce the need for new landfills).</p> <p>Reduce scope 3 GHG impact of operational waste.</p>
Plastics Waste related to Real Property Operations	Work towards the target of diverting 75% of plastic waste by 2030 from federal operations as set out at the G7 meeting in Halifax in September 2018. ⁶	Reduce the volume of plastic waste sent to landfill coming from the operations of the federal government. Reduce ocean plastics pollution.
	Facilitate the elimination of the unnecessary use of single-use plastics in government operations, events and meetings. Note: Exceptions will be where health and safety considerations necessitate the use of certain single use materials.	<p>Reduce single-use plastics sent to landfill which, at times, cannot be recycled.</p> <p>Reduce ocean plastics pollution.</p>

⁶ <https://www.canada.ca/en/treasury-board-secretariat/services/innovation/greening-government/government-canada-actions-plastic-waste-federal-operations.html>

6 Sustainable Workplaces and Employee Wellness

Increasing the focus on employee wellbeing in the workplace can improve measurable real cost factors, such as absenteeism, recruitment and retention, and facilities complaints. Departments should incorporate measures for occupant wellbeing and social sustainability into project design and construction.

The framework below should be used to incorporate wellbeing and social sustainability into the workplace. Departments can also refer to a wellness standard such as Fitwell or WELL to help guide decision making on a workplace health related topics.

Category	Requirement	Intent
Ventilation and Indoor Air Quality (IAQ)	Ensure indoor air quality by adjusting building ventilation, by ensuring interior materials and furniture emit few or no volatile organic compounds and through the incorporation of greenery such as green walls and plants.	Improve employee health and productivity Uncomfortable conditions in buildings and spaces-too hot, too cold, too noisy, too dark, too light, too much glare-restrict the ability of workers to function to full capacity and can lead to lowered job satisfaction and increases in illness symptoms.
Thermal Comfort	At a minimum, comply with American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 55 Thermal Environmental Conditions for Human Occupancy.	
Daylighting and Lighting Quality	Maximise daylighting and sightlines to the exterior. Include daylight and occupancy sensors to control artificial lighting.	
Noise and Acoustics	Reduce sound reverberation time inside the workplace Limit transmission of noise from outside the workplace Minimize background noise from the building's HVAC system and other equipment. Provide opportunities for privacy and concentration when needed in open plan offices.	

Accessibility	Follow universal design principles in order to provide workplaces that are welcoming and equitable. Accessible design should take into consideration a wide range of differences in mobility, manual dexterity, visual and auditory capability, and cognitive function.			
Active Design and Circulation	<p>Design aesthetically pleasing and comfortable workplaces that encourage social connection and collaboration, provide places of respite and relaxation, encourage frequent physical movement and discourage sedentary behaviour.</p> <p>Design spaces that connect for learning, belonging, modernization and collaboration. Consider interactive design features, connectivity that engages (occupant feedback mechanisms for comfort/satisfaction), facilitates temporary neighborhoods in unassigned seating arrangements, offers choice and recognizes variably preferences (customizable booking system–workplace of choice)</p>			
Biophilia and Views	Employ biophilic design principles and concepts to create interior environments that incorporate natural environment elements. Provide easy access to the exterior wherever possible.			
Location and Amenities	Improve access to healthy lifestyle options such as kitchen spaces, shower facilities, secure bicycle storage, fitness options, healthy food choices, etc.			

7 Resources

A number of services and resources exist to help departments green and enhance the climate resilience of their real property operations. The table below provides an overview of the support available to departments at varying implementation stages.

Hierarchy	Function	Tasks	Services and Resources
1	Governance	Governance approaches to implement low carbon operations	Low Carbon Organizational Governance Model (NRCan)
2	Carbon Neutral Portfolio Strategy	Low Carbon Portfolio Strategy (5yr renewal cycle)	PSPC Consultant Standing Offer
3	Low Carbon Implementation Plan	Real Property implementation plan Clean Energy procurement Service Delivery Model	PSPC Consultant Standing Offer
4	Employee Wellness	Assessment of wellbeing and productivity	NRC, PSPC
		Workplace modernisation	PSPC-GC workplace Resources (such as the GCworkplace Design Guide and GCworkplace Playbook)
5	Project Initiation/ Evaluation	Opportunity assessment (feasibility stage analysis/modeling) RFP development and qualification Design Challenge, Risk assessment	Private Sector Consultants, PSPC, NRC, NRCan CanmetENERGY (Renewable Electricity and Energy, Retrofits, New buildings)
6	Project Implementation/ Delivery	Project Management Standing Offers Procurement	PSPC, Defense Construction Canada
7	Project Performance Verification	Performance at project delivery Performance persistence	NRCan, NRC, PSPC
8	Technology Evaluation	Feasibility Cost benefit analysis	NRCan, NRC, PSPC
9	Tools, Programs and Services	Energy Modeling, FBI, Training, Technology Evaluation	NRCan, PSPC, NRC, ISED's Innovative Solutions Canada program and Build in Canada Innovation Program (BCIP), Sustainable Development Technology Canada (SDTC)

