# Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

## SOLID PRECAST CONCRETE PRODUCT (E.G. WALL, SLAB)

from
**K-Prefab AB**
**Programme:** The International EPD® System · www.environdec.com
**Programme operator:** EPD International AB
**EPD registration number:** S-P-01454 Solid Precast Concrete Product
**Publication date:** 2018-12-19
**Revision date:** 2024-08-21
**Validity date:** 2029-08-21
**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.

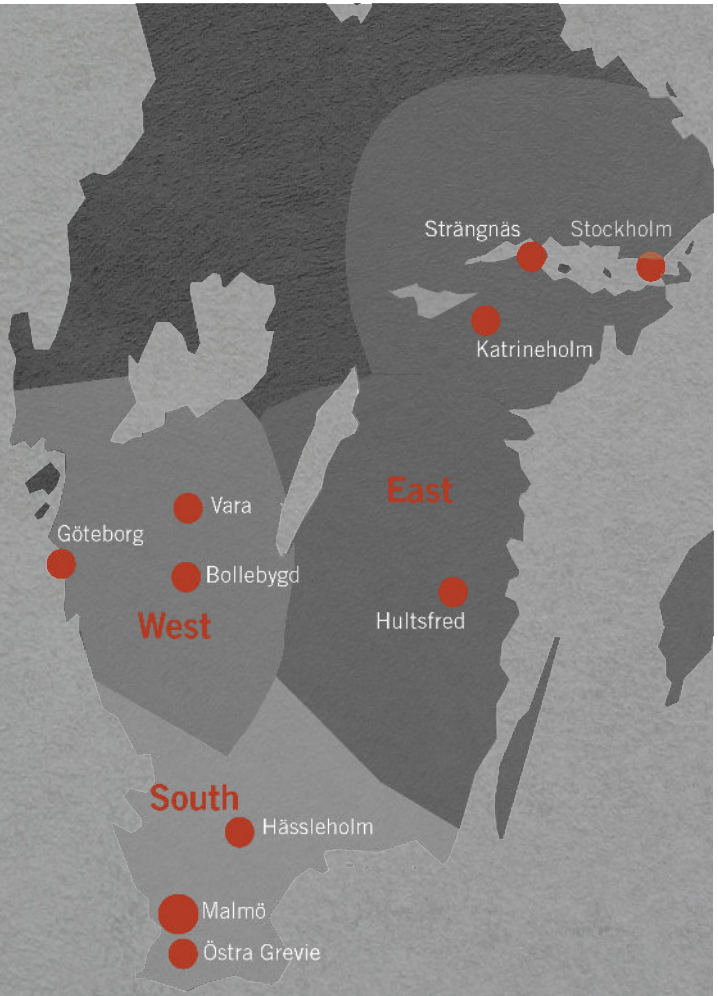
**Description of the organization:** K-Prefab offers a wide range of precast concrete products used in various buildings and infrastructure projects on the Swedish market.

**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, 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. Sustainability and climate are strategic priorities for K-Prefab. K-Prefab's frame system is at the forefront of climate-improved concrete.

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.

# Product information

**Product name:** Solid precast concrete product, e.g. wall, slab, retaining wall

**Product description:** Solid precast concrete products come in many different varieties, most of which are custom made for each project. 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.

