

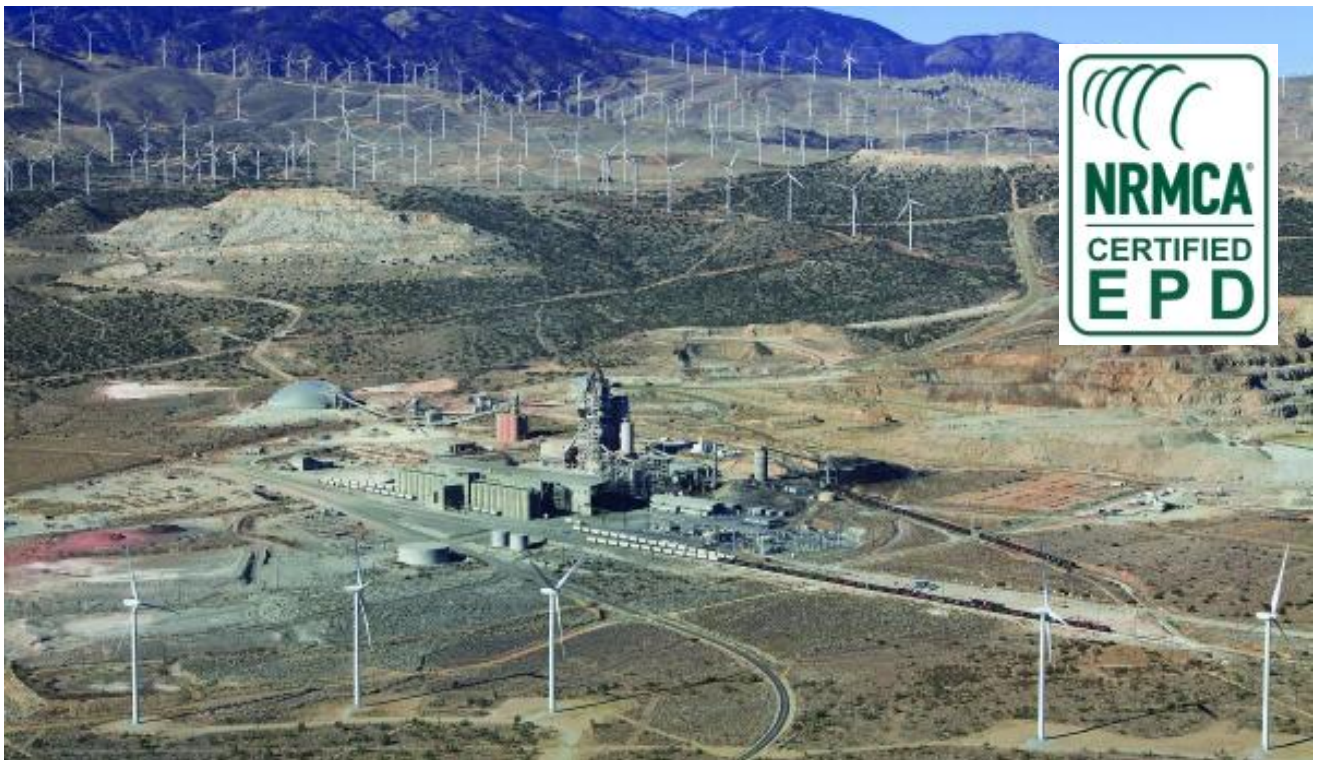
Environmental Product Declaration



CalPortland Company

Mojave Plant

- Type I/II/V cement



NRMCA Certified Environmental Product Declaration

This environmental product declaration was conducted in accordance with ISO 14025:2006

