General Information

This cradle to gate Environmental Product Declaration covers bulk cement products produced at the Balcones 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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LCA/EPD Developer
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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 V3.2 serves as the sub-category PCR

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

Third party verifier Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants

For additional explanatory material
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This LCA EPD was prepared by: Melissa Diaz Segura, LCA and EPD Project Manager • 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.
General Information

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 Balcones cement plant has been producing high quality products since 1980 and employs nearly 140 people. The plant has an annual cement production capacity of over 2 million metric tonnes and provides cement for the construction needs in Texas and surrounding states.

Product
The cement products covered in this EPD meet UN CPC 3744 classification and the following standards:

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Applicable Standard</th>
<th>Standard Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland Limestone Cement</td>
<td>ASTM C595, C1157, AASHTO M240</td>
<td>Type IL</td>
</tr>
<tr>
<td>Portland Cement</td>
<td>ASTM C150, C1157, AASHTO M85</td>
<td>Type I/II</td>
</tr>
</tbody>
</table>

This EPD reports environmental information for two cement products produced by Cemex at its Balcones, TX facility. Type I/II cement is used as the key ingredient in many products such as ready-mix concrete and in a wide variety of applications such as concrete pipes, pre-stressed concrete, roads, foundations, bridges, soil stabilization, roof tiles and more. Type IL cement is a general use cement engineered to reduce the carbon footprint by inter grinding a higher ground limestone content than permitted in Type I/II cement. It is typically used in all applications in which Type I/II cement is used.

Product Components

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Type IL</th>
<th>Type I/II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinker</td>
<td>85%</td>
<td>92.3%</td>
</tr>
<tr>
<td>Limestone, Gypsum &amp; other</td>
<td>15%</td>
<td>7.7%</td>
</tr>
</tbody>
</table>

Declared Unit
The declared unit is one metric tonne of Type I/II and Type IL cement.
Life Cycle Assessment

System Boundary
This EPD is a cradle-to-gate EPD covering A1–A3 stages of the life cycle.

<table>
<thead>
<tr>
<th>PRODUCTION Stage (Mandatory)</th>
<th>CONSTRUCTION Stage</th>
<th>USE STAGE</th>
<th>END-OF-LIFE Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraction and upstream production</td>
<td>Transport to factory</td>
<td>Manufacturing</td>
<td>Installation</td>
</tr>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>MND</td>
</tr>
</tbody>
</table>

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 study recognizes fly ash, silica fume, granulated blast furnace slag, cement kiln dust, flue gas desulfurization (FGD) gypsum, post-consumer gypsum, and sawdust 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 refused derived fuels (RDF), 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:
- **Limestone**: Manufacture specific primary data (2021)
- **Natural Gas**: ecoinvent 3.8 (2021) Market for natural gas, high pressure US"

Electricity grid mix includes: 46.27% Natural Gas, 17.81% Coal, 21.88% Wind, 9.61% Nuclear, 3.49% Solar, 0.43% Petroleum Coke, 0.0% Geothermal, 0.16% Hydro, 0.18% Biomass, 0.06% oil, with a global warming potential of 0.564 kg CO2eq per /kWh
Life Cycle Assessment

Balcones Cement Products¹, bulk shipped: Type I/II, Type IL per 1 metric tonne.**

<table>
<thead>
<tr>
<th>Impact Assessment</th>
<th>Unit</th>
<th>Type IL</th>
<th>Type I/II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global warming potential (GWP)²</td>
<td>kg CO₂ eq</td>
<td>756</td>
<td>816</td>
</tr>
<tr>
<td>Depletion potential of the stratospheric ozone layer (ODP)</td>
<td>kg CFC-11 eq</td>
<td>8.70E-06</td>
<td>9.34E-06</td>
</tr>
<tr>
<td>Eutrophication potential (EP)</td>
<td>kg N eq</td>
<td>2.59E-01</td>
<td>2.74E-01</td>
</tr>
<tr>
<td>Acidification potential of soil and water sources (AP)</td>
<td>kg SO₂ eq</td>
<td>1.40</td>
<td>1.50</td>
</tr>
<tr>
<td>Formation potential of tropospheric ozone (POCP)</td>
<td>kg O₃ eq</td>
<td>30.8</td>
<td>33.1</td>
</tr>
</tbody>
</table>

