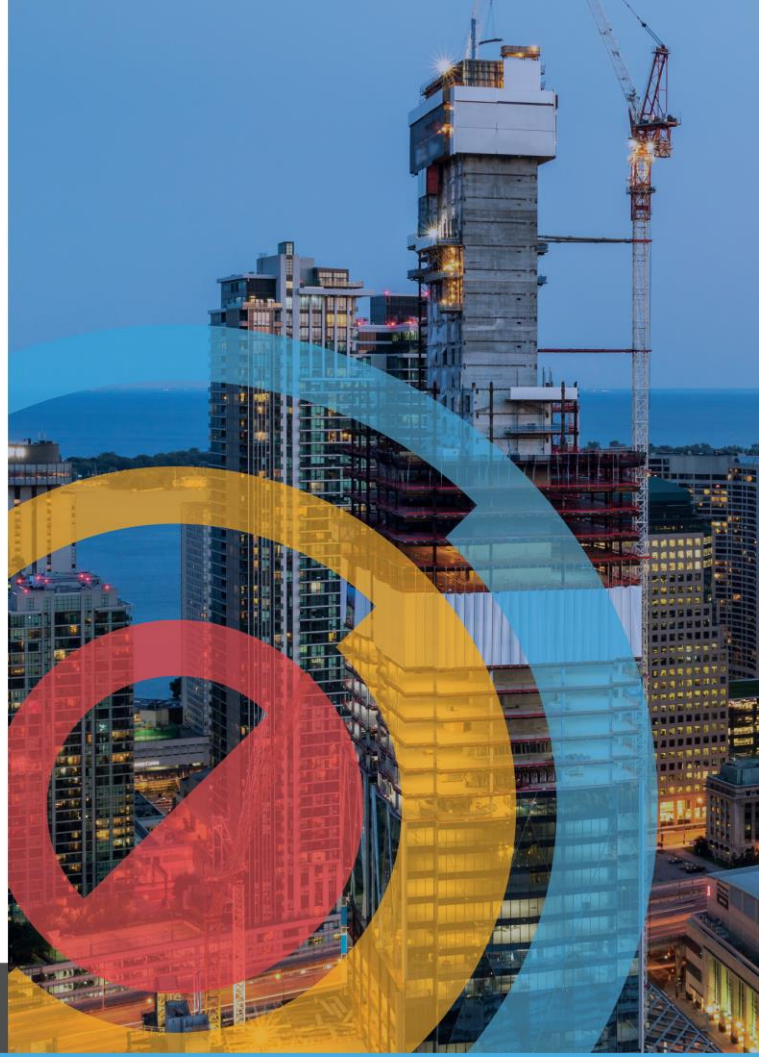
Canada's Standard on Embodied Carbon in Construction

Global Approaches to Low Carbon Construction Policy

April 1, 2025

MANTLE DEVELOPMENTS

We Build Climate Leaders



Mantle Developments

We build climate leaders
We are climate consultants

What sets us apart:

- Leaders in embodied carbon and LCA;
- Pragmatic and policy-driven;
- Focus on helping our clients achieve great climate **AND** business outcomes.

Our team consists of mission- and data-driven engineers, architects, and business/ technology professionals.

- We value transparency, high-quality communications, and your time.

Ryan Zizzo, CEO & Founder *PEng, MASc, LEED AP ND*

- Recognized leader in green buildings and climate with 15+ years experience across Canada and Europe
- Supported the development of the City of Toronto's Toronto Green Standard version 4 update, North America's first policy to cap embodied carbon on certain types of new construction
- Supported the development of the Government of Canada's low-carbon concrete policy (Standard on Embodied Carbon in Construction)
- Canada Green Building Council (CAGBC): Embodied Carbon Technical Advisory Group Member, and previous member (4-year term) on Zero Carbon Steering Committee
- Advisory Board Member of the Carbon Leadership Forum (CLF) and founder of the CLF Toronto Hub

Greening Government Strategy

Launched in 2017 and updated in 2024. Provides a roadmap for the Government of Canada to achieve net zero emissions by 2050.

