

# Environmental Product Declaration



Environmental Product Declaration for a ready mix  
concrete product produced  
by Cementos Moctezuma, S.A. de C.V.  
at their Los Reyes Concrete Plant  
facility in Estado de México



## ADMINISTRATIVE INFORMATION

### International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers ready mix concrete products produced by Cementos Moctezuma, S.A. de C.V. . Declared unit: 1 m3 of concrete
Declaration Owner:	Cementos Moctezuma
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	Ciudad de México, México
	www.cmoctezuma.com.mx
	Labelling Sustainability
	Address, 11670 W Sunset Blvd. City, State, Los Angeles, CA
	<a href="http://labelinsustainability.com/">http://labelinsustainability.com/</a>
Product Category Rule:	ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products: serves as the core PCR. Product Category Rule for Environmental Product Declarations PCR for Concrete serves as the sub-category PCR
	PCR Program Operator: NSF International
	Sub-category PCR review was conducted by: Thomas P. Gloria, Ph. D. of Industrial Ecology Consultants: 35 Bracebridge, Rd., Newton, MA 02459-1728, t.gloria@industrial-ecology.com. Dr. Michael Overcash of Environmental Clarity: 2908 Chipmunk Lane, Raleigh, NC 27607-3117, mrovercash@earthlink.net. Mr. Bill Stough of Sustainable Research Group: PO Box 1684, Grand Rapids, MI 49501-1684, bstough@sustainableresearchgroup.com.
Independent LCA Reviewer and EPD Verifier:	This EPD was independently verified in accordance with ISO 14025 and ISO 21930. The life cycle assessment was independently reviewed in accordance ISO 14044 and the referenced PCR.
	Independent verification of the declaration, according to ISO 14025:2006
	Internal <input type="checkbox"/> ; External <input checked="" type="checkbox"/> X
	Third Party Verifier
	09232024-MSMX-2
Date of Issue:	2 August 2024
Period of Validity:	5 years; valid until 2 August 2029

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## COMPANY DESCRIPTION

Cementos Moctezuma is a Mexican company founded in 1943 that produces, distributes and markets cement, concrete and aggregates. The company has been listed on the Mexican Stock Exchange since 1988 (CMOCTEZ). With a qualified team of 1,303 people, three cement plants with a total installed capacity of 8 million tons per year, 30 concrete mixing plants, and a network with more than 530 distribution centers and points of sale that supply 95% of the national territory.

Cementos Moctezuma is leader in technological innovation, operational efficiency and energy efficiency. The company operates under a sustainability strategy that contributes to the UN 2030 Agenda, and a responsible business model aligned with our purpose: to promote the construction of a better Mexico for families and future generations, committed to the environment.



## STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, <http://labelingsustainability.com/>. This level of study is in accordance with EPD Product Category Rule (PCR) for Ready Mix Concrete published by NSF International (2019) and is a sub-PCR of International Standards Organization (ISO) 21930:2017 Sustainability in buildings and civil works - Core rules for EPDs of construction products and services; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations- Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Cementos Moctezuma SA. de C.V. from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Cementos Moctezuma, S.A. de C.V. by continuously measuring, controlling and reducing the environmental impacts of their products.



## DESCRIPTION OF PRODUCT AND SCOPE

This EPD reports on a concrete mix manufactured at the Cementos Moctezuma concrete facility at Los Reyes plant, in Carretera Federal México - Puebla km 20.5, Col. Loma Encantada, Los Reyes la Paz, Mexico.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and “end-of-life” effects.

## READY MIX CONCRETE DESIGN SUMMARY

The following table provide the details of the ready-mix concrete product considered in this EPD along with key performance parameters.

*Table 1: Declared products with All declared products considered in this environmental product declaration.*

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
1	35N51MA	26.4 MPa 28d strength ready mix concrete.	Ready mix	26.4	0.68

## READY MIX CONCRETE DESIGN COMPOSITION

The following figures provide mass breakdown (kg per functional unit) of the material composition of each ready mix concrete design considered. The product category rules for this EPD recognize fly ash, silica fume, and slag as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a concrete material input.

Please note that the presented breakdown has been randomly altered by +/-10%, and is therefore only an approximation; this manipulation is to ensure confidentiality.

Table 2: Ready mix concrete composition

Product Components	Product Components
Cement	10-15
Aggregates	85-70
Others	5-10
Total	100%



## SYSTEM BOUNDARIES

The following figure depicts the cradle-to-gate system boundary considered in this study.

