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

GENERAL INFORMATION

This cradle to gate Environmental Product Declaration covers five cement products produced at the Picton 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

Picton Cement Plant and Terminal
1370 Hwy 49 South
Picton, Ontario K0K 2T0

PROGRAM OPERATOR

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

NRMCAEPD: 20057

DATE OF ISSUE

January 17, 2022 (valid for 5 years until January 17, 2027)

ENVIRONMENTAL IMPACTS

Lehigh Picton Plant: Product-Specific Type III EPD

Declared Cement Products (six):
GUL/ Type IL; GU/ Type I; MS/ Type II; HE/ Type III; Type S; Type N

Declared Unit: One metric tonne of cement

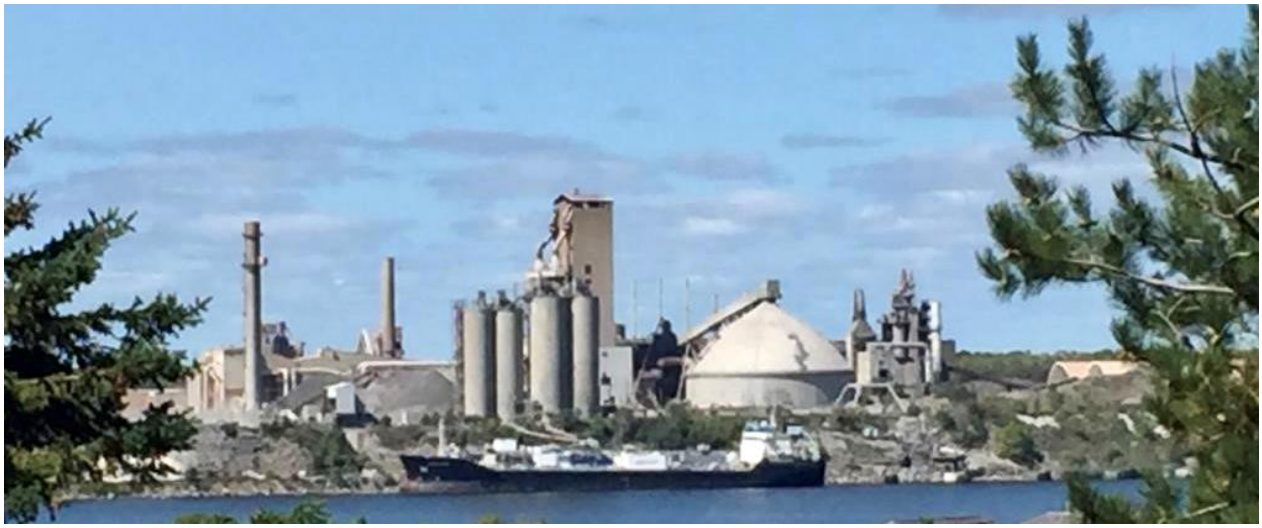
	CEMENT PRODUCTS					
	GUL (Type IL) ECOCEM PLC	GU (Type I)	MS (Type II)	HE (Type III)	Type S	Type N
Global Warming Potential (kg CO_2-eq)	828	893	883	894	611	461
Ozone Depletion Potential (kg CFC-11-eq)	2.78E-05	2.96E-05	2.94E-05	3.00E-05	2.13E-05	1.69E-05
Eutrophication Potential (kg N-eq)	0.65	0.70	0.69	0.70	0.49	0.38
Acidification Potential (kg SO^2-eq)	4.21	4.53	4.48	4.54	3.13	2.39
Photochemical Ozone Creation Potential (kg O_3-eq)	45.12	48.44	47.88	48.52	34.03	26.54
Abiotic Depletion, nonfossil (kg Sb-eq)	1.76E-04	1.86E-04	1.83E-04	1.88E-04	1.53E-04	1.36E-04
Abiotic Depletion, fossil (MJ)	171.26	180.65	175.80	180.16	154.30	143.16
Product Components:						
Clinker	86%	93%	92%	93%	63%	47%
Limestone, Gypsum and Others	14%	7%	8%	7%	37%	53%

Additional detail and impacts are reported on pages 5-6

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 V3.2: 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 Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants
For additional explanatory material Manufacture Representative: Jeff Hook (jeff.hook@lehighhanson.com) This LCA EPD was prepared by: Hannah Renaud (hannah.renaud@athenasmi.org) • Athena Sustainable Materials Institute
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 (Picton, ON 1954), making us a pillar of the many communities around us and providing employment and economic benefit to small towns and cities. We operate cement plants in Edmonton, Alberta, Delta, British Columbia and Picton, Ontario. Our Picton plant is on the south end of the city and started production in 1954. 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 to our local communities through various sponsorship, assisting in trail stewardship in local conservation areas and working with local non-government organizations for donations and volunteering.

