ATLANTIC CASE STUDY



# HOUSING
# FOR HEALTHCARE

Concrete Atlantic béton Atlantique

# ATLANTIC: HOUSING FOR HEALTHCARE CASE STUDY

As governments and industry collaborate and address the housing challenge across Canada, this case study was chosen as it highlights:

- Canada's concrete industry's willingness and readiness to collaborate with government and other partners on the delivery of sustainable and non-market housing.
- The great opportunity choosing concrete provides to construct non-market housing solutions that are lower carbon and sustainable, affordable, and equally as important in an era of climate change, resilient & safe.

## HOUSING FOR HEALTHCARE: 20-unit modular housing

The Housing Trust of Nova Scotia (HTNS) is a non-profit organization dedicated to creating safe, non-market, and sustainable housing across the province. They partner with communities, governments, and local organizations to develop, preserve, and revitalize housing that supports healthcare workers, families, and residents in need.

Housing Trust
OF NOVA SCOTIA

Guided by mission and values, HTNS are committed to building strong, vibrant communities where everyone has a place to call home. The goal of the Housing Trust is "to acquire or build 1,000 units by 2030, transitioning units from the private sector to the community or non-profit sector and building in partnership to create a stock of perpetually non-market housing."



The Housing for Healthcare program, under which this particular 20-unit modular development is built, is a partnership between The Housing Trust and the Government of Nova Scotia. The units will provide non-market housing designated for healthcare and other skilled workers.

The housing development is situated on Glen Allan Drive in Bridgewater, a regional economic hub approximately 100 km southwest of Halifax, N.S. These townhouses, made available for lease starting late 2025, were funded as part of the overall non-market housing program support from the province to HTNS Housing for Healthcare of $45 million at multiple sites.

**Participants on the project include:**

**Architect** – Supreme Homes
**Contractor** – HTNS Construction Team
**Engineer** – ABLE Engineering
**Concrete Supplier** – Bridgewater Ready Mix

Bridgewater Ready Mix as a local producer has committed to lower carbon concrete with the launch of their Type III EPDs for its commercial and residential concrete mix designs, as well as their registered EcoSmart Concrete 30 mix line that commits to 30% carbon reduction without compromising quality and performance.

They use the 3 primary levers available to producers to reduce carbon in mixes, along with some innovative AI/data-specialist and engineering support:

- Plant and process carbon-efficiency improvements
- Transportation carbon-efficiencies
- Mix design and materials carbon-efficiencies





## CONCRETE NEEDS on the project

The Housing Trust of Nova Scotia has a primary mission to provide good quality, non-market housing for low to moderate-income working households, while being environmentally sustainable.

As such, the high-level concrete needs on this project were for lower carbon mixes, with equivalent quality and cost.

As explained in detail in this guide and highlighted in other case studies, two of the keys to lower concrete carbon project success are:

- Performance-Based Specifications, and
- Collaboration between the ready-mixed concrete producer and the project design team.

Both of these two critical success factors were in action on the HTNS project. Mixes were designed and proposed using CSA Performance-Based specifications by Harbourside Engineering, on behalf of Bridgewater Ready Mix, and were collaboratively-reviewed and accepted by the project's structural engineer. This approach supported concrete that met all performance requirements while offering carbon-lowering benefits at equivalent cost. In collaboration with Bridgewater Ready Mix and Harbourside Engineering, the HTNS project team approved the use of EcoSmart Concrete 30 lower carbon concrete.

The following summary outlines the mix designs, volumes, and corresponding applications of the concrete scheduled for placement on this project:

| Applications | | Actual Project Volume ($m^3$) | Mix Design | Cement type | Supplementary Cementitious Materials Type |
|---|---|---|---|---|---|
| Footings exposed to freeze/thaw | Standard | 16 | 25MPa F-2 Air | GUL | Type F Fly Ash |
| Footings not exposed to freeze/thaw | Standard | 51 | 25MPa Non Air N 20mm stone | GUL | Type F Fly Ash |
| ICF Foundation Walls | Standard | 117 | 25MPa Non Air N 14mm stone | GUL | Type F Fly Ash |
| Mud Slabs | No Baseline Available | 107 | 11 MPa Non Air N | GUL | Type F Fly Ash |

## Applying the CCPB Process

In this particular case study, the volumes and mixes did not change significantly pre-to-post project. As such, for this example, we will forgo STEP 1 calculating the Anticipated CO2e Baseline and proceed to STEP 2.

