TEHACHAPI

UNACEM North America
Tehachapi Cement Plant

An Environmental Product Declaration

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TEHACHAPI

An Environmental Product Declaration

In accordance with ISO 14025 and 21930

About this EPD

This is a Type III environmental product declaration (EPD) for Type I/II/V cement produced by UNACEM North America at its Tehachapi cement plant located in Tehachapi, CA. The results of the underlying LCA are computed using the North American (N.A.) version of the Global Cement and Concrete Association (GCCA) Industry EPD Tool for cement and concrete, V4.2 [1]. This tool and the underlying LCA model and database [2] have been previously verified to conform to the prevailing sub-product category rule (PCR) [3], ISO 21930:2017 (the core PCR) [4] as well as ISO 14020:2000 [5] and ISO 14040/44:2006 LCA standards [6], [7].

This EPD is certified by ASTM to conform to the sub-Product Category Rule (PCR) referenced above [3], as well as to the requirements of ISO 14020, ISO 14025 [8], ISO 21930 and ASTM International's General Program Instructions [9]. This EPD is intended for business-to-business audiences.

General Summary

EPD Commissioner and Owner	**UNACEM North America** 21803 N Scottsdale Rd, Suite 220 Scottsdale, AZ. 85255 https://tehacem.us/
TEHACHAPI	Tehachapi company personnel have provided LCI and meta data for limestone extraction, clinker production, and cement manufacture for the 2023 reference year in support of this EPD. *The owner of the declaration is responsible for the underlying information and evidence.*
Product Group and Name	*Cement, UN CPC 3744.*
Product Definition	***Portland cement*** is defined as a hydraulic cement produced by pulverizing clinker, consisting essentially of crystalline hydraulic calcium silicates, and usually containing one or more of the following: water, calcium sulfate, up to 5% limestone, and processing additions (ASTM C150, ASTM C1157, AASTHO M 85, CSA A3001). • Portland Cement *Type I* – For use when the special properties specified for any other type are not required. • Portland Cement *Type II* – *For* general use, more especially when moderate sulfate resistance is desired. • Portland Cement *Type V* – For use when high sulfate resistance is desired. Some cements are designated with a combined type classification, such as Type I/II/V, indicating that the cement meets the requirements of the indicated types and is being offered as suitable for use when either type is desired.
Product Category Rules (PCR)	NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [3].
Date of Issue & Validity Period	April 9th, 2025 – 5 years
Declared Unit	1 metric ton of cement

EPD and Project Report Information

Program Operator	ASTM International
Declaration Number	EPD 954
Declaration Type	Cradle-to-gate (modules A1 to A3). Facility and product-specific.
Applicable Countries	United States and Canada
Product Applicability	Portland cement is the basic ingredient of concrete. Concrete, one of the most widely used construction materials in the world, is formed when portland cement creates a paste with water that binds with sand and rock to harden.
Content of the Declaration	This declaration follows Section 9; Content of an EPD, NSF International, Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [3].
This EPD was independently verified by ASTM in accordance with ISO 14025 and the reference PCR: Internal — External: **X**	Tim Brooke ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken PA 19428-2959, USA cert@astm.org Thomas P. Gloria, Ph. D. Industrial Ecology Consultants 35 Bracebridge Rd. Newton, MA
Notes	The EPD results reported herein are computed using the N.A. GCCA Industry EPD tool for Cement and Concrete, v4.2 (https://concrete-epd-tool.org) [1].
EPD Prepared by: Athena Sustainable Materials Institute	Athena Sustainable Materials Institute 280 Albert Street, Suite 404 Ottawa, Ontario, Canada K1P 5G8 info@athenasmi.org www.athenasmi.org

PCR Information

Program Operator	NSF International
Reference PCR	Product Category Rules for Preparing an Environmental Product Declaration for Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021 [3].
PCR review was conducted by:	Thomas P. Gloria, PhD (Chair), Industrial Ecology Consultants, Mr. Jack Geibig, EcoForm Mr. Bill Stough, Sustainable Research Group