PRODUCT

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

Product Type	Applicable Standard	Standard Designation - Lehigh Brand Name
General Use (Portland) Cement	CSA A3001	Type GU / Type 10
	ASTM C150	Type I
General Use (Portland) Limestone Cement	CSA A3001	Type GUL- EcoCem®PLC
	ASTM C595	Type IL*
Moderate Sulphate Cement	CSA A3001	Type MS/Type 20
	ASTM C150	Type II
High Early Cement	CSA A3001	Type HE / Type 30
	ASTM C150	Type III
Masonry Cement	CSA A3002	Type S and N
	ASTM C91	Type S and N

*Also includes Type I/IIL as identified in NY

PRODUCT DESCRIPTION

This EPD reports environmental transparency information for six cement products, produced by Lehigh Cement at their Picton, ON 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 environmentally friendly product is branded as **EcoCem®*PLC*** and was developed to reduce embodied carbon (measured through GWP). This product is a general use limestone cement 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 GU, GUL, MS, HE, Type S and N.

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:2021; 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.

REFERENCES

Global Cement and Concrete Association (GCCA) 2020. *N.A. version of Industry EPD tool for Cement and Concrete*. https://concrete-epd-tool.org/.
GCCA and PCA, *GCCA Industry EPD Tool for Cement and Concrete (V3.1), LCA Model, North American version*, Prepared by Quantis, November 2021.
ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
ISO 14040:2006/Amd 1:2020 Environmental Management - Life Cycle Assessment - Principles and Framework
ISO 14044:2006/Amd 1:2017/Amd 2:2020 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
NSF 2021: PCR for Portland, Blended, Masonry, Mortar and Plastic (Stucco) Cements v3.2, September 2021
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

CEMENT TYPES

For portland cement types, ASTM C150 describes:

Cement Type	Description
Type I	Normal
Type II	Moderate Sulfate Resistance
Type II (MH)	Moderate Heat of Hydration (and Moderate Sulfate Resistance)
Type III	High Early Strength
Type IV	Low Heat Hydration
Type V	High Sulfate Resistance

For blended hydraulic cements – specified by ASTM C595 – the following nomenclature is used:

Cement Type	Description
Type IL	Portland-Limestone Cement
Type IS	Portland-Slag Cement
Type IP	Portland-Pozzonlan Cement
Type IT	Ternary Blended Cement

In addition, some blended cements have special performance properties verified by additional testing. These are designated by letters in parentheses following the cement type. For example Type IP(MS) is a portland-pozzolan cement with moderate sulfate resistance properties. Other special properties are designated by (HS), for high sulfate resistance; (A), for air-entraining cements; (MH) for moderate heat of hydration; and (LH) for low heat of hydration. Refer to ASTM C595 for more detail.

For performance-based specifications, ASTM C1157 describes cements by their performance attributes:

Cement Type	Description
Type GU	General Use
Type HE	High Early-Strength
Type MS	Moderate Sulfate Resistance
Type HS	High Sulfate Resistance
Type MH	Moderate Heat of Hydration
Type LH	Low Heat of Hydration

LIFE CYCLE IMPACT ASSESSMENT RESULTS – Picton Cement Products: Type GUL called EcoCem®*PLC*, GU/Type 10, and MS/Type 20 (*per 1 metric tonne)*

Impact Assessment	Unit	GUL (Type IL)	GU (Type I)	MS (Type II)
Global warming potential (GWP)[1]	kg CO_2 eq	827.96	892.86	883.43
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	2.78E-05	2.96E-05	2.94E-05
Eutrophication potential (EP)	kg N eq	0.65	0.70	0.69
Acidification potential of soil and water sources (AP)	kg SO_2 eq	4.21	4.53	4.48
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	45.12	48.44	47.88
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	1.76E-04	1.86E-04	1.83E-04
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	171.26	180.65	175.80
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	323.88	347.22	342.51
Renewable primary resources as material, (RPRM)*	MJ, NCV	0.00	0.00	0.00
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	4265.01	4592.87	4512.73
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	0.00	0.00	0.00
Consumption of fresh water	m3	0.98	1.06	1.03
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM)*	kg	27.49	29.66	29.34
Renewable secondary fuels, (RSF)*	MJ, NCV	0.00	0.00	0.00
Non-renewable secondary fuels (NRSF)*	MJ, NCV	0.00	0.00	0.00
Recovered energy, (RE)*	MJ, NCV	-	-	-
Waste & Output Flows				
Hazardous waste disposed*	kg	0.00	0.00	0.00
Non-hazardous waste disposed*	kg	10.59	11.42	11.30
High-level radioactive waste*	kg	0.00	0.00	0.00
Intermediate and low-level radioactive waste*	kg	-	-	-
Components for reuse*	kg	0.00	0.00	0.00
Materials for recycling*	kg	0.20	0.22	0.22
Materials for energy recovery*	kg	0.00	0.00	0.00
Recovered energy exported from the product system*	MJ, NCV	0.00	0.00	0.00
Additional Inventory Parameters for Transparency				
Emissions from calcination and uptake from carbonation	kg CO_2 eq	452.55	488.25	483.00
Biogenic CO_2, reporting the emissions from combustion of waste from renewable sources used in production processes	kg CO_2 eq	0.00	0.00	0.00
Emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2 eq	0.00	0.00	0.00

[1] GWP 100, includes biogenic CO_2 emissions from the combustion of wastes from renewable sources; excludes biogenic CO_2 removals and emissions associated with the production of any biobased products; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

* 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.

