Environmental Product Declaration – EPD

HOLLOW CORE SLABS

ENVIRONMENTAL PRODUCT DECLARATION IN ACCORDANCE WITH ISO 14025 AND EN 15804+A1

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THE INTERNATIONAL EPD® SYSTEM

SKANDINAVISKA BYGGELEMENT

Environmental Product Declaration

PRODUCT NAME *

Hollow core slabs - HDF (Prefabricerade håldäck element - HDF)

PRODUCT DESCRIPTION

A hollow core slab is a precast slab of prestressed concrete. It is typically used in the construction of floors in multi-story apartment buildings.

Concrete is 100% recyclable, which creates the opportunity to reduce the environmental impact by reducing the need for new raw materials. Based on the European waste hierarchy, the concrete can currently be recycled as filling material or ballast while the reinforcement can be recycled. In addition, the concrete contains no hazardous chemical substances for health nor the environment.

The technical standards followed are: SS-EN 1168 + A3:2001 and SS-EN 13369.

TECHNICAL INFORMATION

Compressive strength (concrete)	fck = 32 – 45 N/mm2
Ultimate tensile strength (reinforcing steel)	ftk = 500 N/mm2
Tensile yield strength (reinforcing steel)	fyk= 540 N/mm2
Ultimate tensile strength (prestressing steel)	fpk = 1860 N/mm2

PRODUCT CONTENT

The approximate material content (in weight %) of the product is: cement (14,2%), aggregates (78,5%), water (5,2%), pre-stressed steel (2%), admixtures and others (0,1%).

PICTURE OF THE PRODUCT

UN CPC CODE

375 – Articles of concrete, cement and plaster.

GEOGRAPHICAL SCOPE

Nordic countries

** Swedish original name within parenthesis*

LCA information

PCR USED

The PCR (Product category rules) that has been used in this EPD is PCR 2012:01. Construction products and construction services. Version 2.2. of 2017-05-30.

The sub-PCR PCR 2012:01-SUB-PCR-G. Concrete and concrete elements (EN 16757:2017) has also been used.

DECLARED UNIT

1 ton of hollow core slab delivered to the customer.

SERVICE LIFE

The life length of the product is at least 100 years (Svensk Betong, 2018) according to Skandinaviska Byggelement.

TIME REPRESENTATIVENESS

The production data are from 2017 – 2018. The database data are from 2011 – 2017. No data used is older than 10 years.

DATABASE(S) AND LCA SOFTWARE USED

Databases used are mainly Ecoinvent 3.4 and Thinkstep´s own database from 2017. The LCA software used is GaBi 8.

DATA QUALITY

The quality of the data is judged to be good, since it is up to date data and it is collected directly from the production site.

SYSTEM DIAGRAM

A basic flowchart of the system is presented in the figure below.

FIGURE 1 – FLOW CHART OF THE SYSTEM

Module A1:
Several raw materials are produced, including packaging material.

Module A2:
Raw material and packaging are transported to the production site at Skandinaviska Bygg-element.

Module A3:
Production activities.

Module A4:
Transport of manu-factured product to customer.

DESCRIPTION OF SYSTEM BOUNDARIES AND DELIMITATIONS

This study is a so-called cradle-to-gate with options according to the definition in the PCR used. All life cycle impacts until the transport to the customer are included, see flowchart above. According to the PCR followed, the Polluter Pays Principle is applied in the system. For the waste management, this means that impacts occurring at the material recycling plant shall be allocated to the next life cycle. The life cycle starts by extracting raw materials used for the products, which is defining the boundary towards the nature.

No reusable infrastructure equipment is used for the manufacturing of the hollow core slabs.

Carbonation is not considered in the calculations. Carbonation is a phenomenon where part of carbon dioxide emitted during cement production is rebound to the concrete if exposed to air. This typically occurs during use and end of life stages of a building, which are excluded from this EPD.

The product is manufactured at the production site located in Hallstahammar, Sweden.

LIFE CYCLE STAGES, INCLUDED AND EXCLUDED

The life cycle stages included are A1-A4.
The life cycle stages excluded are A5, B1-B7, C1-C4 and D.
See table in the section presenting the Product system.

ALLOCATIONS MADE

Waste materials are generated in the production which is used as filling material for example in roads within the surroundings of the factory. A conservative assumption is made that all environmental impact is allocated to the products and not to the co-product (i.e. the filling material). The total amount of filling material is 10 kg per declared unit.

