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Cemex Clinchfield Cement Plant

Environmental Product Declaration

General Information

This cradle to gate Environmental Product Declaration covers bulk and bagged cement products produced at the Clinchfield 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.

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EPD 450
May 4th, 2023
Valid for 5 years

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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
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For additional explanatory material Manufacture Representative: Anand Krishnan (anand.krishnan@cemex.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.

General Information

Producer

Cemex is one of the largest building materials companies in the world with operations in the Americas, the Caribbean, Europe, Africa, Middle East, and Asia. Cemex employs over 41,000 employees worldwide and is committed to sustainable practices and CO_2 reduction goals in the communities in which it operates. Cemex Clinchfield cement plant has been producing high quality products since 1920 and employs about 130 people. The plant has an annual cement production capacity of about 710,000 metric tonnes and provides cement for the construction needs in Georgia and surrounding states.

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 Cement	ASTM C595, C1157, AASHTO M240	Type IL
Portland Cement	ASTM C150, C1157, AASHTO M85	Type I/II, Type III
Masonry Cement	ASTM C91	Masonry N, Masonry S

This EPD reports environmental information for five cement products produced by Cemex at its Clinchfield, GA facility. Type I/II cement is used as the key ingredient in many products such as ready-mix concrete and in a wide variety of applications such as concrete pipes, pre-stressed concrete, roads, foundations, bridges, soil stabilization, rooftile and more. Type III cement provides higher early strengths relative to Type I/II cement and is produced by grinding the cement finer. It is typically used in prestress & precast applications. Type IL cement is a general use cement engineered to reduce the carbon footprint by inter grinding a higher ground limestone content than permitted in Type I/II cement. It is typically used in all applications in which Type I/II cement is used. Masonry cements are formulated to produce masonry mortar which is used in brick, concrete block, and stone masonry construction. Masonry cements are produced by inter grinding Portland cement with a high limestone content along with additives that provide water repellency and air entrainment.

Product Components

Inputs	Type IL	Type I/II	Type III	Masonry N	Masonry S
Clinker	85%	92%	92%	52%	61%
Limestone, Gypsum & other	15%	8%	8%	48%	39%

Declared Unit

The declared unit is one metric tonne of Type IL, Type I/II, Type III, Masonry N and Masonry S cement.

Life Cycle Assessment

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:2021; and ISO 21930:2017 section 7.2. Recycling and recycled content is modeled using the cut-off rule.

This study recognizes fly ash, silica fume, granulated blast furnace slag, cement kiln dust, flue gas desulfurization (FGD) gypsum, post-consumer gypsum, and sawdust 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 refused derived fuels (RDF), 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:

Electricity: US-EI custom process "Electricity, high voltage, at grid, eGrid (2021), SERC/US US-EI U"
Limestone: Manufacture specific primary data (2021)
Natural gas: ecoinvent 3.8 (2021) Market for natural gas, high pressure US"
Truck Transport: USLCI (2015) "Transport, combination truck, long-haul, diesel powered, Southeast /tkm/RNA"
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Electricity grid mix includes: 45.83% Natural Gas, 3.21% Hydro, 20.64% Coal, 0.73% Wind, 24.36% Nuclear, 2.31% Solar, 0.0% Geothermal, 1.95% Biomass, 0.46% Oil, 0.34% petroleum coke, with a global warming potential of 0.606 kg CO_2eq per /kWh.

Life Cycle Assessment

Clinchfield Cement Products[1], bulk shipped: Type IL, Type I/II, Type III, Masonry N, Masonry S per 1 metric tonne.**

Impact Assessment	Unit	Type IL	Type I/II	Type III	Masonry N	Masonry S
Global warming potential (GWP)[2]	kg CO_2 eq	781	833	835	509	587
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	3.24E-05	3.42E-05	3.47E-05	2.07E-05	2.40E-05
Eutrophication potential (EP)	kg N eq	3.33E-01	3.69E-01	3.50E-01	2.48E-01	2.73E-01
Acidification potential of soil and water sources (AP)	kg SO_2 eq	2.38	2.48	2.53	1.65	1.86
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	57.2	59.3	61.0	38.7	44.0
Resource Use						
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	3.36E-05	1.50E-04	3.59E-05	6.61E-05	6.01E-05
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	4,500	4,650	4,761	3,206	3,579
Renewable primary energy resources as energy (fuel), (RPRE[3]) *	MJ, NCV	106	114	111	87	93
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	1.60E-01	1.26E-01
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	5,344	5,479	5,643	3,860	4,287
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	4.68E+00	3.69E+00
Consumption of fresh water, (FW[2])	m^3	4.45	4.45	4.79	3.14	3.49
Secondary Material, Fuel and Recovered Energy						
Secondary Materials, (SM[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	1039	1042	1121	632	748
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	415	416	447	252	298
Recovered energy, (RE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Waste & Output Flows						
Hazardous waste disposed, (HW[2]) *	kg	6.72E-04	6.72E-04	6.96E-04	5.55E-04	5.89E-04
Non-hazardous waste disposed, (NHWD[2]) *	kg	3.09	3.10	3.20	2.69	2.82
High-level radioactive waste, (HLRW[2]) *	kg	4.58E-07	4.60E-07	4.78E-07	9.23E-04	7.27E-04
Intermediate and low-level radioactive waste, (ILLRW[2]) *	kg	2.61E-06	2.86E-06	2.74E-06	1.95E-06	2.14E-06
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery, (MER[2]) *	kg	0.00E+00	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	0.00E+00
Additional Inventory Parameters for Transparency						
CO_2 emissions from calcination and uptake from carbonation[4]	kg CO_2 eq	437	438	471	266	315

