

Environmental Product Declaration



In accordance with ISO 14025 and EN 15804+A1 for:

Precast solid concrete walls and floors

from

Skandinaviska Byggelement

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD owner:	FL-Prefab, Industrigatan 12 694 32 Hallsberg, Sweden
EPD registration number:	S-P-01655
First date of publication:	2019-08-16
Validity date:	2024-03-31
Geographical scope:	Nordic countries
PCR used	PCR 2012:01. Construction products and construction services. Version 2.3. of 2018-11-15
Sub-PCR used	PCR 2012:01-SUB-PCR-G. Concrete and concrete elements (EN 16757:2017)



General information

Information about the organization

Owner of the EPD:

FL-Prefab Industrigatan 12 694 32 Hallsberg 070 744 98 74 (Sweden)

Product-related or management system-related certifications:

FL-Prefab has implemented a quality- and environmental- management system according to ISO 9001 and ISO 14001, which is not yet certified.

Name and location of production site:

Industrigatan 12, 694 32 Hallsberg (Sweden)

About the company

FL-Prefab in Hallsberg is a prefab company with around 50 employees. Our factory dates back to the middle of the 60:s. With competent staff and an understanding of the market we are a company that will deliver a broad variety of products for our costumers needs.

Product information

Product name¹:

Precast solid concrete walls and floors (Massivvägg och bjälklag)

Product description:

A solid concrete wall is a loadbearing solid casted wall element that can be used both as internal wall and as external wall. A solid concrete floor is a loadbearing solid casted floor element and is used as an inner floor. The elements can be used for all types of construction projects. The elements are casted with one smooth surface, ready for plastering, with low demands on further work and one finerolled steel-glazed surface. The elements are available in different thicknesses. The solid elements are completed in the factory. They are delivered directly to the construction site and fitted with a crane.

The results of this EPD represent mostly the wall elements. The floor elements are for the most part a complementary product to other floor slabs that is used wherever other solutions are not possible. However, the material composition and resource use for both products is equivalent. The data used for the EPD correspond to weighted values, which were calculated by using factors corresponding to the share of each product of the total production of these elements in the factory over the year 2017.

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 14992 (Walls) and SS-EN 13369 (Floors)

¹ Swedish original name within parenthesis

Technical information:

Compressive strength (concrete)	$f_{ck} = 32 - 55 \text{ N/mm}^2$
Ultimate tensile strength (reinforcing steel)	$f_{tk} = 500 \text{ N/mm}^2$
Tensile yield strength (reinforcing steel)	$f_{yk} = 540 \text{ N/mm}^2$

Product content:

The approximate material content (in weight %) of the product is: cement (18%), aggregates (73%), water (7,7%), reinforcement steel (0,7%), admixtures and others (0,6%).

Picture of the product:



UN CPC code:

375 – Articles of concrete, cement and plaster.

Geographical scope:

Nordic countries

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 wall or floor elements delivered to the customer.

Service life:

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

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.

