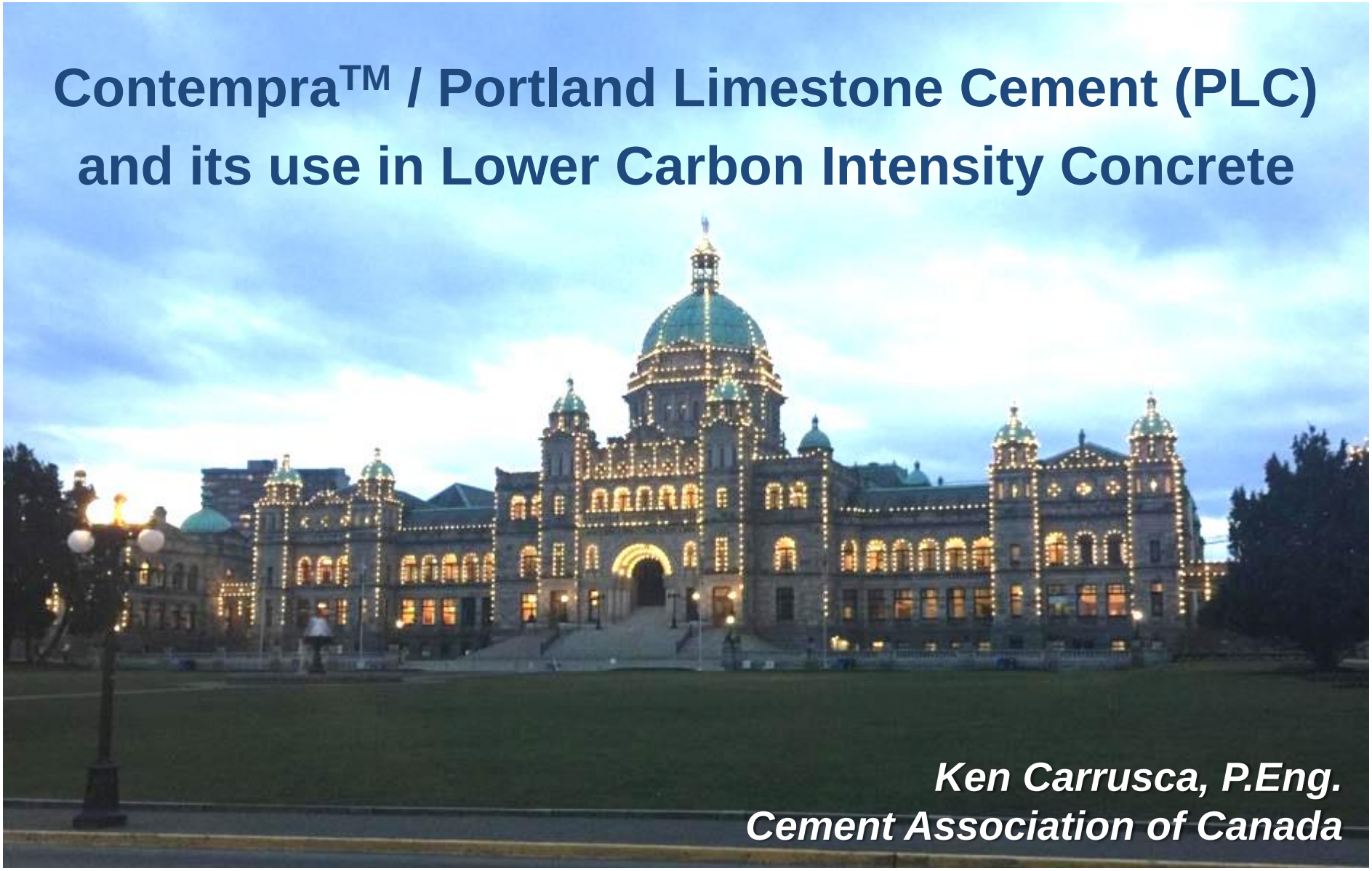
Contempra™ / Portland Limestone Cement (PLC) and its use in Lower Carbon Intensity Concrete



Ken Carrusca, P.Eng.
Cement Association of Canada

Cement Association of Canada

CONCRETE | Build for life™

Contempra™ / PLC

- Background on cement making
- What is Contempra & why use it?
- Extensive research and testing
- Use of PLC in Europe
- BC marketplace and projects

Cement Association of Canada

Contempra™ / PLC

- **Background on cement making**
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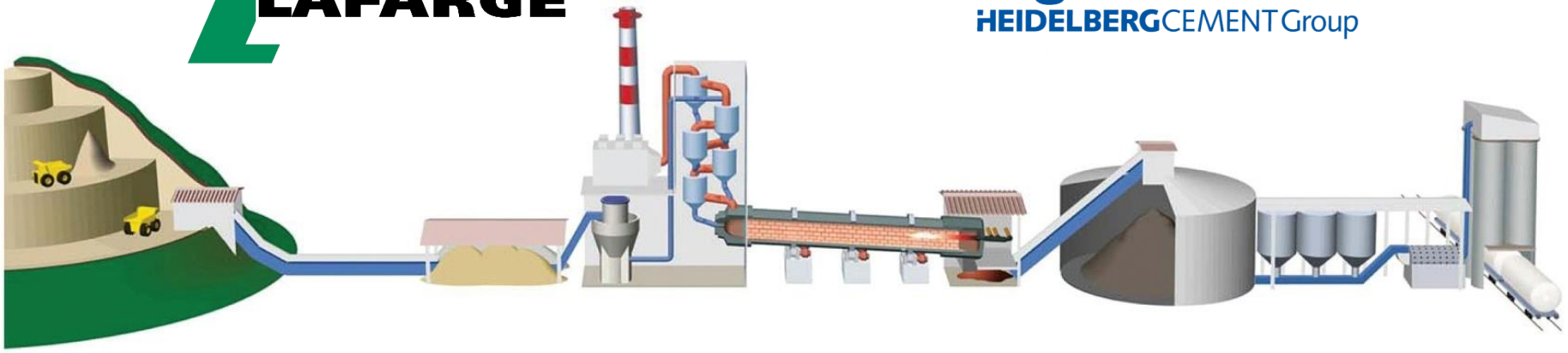
Cement Association of Canada

