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Davenport Cement Plant

Environmental Product Declaration

LIFE CYCLE ASSESSMENT

This cradle to gate Environmental Product Declaration covers bulk cement products produced at the Davenport 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.

Continental Cement Company

Davenport Cement Plant
301 E. Front St.

Buffalo, Iowa 52728

PROGRAM OPERATOR

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428
610-832-9500
https://www.astm.com

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LCA/EPD DEVELOPER

Climate Earth, Inc.
137 Park Place, Suite 204
Pt Richmond, CA 94801
415-391-2725

https://www.climateearth.com

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 V3.1 serves as the sub-category PCR Inclusion of API SPEC 10A under the scope of PCA PCR effective 9/11/2020 per NSF Deviation #2020-037
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: Brett Imsland (Brett.Imsland@continentalcement.com)** **This LCA EPD was prepared by: Melissa Díaz Segura, LCA and EPD Project Manager • 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

Continental Cement Company, headquartered in Chesterfield Missouri, is one of the leading cement manufacturing companies in the mid-west US. Continental Cement Company began making cement in 1903 and are the proud producers of high-quality cement that has been used in many iconic construction projects, like the Empire State Building and the Panama Canal. Continental Cement Company is a wholly owned subsidiary of Summit Materials, Inc.

PRODUCT

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

Product Type	Applicable Standard	Standard Designation
Blended Hydraulic Cement	ASTM C595, AASHTO M240	Type IL (10), Type IS (20)
Hydraulic Cement	ASTM C1157	Type GU (IL20),
Portland Cement	ASTM C150, AASHTO M85	Type I-II

This EPD reports environmental transparency information for four cement types produced by Continental Cement Company at its Davenport, IA plant. 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. 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. The Table below sets out each cement type constituents and applicable standards. Cements are sold in bulk.

PRODUCT COMPONENTS

Inputs	Type I/II	Type IL (10)	Type GU (IL20)	Type IS (20)
Clinker	87.72%	83.61%	75.96%	70.96%
Gypsum	6.23%	5.12%	5.00%	5.00%
Limestone	3.90%	9.13%	18.7%	0.00%
Slag cement	0.00%	0.00%	0.00%	20.00%
Process Addition	2.1%	2.1%	0.30%	4.00%
Grinding aids	0.05%	0.04%	0.04%	0.04%

DECLARED UNIT

The declared unit is one metric tonne of Type I/II, IL (10), GU (IL20), and IS (20) cements.

SYSTEM BOUNDARY

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

PRODUCTION Stage (*Mandatory*)			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	De-construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4
X	X	X	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. Recycled and recovered materials with fuel content and used as fuels, such as scrap tires and agricultural waste, are considered nonrenewable or renewable secondary fuels. Impacts allocated to these fuels are limited to the treatment and transport required for their use from point of generation along with all emissions from combustion.

LIFE CYCLE INVENTORY (LCI)

Primary Sources of LCI Data:

Coal: ecoinvent 3.8 (2021): "Hard coal {RNA}| hard coal mine operation and hard coal preparation"
Electricity: US-EI (2021) "Electricity, high voltage, at grid, eGrid (2021), NERC MRO US"
Limestone: Manufacture specific primary data (2021)
Petroleum Coke: US-EI (2021) "Petroleum coke, at refinery US"
Truck transport: USLCI (2015) "Transport, combination truck, long-haul, diesel powered, East North Central /tkm/RNA"
Truck transport: USLCI (2015) "Transport, combination truck, short-haul, diesel powered, East North Central /tkm/RNA"
Barge Transport: USLCI (2015) Transport, barge, diesel powered/US

Electricity grid mix includes: 17.93% Natural Gas, 3.74% Hydro, 35.26% Coal, 34.78% Wind, 6.43% Nuclear, 0.71% Solar, 0.0% Geothermal, 0.71% Biomass, 0.23% oil, 0.12% Other Fossil, with a global warming potential of 0.547 kg CO_2 eq/kWh.

LIFE CYCLE IMPACT ASSESSMENT RESULTS

Continental Cement Products, bulk shipped: Type I/II, Type IL(10); Type GU (IL20), and IS(20), per 1 metric tonne

Impact Assessment	Unit	Type I/II	Type IL (10)	Type GU (IL20)	Type IS (20)
Global warming potential (GWP)[1]	kg CO_2 eq	890	849	774	725
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	2.56E-06	2.62E-06	2.38E-06	2.22E-06
Eutrophication potential (EP)	kg N eq	1.30	1.26	1.17	1.11
Acidification potential of soil and water sources (AP)	kg SO_2 eq	3.60	3.43	3.15	2.92
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	55.2	52.7	48.5	44.7
Resource Use					
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	4.11E-06	3.98E-06	3.81E-06	3.61E-06
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	3862	3693	3384	3176
Renewable primary energy resources as energy (fuel), (RPRE[2]) *	MJ, NCV	150	147	141	136
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	3956	3784	3471	3260
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Consumption of fresh water, (FW[2])	m^3	6.85E-01	6.67E-01	6.33E-01	6.04E-01
Secondary Material, Fuel and Recovered Energy					
Secondary Materials, (SM[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	298	284	258	241
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	380	363	329	308
Recovered energy, (RE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste & Output Flows					
Hazardous waste disposed, (HW[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed, (NHWD[2]) *	kg	4.43	4.33	4.15	4.03
High-level radioactive waste, (HLRW[2]) *	m^3	4.99E-08	4.86E-08	4.64E-08	4.47E-08
Intermediate and low-level radioactive waste, (ILLRW[2]) *	m^3	4.50E-07	4.39E-07	4.19E-07	4.05E-07
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	2.23E-01	2.18E-01	2.09E-01	2.03E-01
Materials for energy recovery, (MER[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported from the product system, (EE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Additional Inventory Parameters for Transparency					
CO_2 emissions from calcination and uptake from carbonation[3]	kg CO_2 eq	472	450	409	382

* 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 biogenic secondary fuels used in kiln are climate-neutral (CO2 sink = CO2 emissions), ISO 21930, 7.2.7.
[2] Calculated per ACLCA ISO 21930 Guidance.
[3] 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).

Additional Environmental Information

Dewey Portland Cement built and opened the plant in Buffalo, Iowa in 1927. The plant operated 3 long wet kilns. In 1962, the plant was purchased by Martin-Marietta. In 1980, the plant was rebuilt into a single line preheater/precalciner kiln operation. Cementia purchased the plant in 1983 and then sold to Lafarge in 1991. Modifications were made to reduce emissions and increase throughput in 2004 and 2005. In 2015 the plant was purchased by Continental Cement Company, a subsidiary of Summit Materials.

Air pollution control equipment in use at the Davenport plant includes high temperature baghouse, bin vents, cartridge filters, selective non-catalytic reduction (SNCR), and activated carbon injection. Raw mill baghouse dust (CKD) is captured and used as a processing aid in the finish mill.

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