8 Performance Reporting

The primary expected result of implementing the actions listed in the greening government real property guidance is that it will contribute to lowering the government's emissions by at least 40% by 2030 and by 80% by 2050 compared to a 2005-06 baseline.

As specified in the tables below, departments are to provide the required information in the annual CGG call letter data collection process, and report high-level performance in their Departmental Sustainable Development Strategy (DSDS). Starting in fiscal year (FY) 2018-19, it is mandatory in the call letter to report at the facility level.

8.1 Low Carbon Implementation Plan

GGG Outcome	Performance Indicator	Unit of Measure	Level of Reporting
Real property needs evaluated at the portfolio level to determine opportunities for decarbonisation based on rationalization, efficient assets, low carbon energy sources and optimal real property management.	Action plan and a timeline exist to minimize real property carbon footprint. Date of last update.	Yes/No Date	Portfolio level with detailed analysis of optimization at the facility level, including optimization at site/campus scale.

8.2 Energy and GHG Emissions

For government-owned facilities the following must be reported:

GGG Outcome	Performance Indicator	Call Letter Required Data	Unit of Measure	Level of Reporting	Data Collection
<i>Departmental input</i>					
Low-carbon: The primary expected result is that government emissions will be reduced by at least	Percentage change in GHG emissions from fiscal year 2005–06 to current fiscal year, inclusive of renewable power emission credits, if applicable	Total fuel consumption and a breakdown by type of fuel in all government-owned buildings included in reduction target	m ³ and/or litres (to be converted to CO ₂ e)	Facility level and portfolio	Data collected annually via the Government of Canada Facilities

40% by 2030, and on a trajectory to be reduced by 80% in 2050	(Note: Real property emissions only)	Total electricity consumption in all government-owned buildings included in reduction target	kWh (to be converted to CO ₂ e)	Facility level and portfolio	template or RETScreen
		Total district energy consumption (heating and cooling) in all government-owned buildings included in reduction target	GJ (to be converted to CO ₂ e)	Facility level and portfolio	
<i>Clean Electricity:</i> Accelerated demand for clean power across Canada and stimulated job growth with 100% of federal electricity from clean power sources	Percentage and amount of total annual departmental electricity use generated from clean power sources (by producing or purchasing megawatt hours of renewable electricity equivalent to that produced by the high carbon portion of the electricity grid)	Total electricity generated from clean power sources Amount of clean electricity by each sources: <ol style="list-style-type: none"> 1. Conventional grid-tied electricity 2. On-site generation 3. Power Purchase Agreement (PPA) 4. Renewable Energy Certificates (RECs) 	kWh and % kWh and % of by each clean power sources	Portfolio level and a breakdown by province/territory	Data collected annually via the Government of Canada facilities template or RETScreen

Leased space starting in 2019-20

GGs Outcome	Performance Indicator	Call Letter Required Data	Unit of Measure	Level of Reporting	Data Collection
Departmental input					
<i>Expanded inventory:</i> Improved decision making and increased transparency through a more complete	Percentage of lease space tracking GHG emissions	Total amount of leased floor space Amount of leased floor space tracking fuel,	m ² and %	Portfolio	Data to be collected annually via the Government of Canada facilities

greenhouse gas (GHG) inventory.		electricity, and district energy consumption			template or RETScreen
	Departmental emissions from leased space	Total GHG emissions from leased space	Tonnes CO ₂ e	Portfolio	Note: A separate template to be completed for leased space emissions.

