Environmental Product Declaration

In accordance with ISO 14025 and EN 15804+A2

SOLID PRECAST CONCRETE, PRE-STRESSED SLAB

from

K-Prefab AB

Programme: The International EPD® System · www.environdec.com
Programme operator: EPD International AB
EPD registration number: S-P-01455 Precast Concrete pre-stressed Slab
Publication date: 2018-12-19
Revision date: 2022-05-10
Validity date: 2027-05-10
Geographical scope: Sweden

General information

Information about the organization

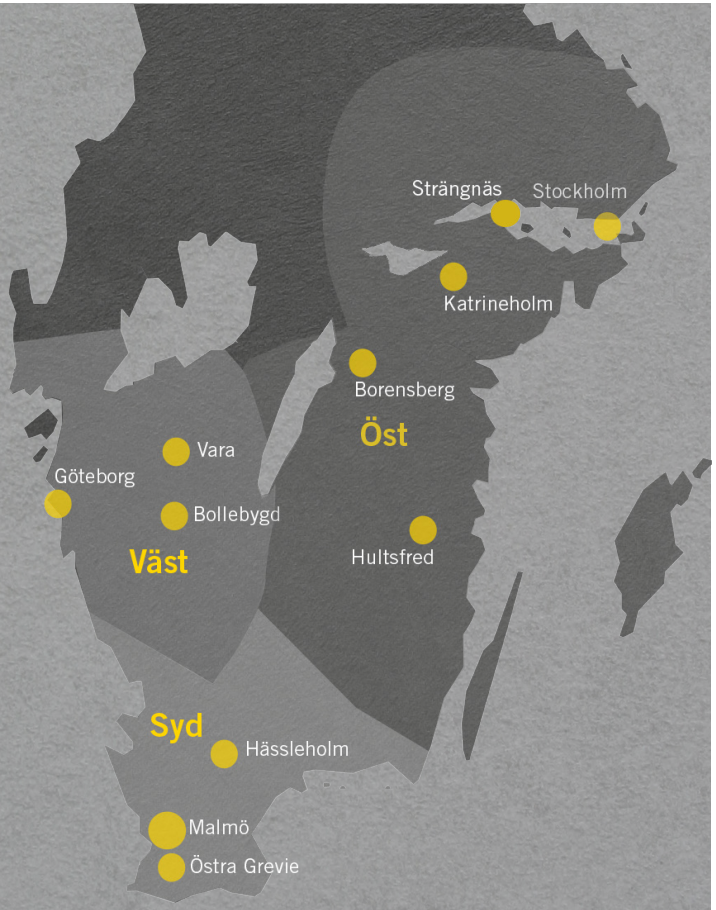
Owner of the EPD: K-Prefab AB,
phone +46 10 455 22 00, info@kprefab.se
K-Prefab AB, Hyllie Stationstorg 13, 215 32 Malmö
The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Description of the organization: K-Prefab offers a wide range of precast concrete products used in various buildings and infrastructure projects on the Swedish market.

Product-related or management system-related certifications: K-Prefab has 14001-certificate.

Name and location of production site: Precast concrete products are manufactured at production sites in Östra Grevie, Hässleholm, Hultsfred, Bollebygd, Vara, Borensberg, Strängnäs and Katrineholm.

About the company
K-Prefab AB offers a wide range of precast concrete products used in various buildings and infrastructure projects on the Swedish market. K-Prefab AB develops and builds homes, schools, offices, industrial- and agricultural buildings with our different concepts and products. K-Prefab can now offer their customers climate positive concrete frames by first of all reducing our own carbon footprint and also by offsetting carbon emissions.

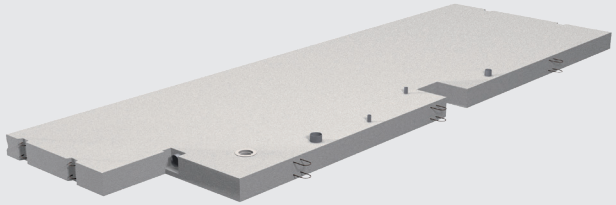


K-Prefab is working with it's clients in all parts of the process – from the early project planning to assembly on site – K-Prefab can help create solutions that are more cost efficient and better for the environment, e.g. by minimizing transmissions through the structure.

As part of the K-Fast group, K-Prefab has the environment high on the agenda. K-Prefab's construction sites are located nearby the largest cities in Sweden. By producing locally, K-Prefab can reduce the environmental impact from transportation. Another important part of our environmental strategy is that K-Prefab production sites are gradually converting to fossil free fuels. We are constantly working to reduce our carbon dioxide emissions and thus our carbon footprint. Our climate target is to reduce carbon footprint with
50% in 3 years.

