Environmental Product Declaration (EPD) for Concrete

Life Cycle Impact Results
(per tonne)

Declared Unit: 1 metric tonne of 35 MPa concrete at 28 days for precast extruded hollow core units

OPERATIONAL IMPACTS	*SEPSA C80350SOD*
Total primary energy consumption	
Non-renewable energy resources (MJ)	**1,100**
Renewable energy resources (MJ)	**10.1**
Material resources consumption	
Non-renewable materials (kg)	**1,200**
Renewable material resources (kg)	**0.20**
Net fresh water (L)	**3,970**
Non-hazardous waste generated (kg)	**176**
Hazardous waste generated (kg)	**3.08E-06**
ENVIRONMENTAL IMPACTS	
Global warming potential (kg CO_2 eq)	**244**
Ozone depletion potential (kg CFC 11 eq)	**8.85E-07**
Acidification potential (kg SO_2 eq)	**1.23**
Eutrophication potential (kg N eq)	**0.03**
Smog creation Potential (kg O_3 eq)	**15.8**

Traci 2.1 Characterization Factors

GRUPO CONSTRUCTOR SEPSA S.A. de C.V.

At GRUPO CONSTRUCTOR SEPSA we dedicate ourselves to the production and promotion of prefabricated concrete elements for the construction industry.

We have over 55 years of expertise in the precast industry providing to our clients with the design, fabrication, transportation, and assembly of various types of structures such as: buildings, bridges, elevated highways, stadiums, reinforced earth walls, and special concrete structures.

We offer total engineering solutions for precast structures, with reinforced elements and prestressed (pretensioned and post-tensioned) concrete members. We can provide high quality elements using advanced technologies in our production processes, equipment and experienced personnel, to fulfill the requirements of our clients.

Our headquarters is located in Cuernvaca, Morelos, and we can cover most of the Mexican territory throughout our strategically located plants in Xochitepec, Morelos; Polotitlán, State of Mexico, and Veracruz, Veracruz. In addition we can produce on site with our mobile production plants where, due to the job requirements, is needed.

We have the most advanced lifting cranes to assemble the precast structures with all the safety procedures, as well as the ultimate beam launcher for bridge girders up to 60 meters long and 130 tons of weight.

In Grupo Constructor SEPSA we are committed with our client satisfaction and we put all our staff and infrastructure to your service.

Adolfo Ruiz Cortines #320
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52-777 3222520
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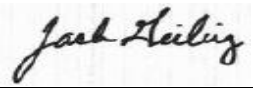
SUSTAINABILITY CERTIFIED NSF Environmental Product Declaration

ENVIRONMENTAL PRODUCT DECLARATION VERIFICATION

EPD Information			
Program Operator		NSF International	
Declaration Holder		Grupo Constructor SEPSA S.A. de C.V.	
Product: C80350S1OD	Date of Issue November 2, 2017	Period of Validity 5 Years	Declaration Number EPD 10130
This EPD was independently verified by NSF International in accordance with ISO 14025: ☐ Internal ☒ External		 Jennifer Oorbeck joorbeck@nsf.org	
This life cycle assessment was independently verified by in accordance with ISO 14044 and the reference PCR.		 Jack Geibig jgeibig@ecoform.com	
LCA Information			
Basis LCA		Life Cycle Assessment Manager for Concrete Environmental Product Declarations June 2013	
LCA Preparer		David Green BASF Corporation david.r.green@basf.com	
This life cycle assessment was critically reviewed in accordance with ISO 14044 by:		Bill Stough Sustainable Research Group bstough@sustainableresearchgroup.com	
PCR Information			
Program Operator		ASTM International	
Reference PCR		ASTM International, Product Category Rules for Preparing an Environmental Product Declaration for Precast Concrete	
Date of Issue		March 2015	
PCR review was conducted by:		Nick Santero PE International (Chairperson)	

Environmental Product Declaration (EPD) for Concrete

Grupo Constructor SEPSA S.A. de C.V.

C80350S1OD

ENVIRONMENTAL PRODUCT DECLARATION: DETAILED VERSION

Product Description

Products covered by this Environmental Product Declaration (EPD) are for structural precast hollow core extruded concrete slabs and walls developed and produced by all Grupo Constructor SEPSA S.A.de C.V. manufacturing sites for the markets in all of the states of Mexico. The specified compressive strength is 35 MPA at 28 days and covers product numbers LS-120/15, LS-120/20, LS-120/25, LS-120/30 for slabs and MS-120/15, MS-120/20, MS-120/25, MS-120/30 for walls. The primary audience for structural precast hollow core extruded concrete slabs are engineers, designers, architects and project owners.