☐ Internal Verification ☒ External Verification

| | | |
|------------------------|---|---|
| Declared Product: | This is a business-to-business Type III environmental product declaration for Type I/II/V cement manufactured by CalPortland in Mojave, California. | |
| Declaration Owner: | CalPortland Company 2025 East Financial Way Glendora CA 91741 www.calportland.com |  |
| Program Operator: | National Ready Mix Concrete Association 900 Spring St., Silver Spring, MD 20910 301-587-1400 www.nrmca.org/sustainability  Lionel Lemay llemay@nrmca.org |  |
| LCA and EPD Developer: | Athena Sustainable Materials Institute 119 Ross Ave, Suite 100, Ottawa, ON K1Y 0N6 613-729-9996 www.athenasmi.org  Matt Bowick matt.bowick@athenasmi.org |  |
| Independent Verifier: | Sustainable Solutions Corporation 155 Railroad Plaza, Suite 203, Royersford, PA 19468 610-569-1047 http://www.sustainablesolutionscorporation.com/  Cara Watson Vought, LCACP cara@sustainablesolutionscorporation.com |  |
| Product Category Rule: | ASTM International, Product Category Rules For Preparing an Environmental Product Declaration For Portland, Blended Hydraulic, Masonry, Mortar, and Plastic (Stucco) Cements. Chair of the Review Panel for the PCR: Nicholas Santero, thinkstep. Please contact ASTM International for communication with the Chair. | |
| Date of Issue: | August 1, 2018 | |
| Period of Validity: | 5 Years (until August 1, 2023) | |
| EPD Number | NRMCAEPD:10022 | |



CalPortland Company
Mojave Plant
Type I/II/V Cement

Description of Company

CalPortland Company is a major diversified building materials and construction solutions provider to the Western United States and Canada. Since 1891, we have reliably provided quality innovative and efficient solutions to your greatest construction challenges with our expertise in cement production and distribution, ready mixed concrete, construction aggregates, asphalt, construction services and other building materials. Our products provide solutions everywhere; in buildings for shelter; roads and bridges that transport and link us; systems that provide electricity, water, gas and waste treatment; and other necessary infrastructure like hospitals, schools, railways and airports. We are creating solid foundations through the use of sustainable materials and renewable technologies.

CalPortland Company is the industry leader for energy conservation and environmental quality. Our commitment to continuously improve our environmental performance and provide positive contributions to our company and to society is a product of not just our words but also our actions. Sustainable development is defined as a society meeting the needs of the present without compromising the ability of future generations to meet their own needs. CalPortland is committed to solving tomorrow's challenges today through the advancement of sustainable materials and renewable technologies.

Product Identification

This EPD reports environmental information for Type I/II/V cement produced by CalPortland Company Inc. at their facility in Mojave, California. Type I/II/V cement is for use when [1] the special properties specified for any other type are not required, [2] for general use, more especially when moderate sulfate resistance or moderate heat of hydration is desired, or [3] for use when high sulfate resistance is desired.

Figure 1 below shows a visual representation of typical finished cement product.



Figure 1: Visual Representation of Typical Cement



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Product Standards

Applicable product standards for portland cement include:

- ASTM C150 – Standard Specification for Portland Cement
- ASTM C1157 – Standard Performance Specification for Hydraulic Cement
- AASHTO M 85 – Standard Specification for Portland Cement (Chemical and Physical)
- CSA A3001 – Cementitious Materials for Use in Concrete

Declared Unit

The declared unit is the basic reference flow set by the ASTM cement PCR: 2014 for the assessed products. The declared unit for this study is defined as one metric ton (1,000 kg).

Please note: only EPDs prepared from cradle-to-grave life-cycle results, and based on same function, reference service life, and quantified by the same functional unit, can be used to assist purchasers and users in making informed comparisons.

The reference service life of cement is dependent on its end-use and therefore not declared herein.

Material Content

Table 1 presents the average material content by input material for the Type I/II/V cement product, as derived from the facility LCI data for the year 2017.

