

Environmental Product Declaration



General Information

This Environmental Product Declaration (EPD) is for 5 structural precast products manufactured by Clark Pacific at their NorCal and Adelanto California plants for use by Microsoft in their parking garage located at 1 Microsoft Way, Redmond Washington 98052. This declaration has been prepared in accordance with ISO 14025, ISO 14040, ISO 14044 and ASTM International's EPD program operator rules.

EPD Scope: Cradle to Gate

EPD Type: Product Specific

Product Category Rule: ASTM Product Category Rules (PCR) for Precast Concrete issued March 2015

Verification Type: Independent external verification of the declaration and data, according to ISO 14025

Declared Unit: 1 metric ton of structural precast product

Date of Issue: November 9, 2020
(valid for 5 years until November 4, 2025)

ASTM Declaration Number: EPD - 161

EPD Owner:

Clark Pacific
710 Riverpoint Court, Suite 100
West Sacramento, CA 95605
916-371-0305



Program Operator:

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428
<http://www.astm.org/EPDs.htm>



Declaration Number: EPD-XXXX

Third-party verifier:

Thomas P. Gloria, PhD • t.gloria@industrial-ecology.com
Industrial Ecology Consultants
35 Bracebridge Rd.
Newton, MA 02459-1728
(617) 553-4929
<http://www.industrial-ecology.com>

PCR review was conducted by:

Nicholas Santero, Spera (Chair)
The PCR peer review report is available upon request: cert@astm.org

LCA and EPD Developer:

Laurel McEwen
Climate Earth, Inc.
137 Park Place, Suite 204
Pt Richmond, CA 94801
(415) 391-2725
<http://www.climateearth.com>



Products

This study reports the average performance of five structural precast products described in Tables 1-3.

Table 1: Description of products Covered in Study

Product	Description	Standards	Number of Designs	Compressive strength (PSI)	Amount of additional hardware (kg/tonne)
<p>Gravity Beam</p> 	<p>A horizontal structural building block for precast structures help support deck members like double tees, hollowcore, and solid slabs. Beams accommodate different flooring types, lengths, and methods.</p>	<p>PCI MNL-116, PCI Category C3</p>	<p>28</p>	<p>9,000</p>	<p>7.35e-12</p>
<p>Gravity Column</p> 	<p>A vertical structural building block for precast structures are made as single story or multi-story members and serve as a gravity and lateral load-resisting element.</p>	<p>PCI MNL-116, PCI Category C3</p>	<p>14</p>	<p>9,000</p>	<p>1.71e-10</p>
<p>Double Tee</p> 	<p>A load bearing structure that resembles two T-beams connected to each other side by side. The strong bond of the flange and the two webs create a structure that is capable of withstanding high loads while having a long span</p>	<p>PCI MNL-116, PCI Category C3</p>	<p>13</p>	<p>6,000</p>	<p>9.34e-12</p>
<p>Spandrel</p> 	<p>A tall narrow beam element that is non-load bearing in the structure. The structural spandrels are used adjacent to double tees to act as vehicle crash barriers for the levels above ramps.</p>	<p>PCI MNL-116, PCI Category C3</p>	<p>1</p>	<p>6,000</p>	<p>2.82e-10</p>
<p>Hollowcore</p> 	<p>A prestressed concrete slab that can serve as the floor and roof deck system with continuous voids to reduce weight and cost.</p>	<p>PCI MNL-116, PCI Category C3</p>	<p>1</p>	<p>3,500</p>	<p>0</p>



Table 2: Average Material Composition Percentage by Weight

	Beam	Column	Double Tee	Spandrel	Hollowcore
Concrete	0.880	0.820	0.959	95.7%	0.992
Rebar	0.079	0.118	0.020	3.4%	0.000
Steel	0.041	0.060	0.021	0.9%	0.008
Other	0.000	0.002	<0.001%	0.000	<0.001

Table 3: Reinforcement Area per Grade and Type (kg/m³)

	A706-60	A706-80	Strand
Beam	41.8	167	40.4
Column	0	298	0
Double Tee	45.4	0	31.7
Spandrel	81.9	0	13.7
Hollowcore	0	0	27.9

Four of the structural precast products (Beam, Column, Double Tee and Spandrel) are produced at Clark Pacific's NorCal plant. Hollowcore is produced at Clark Pacific's Adelanto plant.