### Life Cycle Impacts

A1- A3 PRODUCT STAGE	A4 – A5 INSTALLATION PROCESS STAGE	B1 – B7 USE STAGE	C1 – C4 END OF LIFE STAGE
A1 Raw material supply A2 Transport A3 Manufacturing	A4 Transport to site A5 Installation Process	B1 Use B2 Maintenance B3 Repair B4 Replacement B5 Refurbishment B6 Operational energy use B7 Operational water use	C1 De- installation/ Demolition C2 Transport C3 Waste processing C4 Disposal of Waste
<b>X</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>

Figure 1: General life cycle phases for consideration in a construction works system

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA
- A2: Transportation - Transportation of A1 materials from the supplier to the “gate” of the manufacturing facility (i.e., A3).

- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move and manufacture the declared products and to operate the facility.

According to the PCR, the following figure illustrates the general activities and input requirements for producing ready mix concrete products and is not necessarily exhaustive.

Important to mention that A3 includes an assumption of 5% material loss in all the materials used, considering losses and spills. This does not apply in electricity or fuels.

### System Boundary

Raw Material Supply (A1)	Transport (A2)	Manufacturing (A3)
Cements & SCMs Aggregates Admixtures Batch Water Fibers & Pigments	Truck, Rail, Ship Energy Carriers (fuels)	Energy Carriers (electricity and fuels) Ancillary Materials (lubricants, motor oil, cleaning chemicals, other consumables) Water (manufacturing water, including wash water for cement trucks, but excluding batch water) Waste (end of life treatment of ancillary materials and any packaging) 30% total fleet energy transit mix plants only

*Figure 2: General system inputs considered in the product system and categorized by modules in scope*

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure;
- Production and manufacture of steel production equipment, steel delivery vehicles, earthmoving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies);
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Cementos Moctezuma, S.A. de C.V., is located at their Los Reyes Plant facility in Mexico. All operating data is formulated using the actual data from Cementos Moctezuma, S.A. de C.V.'s plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet that was charged in the EPD Tool for Cement and Concrete (v4.2), International Version, where the data was analysed from scopes A1 to A3, and after that, the tool released an auto declaration with the values exposed next. About the Tool Validity, the suggested validity of the GCCA Industry EPD Tool v4.2 is the same

as PCR 2019:14 v1.3.2 and the applicable c-PCRs. The compliance with applicable PCR and c-PCR shall be monitored annually and the Tool shall be updated if necessary.

Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.



## CUT - OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.



## DATA SOURCES AND DATA QUALITY ASSESSMENT

Table 3: Inputs required by facility from 2023-01-01 to 2023-12-31 (365 days) per ton.

Activity	Value	Units
Electricity consumption and generation (if applicable)		
Gross grid electricity:	2.966	kWh
Fuel requirements for machinery		
Primary fuels (diesel)	0.649	Kg
Transportation fuels (diesel)	9.6	L
Waste generation		
Water	0.11	m3
Non-hazardous waste to landfill	0.97256947	kg
Hazardous waste	0	Kg
High level radioactive waste	0	kg

No recovered on-site energy occurs at this facility.



- Electricity: Electricity generation and consumption values were based on monthly utility bills. By constitutional law, electricity is produced with the next distribution, Coal and peat 12.67%, Oil 1.03%, Gas 61.97%, Biomass 1.34%, Nuclear 3.42%, Hydro 5.86%, Geothermal 1.18%, Solar 6.64%, Wind 5.89%
- Process/space heating: All values for energy, water and waste are Cementos Moctezuma direct reporting for the year 2023.
- Fuel required for machinery: The primary fuels consider the fuel for front loader and the transportation fuels consider the fuel necessary for the UR
- Waste values were based on waste management receipts for 2023.
- The types of Non-hazardous waste includes both organic and inorganic waste.
- Waste generation: Volume of concrete returned from truck washing using a retention pond system.
- Recycled/reused material/components: NA
- Direct A3 emissions accounting: NA
- Waste transport requirements: NA



## ENVIRONMENTAL INFORMACION

For construction services, the total value of A1-A3 shall be replaced with the total value of A1-A3.

Potential environmental impact – mandatory indicators according to ISO 21930:2017.

Indicator	Unit	A1	A2	A3	Tot.A1-A3
GWP-total	kg CO2 eq.	2.55E2	6.08E1	4E0	3.2E2*
ODP	kg CFC 11 eq.	7.88E-6	1.1E-5	2.22E-7	1.91E-5
AP	mol H+ eq.	6.45E-1	2.75E-1	1.12E-2	9.31E-1
EP-marine	kg N eq.	6.48E-4	4.23E-4	3.22E-5	1.1E-3
POCP	kg NMVOC eq.	6.52E-1	2.71E-1	5.87E-3	9.29E-1
ADP-minerals&metals*	kg Sb eq.	8.9E-5	1.87E-4	2.48E-6	2.79E-4
ADP-fossil*	MJ	1.49E3	9.16E2	2.88E1	2.44E3
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption				

\* Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

### Potential environmental impact – additional mandatory and voluntary indicators.

This EPD brief does not report all of the impact categories required by ISO 21930:2017. Additional detail and environmental impacts are reported in the complete EPD available. 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.

