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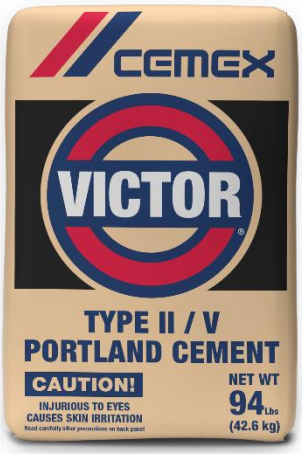
CEMEX Victorville Cement Plant

Environmental Product Declaration



GENERAL INFORMATION

This cradle to gate Environmental Product Declaration covers cement products produced at the Victorville 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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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
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For additional explanatory material **Manufacture Representative: Anand Krishnan (anand.krishnan@cemex.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

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 CO2 reduction goals in the communities in which it operates. CEMEX Victorville cement plant has been producing high quality products for over 100 years and employs approximately 210 people at the plant. The plant has an annual cement production capacity of over 3 million tons and provides cement for the construction needs in the states of California, Nevada, and Arizona.

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
Plastic (Stucco) Cement	ASTM C1328, C1328M	Stucco
Portland Cement	ASTM C150, C1157, AASHTO M85	Type II/V

This EPD reports environmental information for three cement products produced by CEMEX at their Victorville, CA facility. Type II/V 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 integrating a higher ground limestone content than permitted in Type II/V cement. Plastic (Stucco) cement refers to Portland cement-based plasters used for exterior and interior application in structures in a wide range of environments. This is a hydraulic cement used in mortar and grout for masonry construction.

PRODUCT COMPONENTS

Inputs	Type IL	Stucco	Type II/ V
Clinker	82%	72%	91%
Limestone, Gypsum & other	18%	28%	9%

DECLARED UNIT

The declared unit is one metric tonne of Type IL, Stucco, and Type II/V 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: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. 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 3.5 (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 (2020) “Electricity, high voltage, at grid, eGrid (2018), WECC/US US-EI U”
Limestone: Manufacture specific primary data (2020)
Natural Gas: ecoinvent 3.5 (2018) Market for natural gas, high pressure US”
Petroleum Coke: US-EI (2020) “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: 29.78% natural gas, 23.87% hydro, 21.35% coal, 7.94% nuclear, 7.35% wind, 5.67% solar, 2.13% Geothermal, 0.41% other fossil, 0.15% other with a global warming potential of 0.501 kg CO2eq per /kWh.

LIFE CYCLE IMPACT ASSESSMENT RESULTS

Victorville Cement Products, bulk shipped: Type IL, Stucco, and Type II/V; per 1 metric tonne

Impact Assessment	Unit	Type IL	Stucco	Type II/V
Global warming potential (GWP)[1]	kg CO_2 eq	808	720	875
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	9.82E-06	8.94E-06	1.05E-05
Eutrophication potential (EP)	kg N eq	0.34	0.32	0.35
Acidification potential of soil and water sources (AP)	kg SO_2 eq	0.85	0.81	0.88
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	13.6	12.8	14.3
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	4.34E-06	4.17E-06	4.50E-06
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	4,684	4,298	5,008
Renewable primary energy resources as energy (fuel), (RPRE[2]) *	MJ, NCV	230	238	217
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0	0	0
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	4,903	4,523	5,221
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0	0	0
Consumption of fresh water, (FW[2])	m3	2.64	2.55	2.63
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM[2]) *	kg	1.10	0.95	1.21
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	381	332	418
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	140	123	154
Recovered energy, (RE[2]) *	MJ, NCV	0	0	0
Waste & Output Flows				
Hazardous waste disposed, (HW[2]) *	kg	1.08E-03	1.02E-03	1.13E-03
Non-hazardous waste disposed, (NHWD[2]) *	kg	0.24	0.22	0.25
High-level radioactive waste, (HLRW[2]) *	kg	1.19E-07	1.21E-07	1.15E-07
Intermediate and low-level radioactive waste, (ILLRW[2]) *	kg	6.42E-07	6.47E-07	6.33E-07
Components for reuse, (CRU[2]) *	kg	0	0	0
Materials for recycling, (MR[2]) *	kg	2.34E-02	2.21E-02	2.45E-02
Materials for energy recovery, (MER[2]) *	kg	2.71E-02	2.56E-02	2.83E-02
Recovered energy exported from the product system, (EE[2]) *	MJ, NCV	0	0	0
Additional Inventory Parameters for Transparency				
CO_2 emissions from calcination and uptake from carbonation[3]	kg CO_2 eq	459	401	504
Biogenic CO_2, reporting the removals and emissions associated with biogenic carbon content contained within biobased products[4]	kg CO_2 eq	0	0	0