Cement Manufacturing

LAFARGE

Lehigh Hanson
HEIDELBERGCEMENT Group



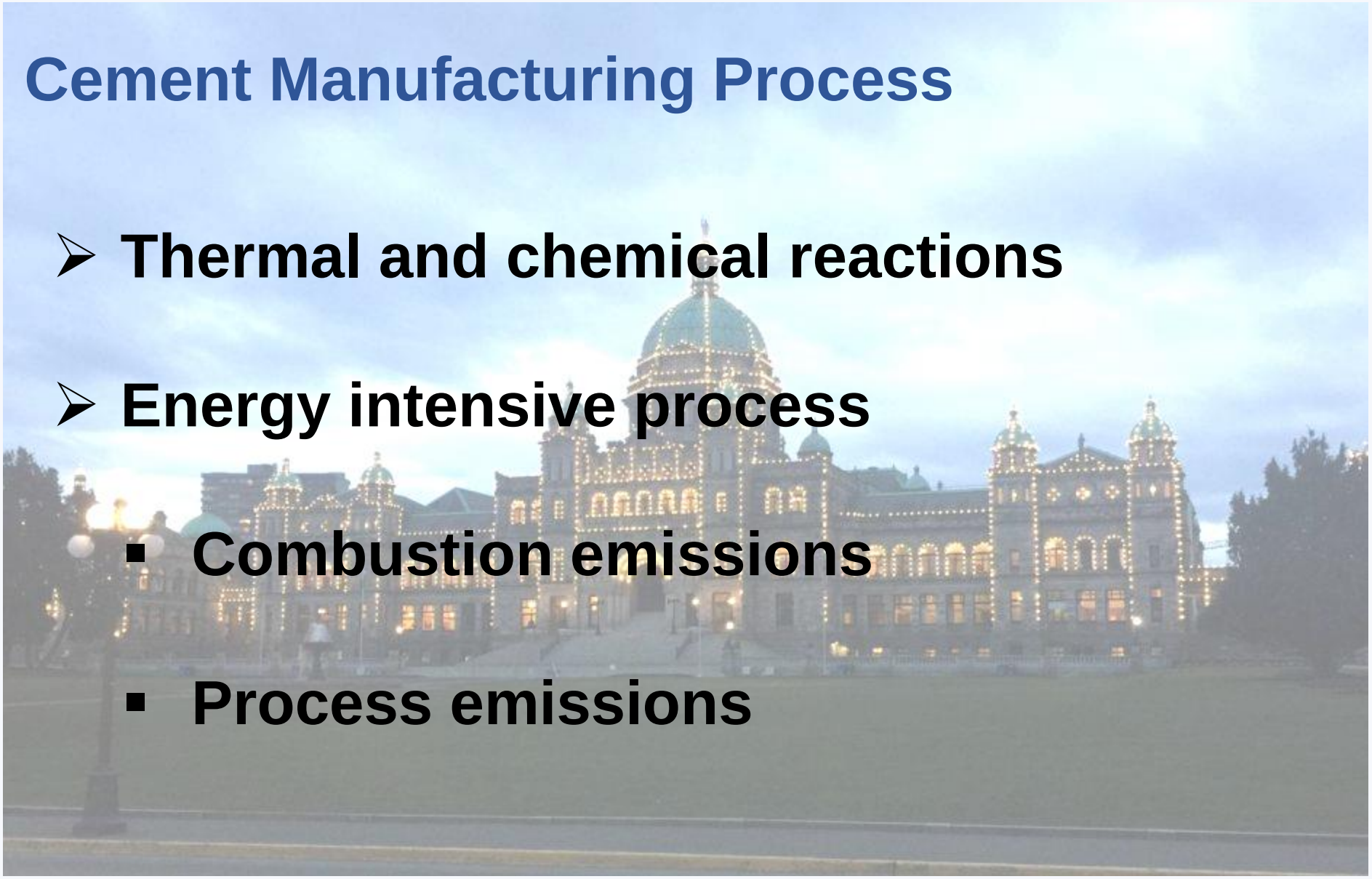
Quarrying	Raw Materials Preparation	Clinker Production	Cement Grinding and Distribution
Limestone and small amounts of sand and clay are extracted, usually from a quarry located near the cement manufacturing plant.	The extracted materials are analyzed, blended with additional mineral components depending on the type of limestone available, and finely ground for further processing.	The materials are heated in a kiln reaching a temperature of 1,470°C. The heat transforms the materials into a molten product called clinker, which is then rapidly cooled.	The clinker is stored and then finely ground. Gypsum is added to control setting time, along with supplementary cementing materials, such as fly ash or slag, to obtain a fine powder called cement, with the desired properties of strength and chemical resistance.

contempra
Cement engineered for a better tomorrow

Up to 15% unprocessed limestone finely inter-ground with clinker to produce Contempra™ / Portland Limestone Cement.