Results per functional or declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
PM	Disease incidence	7.51E-6	4.42E-6	3.6E-8	1.2E-5
IRP	kBq U235 eq.	3.75E0	4.55E0	1.33E-1	8.43E0
ETP	CTUe	3.58E1	1.51E2	1.14E0	1.88E2
HTPC	CTUh	6.05E-7	4.6E-7	1.75E-8	1.08E-6
HTPNC	CTUh	1.41E-5	8.97E-6	3.97E-7	2.35E-5
SQP	Dimensionless	4.08E2	1.12E3	1.06E1	1.53E3

### Use of resources

Results per functional or declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
PERE	MJ	5.34E1	1.78E1	4.53E0	7.57E1
PERM	MJ	0E0	0E0	0E0	0E0
PERT	MJ	5.34E1	1.78E1	4.53E0	7.57E1
PENRE	MJ	1.49E3	9.16E2	2.88E1	2.44E3
PENRM	MJ.	0E0	0E0	0E0	0E0
PENRT	MJ	1.49E3	9.16E2	2.88E1	2.44E3
SM	kg	0E0	0E0	0E0	0E0
RSF	MJ	1.4E-2	0E0	0E0	1.4E-2
NRSF	MJ	5.17E0	0E0	0E0	5.17E0
FW	m3	1.66E0	1.93E-1	1.18E-1	1.97E0
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water				

## Waste production and output flows

### Waste production

Results per functional or declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Hazardous waste disposed	kg	7.55E-4	0E0	0E0	7.55E-4
Non-hazardous waste disposed	kg	1.18E-1	0E0	9.73E-1	1.09E0
Radioactive waste disposed	kg	ND	ND	ND	ND

### Output flows

Results per functional or declared unit					
Indicator	Unit	A1	A2	A3	Tot.A1-A3
Components for re-use	kg	2.4E-2	0E0	0E0	2.4E-2
Material for recycling	kg	1.5E-1	0E0	0E0	1.5E-1
Materials for energy recovery	kg	2.78E-2	0E0	0E0	2.78E-2
Exported energy, electricity	MJ	0E0	0E0	0E0	0E0





## REFERENCES

### **ASTM // NMX Standards:**

- ASTM C33/C33M Standard Specification for Concrete Aggregates // NMX-C-111- ONNCCE-2018 Construction Industry - Aggregates for hydraulic concrete - Specifications and Test Methods.
- ASTM C94 Standard Specification for Ready-Mixed Concrete //NMX-C-155-ONNCCE2004 Construction Industry - Hydraulic Concrete - Mass dosed - Specifications and Test Methods.
- ASTM C150/C150M Standard Specification for Portland Cement // NMX-C-414- ONNCCE-2017 Construction Industry - Hydraulic Cements - Specifications and Test Methods.
- ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete // NMX-C-255-ONNCCE-2006 Construction Industry - Concrete Chemical Admixtures - Specifications, sampling and test methods.
- ASTM C595 Standard Specification for Blended Hydraulic Cements // NMX-C-414- ONNCCE-2017 Construction Industry - Hydraulic Cements-Specifications and Test Methods.
- ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete // NMX-C-146-ONNCCE-2000 Construction Industry - Concrete additives raw or calcined natural pozzolana and fly ash for use as a mineral admixture in Portland cement concrete - Specifications.
- ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete // NMX-C-313-1981 Construction Industry - Cement Portland - Color of mortars and concrete.
- ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars.
- ASTM C1017/C1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete // NMX-C-255-ONNCCE-2006 Construction Industry - Concrete Chemical Admixtures - Specifications, sampling and test methods.
- ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete.
- ASTM C1157/C1157M Standard Performance Specification for Hydraulic Cement // NMXC-414-ONNCCE-2017 Construction Industry - Hydraulic Cements - Specifications and Test Methods.
- ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures // NMX-C-273-ONNCCE-2010 Construction Industry - Hydraulic Cements - Determination of hydraulic activity of additions with Ordinary Portland Cement.

- ASTM C1602/C1602M Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete // NMX-C-122-ONNCCE-2019 Construction Industry - Water for Concrete - Specifications.
- ASTM G109 Standard Test Method for Determining Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments.
- ASTM C330/C330M Standard Specification for Lightweight Aggregates for Structural Concrete // NMX-C-299-ONNCCE-2010 Construction Industry - Structural Hydraulic Concrete - Lightweight aggregates-specifications and test methods.
- ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete // NMX-C-255-ONNCCE-2006 Construction Industry - Concrete Chemical Admixtures - Specifications, sampling and test methods.

### **ISO Standards**

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms.
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling).
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework.
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
- ISO 14067:2018 Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification.
- ISO 14050:2009 Environmental Management - Vocabulary.
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Product.