Tehachapi Cement Plant Production Facility

The Tehachapi cement plant has been producing high-quality cement products in California since 1909. The Tehachapi Region has been associated for many years with the production of lime and cement due to its many limestone deposits. The original Tehachapi cement plant was built by the City of Los Angeles in 1908 to provide materials for the LA aqueduct. In 1921, the plant changed hands, becoming the Monolith Portland Cement Company. The small company town of Monolith emerged with employee housing, a school, and a company store. Although Monolith disappeared as transportation improved, the plant continued producing cement for the Southwestern market. After its purchase by CBR in 1989, the plant went through several ownership transitions and name changes. First, it was Calaveras under CBR. It became Lehigh Southwest Cement after its purchase by Heidelberg Cement in 2002. In 2023, UNACEM acquired the plant from Martin Marietta Materials, Inc., officially renaming it Tehachapi Cement, LLC. It is expected to produce about 1 million tons of high-quality Type I/II/V portland cement for clients in California and the Southwest annually. Grupo UNACEM and Tehachapi Cement understand the importance of corporate action aligned with principles of environmental and social responsibility. Being a natural resource enterprise reliant on nearby limestone deposits, Tehachapi Cement is committed to harmonizing economic, environmental, and community interests in its definition of success. Tehachapi Cement specializes in the production of Type I/II/V (LA) portland cement, which meets the standards of ASTM C-150 for types I, II, and V low alkali cements, and ASTM C 1157 for types GU, MS, and HS cement. This cement is suitable for general construction purposes, particularly in environments with moderate to high sulfate content in soil or water. Moreover, the low alkali content in Tehachapi Cement's Type I/II/V (LA) portland cement minimizes the risk of alkali-silica reactivity (ASR) related damage.

Facility Name: **Tehachapi Cement Plant** 13573 E Tehachapi Blvd. Tehachapi, CA. 93561.

Product Description

This EPD reports environmental transparency information for Type I/II/V cement produced by UNACEM North America at its Tehachapi plant in Tehachapi, CA. 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 outlines the constituents of Type I/II/V cement and its applicable standards.

Products and Standards

Inputs	Type I/II/V ASTM C150
Clinker	91.9%
Gypsum	7.1%
Limestone	1.0%
Other	<1%
Total	100%

Applicable Standards:

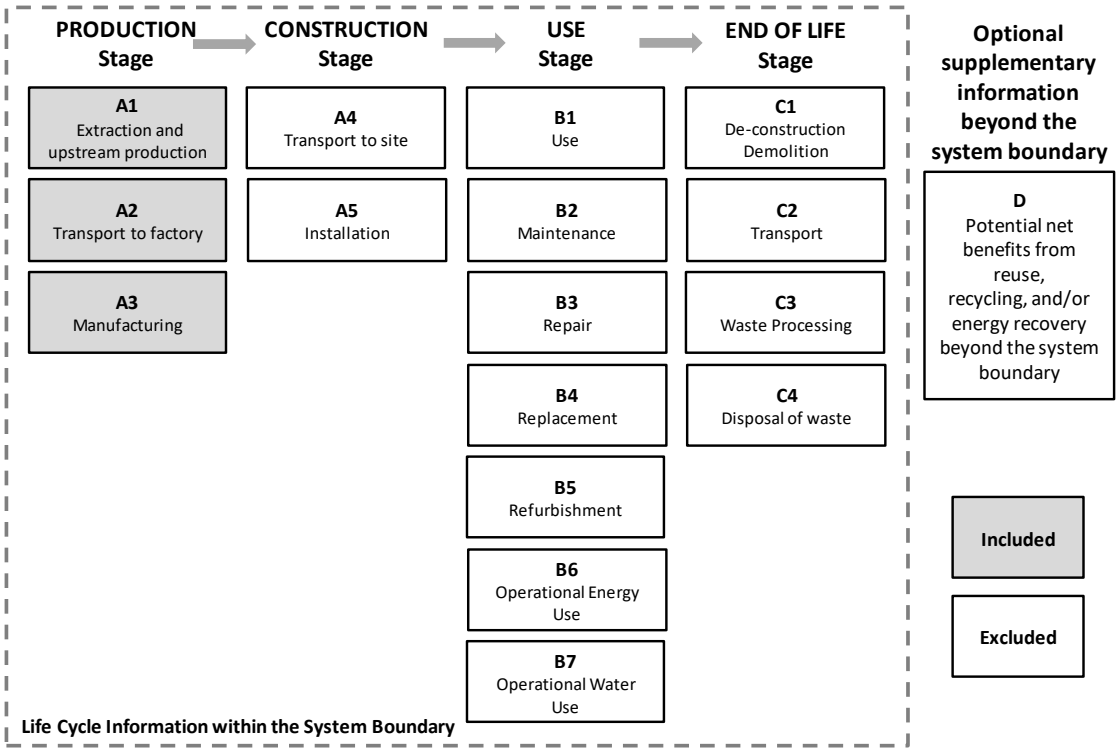
ASTM C150 / C150M, AASHTO M 85, CSA A3001 –Standard Specification for Portland Cement [11], [12] and [13].

Declared Unit

The declared unit is one metric ton of cement.