Cement Association of Canada

Cement Manufacturing Process



- **Thermal and chemical reactions**
- **Energy intensive process**
  - **Combustion emissions**
  - **Process emissions**

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Cement and Concrete in BC

- **Cement Manufacturing Plants**
  - Lafarge in Richmond and Lehigh Hanson in Delta
- **Concrete Operations**
  - 135 ready-mixed concrete batch facilities
  - 17 precast concrete producers
- **Jobs and Investment**
  - More than 2000 direct and indirect BC jobs
  - Over $3 billion of investment in the economy

Cement Association of Canada

Contempra™ / PLC

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Contempra™ / Portland Limestone Cement / PLC ?

- Contempra™
- Portland-Limestone Cement or PLC
- CSA Cement Types
  - GU – General Use Cement
  - GUL – Portland-Limestone Cement
- EcoCem

Cement Association of Canada

Backgrounder

Cement Association of Canada / Association Canadienne du Ciment

Portland-Limestone Cement

A new category of cement is entering the Canadian market. **Portland-limestone cement** (PLC), used successfully in Europe for over 25 years, will be available in Canada in 2010.

What Is Portland-Limestone Cement (PLC)?

While regular portland cement may contain up to 5% limestone, PLC is manufactured by intergrinding portland cement clinker with between 6% and 15% limestone. The clinker used to make PLC is the same clinker that is used to manufacture regular portland cement. The performance of PLC is dependent on the high quality of the limestone. In recognition of this fact, limestone used in PLC is tested for calcium carbonate content, clay content and total organic carbon content. The 15% limestone limit applied to PLC in Canada is well below the maximum limit of 35% permitted in European standards. PLC performance specifications are similar to those of regular portland cement in that PLC must meet the same CSA A3001 physical requirements as regular portland cement.

The CSA A3001-08 Standard lists the four types of PLC as follows.

4.1 Types

The naming practice for portland cement, blended hydraulic cement, and portland-limestone cement shall be as follows:

Portland cement type	Blended hydraulic cement type*	Portland-limestone cement type†‡	Name§
GU	GUb	GUL	General use cement
MS	MSb	–	Moderate sulphate-resistant cement
MH	MHb	MHL	Moderate heat of hydration cement
HE	HEb	HEL	High early-strength cement
LH	LHb	LHL	Low heat of hydration cement
HS	HSb	–	High sulphate-resistant cement

*The suffix "b" indicates that the product is a blended hydraulic cement.
†The suffix "L" indicates that the product is portland-limestone cement.
‡Portland-limestone cements should not be used in an environment subjected to sulphate exposure as defined in Table 3 of CAN/CSA-A23.1.
§See Annex C for information on previous naming conventions.

Note that PLC is not available in either moderate or high sulphate-resistant designations.

How Does It Work?

PLC is manufactured in Canada by intergrinding regular cement clinker with up to 15% limestone. The limestone, being a softer material, is ground more finely than the clinker; however, both the clinker and the limestone in PLC are more finely ground than regular portland cement. Both the size and distribu-

Cement Association of Canada

Backgrounder

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What Is Portland-Limeston

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The CSA A3001-08 Standard li

4.1 Types

The naming practice for portland
shall be as follows:

Portland cement type	Blended hyd cement type
GU	GUb
MS	MSb
MH	MHb
HE	HEb
LH	LHb
HS	HSb

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*Reproduced with the permission of Can
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Note that PLC is not availab
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How Does It Work?

PLC is manufactured in Can
up to 15% limestone. The li
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more finely ground than re

ECOCEM PLC

EcoCem™*PLC* is here!

EcoCem™*PLC* is Lehigh's Portland Limestone Cement that meets CSA's Type GUL specification. EcoCem™*PLC* is an environmentally responsible cement that delivers excellent performance along with a lower carbon footprint. This *made in BC* cement reduces greenhouse emissions and supports our local economy at the same time.

The EcoCem™*PLC* Advantage

Lehigh Cement's Commitment to Sustainability

Lehigh Cement is committed to delivering sustainable building materials which positively contribute to the welfare of society and to the environment — during and after our lifetime. Cement and concrete products already contribute to sustainable buildings and communities across British Columbia. Concrete structures are safe, energy-efficient, durable and cost-effective.

As the next step in its commitment to sustainability, Lehigh Cement has developed EcoCem™*PLC*, a new portland limestone cement that provides excellent performance but has a lower environmental impact than normal Type GU portland cement.

Lowering Emissions

Climate change and clean air are important to the people of British Columbia and they are important to Lehigh Cement. The process of converting raw minerals into cement produces emissions, and reducing these emissions is central to Lehigh's commitment to sustainability. Manufacturing EcoCem™*PLC* can result in up to a 10% reduction in emissions when compared to normal Type GU portland cement. With EcoCem™*PLC*, Lehigh and its customers now have an

Green Building and LEED®

British Columbia has approved the use of portland limestone cement in its building code. The opportunity now exists to be on the leading edge of sustainable construction by using EcoCem™*PLC*, an environmentally friendly cement for concrete production. In combination with available supplementary cementing materials (SCMs), EcoCem™*PLC* allows the production of concrete with the lowest carbon footprint possible.

