Guide for implementing The Standard on Embodied Carbon in Construction

Centre for Greening Government

Treasury Board of Canada Secretariat

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Contents

1. Introduction

This document provides guidance to federal government organizations (as described in section 3 of the *Policy on Green Procurement*) and Canadian building professionals on how to meet the requirements of the Treasury Board Secretariat's *Standard on Embodied Carbon in Construction*. The standard requires major construction projects of Government of Canada real property assets to disclose and reduce the embodied carbon of structural materials used as part of the Government of Canada's commitment to achieve net-zero greenhouse gas (GHG) emissions by 2050.

Background: *The Greening Government Strategy* (GGS) – A Government of Canada (GoC) Directive stipulates:

> *The government will reduce the environmental impact of structural construction materials by:*
>
> - *disclosing the amount of embodied carbon in the structural materials of major construction projects by 2022, based on material carbon intensity or a life-cycle analysis*
> - *conducting whole building (or asset) life-cycle assessments by 2025 at the latest for major buildings and infrastructure projects*
> - *reducing the embodied carbon of the structural materials of major construction projects by 30%, starting in 2025, using recycled and lower-carbon materials, material efficiency and performance-based design standards*

This guide outlines the steps required to: identify applicable projects, how to demonstrate embodied carbon reductions of structural materials on a project basis relative to established baselines, and how departments should use the resulting information to report on their annual greenhouse gas (GHG) emissions. It explains the steps to follow by the various parties involved a construction project's stages.

This guide is intended for Federal Government Departments and Agencies, including project managers, subject matter experts within architecture and engineering services, and environmental specialists, and can also be a resource for Canadian building professionals contracted to work on a federal government construction project.

2. Incorporating embodied carbon requirements into project phases

Meeting the requirements of the Standard for disclosing and reducing embodied carbon entails activities by various stakeholders throughout the project process. The diagram below illustrates key steps in each of the common phases of a construction project:

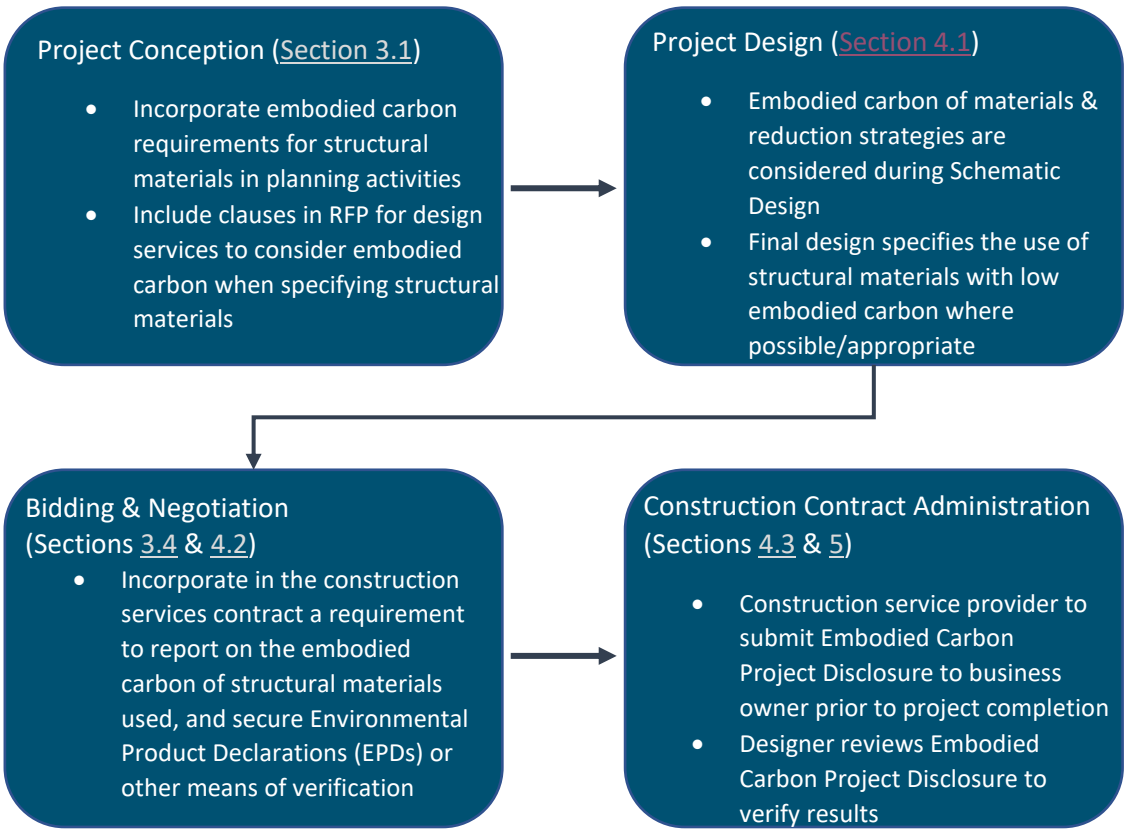

Figure 1 - Key Steps by Project Phase

3. Procurement Guidance for Business Owners:

Business owners have a role in reducing the embodied carbon of structural materials in projects through project planning activities during the initial Project Conception phase, including identification of project requirements and solicitation of design services. They also have a role in communicating the results of project reporting of embodied carbon disclosures.

Key Steps:

1. **Ensure requirements of the Standard are integrated in project planning studies (e.g., the Functional and Technical Program).**
2. **Incorporate clauses into the Statement of Work (SoW) of Requests for Proposals (RFPs) for project design & construction services to ensure specifications will meet the embodied carbon requirements of structural materials where appropriate.**

3.1 Determining Applicability

Business owners should determine whether the standard is expected to apply to a given project based on location, early estimates of its cost and material usage. Where these estimates exceed the thresholds in Appendix A of the standard, the sample clauses in sections 3.2 & 3.3 of this guide should be incorporated into RFPs for design and construction services. See the decision tree below to help determine the standard's applicability to a project:

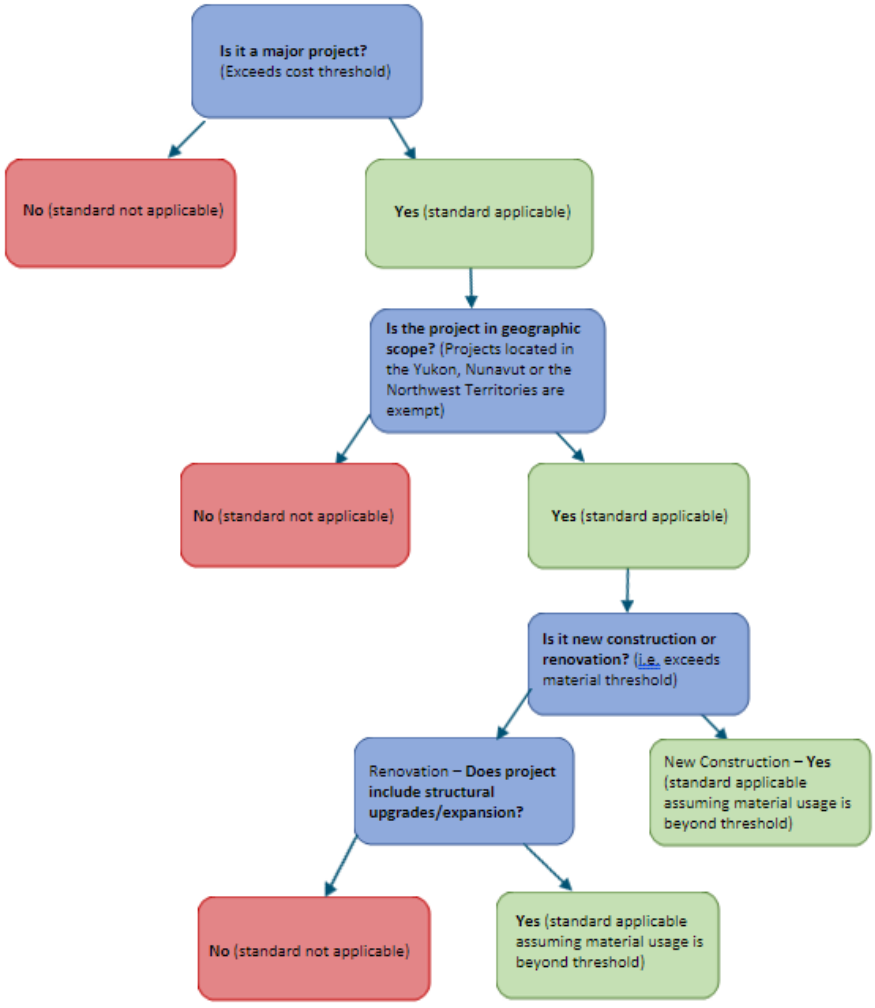

Figure 2 - Decision Tree: Does the standard apply?

3.2 Sample clauses for RFPs for design services

The following list describes requirements that should be included in the SoW section of RFPs for design services solicited by the Government of Canada for major construction projects to ensure section 3.2.2 of the Standard is met, and may be adapted by other organizations for their use:

- The service provider shall assess local material availability and specify structural materials for the project that meet or exceed the carbon footprint reduction requirements listed in Appendix A of the Standard on Embodied Carbon in Construction.
- The service provider shall verify that the Embodied Carbon Project Disclosure is complete, accurate, meets all requirements within the Standard and is submitted to the business owner (departmental authority) prior to project completion.
- The service provider shall complete and submit an Exemption Rationale as described in Appendix C of the Standard where structural materials specified for the project cannot meet required carbon footprint reductions due to material performance requirements or lack of availability.
- Where applicable, the service provider shall include the following clauses (in section 3.3 of this document) into the Statement of Work for construction services.

3.3 Sample clauses for RFPs for construction services

The following list describes requirements that should be included in the SoW section of RFPs for construction services solicited by, or on the behalf of, the Government of Canada for major construction projects to ensure section 3.2.3 of the Standard is met, and may be adapted by other organizations for their use:

- The (construction) service provider shall secure Environmental Product Declarations (EPDs) in a machine-readable format, or equivalent documentation, for each product listed as a structural material in the Standard on Embodied Carbon in Construction that is used in the project.
- The EPDs or equivalent documents used to substantiate the carbon footprint of materials must be:
    - ISO 14025:2006 Type III and ISO 21930:2017 compliant; OR
    - Generated by a software application that is validated as producing EPDs, that are compliant with ISO 14025:2006 Type III and ISO 21930:2017 and uses input data

produced using plant-specific, regional or Canadian industry-specific Life Cycle Inventory (LCI) data; OR
    - Developed using similarly robust LCA methods that comply with ISO 14040:2006 and ISO 14044:2006 or ISO 14067:2018 and that are documented and validated by a third party accredited Professional in a Letter of Assurance.
- The (construction) service provider shall complete the Embodied Carbon Project Disclosure with all relevant details for each eligible product in accordance with the Standard.
- The (construction) service provider shall include in their submittals the completed Embodied Carbon Project Disclosure and all associated EPDs, or a third-party verified LCA report as describe above, prior to project completion.
- Where the construction service provider is unable to procure products with an equivalent (or lower) embodied carbon than those specified due to lack of availability, they shall inform the design professional of record at the earliest opportunity.

3.4 Provide Information Resources to Bidders

Ensure information resources relevant to project requirements, including the Embodied Carbon Project Disclosure Template and this guide (or the departmental equivalent), are incorporated as appendices in RFPs for design and construction services.