## STEP 2: CALCULATE FINAL CO2E BASELINE

The final CO2e Baseline for the project is determined using the Atlantic Concrete Member Industry-Wide Environmental Product Declaration (Atlantic IA EPD) for Ready-Mixed Concrete (July 27, 2022). The following table presents the CO2e Baseline calculations based on mix designs, available EPD Baselines, and actual volumes used in the project.

| Mix Design | Actual Volume ($m^3$) | Atlantic IA EPD Baseline Mix GWP (kg $CO_2/m^3$) | CO2e Baseline (tonnes $CO_2$) |
|---|---|---|---|
| 25MPa F-2 Air | 16 | 370.25 | 5.9 |
| 25MPa Non Air N 20mm stone | 51 | 354.02 | 18.1 |
| 25MPa Non Air N 14mm stone | 117 | 354.02 | 41.4 |
| 11 MPa Non Air N | 107 | no baseline available | 0 |
| **Total** | **291** | **Total CO2e Baseline** | **65.4** |

There is one mix in this table that does not have an available Baseline in the Atlantic Concrete Member Industry-Wide Environmental Product Declaration EPD (Atlantic IA EPD). In addition, the strength of this mix is well below the lowest available baseline presented in the Atlantic IA EPD so any linear regression is absolutely not recommended.

The 11MPa Non Air N mix used for mud slabs on this project used GUL and Type F Fly Ash as noted in the initial mix and application table. As such, if a standard baseline had been available, it would be a safe assumption that some carbon reduction versus baseline would be achieved by virtue of these carbon-lowering cementitious material choices.

However, in this case given the lack of baseline – this case study utilized a conservative approach and assume that no carbon-reduction is achieved between CO2e Baseline and CO2e Project for the 11MPa Non Air N mix.

It is worth noting that the current regional CRMCA EPDs for Ready-Mixed Concrete expire in Q3 of 2027. Canada's ready-mixed concrete industry remains committed to transparent, third-party validated carbon-accounting following appropriate standards of practice as a critical foundation for all industries in the country to achieve their zero carbon goals. In addition, the industry will continue to evaluate and add user value to the industry-wide EPDs in each region, committed to drive progress towards Concrete Zero. It is anticipated that evaluations of needed additional mix designs / baselines will be a key part of the next EPD update projects across the country.



## STEP 2B: ADJUST & CALCULATE CO2E BASELINE FOR ANY SPECIAL APPLICATION MIXES

There is no requirement for Step 2B: ADJUST & CALCULATE CO2e BASELINE FOR ANY SPECIAL APPLICATION MIXES on this particular project case analysis as there were no mixes on this project that fit that category.

## STEP 3: CALCULATE CO2E PROJECT
## STEP 4: CALCULATE GHG REDUCTION
## STEP 5: CALCULATE % GHG REDUCTION

Since the preceding case studies from across the country have fully familiarized the CCPB step-by-step process, this next section completes Steps 3, 4, and 5 in one table.

Remember the CO2e Project calculation uses actual volumes and the EPD value associated with the actual mixes used on this project.

When Plant-Specific Type III EPDs are available, they are the source for the GWP value associated with each actual mix for CO2e Project. **(See Calculation Example (i))** When Plant-Specific Type III EPDS are not available, the GWP value for each actual mix for CO2e Project may be taken from the relevant provincial industry-average EPD. **(See Calculation Example (ii))**

### Calculation Example (i): Using Baseline IA compared to Plant-Specific Type III EPD

| | | | | STEP 2 | | STEP 3 |
|---|---|---|---|---|---|---|
| Actual Project Mixes (all with GUL, 25 FA) | Actual Project Volumes ($m^3$) | Baseline Mix Atlantic IA EPD | Baseline Mix GWP Atlantic IA EPD (kg $CO_2$ / $m^3$) | CO2e Baseline (tonnes $CO_2$) | Type III Plant-Specific EPD | CO2e Project (tonnes $CO_2$) |
| 25MPa F-2 Air | 16 | GU 10FA with air & 0.55 /wcm | 370.25 | 5.9 | 255 | 4.1 |
| 25MPa Non Air N 20mm stone | 51 | GU 10FA without air | 354.02 | 18.1 | 244 | 12.4 |
| 25MPa Non Air N 14mm stone | 117 | GU 10FA without air | 354.02 | 41.4 | 244 | 28.5 |
| 11 MPa Non Air N | 107 | N/A | N/A | N/A | N/A | N/A |
| | | | Total: | 65.4 | | 45.1 |
| | | | % GHG reduction: | | | 31% |