Product information

Product name: Solid precast concrete, pre-stressed, slab



Product description: The solid precast concrete, pre-stressed, slab has many advantages. The built in tension of high-strength multi wire strands in combination with the thickness of the slab leave room for plumbing as well as creating a sturdy construction without the need of post shores. This allows for a shorter construction time as well as a safer work environment.

The solid pre-stressed slabs come in lengths up to 10 meters and widths up to 3,2 meters. If the customer wish, the products can be supplemented with conduits for electrical wires or plumbing. This, however, is not included in the EPD. All products are manufactured indoors, which ensures a high and even quality throughout the year. Since each product is custom made new drawings are made before the production process starts. The products are optimized for each project. In this phase of the project, the customer has the opportunity to make choices that affects the entire lifecycle of the building, e.g. reference service life, product dimension etc.

Raw materials are purchased and transported to the factory. The raw material that has the biggest impact on the climate is the production of cement. During the production, in the cement factory, a process called calcination is taking place. During the calcination, CO_2 is released from the limestone. The finished concrete, however, can retrieve some of this CO_2 during its lifetime. Up to 1/5 of the CO_2, which is released during the cement production, can be retrieved by the concrete. This is an important fact to consider when making a life cycle analysis for an entire building. It has not been considered in this EPD since it does not include the end of life perspective.

In the factory, a mold is prepared. It can be made of different types of materials such as steel or wood. This includes making the holes and openings that are needed for e.g. installations and windows. The reinforcement steel is prepared according to drawing. This means choosing the right quality and dimensions, bending, cutting to correct lengths and binding it together. If the customer wish to include other installations in the product such as conduits or plumbing it is also prepared at this stage of the production. The concrete is made from aggregate, water, cement and admixtures. It is all mixed in a large concrete mixer. There are different formulas used for different products in order to meet the different needs.

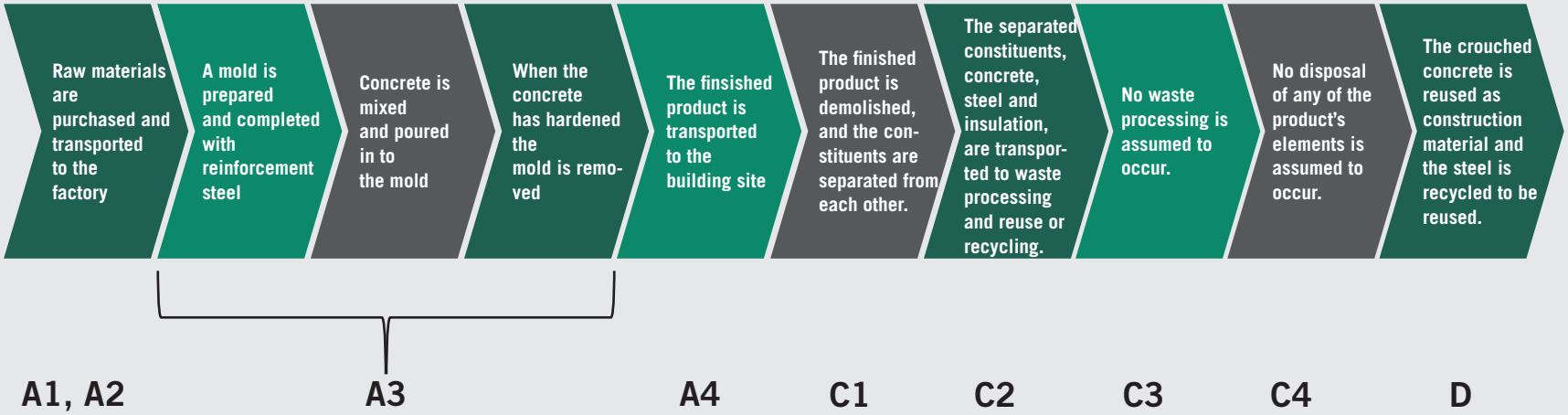
After the concrete is poured in to the mold, there is usually a need to vibrate in order to make sure that the concrete fills out the mold and surrounds the reinforcement steel appropriately. Finally, the surface of the product is treated to ensure the correct quality. The product is then covered and left over night to harden. When the mold is removed, the product is inspected to make sure it meets the standards.

Additional information and technical data for the product can be found at the website:
www.kprefab.se/produkt/forspanda-massivbjalklag/ www.kprefab.se/certifikat-dokument/

Geographical scope (Sweden): Solid precast concrete, pre-stressed, slabs are manufactured at our production sites in Hässleholm, Bollebygd, Strängnäs and Katrineholm. All sites are located in Sweden.