3.5 Report Annual Results from Project Disclosures

The embodied carbon associated with the materials used in a project are considered Scope 3 (indirect) GHG emissions of the asset's business owner. At the end of a project, the contracting authority is expected to provide the business owner with the completed Embodied Carbon Project Disclosure. Business owners should keep Embodied Carbon Project Disclosures with the project's procurement files and share internally to support annual GHG emissions reporting. Reporting and analysis of the embodied carbon of projects provides a fuller picture of an organization's Scope 3 GHG emissions over time and can be used to identify opportunities for future reductions.

Each year, the Treasury Board Secretariat of Canada sends out a call letter requesting Government of Canada departments to report on their annual greenhouse gas (GHG) emissions. Departments must include the consolidated data on the carbon footprint of major projects completed in the previous fiscal year as part of this reporting.

4. Guidance for Design Professionals

The Project Design Phase typically includes multiple sub-phases (schematic design, design development, and construction documentation). During this phase, the design professional of record develops the project design based on the business owner's project requirements. Once the design is approved, construction drawings and specifications are created that will form the basis of construction contract documents. Project requirements identified by the business owner in the design services contract must be included in the specifications.

4.1 Design Phase

- The design professional of record should consider the embodied carbon impacts of material selection during schematic design and pursue strategies that will meet design requirements while reducing the embodied carbon of structural materials used. See subsection 6.3 for additional resources.
- During design development the design professional of record should:
    a. Identify baseline and minimum target global warming potentials (GWPs) that comply with requirements in the Standard for each specified product (i.e. concrete mix) composed of a material listed in Appendix A of the Standard; and
    b. specify product(s) with the lowest carbon footprint available for each type of structural material that meet the performance and other requirements of the project design.
- Where reductions in the carbon footprint of a project can be achieved through the substitution of a lower strength material with a smaller quantity of higher strength material, the design professional of record should identify the relevant elements and quantify the material(s) conserved. This information should be included in project information provided to the construction services provider(s) to support embodied carbon project disclosures.
- During design development the design professional of record should identify if the requirements of the Standard are applicable to the project, based on whether the project's estimated material quantities and total costs meet or exceed the thresholds detailed in Appendix A of the Standard.
- Where necessary to meet performance requirements of a project, the design professional of record should provide an exemption rationale as described in Appendix C of the Standard to the business owner.

4.2 Bidding & Negotiation Phase

- Ensure requirements for structural materials are incorporated in the project's construction drawings and specifications, including the material specific embodied carbon footprint (target GWP) that each product shall not exceed.
- Where the design professional of record is responsible for administering construction services contracts, ensure client requirements for collecting and reporting on embodied carbon data are included in the SoW of RFP(s). See section 3.2. of this document for requirements for major federal government construction projects.

4.3 Construction Contract Administration Phase

- Review the project's embodied carbon disclosure during the Construction Contract Administration phase to ensure adherence to the Standard.
- Provide an exemption rationale where specified materials that meet the requirements of the Standard were not available to be procured for the project.

5. Guidance for Construction Services Providers: Embodied Carbon Project Disclosures

This section aims to describe the key steps for a construction services provider (contractor) to report the embodied carbon of structural materials for a major construction project.

Key Steps:

- **Contractor to fill out the Embodied Carbon Project Disclosure Template the material quantities used, and the embodied carbon data (referencing EPDs or equivalent), for each structural material used in the project listed in the Standard.**
- **Contractor to include the completed Embodied Carbon Project Report and all EPDs (or equivalent) in their project submittal documents and provide them to the business owner prior to project completion.**

5.3 Collect & Input Required Information into the Embodied Carbon Project Disclosure Template

- Identify which specified materials are to be included in the project's embodied carbon disclosure, including those listed in Appendix A of the Standard on Embodied Carbon in Construction, and what information is required to report on each relevant construction product used.