SCENARIOS

One scenario has been modelled and is assumed to be the most probable scenario for the product regarding for example, energy use, raw material use and waste.

DATA USED

Site-specific production data has been retrieved for 2017 and 2018 from the production site. Some of the data is modelled by using EPDs in the model calculations (for instance for cement and reinforcement steel). In some cases, generic data has been used from databases such as Ecoinvent 3.4 and Thinkstep's database from 2017.

The study applies a cut-off criterion of 1%. About 99 % of the material used has been covered in the analysis.

MAIN RAW MATERIALS

The main raw materials used in the product can be found in the flowchart in Figure 1.

PACKAGING

Most of the raw materials used for the production process are transported in bulk and do not require packaging. The only packaging materials are aluminium and low-density polyethylene for concrete admixtures. The products are transported to the customers stacked and lashed on a t truck, so no packaging material is needed.

TRANSPORTATION

The transportation included in this document is transport of raw materials and its packaging, products to customers and waste materials from the production site. The transport is mainly carried out by truck and in some cases by boat.

ENERGY UTILITIES

Both electricity and heat are used at the production site. The specific mix used at the production has been collected from Skandinaviska Bygglement. The electricity is based on 100% hydropower production from Vattenfall. Vattenfall´s EPD for hydropower has been used in the model calculations, the global warming potential of 1 kWh electricity is 10.5 g CO2e. Regarding the heat, a production mix has been modelled based on information provided by the energy supplier for the site, MälarEnergi. Different datasets from databases were used to model this production mix.

RECYCLED MATERIALS

No secondary material is used in the product. Secondary materials are used for the manufacturing of some of the raw materials used in the product, more specifically cement and steel.

SECONDARY ENERGY

Secondary energy comes from waste and waste biomass incineration, which are used to generate heat for the production site.

DIRECT EMISSIONS FROM PRODUCTION SITE

No direct emissions are generated at the production site.

WASTE

Wastes are generated from the packaging used for the raw materials and from the production. Packaging material for raw materials are mainly polyethylene and scrap metal, which are sent to material recycling. Production waste consists of waste concrete, which is sent to landfilling. No hazardous waste is produced at the site.

SCENARIO FOR MODULE A4

According to the PCR followed scenario description for module A4 shall be included. Below table presents the details on the product transport to the customers.

Vehicle type used for transport	Vehicle load capacity	Fuel type and consumption	Capacity utilisation (%)	Distance to construction site (km)	Bulk density of transported products
Euro V truck with trailer	40 tonne payload	Diesel, 3.7 l/10 km.	75	250	Unknown.

MORE INFORMATION

This Environmental Product Declaration (EPD) has been carried out by IVL Swedish Environmental Research Institute. This EPD is in accordance with ISO 14025 and EN 15804. It is a third party externally verified document that reports environmental data of products based on Life Cycle Assessment (LCA) and other relevant information.

Guidance on safe and effective installation, use and disposal of the product can be supplied by Skandinaviska Byggelement. For more information about Skandinaviska Byggelement see www.byggelement.se.

Product system

The life cycle stages included in the analysis is illustrated in the table below, according to EN15804. If a stage is included, it is indicated with an ”X” and if it is not included ”MND” (Module Not Declared) is noted.

Upstream	Core		Downstream													Other env. info
Production stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material supply	Transport	Manufacturing	Transport	Manufacturing	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-constrction demoli-tion	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Inventory and Impact categories

In accordance with the International EPD system programme instructions and the specific PCR used, the following characterization factors are used:

Parameter	Unit	Characterization factors
Global Warming Potential (GWP)	kg CO_2-Equiv.	CML2001 – Jan. 2016, baseline method.
Acidification Potential (AP)	kg SO_2-Equiv.	
Eutrophication Potential (EP)	kg PO_4^{3-} eq.	
Ozone Layer Depletion (ODP)	kg R11-e	
Formation potential of tropospheric ozone (POCP)	kg C2H4 eq.	
Abiotic Depletion potential (elements)	kg Sb-Equiv.	
Abiotic Depletion potente (fossil)	MJ, net calorific value	

Parameter		Unit
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value
	Used as raw materials	MJ, net calorific value
	TOTAL	MJ, net calorific value
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value
	Used as raw materials	MJ, net calorific value
	TOTAL	MJ, net calorific value
Secondary material		kg
Renewable secondary fuels		MJ, net calorific value
Non-renewable secondary fuels		MJ, net calorific value
Net use of fresh water		m^3

Parameter	Unit
Hazardous waste disposed	kg
Non-hazardous waste disposed	kg
Radioactive waste disposed	kg

Parameter	Unit
Components for reuse	kg

Content declaration

For construction product EPDs compliant with EN 15804, the content declaration shall list, as a minimum, substances contained in the products that are listed in the “Candidate List of Substances of Very High Concern for Authorization” when their content exceeds the limits for registration with the European Chemicals Agency. No substances occur on the REACH candidate list of SVHC (Candidate List of Substances of Very High Concern) in the product of the EPD.