LCA information

Declared unit: 1 tonne of solid precast concrete, pre-stressed, slab
Reference service life: Normally 50-100 years and depending on customer requirements[1].
Time representativeness: Data is representative for production year 2021. For materials, energy and transports generic industry data from Ecoinvent has been used. Assessment time for background data is 2010-21.
Database and LCA software used: Ecoinvent 3.8 och SimaPro 9.2
System diagram: This is a cradle to gate EPD with options. The following life cycle stages are included:



See also table below for modules not declared

Life cycle environmental information of								Other environmental information
	Product stage			Construction process stage		Use stage	End of life stage	Reuse recovery stage
Module	A1	A2	A3	A4	A5	B1-B7	C1-C4	D
Modules declared	X	X	X	X	MND	MND	X	X
Geography	EU/SE/G/LO	EU	SE	EU	MND	-	-	
Specific data used	80%					-	-	-
Variation – products	within +/- 10 % compared to the given average					-	-	-

(Description of the system boundary (X = included in LCA; MND = Module Not Declared)

*1 https://www.svenskbetong.se/bygga-med-betong/bygga-med-prefab/miljo-och-hallbarhet/livslangd-for-byggnader

Description of system boundaries:

A1: Extraction and processing of raw materials and generation of electricity and heat from primary energy resources

A2: Transports from suppliers to K-Prefab production sites

A3: Manufacturing of the product at K-Prefab production sites

A4: Transports from K-Prefab production sites to customer. Transport distance to customer has been calculated as a mean value of the outgoing transports from K-prefabs production sites during 2021. The transportation distance is assumed as 151 km roadway with a lorry >32t. Capacity utilisation (included empty returns) has been assumed to 50 %.

C1: The products are demolished, and the constituents are separated from each other.

C2: Transportation for concrete, steel and insulation to waste processing and reuse or recycling.

C3: No waste processing is assumed to occur.

C4: No disposal of any of the product's elements is assumed to occur.

D: Reuse of the crushed concrete as construction material as a replacement of filling material (gravel) and material recycling of steel as a replacement of steel production.

Estimates and assumptions: Heat, electricity use and other energy use as well as waste in production are calculated as a weight average per produced tonne of all products using yearly production data and rate for 2021 for all production locations. Allocation is based on weight. No assumptions made.

There are variation in the mix of materials (cement, reinforcement, gravel etc.) in the concrete products. Material percentages in the table below are averages. However, the variation in material composition for different mixes and the related environmental impact is within +/- 10% compared to the given average in this EPD.

Cut off criteria: All major materials, production energy use and waste are included. Materials less than 1% weight in the concrete product are not taken into account.

Data quality: The data quality can be described as fair for waste estimations and good for other data. The primary data collection has been done thoroughly, all relevant flows are considered.

Content declaration

Product

Weight % per tonne of precast concrete product	Reinforcement	Wire	Cement	Aggregate	Water	Ground granulate
Solid precast concrete, pre-stressed, slab	0,5%	0,5%	18%	72%	7%	2%

There are no SVHC substances according to REACH in the product or in the waste.

Packaging

Distribution packaging: No packaging is used for distribution

Consumer packaging: No consumer packaging is used

End-of-life stage and reuse recovery stage

In the end-of-life stage all the products are assumed to be demolished and the input materials are separated from each other. After the separation 100% of the material are recycled, no deposition is assumed. It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed to have the same weight as the declared product.

End-of life scenarios for input material:

Steel – recycled and included in new steel production.

Concrete – is crushed and can be used as a raw material for road gravel.

Average transport distance for steel to waste processing is assumed to be 50 km. Average transport for concrete to the nearest construction site, where the concrete is reused, is assumed to be 20 km.

The recycled steel and reuse of concrete have been modelled to avoid use of primary materials. The scrap content in the studied steel product has been acknowledged and only the mass of primary steel in the product provides the benefit in order to avoid double counting.