- Determine the quantities supplied to the project for each product being disclosed, and collect Environmental Product Declarations (EPDs), or in the case of disclosure through a third-party verified LCA Report: Life Cycle Inventory (LCI) data from suppliers and other sources that demonstrates the products' Global Warming Potential (GWP). The EPDs or LCI data collected should meet the following conditions:

    - ISO 14025:2006 Type III and ISO 21930:2017 compliant; or

    - Generated by a software application that is validated as producing EPDs, that are compliant with ISO 14025:2006 Type III and ISO 21930:2017 and uses input data produced using plant-specific, regional or Canadian industry-specific Life Cycle Inventory (LCI) data; or

    - Developed using similarly robust LCA methods that comply with ISO 14040:2006 and ISO 14044:2006 or ISO 14067:2018 and that are documented and validated by a third-party accredited professional in a Letter of Assurance; and
    - Provided in a machine-readable format, including but not limited to OpenEPD and ILCD+EPD, wherever possible.
- Confirm the baseline GWP specified by the design services provider is appropriate for each product (material sub-category) supplied. Baseline GWPs for Government of Canada construction projects are

identified in the Treasury Board Secretariat's Standard on Embodied Carbon in Construction. Any change to baseline GWPs compared to those specified by the design services provider, including identifying materials that meet Special Application Requirements as defined in Appendix A of the Standard, must be clearly identified and explained in the Project Narrative section of the Embodied Carbon Project Disclosure.

- Input all required project data into the relevant fields of the Embodied Carbon Project Disclosure Template (see Appendix B of the Standard for detailed instructions).

5.4 Review & Submit

- Verify the results, and ensure the design professional of record has reviewed, the completed Embodied Carbon Project Report prior to its final submission.
- Submit the final report to the appropriate project authority prior to project completion.

6. Additional Resources

6.1 Reporting Documents

- The Embodied Carbon Project Disclosure Template

6.2 Regional Industry-Wide EPDs for Ready-Mix Concrete

- Alberta
- Atlantic Region
- British Columbia
- Manitoba
- Ontario
- Saskatchewan
- Québec

6.3 Information Resources for Designers, Builders & Suppliers

- Getting to Zero – Concrete's Role in Decarbonizing the Built Environment (rmcao.org)
- Strategies for low carbon concrete: primer for federal government procurement
- CSA23.1 - Concrete materials and methods of concrete construction / Test methods and standard practices for concrete
- Canadian National Master Construction Specification

6.4 Related webpages

- Policy on Green Procurement- Canada.ca
- Greening Government Strategy: A Government of Canada Directive - Canada.ca
- Green Procurement on GCpedia

Appendix A: Definition of terms for the Standard on Embodied Carbon in Construction

A1.1 Defined Terms

embodied carbon in construction - the greenhouse gas emissions associated with the extraction, manufacturing, transportation, installation, maintenance, and disposal of construction materials and the process of construction. The minimum scope applicable to the Standard on Embodied Carbon in Construction are the greenhouse gas emissions associated with the extraction and manufacturing of a material listed in Appendix A.

Environmental Product Declaration (EPD) – an environmental declaration providing quantified environmental data using predetermined parameters and, where relevant, additional environmental information. (ISO 21930:2017)

Global Warming Potential (GWP) - a metric that examines each greenhouse gas's ability to trap heat in the atmosphere compared to carbon dioxide (CO2), measured over a specified time horizon.

Life Cycle Assessment (LCA) – a compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle. (ISO 21930:2017)

life cycle assessment reviewer (LCA reviewer) - an individual who:

- is familiar with the requirements of ISO Standard 14025 and ISO 21930 with respect to lifecycle assessment; and
- has scientific and technical expertise with respect to the construction products that are within the scope of the application

major construction projects – for the purposes of this standard, any renovation or new construction project of a Government of Canada real property asset that meets or exceeds the thresholds described in Appendix A of the standard.

structural materials - for the purposes of this standard, materials that are typically used for components that provide bearing support to any other integral member of a structure, or components that support variable and non-variable forces acting on a structure.