There are currently no LEED® Credits specific to the use of EcoCem™*PLC*; however it may contribute toward points available in LEED® Canada NC 1.0 and 2009. Because it is locally manufactured, EcoCem™*PLC* dramatically reduces the emissions associated with the transportation of cementing materials.

Performance

The performance of EcoCem™*PLC* is similar to normal Type GU portland cement. Concrete produced with EcoCem™*PLC* achieves higher earlier strengths and comparable longer term strengths (see graph). In testing with

Cement Association of Canada

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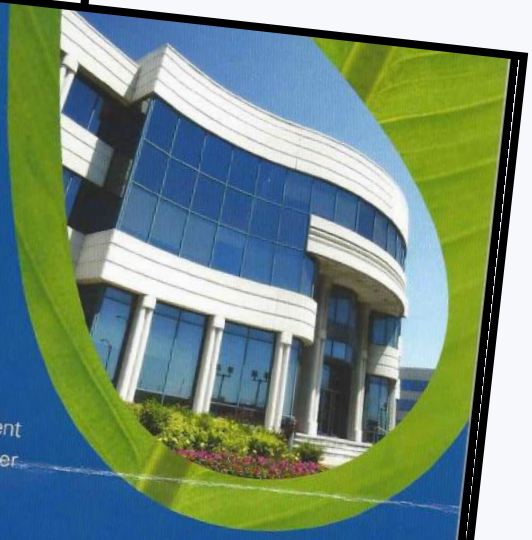

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Performance

The performance
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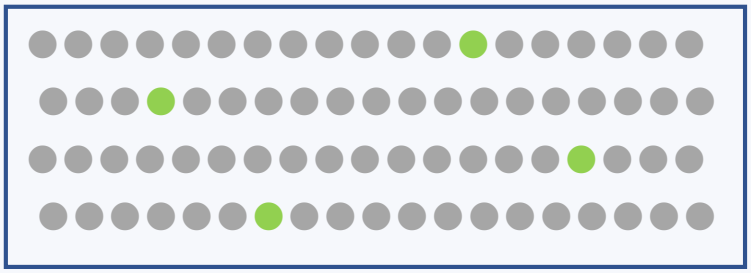
What is Contempra™ ?

- Contempra is made by **inter-grinding** regular clinker with up to 15% limestone, while regular cement contains 5% limestone
- **Contempra is a finer ground product than regular cement**

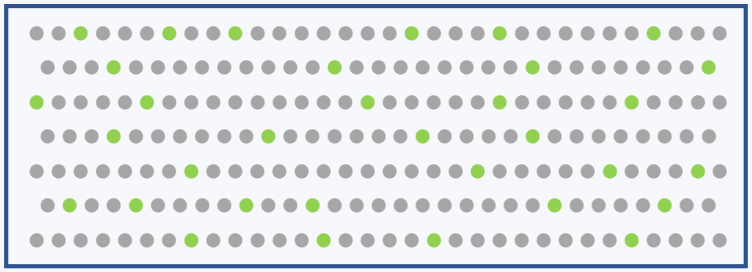
Regular Portland Cement



= ground clinker, precursor to cement

= limestone (5%)

Contempra / Portland Limestone Cement



= finely ground clinker

= finely ground limestone (15%)

Cement Association of Canada

CSA 3000-08

Defines Portland-limestone cement as a product obtained by:

- Inter-grinding portland cement clinker and limestone, to which the various forms of calcium sulphate, water, and processing additions may be added at the option of the manufacturer.

Notes:

(1) *Limestone is designated with the suffix L. Its proportion is indicated in Clause 4.3.1.*

(2) *Portland-limestone cement may be produced by inter-grinding or blending, or a combination of both. The attainment of a homogeneous blend, in the dry state, of any two or more fine materials is important. Appropriate equipment and controls should be provided by the manufacturer.*

Contempra™ / PLC

- Background on cement making
- **What is Contempra & why use it?**
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- Use of PLC in Europe
- BC marketplace and projects

Cement Association of Canada

Environmental Product Declaration (EPD)

Revised Version 1.1

GENERAL USE (GU) AND PORTLAND-LIMESTONE (GUL) CEMENTS

Cement Association of Canada

The Cement Association of Canada (CAC) is pleased to present this Canadian and CAC member industry average environmental product declaration (EPD) for General Use (GU) and Portland-Limestone (GUL) Cements. This EPD was developed in compliance with CAN/CSA-ISO 14025 and has been verified by François Charron Doucet, Groupe AGÉCO.

The EPD includes life cycle assessment (LCA) results for the product stage or cradle-to-gate manufacture of GU and GUL cements as produced in Canada by CAC members in 2014. It is intended for business-to-business communication.

For more information about Cement Association of Canada, please go to www.cement.ca.

