

GENERAL INFORMATION

This cradle to gate Environmental Product Declaration covers three cement products produced at the Bellingham Cement Grinding 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.

Heidelberg Materials

Bellingham Cement Grinding Plant and Terminal
741 Marine Dr.
Bellingham, WA. 98225



PROGRAM OPERATOR

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

NRMCAEPD: 20033

Environmental Impacts

Bellingham Plant: Product-Specific Type III EPD

Declared Cement Products (three):

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

Declared Unit: One metric tonne of cement

	Cement Products		
	Type IL/GUL	Type I/II/GU	Type III/HE
Global Warming Potential (kg CO ₂ -eq)	713	783	792
Ozone Depletion Potential (kg CFC-11-eq)	2.25E-05	2.43E-05	2.52E-05
Eutrophication Potential (kg N-eq)	0.79	0.84	0.93
Acidification Potential (kg SO ₂ -eq)	2.74	3.01	3.02
Photochemical Ozone Creation Potential (kg O ₃ -eq)	78.6	86.3	86.3
Abiotic Depletion, nonfossil (kg Sb-eq)	1.16E-05	1.27E-05	1.28E-05
Abiotic Depletion, fossil (MJ)	3,490	3,803	3,937
Product Components:			
Clinker	82%	91%	90%
Limestone, Gypsum and Others	18%	9%	10%

Additional detail and impacts are reported on page 5

DATE OF ISSUE

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

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.: <input type="checkbox"/> internal <input checked="" type="checkbox"/> 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@heidelbergmaterials.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



Heidelberg Materials is a leading supplier of cementitious construction materials in North America. The Bellingham plant started operation in May 1913, under the name Olympic Portland Cement. The cement plant was one of Bellingham’s largest employers until the 1950s. The plant stopped producing clinker in 1987. The Bellingham plant is now a cement grinding facility and fly ash distribution location. The Bellingham plant receives all its clinker from the Heidelberg plant in Delta, British Columbia. Raw materials for cement production are received by rail, truck and barge into the Port of Bellingham. Water and rail access helps mitigate our environmental impacts through efficient and more sustainable transportation of raw materials and delivery of cement. Heidelberg Materials commitment to sustainable construction includes actively working to create lower carbon cements through supplementary cementitious materials (SCMs) and alternative raw materials and fuels. Heidelberg Materials is committed to reducing greenhouse gas (GHG) emissions and achieving carbon-neutral concrete by 2050. As part of this vision, Heidelberg Materials has developed product and plant specific Environmental Product Declarations (EPDs) as baselines for measuring and reducing embodied carbon.

The health and well-being of our employees, communities and the natural environment are vital to our success. In Bellingham, Heidelberg Materials supports Alderwood Elementary School with an annual donation which helps the school provide much needed meals and access to the music, art and sports programs. Alderwood Elementary is less than one mile from the plant, the annual donation has a positive impact on the community in which we operate.

PRODUCT

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

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

PRODUCT DESCRIPTION

This EPD reports environmental transparency information for three cement products, produced by Heidelberg Materials at their Bellingham, WA grinding 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 Type II/GUL is branded as EcoCemPLC™ 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 Type II, Type I/II and TYPE III 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 Factory	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"

Clinker: primary data (2020) "Delta Cement Plant and Terminal, Delta, BC" **Electricity:** Ecoinvent 3.5 (2018) "Electricity, high voltage {WECC, US only}| 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"

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"

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"

Electricity grid mix includes: 29.2% Natural Gas, 22.6% Hydro, 14.3% Lignite, 13.9% Coal, 8.1% Nuclear, 6.6% Wind, 2.2% Geothermal, 1.7% BC import, 0.6% Wood Chips, 0.4% Biogas, 0.3% Solar with a global warming potential of 0.50 kg CO₂eq per kWh.