A1.2 Glossary and Abbreviations

- Contractor: For simplicity in this guide the term Contractor is used to mean the principal constructor for the project. Depending on the project delivery method, this entity could be a general contractor, a construction manager for construction services, or a design-builder.
- Design professional of record: The professional designer for the project, architect of record or engineer of record
- GGS: Greening Government Strategy
- GoC: Government of Canada
- LCI: Life Cycle Inventory
- RFP: Request for Proposal
- SoW: Statement of Work
- TBS: Treasury Board of Canada Secretariat

Appendix B: Instructions for using the Embodied Carbon Project Disclosure Template

B.1 Complete the Project Overview Information Tab

Fill out all applicable fields in the Project Overview tab of the template including:

- Name of client organization, name of project, and Directory of Federal Real Property (DFRP) number if available.
- Contact information for the contractor and design professional of record.

Project information should include:

- the project's location (geographic coordinates may be substituted where no street address is available),
- asset archetype (e.g. type of infrastructure such as a bridge, or the primary occupancy of a building such as an office),
- the project's spatial footprint (building area) in square meters,
- the number of storeys and gross floor area in square meters (where project is of a building)
- Expected project completion date
- Suppliers of ready-mix concrete to the project (add rows if there are more than two).

B.2 Complete the Ready-Mix Concrete Reporting Tab

1. List all project elements composed of a unique concrete mix in column A.

2. Identify which project mixes were considered Special Applications (column B) or Volume Reductions (column C) as described in Appendix A of the standard.

- Special application requirements are available to accommodate project situations that typically require concrete mixes that have a higher global warming potential (GWP). A 30% increase to the BaseGWP is provided to project mixes that meet the following conditions:
  a) Where the design professional of record has specified high performance concrete (as defined by CSA23.1), or
  b) Where project scheduling and weather conditions require cold weather application (as defined by CSA23.1), or
  c) Where project conditions other than cold weather require the use of high early strength cement.

- Volume reductions are situations where the design professional of record was able to reduce project GHG emissions by substituting a larger volume of a lower strength concrete for a smaller volume of higher strength concrete without the addition of other structural materials). Project mixes may only be identified as having volume reductions by the design professional of record. In these situations, the volume and BaseGWP of the 'typical' (un-reduced) mix is inputted into

columns F & G, while the 28-day strength, volume & GWP of the actual project mix used is to be inputted into columns D, J & K.

3. List the 28-day compressive strength of each project mix in column D.

4. For each project mix, identify the LCA Results table number (column E) and baseline GWP (column F) of the equivalent concrete type from the applicable regional industry-wide EPD (based on the project's location).

Note: Where none of the concretes identified in the Regional Industry Average EPD are equivalent to the project mix in terms of 28-day compressive strength or air entrainment, the identified concrete most similar to the project mix should be selected as a baseline.

5. List the volume of concrete supplied to the project for each project mix in column G.

6. List the EPD number from the supplier's EPD for each project mix in column I. Alternately, where an LCA report is being used instead of EPDs to substantiate the embodied carbon of structural materials, list the mix design reference number for each project mix.

7. List the GWP of each project mix as stated in the supplier's EPD in column J. Alternately source the GWP of each mix from an LCA report where being used to substantiate the embodied carbon of structural materials.

8. List the adjusted (reduced) volume for each project mix whose volume was reduced as defined in Appendix A of the standard.

9. Where carbon sequestration was utilized to reduce the carbon footprint of concrete used in the project, it may be accounted for in the template in the following manner:

a. Fill out a distinct row within the Ready-Mix Concrete Reporting section.
b. Input "Carbon Sequestration" in column A
c. Select "No" in columns B & C
d. Input into column I the EPD number of the EPD provided by the service provider
e. Input into column M the total carbon dioxide equivalent sequestered/stored (in tonnes CO2e) as stated in the EPD.
f. Input "N/A" into columns D, E, F, G, H, J, K and L