CSA Environmental Product Declaration

CSA Group Registered Based on ISO 14025 and Other Requirements

For more information visit csaregistries.ca/epd

#5357-9431

March 2016-2021

Cement Association of Canada

Table 3: LCA Results –Type GU one metric ton – absolute basis

Category Indicator	Unit	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
TRACI v.2.1 Category Indicators					
Global warming potential, GWP	kg CO_2 eq.	940.5	17.9	9.0	913.6
Acidification potential, AP	kg SO_2 eq.	3.7	0.1	0.1	3.5
Eutrophication potential, EP	kg N eq.	0.4	0.06	0.004	0.3
Smog creation potential, POCP	kg O_3 eq.	62.9	2.6	2.2	58.1
Ozone depletion potential, ODP	kg CFC-11 eq.	9.8E-06	1.9E-06	1.8E-08	7.8E-06
Total primary energy consumption					
Non-renewable fossil, PENR-fossil	MJ (HHV)	5594	258	122.4	5213.8
Non-renewable nuclear, PENR-nuclear	MJ (HHV)	586	38	1.5	546.7
Renewable (solar, wind, hydroelectric, and geothermal), PER-HWSG	MJ (HHV)	249	33	0.2	216.5
Renewable (biomass), PER-biomass	MJ (HHV)	481	453	0.03	27.9
Material resources consumption					
Non-renewable material resources, NRMR	kg	1490	1489.0	0.0008	0.6
Renewable material resources, RMR	kg	25	24.2	0.0013	1.3
Net fresh water, NFW	l	1793	116	1	1676
Waste generated					
Hazardous waste generated, HW	kg	0.09	0.004	0	0.09
Non-hazardous waste generated, NHW	kg	0.97	0.01	0	0.96

Industry Average GU and GUL Cements
Cement Association of Canada
Environmental Product Declaration (EPD) # 5357-9431

Table 4: LCA Results – Type GUL one metric ton – absolute basis

Category Indicator	Unit	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
TRACI v.2.1 Category Indicators					
Global warming potential, GWP	kg CO_2 eq.	855.6	17.4	8.3	829.9
Acidification potential, AP	kg SO_2 eq.	3.4	0.1	0.1	3.2
Eutrophication potential, EP	kg N eq.	0.38	0.05	0.004	0.3
Smog creation potential, POCP	kg O_3 eq.	57.4	2.5	2.1	52.8
Ozone depletion potential, ODP	kg CFC-11 eq.	9.0E-06	1.9E-06	1.6E-08	7.2E-06
Total primary energy consumption					
Non-renewable fossil, PENR-fossil	MJ (HHV)	5111	251	112.7	4747.3
Non-renewable nuclear, PENR-nuclear	MJ (HHV)	555	37	1.5	516.1
Renewable (solar, wind, hydroelectric, and geothermal), PER-HWSG	MJ (HHV)	237	32	0.2	204.7
Renewable (biomass), PER-biomass	MJ (HHV)	480	453	0.03	26.4
Material resources consumption					
Non-renewable material resources, NRMR	kg	1444	1443.2	0.0008	0.4
Renewable material resources, RMR	kg	25.2	24.2	0.0013	1.0
Net fresh water, NFW	l	1672	112	1	1559
Waste generated					
Hazardous waste generated, HW	kg	0.09	0.003	0	0.09
Non-hazardous waste generated, NHW	kg	0.97	0.01	0	0.96