* 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).
[4] Type IL, biogenic CO2=0 (-31.6kg CO2/+31.6 CO2), Type II/V, biogenic CO2=0 (-34.7kg CO2/+34.7 CO2), Type Stucco, biogenic CO2=0 (-27.6/+27.6 CO2).

LIFE CYCLE IMPACT ASSESSMENT RESULTS

Victorville Cement Products, bag shipped: Stucco and Type II/V; per 1 metric tonne

Impact Assessment	Unit	Stucco	Type II/V
Global warming potential (GWP)[5]	kg CO_2 eq	728	883
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	9.31E-06	1.08E-05
Eutrophication potential (EP)	kg N eq	0.34	0.37
Acidification potential of soil and water sources (AP)	kg SO_2 eq	0.86	0.93
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	13.5	15.0
Resource Use			
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	6.63E-06	6.96E-06
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	4,401	5,111
Renewable primary energy resources as energy (fuel), (RPRE[6]) *	MJ, NCV	416	394
Renewable primary resources as material, (RPRM[6]) *	MJ, NCV	0	0
Non-renewable primary resources as energy (fuel), (NRPRE[6]) *	MJ, NCV	4,645	5,343
Non-renewable primary resources as material, (NRPRM[6]) *	MJ, NCV	0	0
Consumption of fresh water, (FW[6])	m3	3.97	4.05
Secondary Material, Fuel and Recovered Energy			
Secondary Materials, (SM[6]) *	kg	0.95	1.21
Renewable secondary fuels, (RSF[6]) *	MJ, NCV	332	418
Non-renewable secondary fuels (NRSF[6]) *	MJ, NCV	123	154
Recovered energy, (RE[6]) *	MJ, NCV	0	0
Waste & Output Flows			
Hazardous waste disposed, (HW[6]) *	kg	1.02E-03	1.13E-03
Non-hazardous waste disposed, (NHWD[6]) *	kg	0.22	0.25
High-level radioactive waste, (HLRW[6]) *	kg	1.31E-07	1.25E-07
Intermediate and low-level radioactive waste, (ILLRW[6]) *	kg	6.96E-07	6.81E-07
Components for reuse, (CRU[6]) *	kg	0	0
Materials for recycling, (MR[6]) *	kg	2.21E-02	2.45E-02
Materials for energy recovery, (MER[6]) *	kg	2.56E-02	2.83E-02
Recovered energy exported from the product system, (EE[6]) *	MJ, NCV	0	0
Additional Inventory Parameters for Transparency			
CO_2 emissions from calcination and uptake from carbonation[7]	kg CO_2 eq	401	504
Biogenic CO_2, reporting the removals and emissions associated with biogenic carbon content contained within biobased products[8]	kg CO_2 eq	0	0

* 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.

[5] 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.
[6] Calculated per ACLCA ISO 21930 Guidance.
[7] 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).
[8] Type IL, biogenic CO2=0 (-31.6kg CO2/+31.6 CO2), Type II/V, biogenic CO2=0 (-34.7kg CO2/+34.7 CO2), Type Stucco, biogenic CO2=0 (-27.6/+27.6 CO2).

ADDITIONAL ENVIRONMENTAL INFORMATION

CEMEX unveiled a low-emission, high-efficiency locomotive at the Victorville, CA cement plant in 2019 as part of its continued commitment to sustainability and to enhance air quality in a community where it has operated for more than 100 years. This locomotive lowered emissions by more than 80% and fuel consumption by 25%.

CEMEX Victorville Cement Plant has other initiatives on site promoting sustainability and conservation. The plant is home to four wind turbines that offset thousands of tons of emissions each year. The plant is reducing greenhouse gas emissions and landfill waste by replacing close to 20% of traditional fuels with alternative and renewable resources.

REFERENCES

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