- Applies to all Government of Canada operations, owned and leased property, fleets, procurement, and services.
- Applies to all crown corporations (Canada Post, VIA Rail, CBC, Bank of Canada, LCBO, etc)

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Greening Government Strategy: A Government of Canada Directive

From: Treasury Board of Canada Secretariat

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  - Policy and engagement
  - Oversight and performance management
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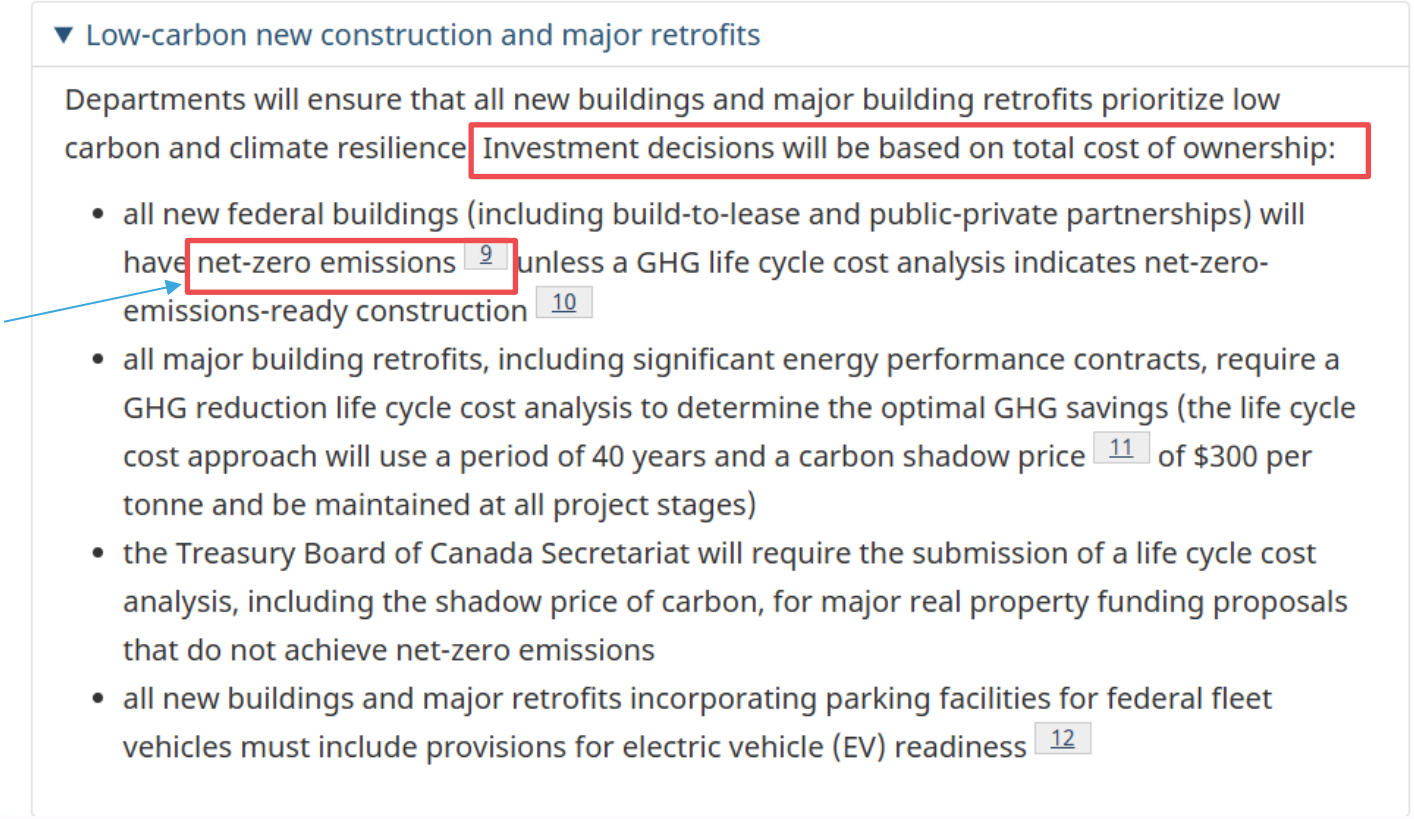
Real Property

- ▶ Low-carbon new construction and major retrofits
- ▶ Climate-resilient new construction and major retrofits
- ▶ Low-carbon operations
- ▶ Buy clean: low-carbon construction
- ▶ Leased facilities
- ▶ Water
- ▶ Waste
- ▶ Biodiversity and nature-based climate solutions

Real Property
Low-carbon new construction and major retrofits

Definition notes:
"Starting in 2025, these buildings will have at least 30% less embodied carbon in major construction materials.