Table 3: LCA Results –Type GU one metric ton – absolute basis

Category Indicator	Unit	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
TRACI v.2.1 Category Indicators					
Global warming potential, GWP	kg CO_2 eq.	940.5	17.9	9.0	913.6
Acidification potential, AP	kg SO_2 eq.	[illegible]	0.16	0.1	3.5
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No[illegible]					
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Industry Average GU and GUL Cements
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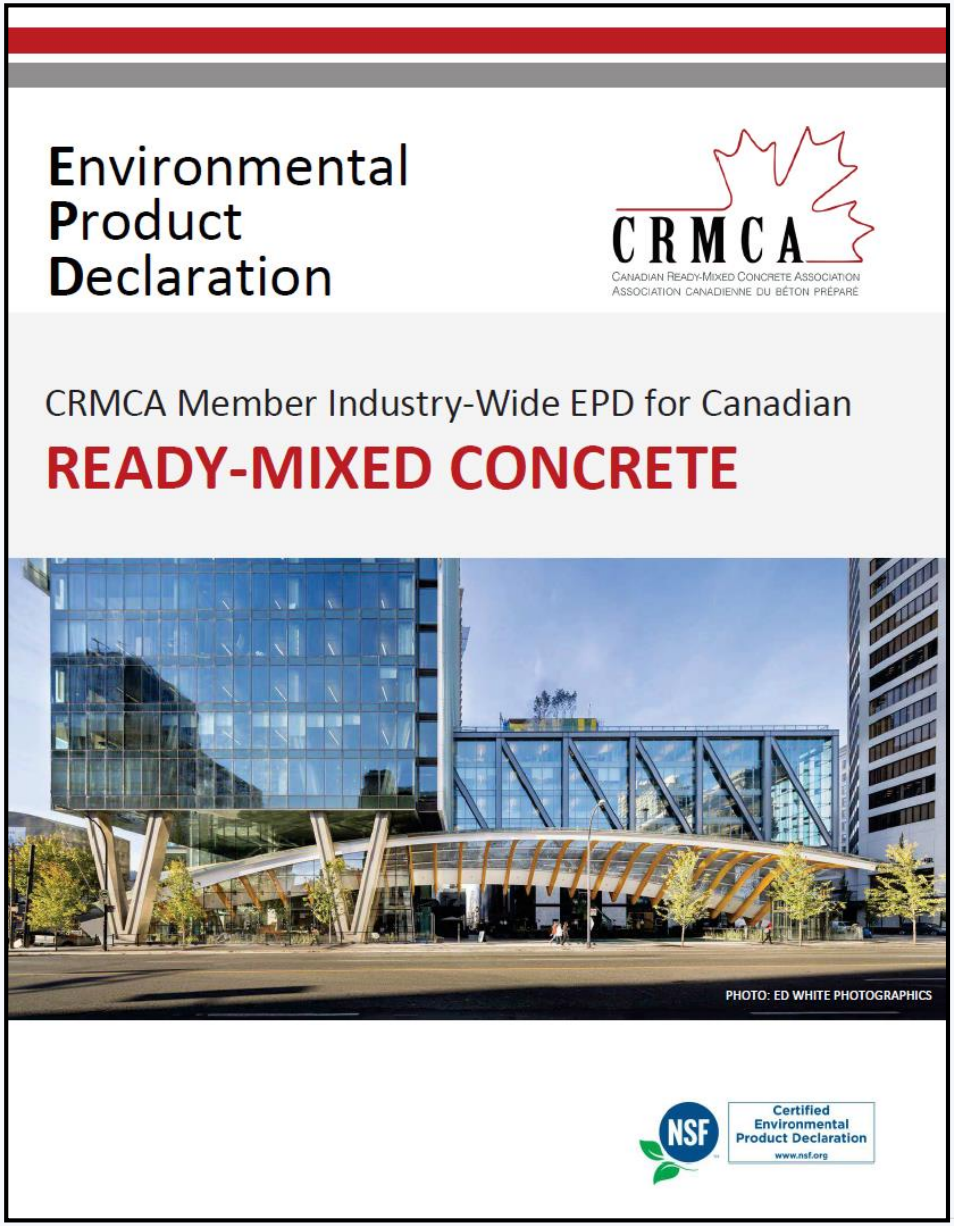
Category Indicator	Unit	Total	A1 Raw Material Supply	A2 Transport	A3 Manufacturing
TRACI v.2.1 Category Indicators					
Global warming potential, GWP	kg CO_2 eq.	855.6	17.4	8.3	829.9
Acidification potential, AP	kg SO_2 eq.	[illegible]	0.15	0.1	3.2
Eutrophication potential, EP	kg N eq.	0.38	0.05	0.004	0.3
Smog creation potential, POCP	kg O_3 eq.	57.4	2.5	2.1	52.8
Ozone depletion potential, ODP	kg CFC-11 eq.	9.0E-06	1.9E-06	1.6E-08	7.2E-06



Concrete EPDs

- Valid from January 6, 2017 to January 6, 2022
- Participation of all Provincial associations, including BCRMCA
- 125 concrete mix designs!
- Both GU and GUL

Cement Association of Canada

Table 8. Summary Results (A1-A3): 31-35 MPa ready mixed concrete product, per cubic meter															
Indicator/LCI Metric	GWP	ODP	AP	EP	POCP	PEC	NRE	RE	NRM	RM	CBW	CWW	TW	CHW	CNHW
Unit (equivalent)	kg CO2	kg CFC-11	kg SO2	kg N	kg O3	MJ	MJ	MJ	kg	kg	m3	m3	m3	kg	kg
Minimum	260.49	3.69E-06	1.23	0.13	22.07	2558.11	2338.42	202.24	2244.44	6.41	0.16	0.14	0.95	0.86	8.94
Maximum	449.79	6.40E-06	1.95	0.20	35.25	3745.89	3412.16	333.73	2576.75	10.84	0.16	0.14	1.30	0.90	9.12
#39-35 GU with air 0-14% FA/SC	449.79	5.37E-06	1.95	0.20	35.25	3745.89	3412.16	333.73	2509.04	10.84	0.16	0.14	1.30	0.87	9.12
#40-35 GU without air 0-14% FA/SC	386.61	4.76E-06	1.69	0.17	30.85	3279.16	2993.18	285.98	2576.75	9.18	0.16	0.14	1.20	0.87	9.05
#41-35 Industry Average Benchmark	417.05	5.42E-06	1.85	0.19	33.37	3537.46	3229.68	307.77	2438.20	9.95	0.16	0.14	1.24	0.88	9.08
#42-35 GU with air 15-29% FA	403.68	4.88E-06	1.76	0.18	32.11	3406.28	3108.47	297.81	2405.27	9.61	0.16	0.14	1.21	0.87	9.07
#43-35 GUL with air 15-29% FA	362.81	4.59E-06	1.57	0.17	27.56	3229.64	2936.63	293.00	2388.81	9.69	0.16	0.14	1.17	0.87	9.07
#44-35 GU without air 15-29% FA	347.87	4.35E-06	1.54	0.16	28.20	2993.85	2738.06	255.79	2490.00	8.15	0.16	0.14	1.12	0.86	9.01
#45-35 GUL without air 15-29% FA	313.52	4.10E-06	1.37	0.14	24.38	2845.30	2593.54	251.75	2475.70	8.22	0.16	0.14	1.08	0.86	9.01
#46-35 GU with air 30-40% FA	353.84	4.36E-06	1.56	0.16	28.71	3039.14	2780.16	258.98	2293.08	8.29	0.16	0.14	1.12	0.86	9.02
#47-35 GUL with air 30-40% FA	318.82	4.10E-06	1.40	0.15	24.81	2887.92	2633.06	254.86	2279.66	8.35	0.16	0.14	1.08	0.86	9.02
#48-35 GU without air 30-40% FA	305.99	3.90E-06	1.37	0.14	25.35	2685.42	2462.25	223.16	2396.23	7.04	0.16	0.14	1.04	0.86	8.97
#49-35 GUL without air 30-40% FA	276.55	3.69E-06	1.23	0.13	22.07	2558.11	2338.42	219.70	2383.97	7.09	0.16	0.14	1.01	0.86	8.97
#50-35 GU with air 25-34% SC	364.06	6.11E-06	1.76	0.18	30.87	3249.29	2984.22	265.08	2327.80	8.48	0.16	0.14	1.12	0.90	9.02
#51-35 GUL with air 25-34% SC	329.36	5.86E-06	1.59	0.17	27.01	3099.43	2838.43	261.00	2314.53	8.54	0.16	0.14	1.08	0.90	9.02
#52-35 GU without air 25-34% SC	314.59	5.38E-06	1.53	0.16	27.16	2862.04	2633.75	228.29	2425.43	7.20	0.16	0.14	1.04	0.89	8.97
#53-35 GUL without air 25-34% SC	285.41	5.16E-06	1.39	0.15	23.92	2735.87	2511.02	224.86	2413.28	7.25	0.16	0.14	1.01	0.89	8.97
#54-35 GU with air 35-50% SC	329.77	6.40E-06	1.68	0.18	29.11	3050.66	2813.04	237.62	2255.30	7.54	0.16	0.14	1.04	0.90	8.98
#55-35 GUL with air 35-50% SC	299.71	6.18E-06	1.54	0.17	25.77	2920.92	2686.83	234.09	2244.44	7.59	0.16	0.14	1.01	0.90	8.98
#56-35 GU without air 35-50% SC	285.78	5.62E-06	1.47	0.15	25.69	2695.19	2489.98	205.21	2364.90	6.41	0.16	0.14	0.98	0.89	8.94
#57-35 GUL without air 35-50% SC	260.49	5.44E-06	1.35	0.15	22.88	2585.84	2383.61	202.24	2354.37	6.45	0.16	0.14	0.95	0.89	8.94