System Boundary

This EPD is a cradle-to-gate EPD covering the production stage (A1-A3) as depicted in the figure below. The production stage includes extraction of raw materials (cradle) through the manufacture of cement ready for shipment (gate). The Tehachapi cement plant extracts its limestone from a neighboring quarry. The plant's cement products are sold in bulk.



Items *excluded* from the 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)
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location

Cut-off Criteria

The cut-off criteria per NSF PCR, Section 7.1.8 [3] and ISO 21930, 7.1.8 [4] were followed. Per ISO 21930, 7.1.8, all input/output data required were collected and included in the LCI modelling. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this EPD.

Data Collection

Gate-to-gate input/output flow data was collected for the following processes for the reference year 2023:

- Limestone quarry operations, clinker production and cement manufacture.

Allocation Rules

Allocation of inventory flows and subsequent environmental impact is relevant when assets are shared between product systems. The allocation method prescribed by the PCR [3] is applied in the underlying LCA model. The sub-category PCR recognizes fly ash, furnace bottom ash, bypass dust, mill scale, polluted soils, spent catalyst, aluminum oxide waste, silica fume, granulated blast furnace slag, iron rich waste, cement kiln dust (CKD), flue gas desulfurization (FGD) gypsum, calcium fluoride rich waste and postconsumer 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.

Further, used tires, plastics, solvents, used oil and oily waste, coal/carbon waste, roofing asphalt, household refuse-derived waste, non-hazardous liquid waste, industrial sludge, and agricultural waste are considered non-renewable and/or renewable secondary fuels. Only the materials, water, energy, emissions, and other elemental flows associated with reprocessing, handling, sorting and transportation from the point of the generating industrial process to their use in the production process are considered. All emissions from combustion at the point of use are considered. For co-products, no credit is considered, and no allocation is applied. See the LCA model and LCA database reports of GCCA's Industry Tool for EPDs of cement and concrete for more information [1], [2].

Data Quality Requirements and Assessment

Data Quality Requirements	Description
Technology Coverage	LCI data represents the prevailing technology in use at the Tehachapi cement plant. The Tehachapi plant operates kilns which utilize efficient *dry with preheater and precalciner* kiln technology. *Technological representativeness is characterized as "high".*
Geographic Coverage	The geographic region considered is the U.S and Canada. *Geographical representativeness is characterized as "high".*
Time Coverage	Activity (primary) data are representative of 2023 calendar year (12 months) covering - Tehachapi limestone extraction, - Tehachapi clinker production, - Tehachapi cement manufacturing, - In-bound/out-bound transportation data - primary data collected for Tehachapi site. *Temporal representativeness is characterized as "high".*
Completeness	All relevant, specific processes, including inputs (raw materials, energy, and ancillary materials) and outputs (emissions and production volume) were considered and modeled to complete production profile for Tehachapi's cement. Tehachapi operates a continuous emissions monitoring system to determine their air emissions. These emissions are reported to the US Environmental Protection Agency. This data for the 2023 calendar year has been drawn on in the completion of this EPD. The completeness of the foreground process chain in terms of process steps has been rigorously assessed.
Consistency	To ensure consistency, cross checks of the energy demand and the calculated raw meal to clinker ratio against ranges reported in the WBCSD Cement Sustainability Initiative, Cement CO2 and Energy Protocol, v3.1 December 2013 have been performed [14]. The LCA team performed mass and energy balances at the facility level and selected process levels to maintain a high level of consistency.
Reproducibility	External reproducibility is not possible as the background report is confidential.
Transparency	Activity datasets are disclosed in the project LCI compilation, and the background reports generated by the GCCA Tool. A comprehensive list of secondary LCI datasets is available on the GCCA Tool website. Note: An account is required to access the GCCA Tool.
Uncertainty	A *sensitivity check* was conducted relative to the PCA Industry Average for portland cement [15]. The variation for significant inputs was found to be well within the expected range and hence, there is a high degree of confidence in the results.

Life Cycle Impact Assessment Results: UNACEM North America Tehachapi Cement Plant

This section summarizes the production stage life cycle impact assessment (LCIA) results including resource use and waste generated metrics based on the cradle-to-gate life cycle inventory inputs and outputs analysis. The results are calculated based on one metric ton of Type I/II/V cement as produced at the Tehachapi cement plant.

It should be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks [4], [8]. Further, many LCA impact categories and inventory items are still emerging or under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting results for these categories – identified with an "*" [3].

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 [3]. Environmental declarations from different programs may not be comparable [6]. 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 [3] [4].