8.3 Climate Change Adaptation

GGs Outcome	Performance Indicator	Call Letter Required Data	Unit of Measure	Level of Reporting	Data Collection
Departmental input					
<i>Adaptation:</i> Increased climate resiliency of federal assets through improved departmental risk planning	Percentage and total amount of government-owned floor space assessed for climate change risks and adaptation opportunities.	Building assessed for risks and opportunities posed by climate change.	Yes/No	Building level	Data to be collected annually via the facilities template (checkbox to be added in template)
	Percentage and amount of government-owned floor space built or retrofitted to incorporate climate-resilient design and/or have adopted climate-resilient building code	Building incorporating climate-resilient design and/or climate-resilient building code requirements	Yes/No	Building level	Data to be collected annually via the facilities template (checkbox to be added in template)

8.4 Water and Waste

Water starting in 2020-21

GGG Outcome	Performance Indicator	Call Letter Required Data	Unit of Measure	Level of Reporting	Data Collection
Departmental input					
<i>Water:</i> Improved understanding of federal water consumption to support better decision making, future target setting and transparency	Total annual volume of potable water used in federal buildings from municipal sources. Note: Includes sources from municipal water supplies or other public or private water utilities.	Total potable water consumed	m ³	Facility level and portfolio	Data to be collected annually via the facilities template

Waste starting in 2020-21

GGG Outcome	Performance Indicator	Call Letter Required Data	Unit of Measure	Level of Reporting	Data Collection
Departmental input					
<i>Waste:</i> Resource use for federal operations reduced through less waste going to landfill Most waste minimization strategies emphasize prioritizing options for reuse, recycling, and then recovery over other disposal options to minimize ecological impacts ⁷ .	Total non-hazardous operational waste ⁸ generated and percentage <u>diverted from landfills</u>	Total weight of non-hazardous waste, with a breakdown by the following disposal methods where applicable: i. Recycling ii. Composting iii. Recovery, including energy recovery iv. Landfill v. Other	Kg and % by disposal methods	Site or region and portfolio level	Data to be collected annually via the updated Facilities template
	Total construction, renovation and demolition (CRD) waste and percentage <u>diverted from landfills</u>			Per CRD projects	

⁷ GRI Standards – Disclosure 306-2 Waste by type and disposal method (p. 8)

⁸ Includes all sources of operational waste not covered by regulations

Annex A - Organizations with government-owned facilities

1. Agriculture and Agri-Food Canada
2. Canada Border Services Agency
3. Canadian Food Inspection Agency
4. Canadian Space Agency
5. Canadian Security Intelligence Service
6. Correctional Service Canada
7. Environment and Climate Change Canada
8. Fisheries and Oceans Canada
9. Health Canada
10. Indigenous and Northern Affairs Canada
11. Innovation, Science and Economic Development Canada
12. Library and Archives Canada
13. National Battlefields Commission
14. National Defence
15. National Research Council
16. Natural Resources Canada
17. Parks Canada Agency
18. Public Health Agency of Canada
19. Public Services and Procurement Canada
20. Royal Canadian Mounted Police
21. Transport Canada
22. Global Affairs Canada

Annex B – Definitions

Adaptation: changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change. Actions / measures that reduce the negative impacts of climate change, while taking advantage of potential new opportunities.

Base building energy: Energy consumed in supplying central building services to lettable/leasable areas and common areas.⁹

Biophilia: The biophilia hypothesis suggests that humans possess an innate tendency to seek connections with nature and other forms of life.

Biophilic design: A concept used within the building industry to increase occupant connectivity to the natural environment through the use of direct nature, indirect nature, and space and place conditions.

Clean electricity: Electricity generated from low-GHG emitting sources such as hydro, nuclear, wind, solar, geothermal, tidal, etc.

Embodied Carbon: Refers to carbon dioxide emitted during the manufacture, transport and construction of building materials, together with end-of-life emissions.

Environmental sustainability: The outcome sought i.e. preserving the support systems of the planet. Environmental sustainability concerns the natural environment and how it endures and remains diverse and productive. Since natural resources are derived from the environment, the state of air, water, and the climate are of particular concern. Environmental sustainability requires society to design activities to meet human needs while preserving the life support systems of the planet. This, for example, entails using water sustainably, utilizing renewable energy, and sustainable material supplies (e.g. harvesting wood from forests at a rate that maintains the biomass and biodiversity).

Floor space (or gross floor area)¹⁰: The total property floor area, measured between the outside surface of the exterior walls of the building(s). This includes all areas inside the building(s) including supporting areas. Floor space is reported in square meters (m²).

Greening: The process of transforming operations to be environmentally sustainable. Greening is the process of transforming artifacts such as a space, into a more environmentally friendly version. The act of greening involves incorporating "green" products and processes into the workplace.

Life-cycle analysis (LCA): The whole-life approach from resource extraction through manufacturing, transportation, installation, use, maintenance and disposal or recycling which provides the critical long-term information necessary to make evidence-based, sustainable design and manufacturing decisions.