* 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. The following optional indicators are not reported and also have high levels of uncertainty: Land use related impacts, toxicological aspects, and emissions from land use change.

**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] These products contain no materials that are considered hazardous as defined by the PCR.
[2] 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.
[3] Calculated per ACLCA ISO 21930 Guidance.
[4] Calcination emissions were calculated based on the Cement CO2 and Energy Protocol detailed output method (B1) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI).

Life Cycle Assessment

Clinchfield Cement Products[5], bagged shipped: Type I/II, Masonry N, Masonry S per 1 metric tonne.**

Impact Assessment	Unit	Type I/II	Masonry N	Masonry S
Global warming potential (GWP)[6]	kg CO_2 eq	848	525	602
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	3.50E-05	2.15E-05	2.49E-05
Eutrophication potential (EP)	kg N eq	4.01E-01	2.80E-01	3.05E-01
Acidification potential of soil and water sources (AP)	kg SO_2 eq	2.55	1.73	1.94
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	60.3	39.6	44.9
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	1.55E-04	7.07E-05	6.46E-05
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	4,868	3,424	3,797
Renewable primary energy resources as energy (fuel), (RPRE[7]) *	MJ, NCV	407	380	386
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0.00E+00	1.60E-01	1.26E-01
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	5,769	4,150	4,577
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0.00E+00	4.68	3.69
Consumption of fresh water, (FW[2])	m^3	6.25	4.94	5.29
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	1,042	632	748
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	416	252	298
Recovered energy, (RE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Waste & Output Flows				
Hazardous waste disposed, (HW[2]) *	kg	6.72E-04	5.55E-04	5.89E-04
Non-hazardous waste disposed, (NHWD[2]) *	kg	3.10	2.69	2.82
High-level radioactive waste, (HLRW[2]) *	kg	4.98E-07	9.23E-04	7.27E-04
Intermediate and low-level radioactive waste, (ILLRW[2]) *	kg	3.04E-06	2.13E-06	2.32E-06
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery, (MER[2]) *	kg	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
Additional Inventory Parameters for Transparency				
CO_2 emissions from calcination and uptake from carbonation[8]	kg CO_2 eq	438	266	315

* 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. The following optional indicators are not reported and also have high levels of uncertainty: Land use related impacts, toxicological aspects, and emissions from land use change.

**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.

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[7] Calculated per ACLCA ISO 21930 Guidance.
[8] Calcination emissions were calculated based on the Cement CO2 and Energy Protocol detailed output method (B1) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI).

References

ACLCA. (2019). *ACLCA Guidance to Calculating Non-LCIA Inventory Metrics in Accordance with ISO 21930:2017.*

ASTM. (April 2020). *General Program Instructions.*

ecoinvent. (2021). *The ecoinvent Database v.3.8.* Zurich, Switzerland: The Swiss Centre for Life Cycle Inventories.

ISO 14020. (2000). *Environmental labels and declarations – General principles.*

ISO 14025. (2006). *Environmental labels and declarations, Type III environmental declarations, Principles and procedures.*

ISO 14040. (2006). *ISO 14040: 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*

ISO 21930. (2017). *ISO 21930; Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.*

Long Trail Sustainability. (2021). *DATASMART (ES-EI Database).* Huntington, VT: Long Trail Sustainability.

National Renewable Energy Laboratory. (2015). *U.S. Life-Cycle Inventory (LCI) database.*

NSF International. (December 2022). *PCR for Concrete.* V.2.2

NSF International. (Sept 2021). *PCR for Portland, Blended, Masonry, Mortar and Plastic (Stucco) Cements v.3.2.*

PRé Sustainability. (2020). *SimaPro Vers. 9.1.0.8.* www.pre-sustainability.com/simapro.

US EPA. (2014). *Tool for the Reduction of Assessment of Chemical and Other Environmental Impacts (TRACI).*

US EPA. (2022). *Emissions & Generation Resource Integrated Database (eGRID).*

Additional Environmental Information

To learn more about the importance of sustainability at Cemex, please visit:
www.cemex.com/sustainability/future-in-action
www.cemexusa.com/sustainability