**Resource Use**

| Abiotic depletion potential for non–fossil mineral resources (ADPelements)* | kg Sb eq | 4.37E-06 | 4.57E-06 |
| Abiotic depletion potential for fossil resources (ADPfossil)                | MJ, NCV  | 5,241    | 5,628    |
| Renewable primary energy resources as energy (fuel), (RPRE³) *             | MJ, NCV  | 0.00E+00 | 0.00E+00 |
| Renewable primary energy resources as material, (RPRM³) *                  | MJ, NCV  | 144      | 150      |
| Non-renewable primary energy resources as energy (fuel), (NRPRE³) *        | MJ, NCV  | 0.00E+00 | 0.00E+00 |
| Non-renewable primary energy resources as material, (NRPRM³) *            | MJ, NCV  | 5,504    | 5,902    |
| Consumption of fresh water, (FW²)                                         | m³       | 1.96     | 2.00     |

**Secondary Material, Fuel and Recovered Energy**

| Secondary Materials, (SM²) *                                               | kg       | 0.00E+00 | 0.00E+00 |
| Renewable secondary fuels, (RSF²) *                                       | MJ, NCV  | 0.00E+00 | 0.00E+00 |
| Non-renewable secondary fuels (NRSF²) *                                   | MJ, NCV  | 0.00E+00 | 0.00E+00 |
| Recovered energy, (RE²) *                                                  | MJ, NCV  | 0.00E+00 | 0.00E+00 |

**Waste & Output Flows**

| Hazardous waste disposed, (HW²) *                                         | kg       | 2.24E-04 | 2.33E-04 |
| Non-hazardous waste disposed, (NHWD²) *                                   | kg       | 3.54     | 3.68     |
| High-level radioactive waste, (HLRW²) *                                   | kg       | 1.42E-07 | 1.49E-07 |
| Intermediate and low-level radioactive waste, (ILLRW²) *                  | kg       | 7.21E-07 | 7.55E-07 |
| Components for reuse, (CRU²) *                                            | kg       | 0.00E+00 | 0.00E+00 |
| Materials for recycling, (MR²) *                                          | kg       | 0.00E+00 | 0.00E+00 |
| Materials for energy recovery, (MER²) *                                   | kg       | 1.05E-02 | 1.09E-02 |
| Recovered energy exported from the product system, (EE²) *                | MJ, NCV  | 0.00E+00 | 0.00E+00 |

**Additional Inventory Parameters for Transparency**

| CO₂ emissions from calcination and uptake from carbonation*                | kg CO₂ eq | 446     | 484      |

* 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. The following optional indicators are not reported and also have high levels of uncertainty: Land use related impacts, toxicological aspects, and emissions from land use change.

**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 These products contain no materials that are considered hazardous as defined by the PCR.
² GWP 100, 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
³ CO₂ from biogenic secondary fuels used in kiln are climate-neutral (CO₂ sink = CO₂ emissions), ISO 21930, 7.2.7.
⁴ Calculated per ACLCA ISO 21930 Guidance.
References


ASTM. (April 2020). *General Program Instructions*.


NSF International. (December 2022). *PCR for Concrete. V.2.2*.

NSF International. (Sept 2021). *PCR for Portland, Blended, Masonry, Mortar and Plastic (Stucco) Cements v.3.2*.


US EPA. (2014). *Tool for the Reduction of Assessment of Chemical and Other Environmental Impacts (TRACI)*.

Additional Environmental Information

To learn more about the importance of sustainability at Cemex, please visit:
www.cemex.com/sustainability/future-in-action
www.cemexusa.com/sustainability