Using the available Plant-Specific Type III EPDs for the mixes on this project, the concrete supplied on the project resulted in a % GHG Reduction of 31%.



## Calculation Example (ii): Using Baseline IA EPD compared to Mix-Specific IA EPD

| | | | | STEP 2 | | STEP 3 |
|---|---|---|---|---|---|---|
| Actual Project Mixes (all with GUL, 25 FA) | Actual Project Volumes ($m^3$) | Baseline Mix Atlantic IA EPD | Baseline Mix GWP Atlantic IA EPD (kg $CO_2$ / $m^3$) | CO2e Baseline (tonnes $CO_2$) | Atlantic IA EPD Mix (kg $CO_2$ / $m^3$) | CO2e Project (tonnes $CO_2$) |
| 25MPa F-2 Air | 16 | GU 10FA with air & 0.55 /wcm | 306.32 | 370.25 | 302.41 | 4.8 |
| 25MPa Non Air N 20mm stone | 51 | GU 10FA without air | 396.85 | 354.02 | 290.17 | 14.8 |
| 25MPa Non Air N 14mm stone | 117 | GU 10FA without air | 409.82 | 354.02 | 290.17 | 33.9 |
| 11 MPa Non Air N | 107 | N/A | N/A | N/A | N/A | N/A |
| | | | Total: | 65.4 | | 53.6 |
| | | | % GHG reduction: | | | 18% |

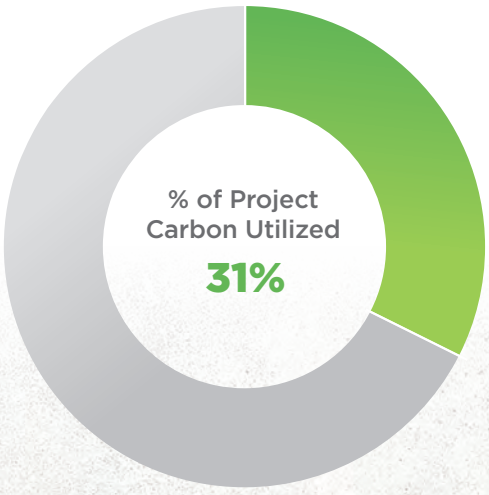
Had it been the case that Plant-Specific Type III EPDs were not available for this project, using the GWP value for each actual mix taken from the relevant regional industry-average EPD, would have resulted in a % GHG Reduction of 18%.

## Project Summary

Applying the concept of the CCPB and following the process through the case study, the HTNS HOUSING FOR HEALTHCARE: 20-unit modular housing project achieved a notable 31% reduction in $CO_2$. A full summary of the Final CO2e Baseline versus the CO2e Project results is shown here.

### Concrete Carbon Project Summary

Using Atlantic IA Baselines & Plant-Specific EPDs




**Summary**

Total Concrete Carbon Project Budget
**64.5 tonnes $CO_2$**

Total Carbon Project Impact
**45.1 tonnes $CO_2$**

Total Carbon Savings
**20.3 tonnes $CO_2$**

% GHG Reduction
**31%**

Whether using Plant-Specific Type III EPDs or the more conservative estimates from regional industry-average EPDs, this case study serves as an excellent example how lower carbon concrete can contribute to resilient, environmentally-sustainable, non-market housing projects.

**Schedule, quality, and cost goals can be achieved, even when lower carbon concrete targets are set, along with key supporting factors:**

- **Use of Performance-Based Specifications,**
- **Collaborative dialogue between the ready-mixed concrete producer and the project team during every pre-project and project phase,**
- **Requiring use of third-party validated EPDs for building materials, and**
- **A vetted carbon analysis process such as the Treasury Board of Canada – endorsed Concrete Carbon Project Budget approach.**



