

Environmental Product Declaration (EPD) for Cement Produced at Delta Cement Plant

GENERAL INFORMATION

This cradle to gate Environmental Product Declaration covers three cement products produced at the Delta Cement Plant. The Life Cycle Assessment (LCA) was prepared in conformity with ISO 21930, ISO 14025, ISO 14040, and ISO 14044. This EPD is intended for business-to-business (B-to-B) audiences.

LEHIGH CEMENT

Delta Cement Plant and Terminal
7777 Ross Road
Delta, BC V4G 1B8



PROGRAM OPERATOR

National Ready Mixed Concrete Association
900 Spring Street
Silver Spring, MD 20910
<https://www.nrmca.org/>

NRMCAEPD: 20034

DATE OF ISSUE

June 1, 2020 (valid for 5 years until June 1, 2025)

ENVIRONMENTAL IMPACTS

Lehigh Delta Plant: Product-Specific Type III EPD

Declared Cement Products (three):

GUL/Type II; GU/Type I/II; HE/Type III cement

Declared Unit: One metric tonne of cement

	CEMENT PRODUCTS		
	GUL/TYPE II	GU/TYPE I/II	HE/TYPE III
Global Warming Potential (kg CO ₂ -eq)	679	746	767
Ozone Depletion Potential (kg CFC-11-eq)	2.10E-05	2.28E-05	2.34E-05
Eutrophication Potential (kg N-eq)	0.62	0.68	0.70
Acidification Potential (kg SO ₂ -eq)	2.58	2.82	2.90
Photochemical Ozone Creation Potential (kg O ₃ -eq)	74.5	81.7	83.8
Abiotic Depletion, nonfossil (kg Sb-eq)	1.12E-05	1.23E-05	1.27E-05
Abiotic Depletion, fossil (MJ)	3,115	3,412	3,508
Product Components:			
Clinker	81%	90%	92%
Limestone, Gypsum and Others	19%	10%	8%

Additional detail and impacts are reported on page 5

ISO 21930:2017 Sustainability in Building Construction-Environmental Declaration of Building Products: serves as the core PCR
NSF PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements V2: serves as the sub-category PCR

Sub-category PCR review was conducted by

Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants

Independent verification of the declaration, according to ISO 21930:2017 and ISO 14025:2006.: internal external

Third party verifier Lindita Bushi, Ph.D. (lindita.bushi@athenasmi.org) • Athena Sustainable Materials Institute

For additional explanatory material

Manufacture Representative: Ignacio Cariaga (Ignacio.Cariaga@lehighhanson.com)

This LCA EPD was prepared by: Laurel McEwen, VP EPD Services • Climate Earth (www.climateearth.com)

EPDs are comparable only if they comply with ISO 21930 (2017), 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.

LIFE CYCLE ASSESSMENT

PRODUCER



Lehigh Cement, a leading supplier of cementitious construction materials in North America, has been manufacturing cement in Canada for more than 100 years (Bamberton, British Columbia - 1904), making us a pillar of the many communities around us and providing employment and economic benefit to small towns and cities. We now operate one cement plant in British Columbia alongside the south arm of the Fraser River in Delta which began production in 1978. Water access helps to mitigate our environmental impacts through efficient and more sustainable transportation of raw materials and delivery of cement to water based terminals. Lehigh Cement's commitment to sustainable construction includes actively working to create lower carbon cements through supplementary cementitious materials (SCMs) and alternative raw materials and fuels. Consistent with HeidelbergCement's vision of reducing greenhouse gas (GHG) emissions to have carbon neutral concrete by 2050, Lehigh has developed product and plant specific EPDs as baselines for its embodied carbon.

The health and well-being of our employees, communities and the natural environment are vital to our success, so we work hard to give back through annual public events at Granville Island, Delta and in Sechelt. We also help raise awareness about the importance of biodiversity at the Burns Bog Conservation Society and have provided donations to several local organizations and foundations with a focus on conservation and community development.

