Portland-Limestone Cement

(Contempra™)



An innovative lower carbon cement that can reduce CO_2 emissions by one megatonne. Every year.

Cement is an essential ingredient in concrete, the indispensable construction material that is literally the foundation of modern communities. Reflecting the cement and concrete industry's commitment to being a proactive partner in finding solutions for a low carbon future, Portland-limestone cement, also known as Contempra, is a new cement that reduces CO_2 emissions by 10% while still producing concrete of comparable strength and durability to concrete produced with regular Portland cement. Portland-limestone cement is recognized in CSA cement and concrete standards.

Portland-limestone cement is rapidly becoming the preferred cement for the majority of new construction projects in Canada. In British Columbia alone, it already accounts for over 50% of the domestic cement consumed in the province and is prioritized in BC's climate plan. Its uptake will accelerate as more and more developers, builders and infrastructure decision makers specify it for their projects, leading to potential GHG reductions of up to one megatonne annually. This is equal to avoiding the consumption of over 347 million litres of gasoline or planting 23 million trees.

Portland-limestone cement makes concrete — already renowned for its strength, durability, resiliency, versatility and energy-efficient attributes — the solution of choice for a low carbon sustainable built environment.

Proven environmental performance

Portland-limestone cement's 10% GHG reduction environmental performance has been validated in a cradle-to-gate Life Cycle Assessment study conducted by the Athena Sustainable Materials Institute, in which it was compared to ordinary Portland cement.

How does Portland-limestone cement work?

Portland-limestone cement's 10% reduction in CO_2 emissions occurs during the cement manufacturing process. While regular Portland cement may contain up to 5% ground limestone, Portland-limestone cement is made by intergrinding up to 15% limestone with a reduced amount of regular clinker — the main energy-intensive ingredient in cement. The clinker used to make Portland-limestone cement is the same clinker that is used to manufacture regular Portland cement. By reducing the amount of clinker used in manufacturing cement by 10%, the industry has taken one of the most important steps in its recent history toward reducing the environmental impact of cement.

How is Portland-limestone cement manufactured?

Portland-limestone cement's manufacturing process involves modifying the clinker and limestone

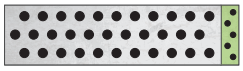
1 Centre Hospitalier Universitaire de Sainte Justine, Montreal. Architect: Provencher-Roy / MSDL Architectes. Built using lower carbon concrete based on Portland-limestone cement.

2 The Confederation Line light rail transit under construction in Ottawa also uses concrete based on Portland-limestone cement.

proportions before the final grinding takes place. The limestone, being a softer material, is ground finer than the clinker. However, both the clinker and the limestone in Portland-limestone cement are ground finer than in regular Portland cement. The particle size and the particle size distribution in Portland-limestone cement have a significant impact on the properties of the final product — concrete. This process of achieving the proper size and distribution of particles in Portland-limestone cement is commonly referred to as "optimizing" the cement.

The result of this optimization process is shown in Figures A and B below:

Figure A:
PORTLAND CEMENT



95% Clinker
5% Limestone

FIGURE B:
PORTLAND-LIMESTONE CEMENT



85% Clinker
15% Limestone

Figure A represents regular Portland cement with a maximum limestone content of 5%. Figure B represents the finer particle size of Portland-limestone
cement with a maximum limestone content of 15%.

Less GHGs, yet comparable performance

The cement industry has invested considerable resources to optimize the properties of Portland-limestone cement to be comparable to regular Portland cement. On average, the Portland-limestone clinker and limestone particles are smaller in size, producing a "particle packing effect" that increases the resulting strength of the concrete.

The limestone is subjected to three quality assurance tests prior to manufacturing to ensure that Portland-limestone cement will provide suitable performance. These tests are for calcium carbonate content, clay content and total organic carbon content.

Since Portland-limestone cement is optimized to provide performance comparable to regular Portland cement manufactured in Canada, no significant changes are required to concrete mix designs when using Portland-limestone cement.

Innovative yet proven

While still relatively new to the Canadian market, Portland-limestone cement has an extensive proven track record in Europe in a variety of commercial and residential applications for over 35 years.

Some European cement standards allow for Portland-limestone cement to be manufactured with up to 35% limestone content. The most popular cement sold in Europe today is Portland-limestone cement with a limestone content of up to 20%. The 15% limestone limit applied to Portland-limestone cement in Canada is well within the maximum limit of 35% permitted in European cement standards.

Extensively tested

Before Portland-limestone cement was adopted by the Canadian Standards Association (CSA) A3001 and A23.1 Standards — which regulate cement manufacturing and use in Canada — the industry conducted extensive research and testing to verify its adequacy for the Canadian environment and construction industry. This included a thorough review of European literature on Portland-limestone cement, followed by comprehensive cement and concrete testing programs performed by various Canadian cement manufacturers and participating university researchers. The tests conclusively confirmed that optimized Portland-limestone cement produces concrete with strength and durability properties equal to that produced using regular Portland cement.

Field trials carried out in the harsher climates of Québec, Nova Scotia, and Ontario over three winters also demonstrated that Portland-limestone cement produced concrete durability characteristics that compared very well with concrete using regular Portland cement.

In Canadian building codes

Portland-limestone cement is included in the CSA cement and concrete standards, referenced in the 2010 National Building Code of Canada.

The new CSA A3001-13 and A23.1-14 Standards now provide specifications for the use of Portland-limestone cement in sulphate exposure environments.

Doing more to reduce GHGs

Portland-limestone cement represents an important milestone in the industry's continued progress in reducing its environmental footprint. Over the last decade, we have reduced our GHG emissions by 15%. Today, we are transitioning from coal to lower carbon fuels, which could reduce our GHG intensity by another 20%. Additionally, we are making significant investments in carbon capture and utilization technologies that could help transform concrete from a carbon emitter into a carbon sink.



3 Telus Garden Development, Vancouver. Architect: Henriquez Partners. Using concrete based on Portland-limestone cement for this project avoided some 1,300 tonnes of CO_2

Portland-limestone cement: less GHGs, yet comparable performance to regular Portland cement.



Registered Environmental Product Declaration

The Cement Association of Canada has registered an EPD for Portland-limestone cement (Contempra) with the CSA Group. The cement EPD, which were prepared by the Athena Sustainable Materials Institute, can be viewed on CSA Group's EPD registry listings.