An Environmental Product Declaration

Inclusive of Transport to US East Coast
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 and IL cements as produced by Cementos Portland Valderrivas, S.A. Cement Company at its Monjos, Spain cement plant inclusive of transportation and offloading to the Coastal Cement Corporation terminal in Boston, Massachusetts. The Type I-II and IL cements are sold as Coastal Cement Corporation products. The results of the underlying LCA are computed with the North American (N.A.) version of the Global Cement and Concrete Association (GCCA) Industry EPD tool for cement and concrete [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] ISO 14025:2006 [6] and ISO 14040/44:2006 LCA standards [7], [8].

This EPD is certified by ASTM to conform to the Sub-Product Category Rule (PCR) referenced above, as well as to the requirements of ISO 14020, ISO 14025, 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
Coastal Cement Corporation
A Company of Dragon Products Company, Inc.
36 Drydock Avenue
Boston, MA 02210
https://www.giantcement.com

The cement manufacturer plant provided both LCI and meta-data for limestone extraction, clinker production, and cement manufacture for reference year 2021.

The owner of the declaration is liable 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 [10], ASTM C219 [11]).

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 III—For use when high early strength is desired.

Some cements are designated with a combined type classification, such as Type I/II, indicating that the cement meets the requirements of the indicated types and is being offered as suitable for use when either type is desired.

Blended cement is a hydraulic cement consisting of two or more inorganic constituents (at least one of which is not Portland cement or Portland cement clinker) which separately or in combination contribute to the strength gaining...
An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

properties of the cement, (made with or without other constituents, processing additions and functional additions, by intergrinding or other blending).
Type IL (ASTM C595 [12]) — is a Portland-limestone cement and is a hydraulic cement in which the limestone content is more than 5% but less than or equal to 15% by mass of the blended cement.


Date of Issue & Validity Period 04/21/2023 – 5 years

Declared Unit 1 metric ton of cement

Program Operator ASTM International

Declaration Number EPD 454

Declaration Type Cradle-to-gate (modules A1 to A3). Facility and product-specific.

Applicable Countries Global

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:

Tim Brooke Tim Brooke
ASTM International 100 Barr Harbor Drive
100 Barr Harbor Drive PO Box C700
PO Box C700 West Conshohocken
West Conshohocken PA 19428-2959, USA PA 19428-2959, USA
cert@astm.org

cert@astm.org

Thomas P. Gloria, Ph. D. Thomas P. Gloria, Ph. D.
Industrial Ecology Consultants 35 Bracebridge Rd.
35 Bracebridge Rd. Newton, MA Newton, MA

Notes The EPD results reported herein are computed using the N.A. GCCA Industry EPD tool for Cement and Concrete (https://concrete-epd-tool.org).

EPD Prepared by: Athena Sustainable Materials Institute
Athena Sustainable Materials Institute
280 Albert Street, Suite 404
280 Albert Street, Suite 404 Ottawa, Ontario, Canada K1P 5G8 Ottawa, Ontario, Canada K1P 5G8
info@athenasmi.org info@athenasmi.org
www.athenasmi.org www.athenasmi.org

EPD and Project Report Information

Internal External X

EPD and Project Report Information

Program Operator ASTM International

Declaration Number EPD 454

Declaration Type Cradle-to-gate (modules A1 to A3). Facility and product-specific.

Applicable Countries Global

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:

Tim Brooke Tim Brooke
ASTM International 100 Barr Harbor Drive
100 Barr Harbor Drive PO Box C700
PO Box C700 West Conshohocken
West Conshohocken PA 19428-2959, USA PA 19428-2959, USA
cert@astm.org
cert@astm.org

Thomas P. Gloria, Ph. D. Thomas P. Gloria, Ph. D.
Industrial Ecology Consultants 35 Bracebridge Rd.
35 Bracebridge Rd. Newton, MA Newton, MA

Notes The EPD results reported herein are computed using the N.A. GCCA Industry EPD tool for Cement and Concrete (https://concrete-epd-tool.org).

EPD Prepared by: Athena Sustainable Materials Institute
Athena Sustainable Materials Institute
280 Albert Street, Suite 404
280 Albert Street, Suite 404 Ottawa, Ontario, Canada K1P 5G8 Ottawa, Ontario, Canada K1P 5G8
info@athenasmi.org info@athenasmi.org
www.athenasmi.org www.athenasmi.org

EPD and Project Report Information

Program Operator ASTM International

Declaration Number EPD 454

Declaration Type Cradle-to-gate (modules A1 to A3). Facility and product-specific.

Applicable Countries Global

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:

Tim Brooke Tim Brooke
ASTM International 100 Barr Harbor Drive
100 Barr Harbor Drive PO Box C700
PO Box C700 West Conshohocken
West Conshohocken PA 19428-2959, USA PA 19428-2959, USA
cert@astm.org
cert@astm.org

Thomas P. Gloria, Ph. D. Thomas P. Gloria, Ph. D.
Industrial Ecology Consultants 35 Bracebridge Rd.
35 Bracebridge Rd. Newton, MA Newton, MA

Notes The EPD results reported herein are computed using the N.A. GCCA Industry EPD tool for Cement and Concrete (https://concrete-epd-tool.org).