Table 1: Material Content for Type I/II/V Cement, kg per metric ton finished cement

| Material Inputs | Quantity |
|--------------------|--------------|
| Clinker | 910 |
| Gypsum | 54.0 |
| Limestone | 35.7 |
| Grinding aids, wet | 0.192 |
| Total | 1,000 |



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System Boundary

As per the ASTM PCR for cement, the system boundary is the product stage (i.e. “cradle-to-gate”), which includes the following modules:

- A1 Raw material supply;
- A2 Transport (to the manufacturer); and
- A3 Manufacturing.

Figure 2 shows the production stage system boundary for cement.

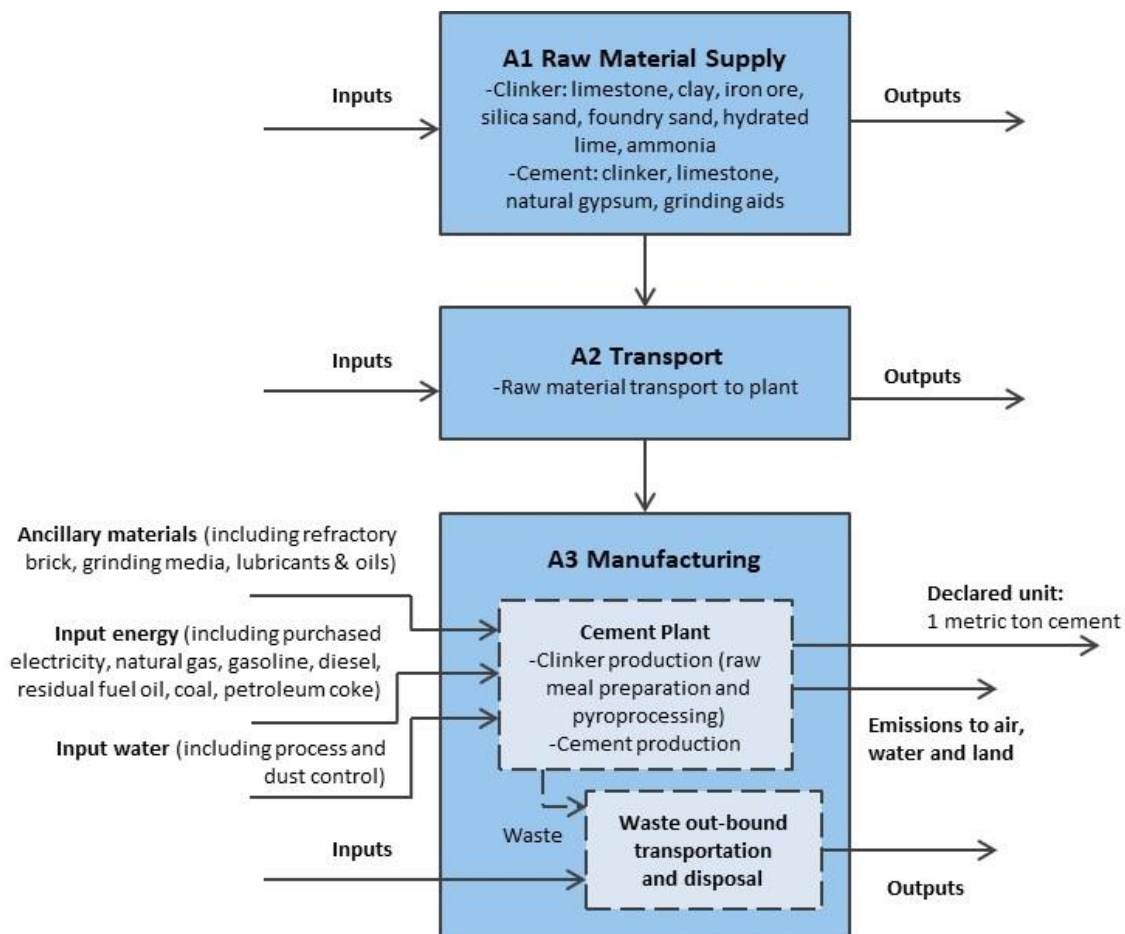


Figure 2: Cradle-to-gate System Boundary for Cement Production

Life Cycle Assessment

This section summarizes the results of the life cycle impact assessment (LCIA) based on the cradle-to-gate life cycle inventory inputs and outputs analysis. The results are calculated on the basis of one metric ton of cement and shown in Table 3; the results are also calculated on the basis of one short ton (2,000 lbs) and shown in Table 4.