▼ Low-carbon new construction and major retrofits

Departments will ensure that all new buildings and major building retrofits prioritize low carbon and climate resilience. Investment decisions will be based on total cost of ownership:

- all new federal buildings (including build-to-lease and public-private partnerships) will have net-zero emissions [9] unless a GHG life cycle cost analysis indicates net-zero-emissions-ready construction [10]
- all major building retrofits, including significant energy performance contracts, require a GHG reduction life cycle cost analysis to determine the optimal GHG savings (the life cycle cost approach will use a period of 40 years and a carbon shadow price [11] of $300 per tonne and be maintained at all project stages)
- the Treasury Board of Canada Secretariat will require the submission of a life cycle cost analysis, including the shadow price of carbon, for major real property funding proposals that do not achieve net-zero emissions
- all new buildings and major retrofits incorporating parking facilities for federal fleet vehicles must include provisions for electric vehicle (EV) readiness [12]

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Real Property
Climate-resilient new construction and major retrofits

▼ Climate-resilient new construction and major retrofits

Departments will ensure that all new buildings and major building retrofits prioritize low carbon and climate resilience, as follows:

- all new federal buildings, infrastructure and major building retrofits, including significant energy performance contracts, require a climate change risk assessment that incorporates both current and future climate conditions in the analysis and the incorporation of adaptation measures to reduce significant risks
- as of 2025, office tenant operations will be located in buildings (both leased and Crown-owned) based on identified operational risk level thresholds in discussion with client departments
- new and renewed office space leases, and occupancy agreements in Crown-owned buildings, for critical operations must have assessed and addressed significant climate risks

Real Property
Buy clean: low-carbon construction

▼ Buy clean: low-carbon construction

The government will implement Buy Clean in its procurement by reducing the environmental impact of construction materials and design by:

- disclosing the amount of embodied carbon [16] in the construction materials of major construction projects, based on material carbon intensity or a life cycle assessment
- conducting whole-building (or asset) life cycle assessments by 2025 at the latest for major buildings and infrastructure projects
- reducing the embodied carbon of major construction projects by 30%, starting in 2025, using recycled and lower-carbon materials, material efficiency and performance-based design

Projects will also minimize the use of harmful materials in construction and renovation, including using low volatile organic compound (VOC) materials in building interiors.

Standard on Embodied Carbon in Construction

Effective December 31, 2022

Subsections of 7.1-7.3 of the Policy on Green Procurement

"Sets minimum requirements for the procurement of design and construction services to **disclose and reduce the embodied carbon of major construction projects**. Major construction projects typically include the renovation or new construction of buildings or engineering assets."

Requirements

1. **Disclose the carbon footprint of ready-mix concrete on all major buildings and engineering assets.**
    - Must submit a project disclosure template and Environmental Product Declarations (EPD) or third-party Life Cycle Assessment (LCA) report.

2. **Reduce the embodied carbon footprint of concrete used by 10% in government projects** calculated based on the Regional Industry Average EPD.

Standard on Embodied Carbon in Construction

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Standard on Embodied Carbon in Construction

The objective of this standard is to establish requirements to disclose and reduce the embodied carbon footprint of construction projects in accordance with the commitments in the *Greening Government Strategy*.

Date modified: 2022-11-14

Expand all | Collapse all

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- ▸ 2. Effective date
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▸ More information

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Print-friendly | XML

▾ Appendix A: Schedule of Structural Materials and Carbon Footprint Requirements

This schedule forms part of the requirement for the disclosure of and reduction in the carbon footprint of structural materials.