Production Stage EPD Results: UNACEM North America – Tehachapi Cement Plant – per Metric Ton

Impact category and inventory indicators	Unit	Type I/II/V ASTM C150
Global warming potential, GWP 100, AR5	kg CO_2 eq	**908**
Ozone depletion potential, ODP	kg CFC-11 eq	**2.42E-05**
Eutrophication potential, EP	kg N eq	**1.02**
Acidification potential, AP	kg SO_2 eq	**1.51**
Smog formation potential, SFP	kg O_3 eq	**27.4**
Abiotic depletion potential for non-fossil, mineral resources ADP elements*	kg Sb eq	**2.54E-04**
Abiotic depletion potential for fossil resources, ADP fossil	MJ LHV	**4909**
Renewable primary resources used as an energy carrier (fuel), RPRE*	MJ LHV	**328**
Renewable primary resources with energy content used as material, RPRM*	MJ LHV	**0**
Non-renewable primary resources used as an energy carrier (fuel), NRPRE*	MJ LHV	**4909**
Non-renewable primary resources with energy content used as material, NRPRM*	MJ LHV	**0**
Secondary materials, SM*	kg	**26.8**
Renewable secondary fuels, RSF *	MJ LHV	**128**
Non-renewable secondary fuels, NRSF *	MJ LHV	**0**
Consumption of freshwater, FW	m^3	**1.56**
Hazardous waste disposed, HWD*	kg	**0.087**
Non-hazardous waste disposed, NHWD *	kg	**0.21**
High-level radioactive waste, conditioned, to final repository, HLRW*	kg	**x[1)]**
Intermediate and low-level radioactive waste, conditioned, to final repository, ILLRW*	kg	**x[1)]**
Components for re-use, CRU*	kg	**0**
Materials for recycling, MFR*	kg	**0**
Materials for energy recovery, MER*	kg	**0**
Recovered energy exported from the product system, EE*	MJ LHV	**0**
Additional Indicators:		
Global warming potential - biogenic, GWP-bio*	kg CO_2 eq	**0.89**
Emissions from calcination	kg CO_2 eq	**482**
Emissions from combustion of secondary fuels from renewable sources*	kg CO_2 eq	**0.14**
Emissions from combustion of secondary fuels from non-renewable sources*	kg CO_2 eq	**2.51**

Table Notes:

x[1)] – The GCCA EPD Tool does not support these indicators.
* Use caution when interpreting results for these categories

LCA Interpretation

The Manufacturing module (A3) drives most of the potential environmental impacts. Manufacturing impacts are primarily driven by energy use (electricity and thermal fuels) and process calcination emissions during the pyroprocessing of limestone in the production of clinker. Clinker content in cement similarly defines the relative environmental profile of the final cement product. Raw Material Extraction (A1) is the second largest contributor to the Production stage EPD results, followed by Transportation (A2).

Additional Environmental Information

Environmental Protection Manufacture and Equipment:

Air pollution abatement equipment used at UNACEM North America's Tehachapi cement plant consists of high temperature baghouses, bin vents, cartridge filters, selective non-catalytic reduction, and activated carbon injection.

References

[1] Global Cement and Concrete Association (GCCA) and Portland Cement Association (PCA), GCCA Industry EPD Tool for Cement and Concrete (V4.2), User's Manual, North American version, Prepared by Quantis, December 2023. https://concrete-epd-tool.org/

[2] Global Cement and Concrete Association (GCCA) LCA Database, North American version (V4.2), Prepared by Quantis, December 2023. https://concrete-epd-tool.org

[3] NSF International, Product Category Rule Environmental Product Declarations, PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements, V3.2, September 2021.

[4] ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.

[5] ISO 14020:2000 Environmental labels and declarations — General principles

[6] ISO 14040:2006/Amd1:2020 Environmental management - Life cycle assessment - Principles and framework.

[7] ISO 14044:2006/Amd1:2017/Amd2:2020 Environmental management - Life cycle assessment - Requirements and guidelines.

[8] ISO 14025:2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.

[9] ASTM General Program Instructions. V.8.0, April 29, 2020.

[10] NSF International, Product Category Rule Environmental Product Declarations, PCR for Concrete, V2.3 – NSF/ASTM 1112-19 with 2024 deviation and 2025 extension, February 2025.

[11] ASTM C150 / C150M – 20 Standard Specification for Portland Cement.

[12] CSA A3001 – Cementitious Materials for Use in Concrete

[13] AASHTO M 85-21 Standard Specification for Portland Cement (ASTM Designation: C150/C150M-21)

[14] WBCSD CSI 2013: CO_2 and Energy Protocol Version 3.1. December 9, 2013. https://www.cement-co2-protocol.org/en/

[15] Portland Cement Association Environmental Product Declaration – Portland Cement, ASTM International, March 12, 2021. https://pcr-epd.s3.us-east-2.amazonaws.com/634.EPD_for_Portland_Athena_Final_revised_04082021.pdf