This EPD reports the impacts for the precast hollow core concrete product further defined by UN CPC class 3755. The life cycle phases covered are A1 (Raw Material Supply: Upstream Processes), A2 (Transportation from Supplier to Gate of Producer) and A3 (Concrete Production – Core Process). This EPD covers only the cradle-to-gate impacts of precast concrete 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.

Product Components

The product components for the mixes identified for this EPD meet the following ASTM Standards:

Component	*Standard*	*Specification for:*
Portland Cement	ASTM C150, ASTM C1157, AASHTO M 85, or CSA A3001	Portland Cement
Fine Aggregate - natural sand	CSA A23.1, ASTM C33/C33M	Concrete fine aggregates
Course Aggregate – natural gravel or crushed	CSA A23.1, ASTM C33/C33M	Concrete course aggregates
Batch Water	ASTM C1602	Mixing water used in the production of hydraulic cement concrete
Admixtures	ASTM C494/C494M, ASTM C1017/C1017M	Chemical Admixtures for Concrete
Reinforcing Bars	ASTM A-416/A-416M	Low-Relaxation, Seven-Wire Steel Strand

EPD Program Operator
NSF International
789 N. Dixboro Rd.
Ann Arbor MI 48105 USA
www.nsf.org

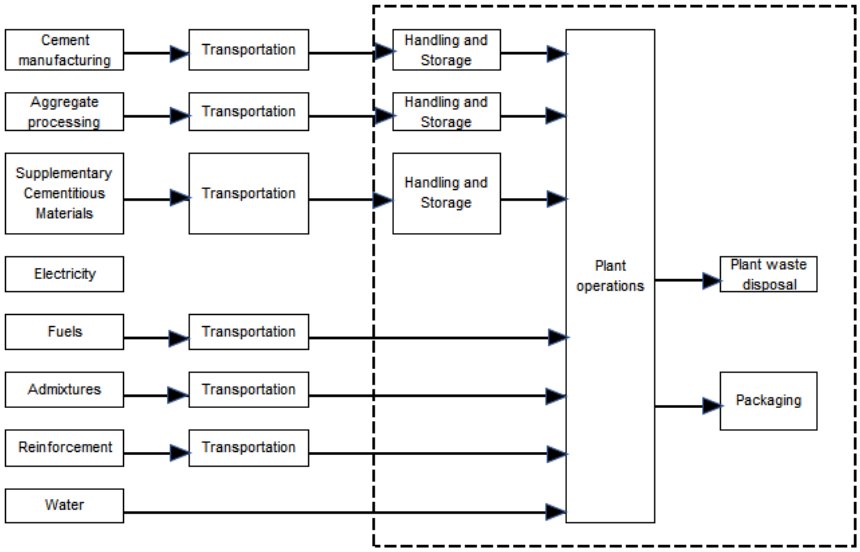
Date of Issue: November 2, 2017
Period of Validity: 5 years
Declaration#: EPD10130

NSF Sustainability℠
Sustainability Assured

The reinforcement for the products represented in this EPD are detailed as prestressed strand 19,000 kg/cm2; 12.7 mm, 9.5 mm with an area of 98.7 mm2 and 74.2 mm2 respectively. The finished products comply with the following additional standards and product specifications: NMX-C-083-ONCCE-2002; NMX-C-159_ONCCE-2004; ACI 318-05 Section 034100, ANNIPAC Manual de Diseno, PCI Design Handbook.

Production/Manufacturing

The product manufacturing phase includes the extraction and processing of raw materials, the average or specific transportation of raw materials from the extraction site or production source to the manufacturing site including empty backhauls and the manufacturing of the product including the casting of concrete, curing of the units and any applicable post production finishing. Formwork is not included in the system boundary based on the PCR.



Declared Unit

The declared unit is 1 metric tonne of structural precast for slabs and walls produced for commercial applications.

Cut-off Criteria

The cut-off criteria for the exclusion of inputs and outputs in the LCA are defined in the PCR for mass and energy were applied. All input/output flows reported by Grupo Constructor SEPSA S.A. de C.V. were included in the LCI modeling. None of the reported flow data was excluded based on the defined cut-off criteria.

Life Cycle Assessment (LCA)

The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.
A summary of the life cycle stages ***included*** in the EPD is as follows:

1. Raw Material Supply (upstream processes): Extraction, handling and processing of the raw materials including fuels used in the production and transport within the manufacturing process of structural precast elements.
2. Transportation: The average or specific transportation of raw materials (including recycled materials) from the extraction site, source of manufacturing or terminal of distribution to the manufacturing site and includes empty backhauls and any transportation to interim distribution centers or terminals.
3. Manufacturing: The manufacturing of structural precast elements including all energy and materials necessary and all emissions including waste. A list of minimal inclusions is provided in the PCR.