Clinker 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/>

LIFE CYCLE IMPACT ASSESSMENT RESULTS – Bellingham Cement Products: Type IL (GUL) named EcoCemPLC™, Type I/II (GU) and Type III (HE); per 1 metric tonne

Impact Assessment	Unit	GUL (Type IL)	GU (Type I/II)	HE (Type III)
Global warming potential (GWP) ¹	kg CO ₂ eq	713	783	792
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	2.25E-05	2.43E-05	2.52E-05
Eutrophication potential (EP)	kg N eq	0.79	0.84	0.93
Acidification potential of soil and water sources (AP)	kg SO ₂ eq	2.74	3.01	3.02
Formation potential of tropospheric ozone (POCP)	kg O ₃ eq	78.6	86.3	86.3
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	1.16E-05	1.27E-05	1.28E-05
Abiotic depletion potential for fossil resources (ADP _{fossil})	MJ, NCV	3,490	3,803	3,937
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	670	728	764
Renewable primary resources as material, (RPRM)*	MJ, NCV	0.00	0.00	0.00
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	3,690	4,015	4,178
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	0.00	0.00	0.00
Consumption of fresh water	m ³	3.11	3.35	3.40
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM)*	kg	10.0	15.0	15.0
Renewable secondary fuels, (RSF)*	MJ, NCV	242	268	267
Non-renewable secondary fuels (NRSF)*	MJ, NCV	121	134	133
Recovered energy, (RE)*	MJ, NCV	0.00	0.00	0.00
Waste & Output Flows				
Hazardous waste disposed*	kg	0.03	0.03	0.03
Non-hazardous waste disposed*	kg	0.35	0.37	0.37
High-level radioactive waste*	kg	4.32E-08	4.29E-08	5.88E-08
Intermediate and low-level radioactive waste*	kg	1.22E-06	1.26E-06	1.40E-06
Components for reuse*	kg	0.00	0.00	0.00
Materials for recycling*	kg	0.07	0.07	0.07
Materials for energy recovery*	kg	4.06E-05	4.49E-05	4.47E-05
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	420	465	463
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 (- 32 kg CO₂e/+32 kg CO₂e).

ADDITIONAL ENVIROMENTAL INFORMATION

The Bellingham Grinding Plant has processes in place which identifies environmental impacts and related best management practices and controls. These policies and procedures are continually reviewed and updated to reflect current environmental knowledge and regulations. The various plans provide plant personnel with information on environmental procedures and requirements.

- Site Specific Emergency Management Plan
- Spill Prevention, Control, and Countermeasures Plan
- Stormwater Pollution Prevention Plan
- Operations and Maintenance Plan for Air Emission Sources
- Solid Waste Control Plan

For environmental reporting the plant complies with Washington State and United States federal requirements and reporting. The Plant maintains a Title V Air Operating Permit (AOP 022R1) issued by the Northwest Clean Air Agency (NWCAA) in accordance with the provisions of the Regulation of the NWCAA and Chapter 173-401 of the Washington Administrative Code. The permit also requires compliance with the federal New Source Performance Standards (NSPS) and the National Emission Standards for Hazardous Air Pollutants (NESHAP). Emissions reporting is completed annually through the Washington Emissions Inventory Reporting System.

The Plant maintains a Tier II inventory and submits annual reports to the Washington Department of Ecology, Whatcom County, and the local fire department under the Community-Right-to-Know reporting program.

The Plant maintains a Solid Waste Control Plan which outlines the proper handling, management, and disposal requirements for general office waste, universal waste (e.g. batteries, light bulbs, scrap metal), electronics, and hazardous materials (e.g. waste oil, waste chemicals, oily rags, etc.).

Heidelberg Materials Sustainability Commitments 2030

The world needs smart, sustainable and resilient infrastructure, buildings, and public spaces. At Heidelberg Materials, we are transforming our business to address these challenges, and are placing sustainability at the core of what we do.

The United Nations Sustainable Development Goals (SDGs) shape our strategy and sustainability commitments. Our Sustainability Commitments 2030 support our vision to build a more sustainable future that is net zero, safe and inclusive, nature positive, and circular and resilient. Learn more at [Sustainability Commitments 2030 \(heidelbergmaterials.com\)](https://www.heidelbergmaterials.com).