As per ASTM PCR for cement, Section 8, US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI, version 2.1) impact categories are used as they provide a North American context for the mandatory category indicators to be included in this EPD. These are relative expressions only and do not predict category impact end-points, the exceeding of thresholds, safety margins or risks. Total primary and sub-set energy consumption was compiled using a cumulative energy demand model. Material resource consumption and generated waste reflect cumulative life cycle inventory flow information.

Table 3: LCA Results (A1-A3) – 1 metric ton Type I/II/V cement

| Environmental Indicator | Unit | Quantity |
|--|------------------------|----------|
| TRACI 2.1 impact categories | | |
| Global warming potential (GWP) | kg CO ₂ eq. | 854 |
| Acidification potential | kg SO ₂ eq. | 2.00 |
| Eutrophication potential | kg N eq. | 0.0944 |
| Smog creation potential | kg O ₃ eq. | 36.7 |
| Ozone depletion potential | kg CFC-11 eq. | 1.49E-05 |
| Total primary energy consumption | | |
| Non-renewable fossil | MJ (HHV) | 5,841 |
| Non-renewable nuclear | MJ (HHV) | 108 |
| Renewable (solar, wind, hydroelectric, and geothermal) | MJ (HHV) | 171 |
| Renewable (biomass) | MJ (HHV) | 1.78 |
| Material resources consumption | | |
| Non-renewable material resources | kg | 1,452 |
| Renewable material resources | kg | 0.0729 |
| Net fresh water (inputs minus outputs) | l | 698 |
| Waste generated | | |
| Non-hazardous waste generated | kg | 8.58 |
| Hazardous waste generated | kg | 0.0139 |



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Table 4: LCA Results (A1-A3) – 1 short ton Type I/II/V cement

| Environmental Indicator | Unit | Quantity |
|--|------------------------|----------|
| TRACI 2.1 impact categories | | |
| Global warming potential (GWP) | kg CO ₂ eq. | 774 |
| Acidification potential | kg SO ₂ eq. | 1.82 |
| Eutrophication potential | kg N eq. | 0.0856 |
| Smog creation potential | kg O ₃ eq. | 33.3 |
| Ozone depletion potential | kg CFC-11 eq. | 1.35E-05 |
| Total primary energy consumption | | |
| Non-renewable fossil | MJ (HHV) | 5,299 |
| Non-renewable nuclear | MJ (HHV) | 98 |
| Renewable (solar, wind, hydroelectric, and geothermal) | MJ (HHV) | 156 |
| Renewable (biomass) | MJ (HHV) | 1.62 |
| Material resources consumption | | |
| Non-renewable material resources | kg | 1,317 |
| Renewable material resources | kg | 0.0662 |
| Net fresh water (inputs minus outputs) | l | 634 |
| Waste generated | | |
| Non-hazardous waste generated | kg | 7.78 |
| Hazardous waste generated | kg | 0.0126 |

Declaration Type & Comparability Limitation Statement

The type of EPD based on the EPD project report is defined as “cradle-to-gate” EPD of cement covering the product stage (modules A1 to A3) and is intended for use in Business-to-Business communication.

The following ISO statement indicates the EPD comparability limitations and intent to avoid any market distortions or misinterpretation of EPDs based on the ASTM’s Cement PCR: 2014:

- EPDs from different programs (using different PCR) may not be comparable.
- Declarations based on the ASTM Cement PCR are not comparative assertions; that is, no claim of environmental superiority may be inferred or implied.