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CEMEX Miami Cement Plant

Environmental Product Declaration

LIFE CYCLE ASSESSMENT

This cradle to gate Environmental Product Declaration covers bulk and bagged cement products produced at the Miami 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 414
January 24th, 2023
Valid for 5 years

LCA/EPD DEVELOPER

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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.

LIFE CYCLE ASSESSMENT

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 Miami cement plant has been producing high quality products since 1958 and employs nearly 140 people. The plant has an annual cement production capacity of about 1.1 million metric tonnes and provides cement for the construction needs in Florida.

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
Stucco Cement	ASTM C1328	Stucco
Masonry Cement	ASTM C91	Masonry

This EPD reports environmental information for four cement products produced by CEMEX at its Miami, FL facility. Type I/II cement is used as the key ingredient in many products such as ready-mix concrete and in a wide array of applications such as concrete pipes, pre-stressed concrete, roads, foundations, bridges, soil stabilization, rooftile and more. Type IL cement is a general use cement engineered to reduce the carbon footprint by inter grinding a higher limestone content than permitted in Type I/II cement. It is typically used in all applications in which Type I/II cement is used. Stucco cement refers to Portland cement-based plasters used for exterior and interior application in structures in a wide range of environments. Masonry cements are formulated to produce masonry mortar which is used in brick, concrete block, and stone masonry construction. Stucco and 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	Stucco S	Masonry M
Clinker	84%	92%	57%	58%
Limestone, Gypsum & other	16%	8%	43%	42%

DECLARED UNIT

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

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 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:

Coal: ecoinvent 3.8 (2018): "Hard coal {RNA}| hard coal mine operation and hard coal preparation"
Diesel: US-EI (2020) "Diesel, combusted in industrial equipment/US"
Electricity: US-EI (2021) "Electricity, high voltage, at grid, eGrid (2019), SERC/US US-EI U"
Limestone: Manufacture specific primary data (2020)
Natural Gas: ecoinvent 3.8 (2021) Market for natural gas, high pressure US"
Petroleum Coke: US-EI (2021) "Petroleum coke, at refinery US"
Truck transport: USLCI (2015) "Transport, combination truck, long-haul, diesel powered, West/tkm/RNA"
Truck transport: USLCI (2015) "Transport, combination truck, short-haul, diesel powered, West/tkm/RNA"

Electricity grid mix includes: 46.28% Natural Gas, 3.09% Hydro, 21.96% Coal, 0.42% Wind, 24.05% Nuclear, 1.21% Solar, 0.0% Geothermal, 2.16% Biomass, 0.43% oil, 0.21% Other Fossil, with a global warming potential of 0.624 kg CO_2eq per /kWh.

LIFE CYCLE IMPACT ASSESSMENT RESULTS

Miami Cement Products[1], bulk shipped: Type IL, Type I/II; Stucco S, Masonry M per 1 metric tonne

Impact Assessment	Unit	Type IL	Type I/II	Stucco S	Masonry M
Global warming potential (GWP)[2]	kg CO_2 eq	758	829	536	548
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	4.26E-06	4.48E-06	3.78E-06	4.03E-06
Eutrophication potential (EP)	kg N eq	0.49	0.53	0.37	0.38
Acidification potential of soil and water sources (AP)	kg SO_2 eq	2.12	2.33	1.58	1.63
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	53.5	59.4	39.1	40.1
Resource Use					
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	2.08E-05	3.69E-05	1.46E-05	1.55E-05
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	4,601	4,957	3,432	3,462
Renewable primary energy resources as energy (fuel), (RPRE[3]) *	MJ, NCV	62.2	62.5	54.7	55.4
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	5,129	5,478	3,897	3,932
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	1.83	1.83	1.73	1.75
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	73.4	80.4	49.7	50.8
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	244	267	165	169
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	1.79E-04	1.87E-04	1.53E-04	1.54E-04
Non-hazardous waste disposed, (NHWD[2]) *	kg	9.02E-01	9.41E-01	7.69E-01	7.76E-01
High-level radioactive waste, (HLRW[2]) *	m^3	2.86E-07	2.84E-07	2.51E-07	2.55E-07
Intermediate and low-level radioactive waste, (ILLRW[2]) *	m^3	1.40E-06	1.42E-06	1.22E-06	1.24E-06
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	1.30E-03	1.35E-03	1.11E-03	1.11E-03
Materials for energy recovery, (MER[2]) *	kg	1.70E-01	1.78E-01	1.45E-01	1.46E-01
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[4]	kg CO_2 eq	491	538	332	340

* 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 (B2) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI).

LIFE CYCLE IMPACT ASSESSMENT RESULTS

Miami Cement Products[5], bagged shipped: Type IL, Type I/II; Stucco S, Masonry M per 1 metric tonne

Impact Assessment	Unit	Type IL	Type I/II	Stucco S	Masonry M
Global warming potential (GWP)[6]	kg CO_2 eq	770	842	548	560
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	4.89E-06	5.11E-06	4.42E-06	4.66E-06
Eutrophication potential (EP)	kg N eq	0.52	0.55	0.39	0.41
Acidification potential of soil and water sources (AP)	kg SO_2 eq	2.18	2.39	1.64	1.68
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	54.2	60.2	39.82	40.82
Resource Use					
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	2.37E-05	3.99E-05	1.75E-05	1.85E-05
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	4,771	5,128	3,603	3,632
Renewable primary energy resources as energy (fuel), (RPRE[7]) *	MJ, NCV	253.8	254.2	246.4	247.1
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	5,360	5,709	4,127	4,163
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	3.06	3.06	2.96	2.98
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	73.4	80.39	49.7	50.8
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	243.88	267.13	165	169
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	1.79E-04	1.87E-04	1.53E-04	1.54E-04
Non-hazardous waste disposed, (NHWD[2]) *	kg	0.90	0.94	0.77	0.78
High-level radioactive waste, (HLRW[2]) *	m^3	3.18E-07	3.16E-07	2.82E-07	2.87E-07
Intermediate and low-level radioactive waste, (ILLRW[2]) *	m^3	1.55E-06	1.57E-06	1.37E-06	1.40E-06
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	1.30E-03	1.35E-03	1.11E-03	1.11E-03
Materials for energy recovery, (MER[2]) *	kg	1.70E-01	1.78E-01	1.45E-01	1.46E-01
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[8]	kg CO_2 eq	491	538	332	340

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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 (B2) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI).

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ADDITIONAL ENVIRONMENTAL INFORMATION

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