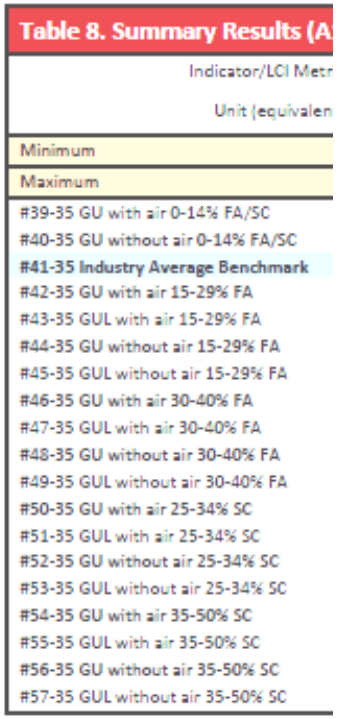


Table 8. Summary Results (A1-A3): 31-35 MPa re

Indicator/LCI Metric Unit (equivalent)	GWP kg CO2	ODP kg CFC-11
Minimum	260.49	3.69E-06
Maximum	449.79	6.40E-06
#39-35 GU with air 0-14% FA/SC	449.79	5.37E-06
#40-35 GU without air 0-14% FA/SC	386.61	4.76E-06
#41-35 Industry Average Benchmark	417.05	5.42E-06
#42-35 GU with air 15-29% FA	403.68	4.88E-06
#43-35 GUL with air 15-29% FA	362.81	4.59E-06
#44-35 GU without air 15-29% FA	347.87	4.35E-06
#45-35 GUL without air 15-29% FA	313.52	4.10E-06
#46-35 GU with air 30-40% FA	353.84	4.36E-06
#47-35 GUL with air 30-40% FA	318.82	4.10E-06
#48-35 GU without air 30-40% FA	305.99	3.90E-06
#49-35 GUL without air 30-40% FA	276.55	3.69E-06

Calculation of CO_2 Reduction

- For example:
  - GU = 403.68 kg CO_2 / cubic meter of concrete
  - GUL = 362.81kg CO_2 / cubic meter of concrete
  - Reduction of 403.68 – 362.81 = **40.87 kg CO_2 per cubic meter**

- Using **30,000 m^3 of GUL / PLC / Contempra / EcoCem concrete:**
  - 30,000 m^3 x 40.87 kg CO_2/m^3 = 1,226,100 kg = **1,226 tonnes CO_2**
  - Equivalent to **taking 260 cars* off the road for a year!**

**US EPA: one car generates 4.7 metric tonnes of CO_2 per year*

Cement Association of Canada

Why should we use Contempra™ / PLC?