PRODUCT

The cement products covered in this EPD meet UN CPC 3744 classification and the following standards:

Product Type	Applicable Standard	Standard Designation
General Use Limestone (Portland Limestone) Cement	CSA A3001	Type GUL
	ASTM C595, C1157, AASHTO M240	Type IL
General Use (Portland) Cement	CSA A3001	Type GU
	ASTM C150, C1157, AASHTO M85	Type I/II
High Early Cement	CSA A3001	Type HE
	ASTM C150, C1157, AASHTO M85	Type III

PRODUCT DESCRIPTION

This EPD reports environmental transparency information for three cement products, produced by Lehigh Cement at their Delta, BC facility. These cements are hydraulic binders and are manufactured by grinding cement clinker and other main or minor constituents into a finely ground, usually grey colored mineral powder. Cement is just one ingredient in the mixture that creates concrete, but it is the most chemically active ingredient and crucial to the quality of the final product. When mixed with water, cement acts as a glue to bind together the sand, gravel or crushed stone to form concrete, one of the most durable, resilient and widely used construction materials in the world. Our GUL/Type IL is branded as **EcoCem®PLC** and was developed to be more environmentally friendly by reducing its carbon footprint (reduction measured through GWP). This product is a general use product for concrete and mortar as well as all the other various applications for cement, including engineered soils and solidification/stabilization of materials and wastes.



DECLARED UNIT

The declared unit is one metric tonne of GUL, GU and HE cement.

SYSTEM BOUNDARY

This EPD is a cradle-to-gate EPD covering A1-A3 stages of the life cycle.

PRODUCTION STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE			
Extraction and upstream production	Transport to Factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste Processing	Disposal of Waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Note: MND = module not declared; X = module included.

CUT-OFF

Items excluded from system boundary include:

- production, manufacture and construction of manufacturing capital goods and infrastructure;
- production and manufacture of production equipment, delivery vehicles, and laboratory equipment;
- personnel-related activities (travel, furniture, and office supplies); and
- energy and water use related to company management and sales activities that may be located either within the factory site or at another location.

ALLOCATION PROCEDURE

Allocation follows the requirements and guidance of ISO 14044:2006, Clause 4.3.4; NSF PCR:2020; and ISO 21930:2017 section 7.2. Recycling and recycled content is modeled using the cut-off rule.

This sub-category PCR recognizes fly ash, silica fume, granulated blast furnace slag, cement kiln dust, flue gas desulfurization (FGD) gypsum, and post-consumer gypsum as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a cement material input.

LIFE CYCLE INVENTORY (LCI)

Primary Sources of LCI Data:

Barge transport: ecoinvent 3.5 (2018) "Transport, freight, inland waterways, barge {RoW}| market for transport, freight, inland waterways, barge | Cut-off, U"

Coal: ecoinvent 3.5 (2018) "Hard coal {RNA}| market for | Cut-off, U"

Electricity: Ecoinvent 3.5 (2018) "Electricity, medium voltage {CA-BC}| market for | Cut-off, U"

Gypsum: ecoinvent 3.5 (2018) "Gypsum, mineral {GLO}| market for | Cut-off, U"

Limestone: ecoinvent 3.5 (2018) "Limestone, crushed, for mill {CA-QC}| production | Cut-off, U"

Natural Gas: ecoinvent 3.5 (2018) "market for natural gas, high pressure CA-AB"

Ocean transport: ecoinvent 3.5 (2018) "Transport, freight, sea, transoceanic ship {GLO}| market for | Cut-off, U"

Rail transport: ecoinvent 3.5 (2018) "Transport, freight train {US}| market for | Cut-off, U"

Sand: ecoinvent 3.5 (2018) "Silica sand {RoW}| production | Cut-off, U"

Shale: ecoinvent 3.5 (2018) "Shale {GLO}| market for | Cut-off, U"