Material category	Concrete
Material subcategory	Ready mix
For projects or programs at or above	$10 million where design services are solicited on or after December 31, 2022. $5 million where design services are solicited after December 31, 2024.
Minimum material quantity [1]	100 m3 (sum of all mixes used)
Minimum resolution for disclosure requirement	The highest-resolution Environmental Product Declaration (EPD) available must be used to source the global warming potential (GWP) for each mix used in the project (for example, product-specific, regional average, in that order)
Greenhouse gas reduction requirement	For design services solicited on or after December 31, 2022, the embodied greenhouse gas (GHG) emissions of procured ready-mix concrete shall be disclosed on a project basis and be substantiated with EPDs in accordance with the *Standard on Embodied Carbon in Construction*. Project GHG emissions from ready-mix concrete are the sum of GHG emissions from all mixes used, calculated using the global warming potentials (GWPs) and volumes of each mix placed. The total project GHG emissions from ready-mix concrete shall be at least 10% less than those calculated using the GWPs of the baseline mix in the Regional Industry Average Environmental Product Declaration (EPD) for the strength class of each mix and the volume of mix placed (see equations 1 and 2). The Embodied Carbon Disclosure Template must be used to demonstrate this outcome. **Equation 1** $$\text{GHG Reduction} = \text{CO2e Baseline} - \text{CO2e Project}$$ ▸ Figure 1 - Text version **Equation 2** $$\%\ \text{GHG Reduction} = \frac{(\text{GHG Reduction}) \cdot 100}{\text{CO2e Baseline}}$$ ▸ Figure 2 - Text version

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Standard on Embodied Carbon in Construction

▾Appendix A: Schedule of Structural Materials and Carbon Footprint Requirements

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▾Appendix B: Information for the Embodied Carbon Project Disclosure Template

The Embodied Carbon Project Disclosure Template must be completed for every applicable project to demonstrate that the requirements of the standard were met. The completed template is to be secured by the organization before project completion. The following information must be provided as part of completing the template.

Project Overview

The following project information must be included when completing an Embodied Carbon Project Disclosure Template.

- Name of client organization
- Name of client project
- Client project number
- Government of Canada Directory of Federal Real Property (DFRP) identification (if available)
- Prepared by (name of general contractor)
- Name of general contactor's company
- General contractor's email
- General contractor's phone number
- Date of preparation by contractor (day-month-year)
- Reviewed by (name of designer)
- Name of designer's company
- Designer's email
- Designer's phone number
- Date of review by designer (day-month-year)
- Project location (street address)
- Project location (city or town)
- Project location (province or territory)
- Asset archetype (for example, bridge, office, lab)
- Project footprint or building area (m²)
- Number of floors (if applicable)
- Project gross floor area (m², if applicable)
- Anticipated project completion date (day-month-year)
- Name of material supplier 1
- Material supplier 1 email
- Name of material supplier 2
- Material supplier 2 email
- Project narrative (designer notes)

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Standard on Embodied Carbon in Construction

- Applies to **new construction or renovation of real property projects >$5M**. From 2022-2025 was >$10M.
- Currently only applies to **ready-mix concrete over 100 m3** in total on the project.
- Additional materials are expected to be added in the future, starting with steel.
- **Precast concrete to be added (soon?)**
    - Future-proofing strategy: be at least 10% (ideally 20%) below industry-average.

Standard on Embodied Carbon in Construction

Additional notes:

- High early strength, high or ultra-high performance, or cold-weather application, the **benchmark is increased by 130%.**

- Reduction requirement does not apply “if the required performance of a structural material hinders the implementation of the [reduction requirement] **or if a material is not available in a given region**.”

- The Standard does **not apply to projects in the Yukon, Nunavut, and the Northwest Territories** as there are limited low-carbon concrete options in those locations.

How to demonstrate compliance

Baseline:

Table 6. LCA Results 25 MPa concrete without air

	Unit	Baseline 25 MPa concrete without air GU 10 SL	25 MPa concrete without air GU	25-MPa concrete without air GU 15 SL	25 MPa concrete without air GU 25 SL	25-MPa concrete without air GU 35 SL	25-MPa concrete without air GU 50 SL	25 MPa concrete without air GUL	25 MPa concrete without air GUL 15 SL	25-MPa concrete without air GUL 25 SL	25-MPa concrete without air GUL 35 SL	25-MPa concrete without air GUL 50 SL
Environmental impacts												
GWP	kg CO_2 eq.	254.05	273.67	244.24	224.62	205.01	175.58	255.89	229.13	211.29	193.45	166.69
ODP	kg CFC-11 eq.	6.35E-06	6.25E-06	6.40E-06	6.49E-06	6.58E-06	6.72E-06	5.38E-06	6.16E-06	6.28E-06	6.41E-06	6.59E-06
EP	kg N eq.	0.20	0.21	0.19	0.19	0.18	0.16	0.19	0.18	0.18	0.17	0.16
AP	kg SO_2 eq.	1.22	1.25	1.21	1.18	1.15	1.10	1.19	1.16	1.13	1.11	1.07
POCP	kg O_3 eq.	20.96	21.11	20.88	20.73	20.58	20.35	20.30	20.19	20.12	20.05	19.94
Use of primary resources												
RPR_E	MJ, NCV	72.27	76.83	69.99	65.41	60.88	54.04	76.62	69.82	65.28	60.74	53.94
RPR_M	MJ, NCV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$NRPR_E$	MJ, NCV	1600.80	1637.11	1582.64	1546.33	1510.02	1455.55	1555.40	1513.19	1485.05	1456.91	1414.69
$NRPR_M$	MJ, NCV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Use of secondary resources												
SM	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	MJ, NCV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ, NCV	115.37	128.18	108.96	96.14	83.32	64.09	119.14	101.27	89.36	77.44	59.57
RE	MJ, NCV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Abiotic depletion potential												
ADPF	MJ, LHV	587.66	585.65	588.67	590.69	592.71	595.73	581.27	584.95	587.41	589.86	593.54
ADPe	kg Sb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Consumption of freshwater resources												
FW	m^3	2.47	2.52	2.45	2.40	2.35	2.28	2.50	2.43	2.38	2.33	2.27
Waste and output flows												
HWD	kg	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
NHWD	kg	209.33	232.58	197.70	174.45	151.19	116.31	219.89	186.91	164.93	142.94	109.97
HLRW	m^3	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07
ILLRW	m^3	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07	2.95E-07
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Additional inventory parameters for transparency												
CCE	kg CO_2 eq.	118.50	131.67	111.92	98.75	85.59	65.83	121.55	103.32	91.16	79.01	60.78

CONCRETE ONTARIO
Ready Mixed Concrete Association of Ontario

ASTM INTERNATIONAL
Helping our world work better

Proposed:

ENVIRONMENTAL
PRODUCT
DECLARATION

READY MIX CONCRETE PRODUCED BY LAFARGE

FACILITY: BURLINGTON Q01

ECO.Pact

MIX NAME: RMP25N511X

STRENGTH: 25 Mpa at 28 days Non-Air

Impact Indicator		per m3
Climate Change	kg CO2e	130.17
Ozone Depletion	kg CFC11e	4.18E-06
Acidification	kg SO2e	1.00
Eutrophication	kg NE	0.13
SFP (Smog)	kg O3e	28.18
Non-renew. energy	MJ, NCV	1535.24

1. GENERAL INFORMATION

Declared Product	Ready-mixed concrete produced by Lafarge
Date of Issue	2/15/2022
Period of Validity	5 Years
EPD Holder	Lafarge - Eastern Canada 6509 Airport Road Mississauga, ON, L4V 1S7
Program Operator	ASTM International 100 Barr Harbor Drive,West Conshohocken, PA 19428-2959, USA
LCA and EPD Developer	Athena Sustainable Materials Institute 280 Albert Street, Suite 404, Ottawa, ON K1P 5G8, Canada
Core PCR	ISO 21930:2017 Sustainability in Building Construction — Environmental Declaration of Building Products
Sub-category PCR	NSF International Product Category Rule (PCR) for Concrete Version 1 (February 22, 2018), verified by Thomas P. Gloria, Ph.D., Industrial Ecology Consultants
Independent LCA Reviewer and EPD Verifier	Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006 by: Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) - Industrial Ecology Consultants ☐ internal ☒ external

The declared product meets the following product specifications:

- ACI 211: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- ACI 318: Building Code Requirements for Structural Concrete
- ASTM C94: Standard Specification for Ready-Mixed Concrete
- CSI MasterFormat Division 03-30-00: Cast-in-Place Concrete
- UNSPSC Code 30111500: Ready Mix

Disclaimer:

EPDs are comparable only if they comply with this document, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

130 vs 254 = 48% below “baseline”.
> 10% below baseline requirement.