⁹ 2017 GRESB Real Estate Assessment Reference Guide

¹⁰ CAGBC Zero Carbon Standard

Life-cycle costing (LCC): LCC¹¹ is a method for assessing the total cost of facility ownership. It takes into account all costs of acquiring, owning, and disposing of a building or building system. LCC is especially useful when project alternatives that fulfill the same performance requirements, but differ with respect to initial costs and operating costs, have to be compared in order to select the one that maximizes net savings. For example, LCC will help determine whether the incorporation of a high-performance HVAC or glazing system, which may increase initial cost but result in dramatically reduced operating and maintenance costs, is cost-effective or not. LCC analysis should include the following elements¹²:

- Construction costs;
- Electricity and energy costs;
- Maintenance costs consistent with operations specifications of the mechanical equipment specified;
- A capital discount rate of 3%, consistent with federal government life cycle cost analyses.

Major renovation: Projects in which changes proposed to the building envelope and HVAC systems or the proposed value of work is more than 50% of the assessed value of the building

Net zero carbon ready building: A building is one in which energy consumption is reduced to a minimum through building design strategies and efficiency measures to the point where it would be practical/economical in the future to use non-carbon based (fossil) fuel sources to meet its energy needs.

Recapitalization: The investment to update existing real property in order to meet regulatory requirements or expenditures for improvements such as increased service capacity or extension of its useful life.¹³

Renewable Energy Certificate (REC): An authorized representation of the environmental attributes associated with the generation of 1 MWh of renewable energy.

Resilient: Resiliency is the elasticity, or adaptability of buildings to ‘endure’ and maintain operations in changed climate conditions, or recover from a climate change related disruption or impact. It requires designers to identify hazards and vulnerabilities local to a given site, before projecting impacts and implementing measures that reduce risk and increase flexibility to adapt. Ultimately, the result can lead to strong, resilient communities that have reduced vulnerability to climate change.

Sustainable workplace: A workplace that is designed to protect or improve the natural environment through the selection of construction and fit up materials, supports the physical and psycho-social health of workers and incorporates values of social and ethical responsibility. A sustainable workplace is rooted in the principles of continuous improvement and employee engagement.

Tenant Space: Lettable floor area (both vacant and let/leased areas)¹⁴

¹¹ <https://www.wbdg.org/resources/life-cycle-cost-analysis-lcca>

¹² P. 35, The City of Toronto Zero Emissions Buildings Framework

¹³ http://www.oag-bvg.gc.ca/internet/English/parl_oag_201210_05_e_37349.html#def2

¹⁴ 2017 GRESB Real Estate Assessment Reference Guide

Whole building energy: Energy used by tenants and base building services to lettable/leasable and common spaces. This should include all energy supplied to the building for the operation of the building and the tenant space.

Zero carbon building: A Zero Carbon building is one in which:

- There is no fossil fuel use onsite for daily operations with the exception of backup generators and systems
- Any onsite energy used should be low carbon e.g. clean electricity, renewable natural gas or approved forms and sources of biomass
- Residual GHG emissions from the use of very low carbon electricity grids do not need to be included

The following are not part of the definition:

- Use of carbon offsets are not permitted under the Greening Government Strategy
- On-site renewable energy production cannot be used to offset on-site GHG emission production from fossil fuel combustion (i.e., “carbon balance approaches” not permitted under the GoC GHG Accounting and Reporting Guidance. Furthermore onsite renewable electricity can only displace grid electricity).

Annex C - References

- City of Vancouver Green Buildings by-law
http://bylaws.vancouver.ca/Bulletin/G002_2017April28.pdf
- City of Vancouver Energy Modeling guide <http://vancouver.ca/files/cov/energy-modelling-guidelines-v1.0.pdf>
- Global Reporting Initiative (GRI) Standards: <https://www.globalreporting.org/standards>
- [Global Reporting Initiative \(GRI\) G4 Construction and Real Estate Supplement](#)
- [2017 GRESB Real Estate Assessment](#)
- [2017 GRESB Real Estate Assessment Reference Guide](#)
- Integrated design principles (IDP):
<http://www.nrcan.gc.ca/energy/efficiency/buildings/eenb/integrated-design-process/4047>
- NRCan resources on recommissioning:
<https://www.nrcan.gc.ca/energy/efficiency/buildings/capacity-building-resources/learn-more/4257>
- PIEVC Engineering Protocol: <https://pievc.ca/protocol>
- PSPC's Technical Reference for Office Building Design
- [Sustainability Accounting Standard for Real Estate Owners, Developers & Investment Trusts \(2016 – SASB\)](#)
- The City of Toronto Zero Emissions Buildings Framework (<https://web.toronto.ca/wp-content/uploads/2017/11/9875-Zero-Emissions-Buildings-Framework-Report.pdf>)