- Not all LCA datasets for upstream materials include these impact categories and thus results may be incomplete. 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.

LIFE CYCLE IMPACT ASSESSMENT RESULTS – Picton Cement Products: HE/Type 30, Type S and Type N (*per 1 metric tonne*)

Impact Assessment	Unit	HE (Type III)	Type S	Type N
Global warming potential (GWP)[1]	kg CO_2 eq	893.77	610.58	460.95
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	3.00E-05	2.13E-05	1.69E-05
Eutrophication potential (EP)	kg N eq	0.70	0.49	0.38
Acidification potential of soil and water sources (AP)	kg SO_2 eq	4.54	3.13	2.39
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	48.52	34.03	26.54
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb e	1.88E-04	1.53E-04	1.36E-04
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	180.16	154.30	143.16
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	346.97	249.75	198.67
Renewable primary resources as material, (RPRM)*	MJ, NCV	0.00	0.00	0.00
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	4592.00	3289.55	2613.24
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	0.00	0.00	0.00
Consumption of fresh water	m3	1.05	0.79	0.65
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM)*	kg	29.66	20.09	14.99
Renewable secondary fuels, (RSF)*	MJ, NCV	0.00	0.00	0.00
Non-renewable secondary fuels (NRSF)*	MJ, NCV	0.00	0.00	0.00
Recovered energy, (RE)*	MJ, NCV	-	-	-
Waste & Output Flows				
Hazardous waste disposed*	kg	0.00	0.00	0.00
Non-hazardous waste disposed*	kg	11.42	7.74	5.77
High-level radioactive waste*	kg	0.00	0.00	0.00
Intermediate and low-level radioactive waste*	kg	0.00	0.00	0.00
Components for reuse*	kg	-	-	-
Materials for recycling*	kg	0.22	0.15	0.11
Materials for energy recovery*	kg	0.00	0.00	0.00
Recovered energy exported from the product system*	MJ, NCV	0.00	0.00	0.00
Additional Inventory Parameters for Transparency				
Emissions from calcination and uptake from carbonation	kg CO_2 eq	488.25	330.75	246.75
Biogenic CO_2, reporting the emissions from combustion of waste from renewable sources used in production processes	kg CO_2 eq	0.00	0.00	0.00
Emissions from combustion of waste from non-renewable sources used in production processes	kg CO_2 eq	0.00	0.00	0.00

[1] GWP 100, includes biogenic CO_2 emissions from the combustion of wastes from renewable sources; excludes biogenic CO_2 removals and emissions associated with the production of any biobased products; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

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ADDITIONAL ENVIROMENTAL INFORMATION

Environmental Management System (EMS)

The Lehigh Picton Plant has an EMS for both the control and development of reporting compliance requirements and routine inspection / sampling requirements. The EMS is updated to reflect changing regulations and operations relevant to the facility to monitor compliance requirements and updating of policies and procedures.

Audits are routinely conducted monitoring operations and impact sources with respect to land, water and air sources including noise. Routine audits, monitoring and reporting include;

- Annual Continuous Emissions Monitoring (CEM), ensuring that the emissions monitoring is operated in accordance with Environment Canada Report EPS 1/PG/7, "Protocols and Performance Specifications for Continuous Monitoring of Gaseous Emissions from Thermal Power Generation", December 2005 (PG/7) (Note: Regulators commonly apply this protocol to a wide range of industrial facilities, not just for thermal power generation)
- GHG Reporting and verification Audits, The GHG reporting, and verification require the application of methodologies for Federal and provincial reporting standards.
- Emission Summary Dispersion Modelling as required under O.Reg 419/05
- Spills Prevention and Contingency Planning as required under O.Reg 224/07
- Waste Audit and Waste Reduction Work Plans as required under O.Reg 102/94
- Canadian National Pollutant Inventory Release (NPRI) and Toxic's Reduction Plans
- Industrial Effluent Discharge loading monitoring to receiving water as required by the Municipal Industrial Strategy for Abatement (MISA) for storm water management
- Wellhead monitoring of static water levels

Air Permit

The Picton Plan operates under the Environmental Compliance Approval (ECA) NUMBER 0073-BHGQHC Issue Date: October 31, 2019.

Used Oil, Waste Oil Products, Waste Chemicals and Anti-Freeze:
The Picton plant stores these wastes in appropriate storage bins or containers in a containment area. A third-party contractor removes this waste under the Transportation of Dangerous Goods Handling practices and properly disposes of it as per provincial regulations. The manifests of waste handling are managed for the safe and proper disposal requirements.

Recycling Programs

The Picton plant utilizes waste segregation bins segregating carboard, wood, metals, and recyclable materials from waste streams. Third party contractors manage the waste / recycling haulage to local transfer stations. Similarly, batteries and electronic goods are managed via third party haulage and disposal.

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 continuously innovates to improve services and products that increase sustainability and 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. 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.