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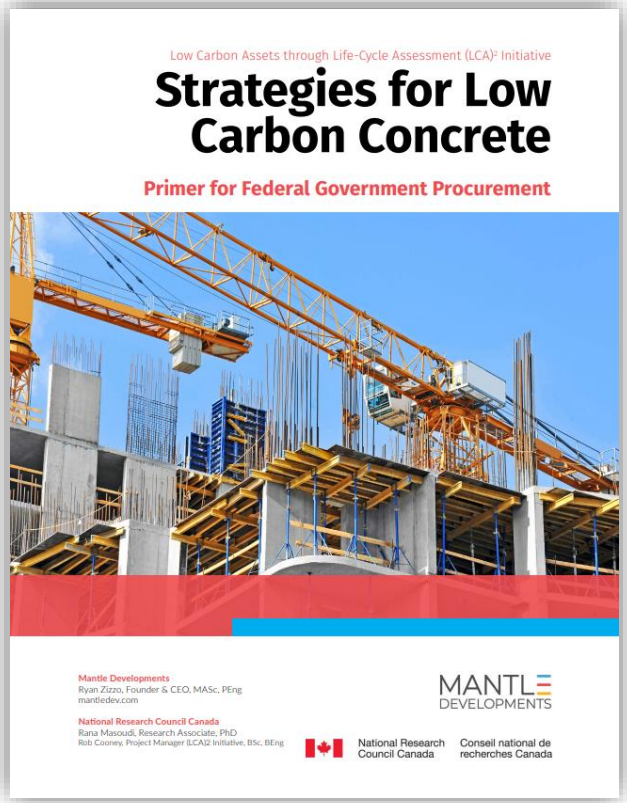
NRCan's Low Carbon Concrete Primer

Link



Low Carbon Concrete Guidance

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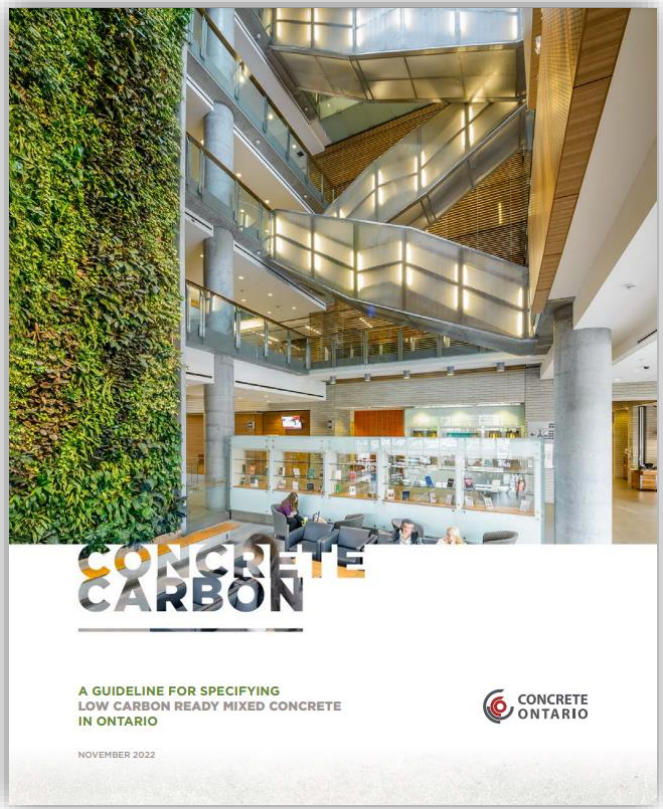