Truck transport: USLCI (2015) "Transport, combination truck, long-haul, diesel powered, Northwest/tkm/RNA"

Truck transport: USLCI (2015) "Transport, combination truck, short-haul, diesel powered, Northwest/tkm/RNA"

Wood Chips: ecoinvent 3.5 (2018) "Residual wood, dry {GLO}| market for | Cut-off, U"

Electricity grid mix includes: 87.2% hydro, 5.8% natural gas, 3.9% coal, 2.0% wind, 1.1% nuclear with a global warming potential of 0.096 kg CO₂eq per /kWh

Delta's direct greenhouse gas (GHG) emissions were calculated based on Western Climate Initiative's (WCI) standard for stationary combustion GHG emissions reporting. WCI is Delta's regional GHG reporting authority. Calcination emissions were calculated based on the Cement CO₂ and Energy Protocol detailed output method (B2) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI). All cement kiln dust is recycled back into kiln.

REFERENCES

Climate Earth 2020: Lehigh Cement – LCA Project Report, Delta and Bellingham Plants

ecoinvent v3.5: 2018 The Swiss Centre for Life Cycle Inventories

ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines

ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework

NSF 2020: PCR for Portland, Blended, Masonry, Mortar and Plastic (Stucco) Cements v3, May 2020

USLCI: 2015 The U.S. Life Cycle Inventory Database

WBCSD CSI 2013: CO₂ and Energy Protocol Version 3.1 of 9 December 2013; <https://www.cement-co2-protocol.org/en/>

WCI: 2010 WCI, Final Essential Requirements of Mandatory Reporting

LIFE CYCLE IMPACT ASSESSMENT RESULTS – Delta Cement Products: GUL (Type I/L) named EcoCem®PLC, GU (Type I/II) and HE (Type III); per 1 metric tonne

Impact Assessment	Unit	GUL (Type I/L)	GU (Type I/II)	HE (Type III)
Global warming potential (GWP) ¹	kg CO ₂ eq	679	746	767
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	2.10E-05	2.28E-05	2.34E-05
Eutrophication potential (EP)	kg N eq	0.62	0.68	0.70
Acidification potential of soil and water sources (AP)	kg SO ₂ eq	2.58	2.82	2.90
Formation potential of tropospheric ozone (POCP)	kg O ₃ eq	74.5	81.7	83.8
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	1.12E-05	1.23E-05	1.27E-05
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	3,115	3,412	3,508
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	742	802	820
Renewable primary resources as material, (RPRM)*	MJ, NCV	0.00	0.00	0.00
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	3,267	3,578	3,678
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	0.00	0.00	0.00
Consumption of fresh water	m ³	3.52	3.74	3.81
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM)*	kg	12.6	10.5	10.5
Renewable secondary fuels, (RSF)*	MJ, NCV	240	264	272
Non-renewable secondary fuels (NRSF)*	MJ, NCV	120	132	136
Recovered energy, (RE)*	MJ, NCV	0.00	0.00	0.00
Waste & Output Flows				
Hazardous waste disposed*	kg	0.06	0.06	0.06
Non-hazardous waste disposed*	kg	0.42	0.44	0.44
High-level radioactive waste*	kg	1.84E-08	1.98E-08	2.04E-08
Intermediate and low-level radioactive waste*	kg	9.90E-07	1.04E-06	1.06E-06
Components for reuse*	kg	0.00	0.00	0.00
Materials for recycling*	kg	0.10	0.11	0.11
Materials for energy recovery*	kg	8.97E-05	9.38E-05	9.50E-05
Recovered energy exported from the product system*	MJ, NCV	0.00	0.00	0.00
Additional Inventory Parameters for Transparency				
CO ₂ emissions from calcination and uptake from carbonation	kg CO ₂ eq	417	459	472
Biogenic CO ₂ , reporting the removals and emissions associated with biogenic carbon content contained within biobased products ²	kg CO ₂ eq	0.00	0.00	0.00

* Emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories.

Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products.

¹ GWP 100; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

CO₂ from biomass secondary fuels (wood chips made from construction waste as well as whole wood construction waste) used in kiln are climate-neutral (CO₂ sink = CO₂ emissions), ISO 21930, 7.2.7.

² GUL, biogenic CO₂= 0 (- 29 kg CO₂e/+29 kg CO₂e); GU, biogenic CO₂= 0 (- 32 kg CO₂e/+32 kg CO₂e); HE, biogenic CO₂= 0 (- 33 kg CO₂e/+33 kg CO₂e).

ADDITIONAL ENVIRONMENTAL INFORMATION

Environmental Management System (EMS)

The Delta Plant has an EMS in place. The EMS identifies environmental impacts and ensures that control procedures are continually updated to reflect current environmental knowledge and regulations. Environmental policies and procedures are written in the EMS manual which serves as a reference and provides operating personnel with environmental procedures. For environmental reporting the plant complies with the Canadian and British Columbia provincial protection requirements and emissions reports:

- Canadian National Pollutant Release Inventory (NPRI) which is federal.
- Greenhouse Gas Industrial Reporting and Control Act – Here in BC we report CO₂ emissions to both federal and provincial. In Delta's case, the emissions are audited and verified by Stantec Consulting Ltd.
- Cement Low Carbon Fuel Program (CLCFP) under the BC Ministry of Environment and Climate Change Strategy – Climate Action Secretariat. CO₂ emissions are reported to this sector of the ministry.
- WBCSD Cement Sustainability Initiative Cement CO₂ and Energy Protocol, Version 3.1.

Air Permit

- The Delta Plant has an air quality permit with the regional regulator Metro Vancouver (formerly the Greater Vancouver Regional District (GVRD)). It is Permit GVA0175 under GVRD Air Quality Management Bylaw No. 1082, 2008 and the BC Environmental Management Act, S.B.C 2003,c.53.

Used Oil, Waste Oil Products, Waste Chemicals and Anti-Freeze:

The Delta plant stores these wastes in appropriate storage bins and containers in a containment area. A third party contractor removes this waste and properly disposes of it as per provincial regulations. Communication of final disposal is given to the Delta plant.

Recycling Programs

The Delta plant has taken steps for warehouse storage and maintains third party contractors that pick up and recycle the following from the Delta plant and office operations: used batteries, discarded paper, outdated or damaged electronic hardware and parts. The used vehicle batteries are collected and stored in the plant warehouse. A Delta plant employee takes these batteries to a local recycling depot.

Sustainability Commitments

Lehigh Cement, a Lehigh Hanson affiliated company, is a part of the HeidelbergCement Group, a leading construction materials company worldwide. HeidelbergCement's Sustainability Commitments 2030 define the key topics and core principles of Lehigh Cement's sustainability strategies, aligning with the UN Assembly Sustainable Development Goals (SDGs). Company sustainability performance ratings and ranking are publicly available at <https://www.heidelbergcement.com/en/sustainability-report>.

Lehigh Cement supports HeidelbergCement's Sustainability Commitments 2030. HeidelbergCement's goal of a 30% carbon footprint reduction as compared to 1990, encourages the discovery of innovative approaches and thought processes to reduce environmental impacts and ensure a sustainable business model. Working to incorporate knowledge and practices learned from global resources for local applications, Lehigh Cement continuously innovates to improve services and products that increase efficiency on the jobsite. Lehigh Cement also strives for effective management of all processes and resources and works with the local communities to promote resilient infrastructure and provide increased transparency. Lehigh Cement aligns and works globally with HeidelbergCement to push toward carbon neutral concrete by 2050. To learn more about Lehigh Cement's sustainability commitment, visit <https://www.lehighhanson.com/about/sustainability>.