EPD Prepared by: Athena Sustainable Materials Institute
Athena Sustainable Materials Institute
280 Albert Street, Suite 404
280 Albert Street, Suite 404 Ottawa, Ontario, Canada K1P 5G8 Ottawa, Ontario, Canada K1P 5G8
info@athenasmi.org info@athenasmi.org
www.athenasmi.org www.athenasmi.org
An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

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

Coastal Cement Corporation and Production Facility

Coastal Cement Corporation owns and operates a cement terminal in Boston, MA. Coastal Cement Corporation purchases cements to supply its customers with high quality portland cement for many years. Its portland cement products have been used by its customers in the northeast for many projects such as “Big Dig” (The Central Artery/Tunnel Project) in Downtown Boston, MA, Amazon Fulfillment Center in North Andover, MA, and Waltham High School Campus in Waltham, MA. Coastal Cement Corporation currently employs Massachusetts residents and indirectly supports many jobs in the area. Coastal Cement Corporation contributes regularly to support and bolster the local communities in which the company operates. Coastal Cement Corporation aligns its values with those of the World Business Council for Sustainable Development and the Global Cement and Concrete Association by ensuring that its operations are sustainable for current and future generations. Coastal Cement Corporation minimizes the impact of its operations on its neighbors and focuses on operating in an environmentally ethical manner. The health and safety of our employees is vital to our success as we strive for zero harm.

Production Facility Name: Coastal Cement Corporation
36 Drydock Avenue
Boston, MA 02210

Product Description

This EPD reports environmental transparency information for Type I-II and IL cements produced at an off-site cement plant (inclusive of transportation and offloading burdens) for distribution via a terminal located in Boston, MA. 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 sets out each cement type constituents and applicable standards. Cements are primarily sold in bulk with some Type II cements sold as packaged.

Products and Standards

The cement plant’s Type I-II and IL cements are comparable in make-up to similar products available on the US market and comply with the following standards:
An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

Declared Unit

The declared unit is one metric ton of cement (delivered and offloaded at a Boston terminal).

System Boundary

This is a cradle-to-gate EPD covering the production stage (A1-A3) as depicted in the figure below; inclusive of transport to and offloading at Coastal Cement Corporation’s cement terminal in Boston, MA. The production stage includes extraction of raw materials (cradle) through the manufacture of cements ready for shipment (gate). The cement plant sources its limestone supply from an adjacent quarry.

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
An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

The cut-off criteria as 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 were collected for the following processes for the reference year 2021:
• Limestone quarry operations, clinker production and cement manufacture.
• Transport mode and distance from cement plant to Spain port (truck), Spain port to Boston port (bulk carrier), and offloading at Boston port.

Allocation Rules
Allocation of inventory flows and subsequently 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 the N.A. version of GCCA’s Industry Tool for EPDs of cement and concrete for more information [1 & 2].

Data Quality Requirements and Assessment

<table>
<thead>
<tr>
<th>Data Quality Requirements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Coverage</td>
<td>Data represents the prevailing technology in use at the cement plant. Whenever available, for all upstream and core material and processes, North American typical or global average industry LCI datasets were utilized. The cement plant utilizes a dry with preheater and precalciner kiln technology. Technological representativeness is characterized as “high”.</td>
</tr>
<tr>
<td>Geographic Coverage</td>
<td>The geographic region considered is Global. Geographical representativeness is characterized as &quot;high&quot;.</td>
</tr>
</tbody>
</table>
### Time Coverage
Activity (primary) data are representative of 2021 calendar year (12 months).
- Limestone extraction,
- Clinker production,
- Cement manufacturing,
- In-bound/out-bound transportation data - primary data collected for quarry site and cement plant.

*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 in the GCCA Tool to complete production profile for the cement products. The cement plant operates a continuous emissions monitoring system and reports emissions. These data for 2021 were drawn on in the completion of this EPD. The completeness of the foreground process chain in terms of process steps is 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 were conducted [14]. The LCA team conducted 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 source LCI data and subsequent LCA background reports are confidential.

### Transparency
Activity datasets are disclosed in the project LCI compilation, and the background reports generated by the GCCA Tool.

### Uncertainty
A sensitivity check was conducted relative to the PCA industry average [15]. The variation across significant inputs were found to be well within the expected range and hence, there is high degree of confidence in the results.

---

### Life Cycle Impact Assessment Results: Cement Plant and Transport/Offloading in Boston, MA Coastal Cement Corporation

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 1 metric ton of each cement type as produced at the cement plant and delivered and offloaded at Coastal Cement Corporation's Boston, MA cement terminal.