NorCal Plant

40600 County Road 18C
Woodland, CA 95776

Adelanto Plant

9367 Holly Road
Adelanto, CA 92301

System boundary

This study captures the following mandatory cradle-to-gate (A1-A3) life cycle product stages (as illustrated in Figure 1).

PRODUCTION Stage (Mandatory)			CONSTRUCTION Stage		USE Stage					END-OF-LIFE Stage			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4

Figure 1: Life-Cycle Stages and Modules

Except as noted above, all other life cycle stages as described in Figure 1 are excluded from the LCA study.

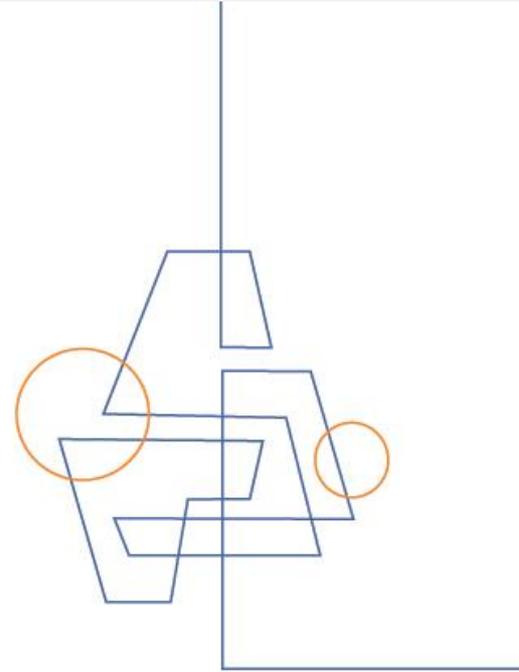


The Production Stage includes the following processes:

- A1 - Extraction and processing of raw materials, including fuels used in product production and transport within the manufacturing process (A3);
- A2 - Average or specific transportation of raw materials from the extraction site or source to manufacturing site, inclusive of empty backhauls (where applicable);
- A3 - Manufacturing of each precast product including all energy and materials required and all emissions and wastes produced;

The Production Stage excludes the following processes:

- Production, manufacture, and construction of manufacturing capital goods and infrastructure;
- Formwork;
- Production and manufacture of production equipment, delivery vehicles, and laboratory equipment;
- Personnel related activities (travel, office operations and 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.



The main processes included in the system boundary are illustrated in Figure 2.

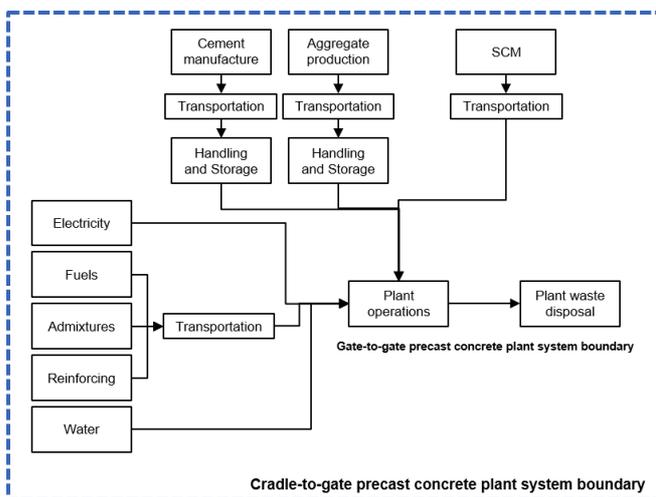


Figure 2: Main Processes Included in System Boundary

Electricity impacts are calculated based on the 2014 resource mix at the level of North American Electricity Reliability Council (NERC) Western Electricity Coordinating Council (WECC) region. The 2014 grid mix contains: 29.2% Natural Gas, 22.6% Hydro, 14.3% Lignite, 13.9% Coal, 8.1% Nuclear, 6.6% Wind, 2.2 Geothermal, 1.7% British Columbia (BC) import, 0.6% Wood Chips, 0.4% Biogas, 0.3% Solar. NorCal generates on-site 71.6 % of their electricity via solar.