A summary of life cycle stages ***excluded*** from the EPD is as follows:

1. Production, manufacture and construction of manufacturing capital goods and infrastructure.
2. Formwork.
3. Production and manufacture of production equipment, delivery vehicles and laboratory equipment.
4. Personnel-related activities (travel, furniture and office supplies).
5. Energy and water use related to company management and sales activities that may be located either within the factory site or at another location.

A summary of the limitations of this EPD include:

1. This EPD covers only the cradle-to-gate impacts of precast concrete using a declared unit and the results cannot be used to compare between products.
2. All assumptions from the LCA are described. Module A1, A2 and A3 are declared as one aggregated module A1-A3.
3. Only EPD prepared from cradle-to-grave life-cycle results and based on the same function, reference service life, quantified by the same functional unit and meeting all the conditions in ISO 14025, Section 6.7.2 can be used to assist purchasers and users in making informed comparisons between products.
4. Life Cycle Impact Assessment results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.
5. EPD of structural precast products may enable comparison between products but do not themselves compare products as stated in ISO 14025, Sections 4 and 6.7.2.
6. The life cycle analysis is cradle-to-gate and includes any transportation associated with the offsite movement of waste derived materials generated during concrete production.

Data Quality and Variability

This EPD was created using industry average data for upstream materials. Variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel type used. The data sources used in the life-cycle assessment are included in Table 1. An assessment of the data quality selected for this EPD was conducted using the five data quality indicators per the "Greenhouse Gas Protocol Product Life Cycle Accounting and Reporting Standard". A summary of the assessment is shown in Table 2 with data quality rated from low to high in the categories of "Technological Representativeness", "Geographical Representativeness", "Temporal Representativeness", "Completeness" and "Reliability".

LCI	Data Source	Version	Year (Updated)	Region	Technology
Portland Cement	GaBi	6.115	2014	United States	Current
Natural Aggregate	GaBi	6.115	2015	United States	Current
Natural Course Aggregate	GaBi	6.115	2015	United States	Current
Water	GaBi	6.115	2015	United States	Current
MasterPolyheed	GaBi/BASF	6.115	2016	United States	Current
Steel Strand	GaBi	6.115	2016	Global	Current
Wood	GaBi	6.115	2015	United States	Current
Cardboard	GaBi	6.115	2015	United States	Current
Plastic	GaBi	6.115	2014	Regional average	Current
Electricity	GaBi	6.115	2015	Mexico	Current
Diesel	GaBi	6.115	2016	United States	Current
Natural Gas	GaBi	6.115	2016	United States	Current
Truck Transport	GaBi	6.115	2015	United States	Current
Rail Transport	GaBi	6.115	2015	United States	Current
Sea Transport	GaBi	6.115	2015	United States	Current

Table 1: Data Sources

LCI	Data Source	Version	Year (Updated)	Region	Technology
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Natural Gas	GaBi	6.115	2016	United States	Current
Truck Transport	GaBi	6.115	2015	United States	Current
Rail Transport	GaBi	6.115	2015	United States	Current
Sea Transport	GaBi	6.115	2015	United States	Current

Table 2: Data Quality Assessment

References

1. North American Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) and/or GHG Protocol Conformant Product 'Carbon Footprint' of Concrete.
2. Saling, P., A. Kicherer, B. Dittrich-Kraemer, R. Wittlinger, W. Zombik, I. Schmidt, W. Schrott, and S. Schmidt. 2002. Eco-efficiency Analysis by BASF: The Method. Int. J. Life Cycle Assess., 7 (4): 203.
3. Shonnard, D.; Kicherer, A; and Saling, P. Industrial Applications Using BASF Eco-Efficiency Analysis: Perspectives on Green Engineering Principles. Environ. Sci. Technol. 2003, 37, 5340-5348.
4. ISO, International Organization for Standardization. Environmental Management-Life Cycle Assessment-Principles and Framework; ISO 14040:2006; ISO 14044:2006. ISO, Geneva, Switzerland, www.iso.org (2006)
5. ISO, International Organization for Standardization. Environmental Management- Eco-efficiency assessment of product systems -- Principles, requirements and guidelines; ISO 14045. ISO, Geneva, Switzerland, www.iso.org (2012)
6. Boustead Consulting Ltd UK, The Boustead Model 5.1.2600.2180 LCA database.
7. Thinkstep: GaBi Software-System and Database for Life Cycle Engineering, Copyright © 1992-2016 thinkstep AG