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], [5]. 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 [8]. EPDs are comparable only if they comply with ISO 21930, 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].
An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

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 1 metric ton of each cement type as produced at the cement plant and delivered and offloaded at Coastal Cement Corporation’s Boston, MA cement terminal.

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], [5]. 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 [8]. EPDs are comparable only if they comply with ISO 21930, 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].

### Production stage EPD Results – per metric ton delivered/offloaded in Boston, MA

<table>
<thead>
<tr>
<th>Impact category and inventory indicators</th>
<th>Unit</th>
<th>Portland Type I/II ASTM C150</th>
<th>Blended Type IL ASTM C595</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming potential, GWP 100, AR5</td>
<td>kg CO2 eq</td>
<td>866</td>
<td>791</td>
</tr>
<tr>
<td>Ozone depletion potential, ODP</td>
<td>kg CFC-11 eq</td>
<td>3.25E-05</td>
<td>3.01E-05</td>
</tr>
<tr>
<td>Smog formation potential, SFP</td>
<td>kg O3 eq</td>
<td>38.0</td>
<td>35.4</td>
</tr>
<tr>
<td>Acidification potential, AP</td>
<td>kg SO2 eq</td>
<td>2.3</td>
<td>2.1</td>
</tr>
<tr>
<td>Eutrophication potential, EP</td>
<td>kg N eq</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Abiotic depletion potential for non-fossil mineral resources, ADP elements*</td>
<td>kg Sb eq</td>
<td>1.93E-04</td>
<td>1.75E-04</td>
</tr>
<tr>
<td>Abiotic depletion potential for fossil resources, ADP fossil*</td>
<td>MJ LHV</td>
<td>349</td>
<td>329</td>
</tr>
<tr>
<td>Renewable primary resources used as an energy carrier (fuel), RPRE*</td>
<td>MJ LHV</td>
<td>207</td>
<td>181</td>
</tr>
<tr>
<td>Renewable primary resources with energy content used as material, RPRM*</td>
<td>MJ LHV</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Non-renewable primary resources used as an energy carrier (fuel), NRPRE*</td>
<td>MJ LHV</td>
<td>2783</td>
<td>2543</td>
</tr>
<tr>
<td>Non-renewable primary resources with energy content used as material, NRPRM*</td>
<td>MJ LHV</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Secondary materials, SM*</td>
<td>kg</td>
<td>31.3</td>
<td>28.5</td>
</tr>
<tr>
<td>Renewable secondary fuels, RSF *</td>
<td>MJ LHV</td>
<td>498</td>
<td>455</td>
</tr>
<tr>
<td>Non-renewable secondary fuels, NRSF *</td>
<td>MJ LHV</td>
<td>172</td>
<td>157</td>
</tr>
</tbody>
</table>
### An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovered energy, RE*</td>
<td>MJ LHV</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Consumption of freshwater, FW*</td>
<td>m3</td>
<td>0.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Hazardous waste disposed, HWD*</td>
<td>kg</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>Non-hazardous waste disposed, NHWD*</td>
<td>kg</td>
<td>0.25</td>
<td>0.23</td>
</tr>
<tr>
<td>High-level radioactive waste, conditioned, to final repository, HLRW*</td>
<td>kg</td>
<td>x¹)</td>
<td>x¹)</td>
</tr>
<tr>
<td>Intermediate- and low-level radioactive waste, conditioned, to final repository, ILLRW*</td>
<td>kg</td>
<td>x¹)</td>
<td>x¹)</td>
</tr>
<tr>
<td>Components for re-use, CRU*</td>
<td>kg</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Materials for recycling, MFR*</td>
<td>kg</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Materials for energy recovery, MER*</td>
<td>kg</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Recovered energy exported from the product system, EE*</td>
<td>MJ LHV</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Global warming potential - biogenic, GWPbio*</td>
<td>kg CO₂ eq</td>
<td>2.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Emissions from calcination*</td>
<td>kg CO₂ eq</td>
<td>483</td>
<td>441</td>
</tr>
<tr>
<td>Emissions from combustion of waste from renewable sources*</td>
<td>kg CO₂ eq</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Emissions from combustion of waste from non-renewable sources*</td>
<td>kg CO₂ eq</td>
<td>21.5</td>
<td>19.7</td>
</tr>
</tbody>
</table>

**Table Notes:**

- x¹) – 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) 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). It is noted that long distance transport and terminal offloading contributes approximately 45kg CO2e to the overall GWP profile of the imported cements.

### Additional Environmental Information

**Environmental Protection and Equipment**

Coastal Cement Corporation complies with applicable U.S. Environmental Protection Agency (EPA) regulations, monitors, and report its emissions to air. Air pollution abatement equipment used at the Boston, MA facility consists of baghouses. Coastal Cement Corporation has developed a Health and Safety Management System.
An Environmental Product Declaration
In Accordance with ISO 14025 and 21930

References

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 14025:2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
11. ASTM C219 - Standard Terminology Relating to Hydraulic and Other Inorganic Cements