This Environmental Product Declaration (EPD) reports the impacts for 1 m$^3$ of ready mixed concrete mix, meeting the following specifications:

- ASTM C94: Ready-Mixed Concrete
- UNSPSC Code 30111505: Ready Mix Concrete
- CSI Section 03 30 00: Cast-in-Place Concrete

**Company**

Martin Marietta  
2710 Wycliff Road  
Raleigh, NC 27607  
http://www.martinmarietta.com/

**Plant**

Chambers Plant  
2650 Chambers Rd.  
Aurora, CO 80011

**EPD Program Operator**

National Ready Mixed Concrete Association  
900 Spring St. • Silver Spring • MD 20910  
http://www.nrmca.org/sustainability/  
NRMCAEPD:10010

**Date of Issue**

10/27/2016 (valid for 5 years until 10/27/2021)

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### Environmental Impacts

**Declared Product:**

Mix A3700 • Chambers Plant  
Exterior 3000 PSI  
Compressive strength: 3000 psi at 28 days

**Declared Unit:** 1 m$^3$ of concrete

<table>
<thead>
<tr>
<th>Impact Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Warming Potential (kg CO$_2$-eq)</td>
<td>307</td>
</tr>
<tr>
<td>Ozone Depletion Potential (kg CFC-11-eq)</td>
<td>7.8E-6</td>
</tr>
<tr>
<td>Acidification Potential (kg SO$_2$-eq)</td>
<td>0.96</td>
</tr>
<tr>
<td>Eutrophication Potential (kg N-eq)</td>
<td>0.36</td>
</tr>
<tr>
<td>Photochemical Smog Creation Potential (kg O$_3$-eq)</td>
<td>19.0</td>
</tr>
<tr>
<td>Total Primary Energy Consumption (MJ)</td>
<td>2,101</td>
</tr>
<tr>
<td>Nonrenewable (MJ)</td>
<td>2,016</td>
</tr>
<tr>
<td>Renewable (MJ)</td>
<td>84.5</td>
</tr>
<tr>
<td>Total Concrete Water Consumption (m$^3$)</td>
<td>3.13</td>
</tr>
<tr>
<td>Batching Water (m$^3$)</td>
<td>0.17</td>
</tr>
<tr>
<td>Washing Water (m$^3$)</td>
<td>0.13</td>
</tr>
<tr>
<td>Nonrenewable Material Resource Consumption (kg)</td>
<td>2,319</td>
</tr>
<tr>
<td>Renewable Material Resource Consumption (kg)</td>
<td>2.04</td>
</tr>
<tr>
<td>Hazardous Waste Production (kg)</td>
<td>0.01</td>
</tr>
<tr>
<td>Nonhazardous Waste Production (kg)</td>
<td>2.82</td>
</tr>
</tbody>
</table>

**Product Components:** natural aggregate (ASTM C33), Portland cement (ASTM C150), fly ash (ASTM C618), admixture (ASTM C494), batch water (ASTM C1602)

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The Carbon Leadership Forum PCR: Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) for Concrete, Version 1.1 dated 12/4/2013, serves as the PCR for this EPD.  
http://www.carbonleadershipforum.org  

**PCR review** was conducted by: Nicholas Santero • thinkstep (formerly PE International)

**Independent verification** of the declaration, according to ISO 14025:2006: ☑ internal ☐ external

**Third party verifier:** Tad Radzinski (tad@sustainablesolutionscorporation.com) • Sustainable Solutions Corporation

**LCA and EPD developer:** Laurel McEwen (laurel.mcewen@climateearth.com) • Climate Earth

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Martin Marietta • http://www.martinmarietta.com/
Life cycle assessment

This EPD is based on a ‘cradle-to-gate’ life cycle assessment (LCA) of ready mixed concrete mixes. A summary of life cycle processes included in the EPD is as follows:

- Raw material supply (upstream processes): Extraction, handling, and processing of the raw materials used in production of concrete: cement, supplementary cementitious materials, aggregate (coarse and fine), water, admixtures, and other materials or chemicals used in concrete mixtures.
- Transportation: Transportation of these materials from supplier to the gate of the concrete producer.
- Manufacturing (core processes): Energy used to store, batch, mix, and distribute the concrete and operate the facility (concrete plant).
- Water use in mixing and distributing concrete.

A summary of cradle-to-gate life cycle processes excluded from the EPD is as follows:

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

A summary of the limitations of this EPD include the following:

- This EPD does not report all of the environmental impacts due to manufacturing of the product, but rather environmental impacts for categories with established LCA-based methods to track and report. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change, water use in the upstream manufacturing process, and habitat destruction.
- This EPD reports the results of an LCA for ‘cradle-to-gate’ analysis. Thus, declarations themselves are not comparative assertions, defined as an environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function. An EPD does not make any statements that the product covered by the EPD is better or worse than any other product.
- In order to assess the local impacts of product manufacturing, additional analysis is required.
- Life cycle impact assessment results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

Note: The product manufacturer has the option of declaring additional information about their product including conformance with any other sustainability certification programs that often have performance and prescriptive requirements that aim to illustrate environmental best practices that cannot be captured by LCA.

Data quality, variability, and comparability

This EPD was created using plant-specific data for upstream materials. Potential variations due to supplier locations, manufacturing processes, and efficiencies and fuel use are thus accounted for in this EPD. EPDs of concrete mixtures may not be comparable if they do not comply with this standard and data from this EPD. While EPDs can be used to compare concrete mixes, the data cannot be used to compare between construction products or concrete mixes used in different concrete products unless the data is integrated into a comprehensive LCA. For example, precast concrete, concrete masonry units, and site-cast concrete all have different manufacturing processes whose impacts are attributed to different LCA stages. This precludes direct comparison between mixes used in these different products until all life cycle phases are included.

Data sources

Information on the LCI data source, process name, geography, and year for each unit process are given below:

- Portland cement: Portland Concrete Association, Industry Average EPD, 2016
- Slag cement: Slag Cement Association, industry average EPD, 2014
- Fly ash: by product of coal combustion; no upstream manufacturing impacts
- Silica fume: by product of silicon and ferrosilicon alloy production; no upstream manufacturing impacts
- Admixture (other): Highest impact in each impact category of the six EFCA admixtures EPDs, 2006
- Electricity (ASC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (FRCC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (HICC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (MRO): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (NIPCC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (RFCC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (SERC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (SPP): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (TRE): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012
- Electricity (WECC): Ecoinvent 3.2: “Electricity, medium voltage, market for, Alloc Rec”, 2012