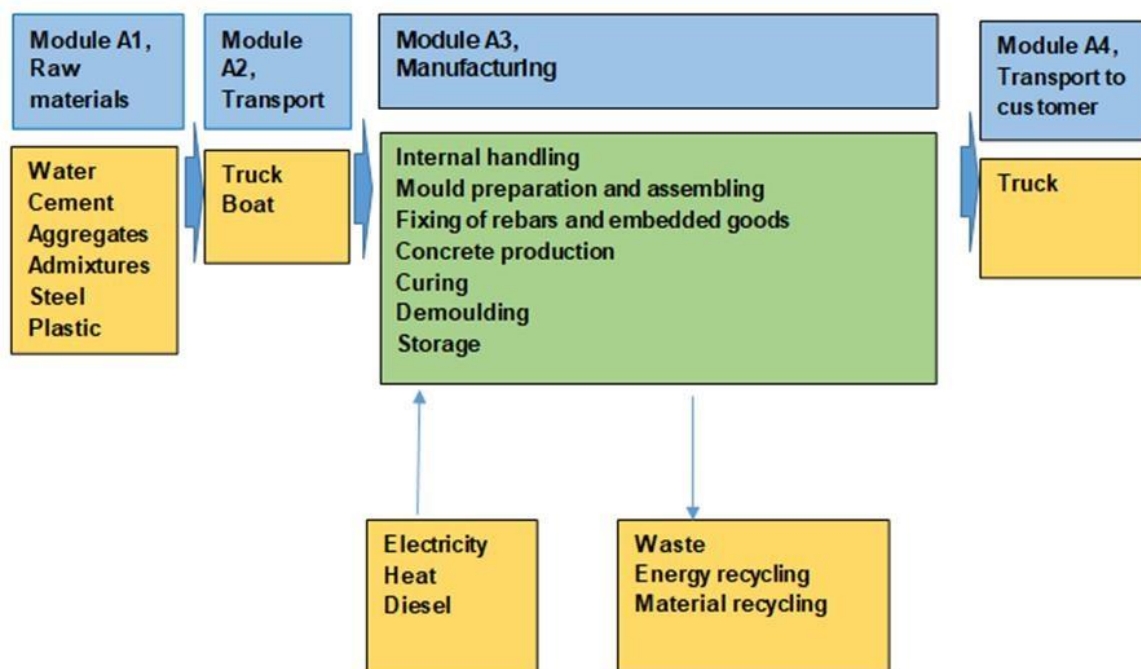


Figure 1 – Flow chart of the system

- Module A1: Several raw materials are produced, including packaging material.
- Module A2: Raw material and packaging are transported to the production site at FL-Prefab.
- Module A3: Production activities.
- Module A4: Transport of manufactured 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.

According to the sub PCR used some infrastructure equipment shall be included if they are reusable for a limited number of times. They shall be taken into account at the product stage by dividing their total impact by the number of uses. The infrastructure product considered is wood molding for casting.

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 produced at the production site located in Hallsberg, 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 Hallsberg. 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 0.04 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 seen 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 material is low-density polyethylene for concrete admixtures. The

products are transported to the customers on trestles or trusses which is part of the truck, i.e. no use of packaging material.

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 FL-Prefab. The electricity is based on 100% hydropower production from Vattenfall. Vattenfall's EPD² for hydropower has been used in the model calculations, the global warming potential of 1 kWh electricity is 10.5 g CO_{2e}. Regarding the heat, a production mix has been modelled based on information provided by the energy supplier for the site, E-ON. 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. This is sent to the material recycling. Production waste also consists of iron and metal scrap, wood and waste concrete. The iron and metal scrap is sent to recycling, the wood waste is sent to incineration with energy recovery and the waste concrete 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.	70	250	Unknown

More information:

² www.environdec.com/Detail/?Epd=7468

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 FL-Prefab on request.

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.

Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction, demolition	Transport	Waste processing	Disposal	Reuse, recycling or energy recovery potentials
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 eq.	
Acidification potential (AP)	kg SO ₂ eq.	
Eutrophication potential (EP)	kg PO ₄ ³⁻ eq.	
Formation potential of tropospheric ozone (POCP)	kg C ₂ H ₄ eq.	

Ozone layer depletion potential (ODP)	kg R11-e	CML2001 – Jan. 2016, baseline method.
Abiotic depletion potential – Elements	kg Sb eq.	
Abiotic depletion potential – Fossil resources	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 – Nonrenewable	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 CO ₂ eq.	1,60E+02	1,74E+02
Acidification potential (AP)	kg SO ₂ eq.	5,98E-01	6,29E-01
Eutrophication potential (EP)	kg PO ₄ ³⁻ eq.	5,86E-02	6,60E-02
Formation potential of tropospheric ozone (POCP)	kg C ₂ H ₄ eq.	3,15E-02	3,15E-02
Ozone layer depletion potential (ODP)	kg R11-e	7,14E-08	7,14E-08
Abiotic depletion potential – Elements	kg Sb eq.	3,06E-04	3,07E-04
Abiotic depletion potential – Fossil resources	MJ, net calorific value	8,35E+02	1,01E+03

* 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	1,20E+03
	Used as raw materials	MJ, net calorific value	0,00E+00
	TOTAL	MJ, net calorific value	1,20E+03
Primary energy resources – Nonrenewable	Use as energy carrier	MJ, net calorific value	5,55E+02
	Used as raw materials	MJ, net calorific value	2,89E-02
	TOTAL	MJ, net calorific value	5,55E+02
Secondary material	kg	10E+00	10E+00
Renewable secondary fuels	MJ, net calorific value	1,09E+02	1,09E+02
Non-renewable secondary fuels	MJ, net calorific value	1,50E+02	1,50E+02

Net use of fresh water	m ³	9,08E+00	9,63E+00
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* 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	3,05E-03	3,06E-03
Non-hazardous waste disposed	kg	4,90E+00	4,92E+00
Radioactive waste disposed	kg	3,42E-02	3,42E-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
EPD registration number:	S-P-1655
Published:	2019-08-16
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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: <input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
Third party verifier: Carl-Otto Nevén, NEVÉN Miljökonsult, carlootto.neven@bredband.net Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

References

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