- Can reduce GHG emissions by 1 million tonnes of CO_2 (eq) per year across Canada
- Equivalent to taking 210,000 cars off the road or the planting of 25 million trees a year
- Contempra reflects the industry's continued commitment to sustainable development and a better environment

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Contempra™ / PLC

- Background on cement making
- What is Contempra & why use it?
- **Extensive research and testing**
- Use of PLC in Europe
- BC marketplace and projects

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Extensive Research and Testing

1: Literature Review

2: Prototypes and Trials

3: Extensive Testing

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1. Literature Review, May 2007

- Results reported in the literature appeared to be affected by the quality and particle size distribution of the limestone
- Variances also resulted depending on whether the limestone was inter-ground, blended, or added at the mixer
- Proper interpretation of the data was carried out to fully investigate these effects

2. Prototypes and Trials

- Various Canadian cement companies produced prototypes of Contempra cement at their plants
- Chemical and physical analyses were performed with those products
- Concrete performance and durability tests were carried out at universities and CAC member companies

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3. Extensive Testing

- Tests carried out with Canadian materials confirmed findings of the literature review and European experience
- After optimization, the prototype concrete demonstrated equivalent strength to that achieved with regular cement
- Field trials in the climates of Ontario, Quebec and Nova Scotia over two winters established that Contempra produces concrete with a durability equivalent to that from regular cement

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Adopted in Canadian Building Codes

- Included in CSA A3001 and A23.1 standards under the name Portland-limestone cement, and referenced in the 2010 National Building Code of Canada
- Approved for use in British Columbia, Manitoba, Ontario, Quebec and Nova Scotia
- Not yet used in high sulphate exposure environments, but additional testing has been carried out and changes to CSA requirements are pending

Contempra™ / PLC

- Background on cement making
- What is Contempra & why use it?
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- BC marketplace and projects

Cement Association of Canada

Track Record in Europe

- Used in Europe for over 25 years in a variety of applications and exposure conditions
- Known as Portland-Limestone Cement
- 20% limestone used in popular European cement products
- Up to **35% limestone** content is allowed

Contempra™ / PLC

- Background on cement making
- What is Contempra & why use it?
- Extensive research and testing
- Use in Europe
- **BC marketplace and projects**

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Telus Garden Development

- West Georgia and Seymour, Vancouver
- $750 million project
- 1 million square feet
- LEED Platinum

- **60,000 m³** of concrete, of which about 55% was PLC

- **avoided ~ 1,300 tonnes of CO_{2eq} (taking 287cars* off the road for a year)**

Image: Nicolas Blachette

Solo District
Willingdon and Lougheed, Burnaby

- Mixed commercial, office, residential
- 2 towers, with the taller being 48-storeys high

- **90,000 m^3** of concrete of which 75% was PLC
- 33,000 tonnes of cement

- **avoided ~ 2,750 tonnes of CO_{2eq} (taking 590 cars* off the road for a year)**

Image: Chris Dikeakos Architects

Vancouver House
Pacific and Howe

- 52 storey, 600,000 square foot tower
- Vertical and horizontal post-tensioned concrete
- Features twisting and overhanging floors

- **20,000 m^3** concrete so far, 80% of which is PLC including high early strength, low shrinkage for post-tensioned slabs

- **avoided ~ 654 tonnes of CO_{2eq} so far (taking 139 cars* off the road for a year)**

Image: Westbank

Wall Centre False Creek (originally Vancouver Playhouse)

- first Lafarge project completed with Contempra
- three 13 - 15 storey residential towers

- **30,000 m^3** of 100% Contempra concrete

- **avoided ~ 1,226 tonnes of CO_{2eq} (taking 260 cars* off the road for a year)**

Image: SonjaPedersen.com

The Mark
1372 Seymour

- Located at north end of Granville Street Bridge
- 41 storey tower with 302 suites
- LEED Gold

- **35,000 m^3** of 100% Contempra concrete

- **avoided ~ 1,430 tonnes of CO_{2eq}**
  (taking 304 cars* off the road for a year)

Image: TheMarkCondoVancouver.ca

Trump International Hotel & Tower 1151 West Georgia, Vancouver

- Owned by Holborn Group
- Conceptual design by Arthur Erickson; similar to the "Turning Torso" in Malmö,Sweden
- 63-storey, 187.8 metre / 616 foot tower (2^{nd} to Shangri-La at 201.2 m / 660 feet)
- LEED Silver
- **35,000 m^3** of 100% Contempra based concrete
- **avoided ~ 1,430 tonnes of CO_{2eq} (taking 204 cars* off the road for a year)**

Image: Arlen Redekop, PNG

Teck Acute Care Centre
BC Children's Hospital, Vancouver

- 640,000 square feet over 8 floors
- 231 private patient rooms
- LEED Gold

- **35,000 m^3** of concrete of which 73% was PLC
- 9,600 tonnes of cement

- **avoided ~ 1,040 tonnes of CO_{2eq} (taking 222 cars* off the road for a year)**

Image: HDR / CEI

PLC in Public Sector Infrastructure

Promoting use of Low Carbon and Renewable Materials in Infrastructure

> ***"Approving use of Portland-limestone cement in public sector infrastructure.*** *This material reduces GHG emissions associated with existing cement manufacturing by approximately 10 per cent, while producing concrete with similar strength and durability. This cement has been popular in Europe for over 25 years now, but is new to Canada."*

BC Climate Leadership Plan
August 19, 2016

Cement Association of Canada

In conclusion, Contempra / PLC:

- Has an extensive proven track record
- Can reduce GHG emissions by up to 10% when compared to regular cement
- Produces concrete with a equivalent strength and durability to that made with regular cement
- Included in the CSA cement and concrete standards
- Available from local cement / concrete producers in BC
- BC Public Sector should adopt PLC as the preferred option for concrete infrastructure

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Thank you!

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