Environmental performance

POTENTIAL ENVIRONMENTAL IMPACT PER TONNE OF PRODUCT

Parameter	Unit	A1-A3	A1-A4*
Global warming potential (GWP)	kg CO2 eq.	1,53E+02	1,65E+02
Acidification potential (AP)	kg SO2 eq.	2,53E-01	2,82E-01
Eutrophication potential (EP)	kg PO43- eq.	6,10E-02	6,79E-02
Formation potential of tropospheric ozone (POCP)	kg C2H4 eq.	2,94E-02	2,94E-02
Ozone layer depletion potential (ODP)	kg R11-e	5,38E-07	5,38E-07
Abiotic depletion potential – Elements	kg Sb eq.	2,83E-04	2,84E-04
Abiotic depletion potential – Fossil resources	MJ, net calorific value	7,94E+02	9,65E+02

* Additional information

”E” is written as a substitute for the number of zeros. For example, 3,5 E-02 means 0,035.

USE OF RESOURCES PER TONNE OF PRODUCT

Parameter		Unit	A1-A3	A1-A4*
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	7,53E+02	7,63E+02
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	7,53E+02	7,63E+02
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	8,64E+02	1,04E+03
	Used as raw materials	MJ, net calorific value	2,28E-02	3,21E-02
	TOTAL	MJ, net calorific value	8,64E+02	1,04E+03
Secondary material		kg	2,58E+01	2,58E+01
Renewable secondary fuels		MJ, net calorific value	8,56E+01	8,56E+01
Non-renewable secondary fuels		MJ, net calorific value	1,18E+02	1,18E+02
Net use of fresh water		m3	1,96E+00	2,48E+00

* Additional information

”E” is written as a substitute for the number of zeros. For example, 3,5 E-02 means 0,035.

Waste production and output flows

WASTE PRODUCTION PER TONNE OF PRODUCT

Parameter	Unit	A1-A3	A1-A4*
Hazardous waste disposed	kg	5,22E-03	5,23E-03
Non-hazardous waste disposed	kg	2,57E+00	2,59E+00
Radioactive waste disposed	kg	3,03E-02	3,03E-02

* Additional information

”E” is written as a substitute for the number of zeros. For example, 3,5 E-02 means 0,035.

OUTPUT FLOWS PER TONNE OF PRODUCT

Parameter	Unit	A1-A3	A1-A4*
Components for reuse	kg	-	-

* Additional information

”E” is written as a substitute for the number of zeros. For example, 3,5 E-02 means 0,035.

Programme-related information and verification

The EPD owner has the sole ownership, liability, and responsibility for the EPD. Environmental product declarations within the same product category from different programs may not be comparable. Environmental product declarations of construction products may not be comparable if they do not comply with EN 15804.

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com
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Product Category Rules:	PCR 2012:01. Construction products and construction services. Version 2.2. of 2017-05-30
Sub-PCR used:	PCR 2012:01-SUB-PCR-G. Concrete and concrete elements (EN 16757:2017)
Product group classification:	UN CPC 375 – Articles of concrete, cement and plaster.
Reference year for data:	2017
Geographical scope:	Nordic countries

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2012:01. Construction products and construction services. Version 2.2 of 2017-05-30. UN CPC code 375 – Articles of concrete, cement and plaster.
PCR review was conducted by: The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Carl-Otto Nevén, NEVÉN Miljökonsult, carlotto.neven@bredband.net Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No

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About Skandinaviska Byggelement AB

Skandinaviska Byggelement AB is one of Sweden's leading suppliers of complete structural systems in concrete and prefabricated concrete elements. We produce and deliver project-adapted frames and elements directly to the construction site, ready for assembly. Skandinaviska Byggelement manufactures and supplies frame systems and concrete elements for multi-dwelling buildings, office, hotel, industrial buildings, business premises and healthcare and school. Skandinaviska Byggelement was created as a company in 2002 and has been part of the Peab Group since 2006.

Find out more at byggelement.se.

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