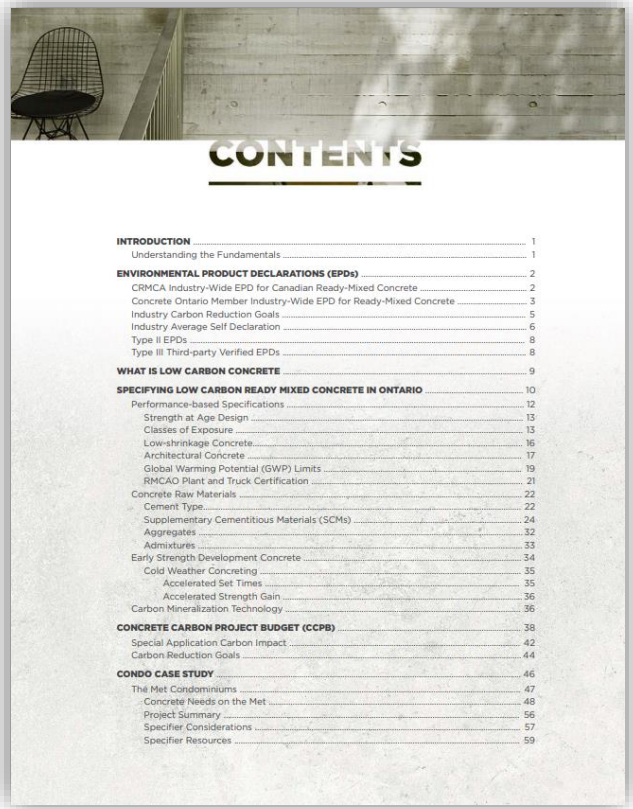

CONTENTS

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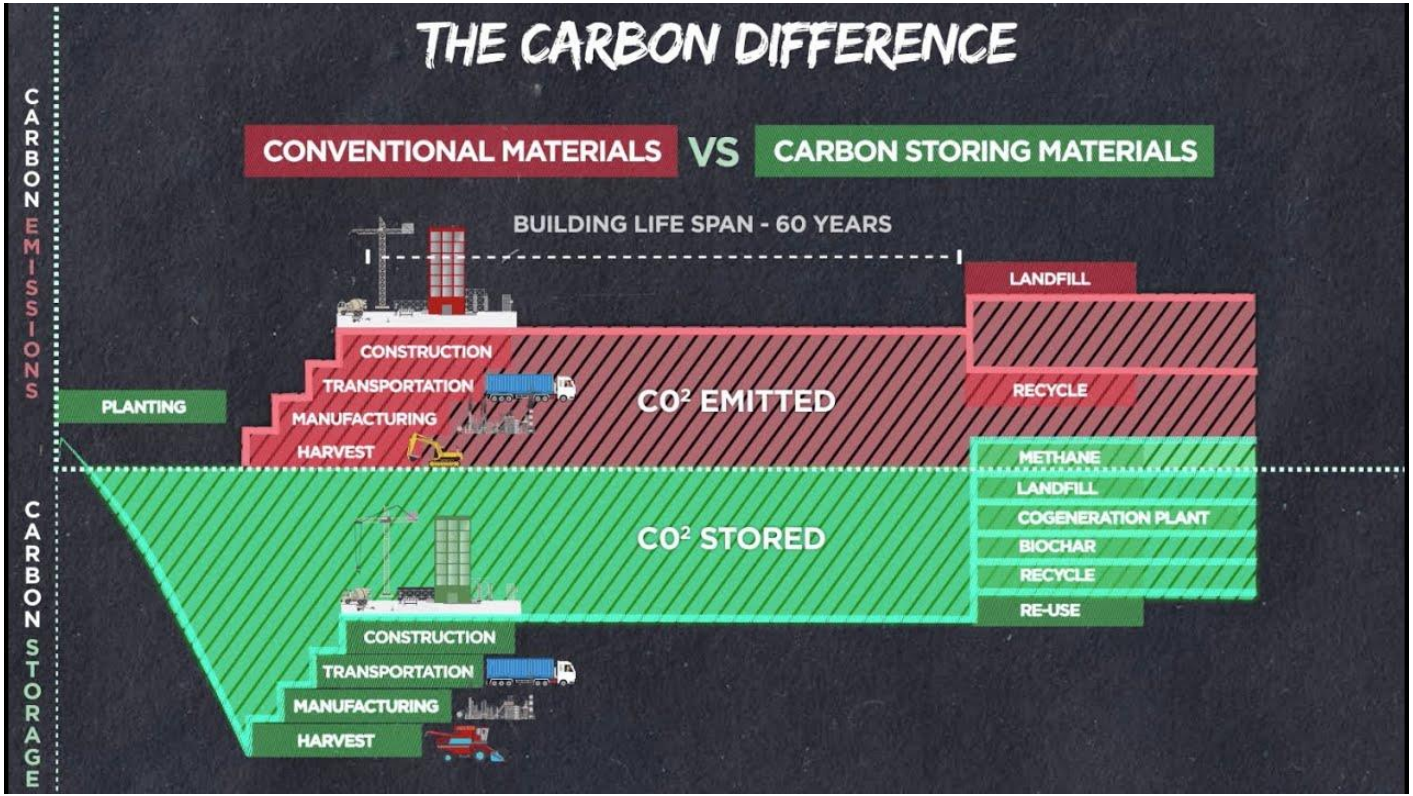
Where we need to go: concrete as a carbon sink



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Let’s chat. Thank you!

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