ENVIRONMENTAL PRODUCT DECLARATION

Environmental Impacts

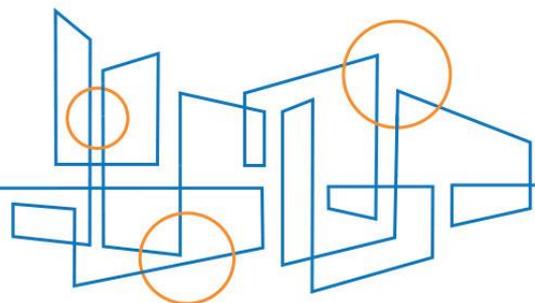
Cradle to Gate (A1-A3) impact results per 1 metric ton of product are outlined in Table 4.

Table 4: Cradle-to-Gate Impact Results for Products Covered in Study

Impact category	Unit	Gravity Beam	Gravity Column	Double Tee	Spandrel	Hollowcore
Global warming potential	kg CO ₂ eq	342	431	275	268	243
Acidification potential	kg SO ₂ eq	1.51	1.93	1.13	1.10	0.90
Eutrophication potential	kg N eq	0.14	0.18	0.12	0.12	0.40
Smog creation potential	kg O ₃ eq	30.3	36.4	24.8	24.1	21.5
Ozone depletion potential	kg CFC-11 eq	2.80E-06	4.13E-06	2.84E-06	2.51E-06	7.09E-06
Energy Consumption						
Total primary energy consumption	MJ (HHV)	3,602	4,876	2,547	2,511	2,555
Nonrenewable energy	MJ (HHV)	3,465	4,679	2,472	2,421	2,404
Renewable energy	MJ (HHV)	137	197	74.8	90.5	15
Material resources consumption						
Nonrenewable material	kg	947	1,031	1,093	1,043	1,108
Renewable material	kg	0.10	0.18	0.10	0.06	0.08
Net fresh water	l	4,704	5,369	4,125	4,253	6,209
Waste Generated						
Non-hazardous waste generated	kg	7.06	8.94	5.36	5.82	11.1
Hazardous waste generated	kg	2.63E-03	3.29E-03	2.89E-03	2.53E-03	3.31E-03

This EPD only covers the cradle-to-gate impacts of aggregates using a declared unit and the results cannot be used to compare between products. EPDs from different programs (using different PCR) may not be comparable.

Explanatory materials may be requested by contacting: Emily Clark, (530) 207-4100





Additional Environmental Information

Adelanto Plant Storm Water Design

Clark Pacific's newest plant located in Adelanto, is an award-winning Sustainable Zero Storm Water Discharge Storm Water Site. In 2018, Clark Pacific received an award for "Outstanding Industrial Sustainable Stormwater BMP Project" from the California Stormwater Quality Association (CASQA). At 111-acres, the Adelanto Plant is scaled to facilitate both production needs, storm water capacity to ensure complete capture, and allow for infiltration back into underground aquifers. During a storm event, the water is funneled through a series of channels and storm drains to the final detention infiltration basin. The Dry Extended Detention Basin accounts for 522% for the required retention volume for the site and nearly double the entire on-site run off generated from 100-year storm event criteria.

NorCal Plant Storm Water Design

Clark Pacific's 170-acre NorCal Plant was designed and engineered for Zero Discharge of storm water with advanced pollution prevention CASQA approved BMPs built into the site. In 2018, Clark Pacific was officially recognized by the Sacramento Area Business Environmental Resource Center (BERC) and awarded the Sustainable Business of the Year Award "for outstanding efforts in enhancing sustainability, conserving resources, and reducing pollution". All storm water is captured for filtration through a system of grassy swales and treated berms and drain inserts. Storm water is collected in a filtration pond and then diverted and stored in a CASQA TC-22 Dry Extended Detention Basin, which prevents potential pollutants from entering ground water systems. The detention basin is designed with a 100-year, 24-hr storm event capacity.

NorCal Plant Solar Farm and Rail Spur

Clark Pacific owns and operates a 5-acre solar farm located at the NorCal Plant. The 1.11 MW system has generated over 5.03 GWh during its lifetime, since installation in August 2017. The solar farm offsets approximately 40% of Clark Pacific's electrical consumption across all three plants. Utilization of solar energy helps Clark Pacific offset GHG emissions associated with plant operations and energy use and move more towards sustainable operative goals. Additionally, the NorCal plant has installed a rail spur, which helps remove trucks from the road and allows rail delivery of aggregates needed for the manufacturing process.