Environmental performance per tonne product

Potential environmental impact

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	C1	C2	C3	C4	D
Climate change - Fossil	kg CO_2 eq	1,33E+02	4,69E+00	3,90E+00	1,42E+02	1,31E+01	3,98E+00	1,76E+00	0,00E+00	0,00E+00	-5,82E+00
Climate change - Biogenic	kg CO_2 eq	-8,85E+00	2,89E-03	1,32E-01	-8,72E+00	1,33E-02	1,40E-03	1,79E-03	0,00E+00	0,00E+00	-1,14E-02
Climate change - Land use and LU change	kg CO_2 eq	3,82E-02	1,14E-03	1,50E-03	4,08E-02	4,92E-03	3,97E-04	6,61E-04	0,00E+00	0,00E+00	-1,81E-03
Climate change - total	kg CO_2 eq	1,24E+02	4,70E+00	4,05E+00	1,33E+02	1,31E+01	3,98E+00	1,77E+00	0,00E+00	0,00E+00	-5,83E+00
Ozone depletion	kg CFC11 eq	3,52E-06	7,62E-07	8,82E-07	5,16E-06	3,27E-06	8,50E-07	4,40E-07	0,00E+00	0,00E+00	-7,87E-07
Acidification	mol H+ eq	2,80E-01	3,07E-02	1,24E-02	3,23E-01	4,18E-02	4,13E-02	5,62E-03	0,00E+00	0,00E+00	-6,44E-02
Eutrophication, freshwater	kg P eq	1,00E-02	1,99E-04	7,88E-05	1,03E-02	8,53E-04	1,23E-04	1,15E-04	0,00E+00	0,00E+00	4,89E-04
Eutrophication, marine	kg N eq	3,56E-02	1,19E-02	2,33E-03	4,98E-02	9,36E-03	1,83E-02	1,26E-03	0,00E+00	0,00E+00	-2,13E-02
Eutrophication, terrestrial	mol N eq	9,77E-01	1,30E-01	2,60E-02	1,13E+00	1,02E-01	2,01E-01	1,37E-02	0,00E+00	0,00E+00	-2,91E-01
Photochemical ozone formation	kg NMVOC eq	2,50E-01	3,66E-02	8,14E-03	2,95E-01	4,03E-02	5,52E-02	5,41E-03	0,00E+00	0,00E+00	-6,38E-02
Resource use, minerals and metals*	kg Sb eq	1,17E-04	7,35E-06	4,63E-06	1,29E-04	3,14E-05	2,05E-06	4,22E-06	0,00E+00	0,00E+00	1,08E-05
Resource use, fossils*	MJ	4,74E+02	7,02E+01	5,38E+01	5,98E+02	2,14E+02	5,46E+01	2,87E+01	0,00E+00	0,00E+00	-7,36E+01
Water deprivation potential*	m3 depriv.	1,15E+01	1,76E-01	3,61E-02	1,17E+01	7,35E-01	8,54E-02	9,87E-02	0,00E+00	0,00E+00	-2,81E+00

* The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq	1,33E+02	4,69E+00	3,90E+00	1,42E+02	1,31E+01	3,98E+00	1,76E+00	0,00E+00	0,00E+00	-5,82E+00

The values for the impact category GWP-GHG were not available since the input data for raw materials did not have any available data to calculate the GWG-GHG according to EN 15804+A1. Thereby the values for GWP-GHG have been approximated with the values from the impact category Climate change – Fossil according to EN 15804:2012+A2:2019. The impact category is assumed to be comparable since there is no biogenic material in the products.

Use of resources

PARAMETER		UNIT	A1	A2	A3	TOTAL A1-A3	A4	C1	C2	C3	C4	D
Primary energy resources – Renewable	PERE	MJ, net calorific value	2,12E+02	6,54E-01	1,35E+01	2,27E+02	2,72E+00	3,07E-01	3,65E-01	0,00E+00	0,00E+00	-2,35E-01
	PERM	MJ, net calorific value	1,02E-01	0,00E+00	0,00E+00	1,02E-01	0,00E+00	0,00E+00	0,00E+00	-5,92E-02	0,00E+00	0,00E+00
	PERT	MJ, net calorific value	2,13E+02	6,54E-01	1,35E+01	2,27E+02	2,72E+00	3,07E-01	3,65E-01	-5,92E-02	0,00E+00	-2,35E-01
Primary energy resources – Non-renewable	PENRE	MJ, net calorific value	5,06E+02	7,46E+01	5,72E+01	6,37E+02	2,27E+02	5,80E+01	3,05E+01	0,00E+00	0,00E+00	-7,81E+01
	PENRM	MJ, net calorific value	1,30E-02	0,00E+00	0,00E+00	1,30E-02	0,00E+00	0,00E+00	0,00E+00	-7,50E-03	0,00E+00	0,00E+00
	PENRT	MJ, net calorific value	5,06E+02	7,46E+01	5,72E+01	6,37E+02	2,27E+02	5,80E+01	3,05E+01	-7,50E-03	0,00E+00	-7,81E+01
SM = Use of secondary material		kg	3,15E+01	0,00E+00	0,00E+00	3,15E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF = Use of renewable secondary fuels		MJ, net calorific value	9,48E+01	0,00E+00	0,00E+00	9,48E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF = Use of non-renewable secondary fuels		MJ, net calorific value	1,60E+02	0,00E+00	0,00E+00	1,60E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW = Use of net fresh water		m^3	1,10E+02	3,96E-01	3,08E-01	1,11E+02	1,61E+00	1,90E-01	2,16E-01	0,00E+00	0,00E+00	-4,07E-01

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials. PERM = Use of renewable primary energy resources used as raw materials. PERT= Total use of renewable primary energy resources. PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials. PENRM = Use of non-renewable primary energy resources used as raw materials. PENRT = Total use of non-renewable primary energy re-sources. SM = Use of secondary material. RSF = Use of renewable secondary fuels. NRSF = Use of non-renewable secondary fuels. FW = Use of net fresh water.

Waste production and output flows per tonne product

Waste production

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2,52E-02	0,00E+00	0,00E+00	2,52E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-hazardous waste disposed	kg	5,54E+02	0,00E+00	0,00E+00	5,54E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Radioactive waste disposed	kg	1,51E-03	0,00E+00	0,00E+00	1,51E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Output flows

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3	A4	C1	C2	C3	C4	D
Components for re-use	kg	2,84E-05	0,00E+00	0,00E+00	2,84E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	1,58E+00	0,00E+00	3,66E+00	5,23E+00	0,00E+00	0,00E+00	0,00E+00	1,00E+03	0,00E+00	0,00E+00
Materials for energy recovery	kg	9,53E-03	0,00E+00	3,86E+00	3,87E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Interpretation of LCA results

Environmental impact for 1 tonne of precast product is mainly caused by extraction and processing of cement and iron reinforcement used in the product (calculated in module A1). Impact in A1 is further increased by product waste mainly in the form of reinforcement and wood from molds to create cast products. Impact from other waste in the process is insignificant.

Approximately 90% of the greenhouse warming potential for module A comes from raw materials in the product (A1). This is based on the results for the impact category climate change – total. For impact factor acidification potential, the raw material accounts for more than 85% of the total. For the impact factors for eutrophication potential: freshwater, marine and terrestrial, the raw material accounts within the interval of 72% - 97% of the total.

Impact for extraction of fuel oil and generation of electricity are also calculated in module A1. The electricity is modelled as hydro power and the certificate for obtaining 100% of hydro powered electricity. Sea and land transport is used to ship materials from suppliers to K-Prefab production sites. Environmental impact from these transports is calculated in module A2 and is less than 5% in relation to impact in module A1 for the impact category climate change – total.

In module A3, environmental impact from energy use is calculated. Impact is mainly coming from use of fuel oil the manufacturing process. Almost 2,5% of the total greenhouse warming potential comes from fuel oil used in the process for A1+A2+A3+A4 together. For the impact factor acidification, fuel oil in the process accounts for 2,8% of the total potential for A1+A2+A3+A4 together, and for the eutrophication impact factors the fuel oil accounts for approximately 1%.

Programme-related information and verification

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

Programme:	The International EPD® System www.environdec.com info@environdec.com	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
EPD registration number:	S-P-01455 Precast Concrete pre-stressed Slab	
Published:	2018-12-19	
Revised:	2022-05-10 Version 2	
Revision update:		
Valid until:	2027-05-10	
Product Category Rules:	PCR 2019:14 Construction products (1.11)	
Product group classification:	UN CPC 37550	
Reference year for data:	2021	
Geographical scope:	Sweden	

CEN standard EN 15804 +A2 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2012:01 Construction products and construction services. v2.31 (UN CPC 37550)
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Martin Erlandsson, IVL Svenska Miljöinstitutet Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No

References

General Programme Instructions of the International EPD® System. Version 3.0.

PCR 2019:14 Construction products v1.11
c-PCR-003 Concrete and concrete elements

EN 15804:2010-08 Sustainability of construction works
- Environmental Product Declarations
- Core rules for the product category of construction products

Ecoinvent 3.8 database, http://www.ecoinvent.org/

LCA software SimaPro Analyst 9.2

Contact information:

EPD owner:	K-PREFAB K-Prefab AB, Hyllie Stationstorg 13, 215 32 Malmö, kprefab.se Phone +46 10 455 22 00, info@kprefab.se
LCA author:	WSP Sverige AB, www.wsp.com Sandra Franz, sandra.franz@wsp.com +46 721 43 84 94
Programme operator:	EPD® EPD International AB info@environdec.com

Go to kprefab.se to find additional information about K-Prefab.

K-Prefab AB, Hyllie Stationstorg 13, SE-215 32 Malmö, Tel +46(0)10-455 22 00, kprefab.se

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May 2022