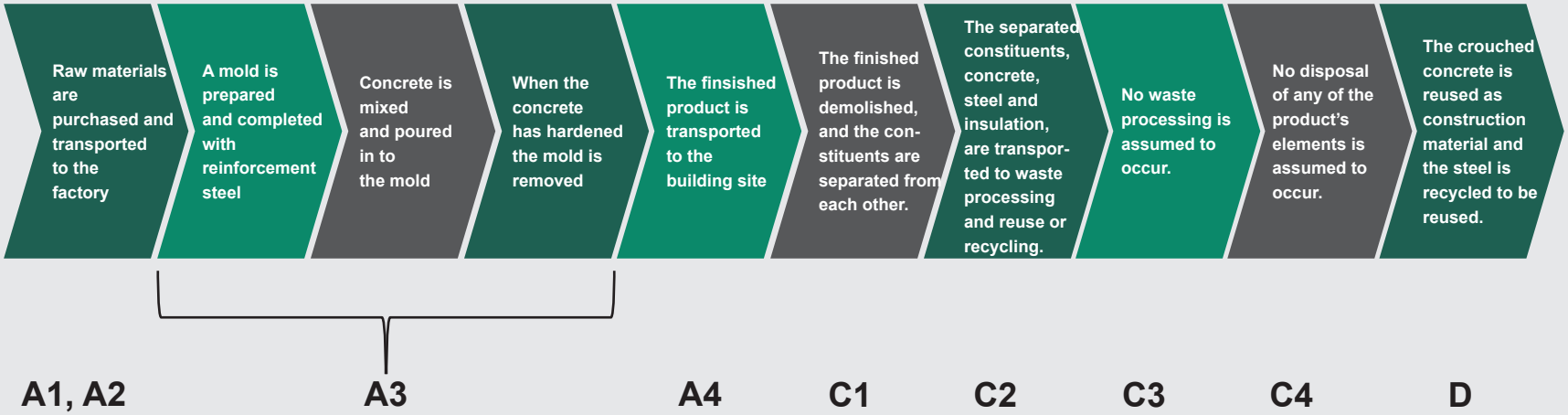
The reinforcement steel is prepared according to drawing. This means choosing the right quality and dimensions, bending, cutting to correct lengths and binding it together. If the customer wish to include other installations in the product such as conduits or plumbing it is also prepared at this stage 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. If the customer wish the products could, at this stage, be supplemented with windows and paint before being delivered to the building site.

**Additional information and technical data for the product can be found at the website:**
www.kprefab.se/produkt/massivt-vaggelement/
www.kprefab.se/om-oss/hallbarhet/certifikat-bedomningar/

**Geographical scope (Sweden):** Solid precast concrete products are manufactured at our production sites in Östra Grevie, Hässleholm, Hultsfred, Bollebygd, Vara, Strängnäs and Katrineholm. All sites located in Sweden.

# LCA information

**Declared unit:** 1 tonne of precast concrete product
**Reference service life:** Normally 50-100 years and depending on customer requirements[1].
**Time representativeness:** Reference year for calculations is 2023. Production data is collected from environmental reports from the various production sites. Assessment period for background data is taken from Ecoinvent 3.8 and is compiled in 2024.
**Database and LCA software used:** Ecoinvent 3.8 och SimaPro 9.3.0.3, EN 15804 reference package EF 3.0.
**System diagram:** This is a cradle to gate EPD with options. The following life cycle stages are included:




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

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 | 56% | | | | | - | - | - |
| Variation – products | - | | | | | - | - | - |

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

**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 2023. The transportation distance is assumed as 133 km roadway with Transport, freight, lorry >32 metric ton, euro6 {RER}| market for transport, freight, lorry >32 metric ton, EURO6 | Cut-off, S. 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 asa 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.

**Electricity:** The electricity mix has been moduled as 100% hydropower, with a Guarantee of origin from the supplier of the electricity. Should K-Prefab change from hydropower to the Swedish residual mix, it would lead to their emissions of carbon dioxide increasing from 0,09 kg $CO_2$ eq per kWh to 0,98 kg $CO_2$ eq per kWh, an increase of 989%.

# Content information

## Product

| Product components | Weight, kg | Post-consumer material, weight-% | Biogenic material, weight-% and kg C/kg |
|---|---|---|---|
| Reinforcement | 20 | 0 | 0 |
| Cement | 150 | 0 | 0 |
| Aggregate | 740 | 0 | 0 |
| Water | 80 | 0 | 0 |
| Ground granulate | 10 | 0 | 0 |
| Total | 1000 | 0 | 0 |
| **Packaging materials** | **Weight, kg** | **Weight-% (versus the product)** | **Weight biogenic carbon, kg C/kg** |
| No packaging | | | |
| Total | | | |

No materials contain dangerous substances (SVHC), as defined by the European Chemical Agency, that account for more than 0,1 % of the product weight. The packaging contains biogenic carbon but is less than 5 % of the total product weight and is therefore not disclosed, in accordance with EN 15084:2012+A2:2019.

# Packaging

**Distribution packaging:** No packaging is used for distribution
**Consumer packaging:** No consumer packaging is used

# End-of-life stage and reuse recovery stage

| End-of-life (C1-C4) | Unit (per declared unit) | Weight of distance |
|---|---|---|
| Collection process specified by type | kg collected separately | 1000 |
| | kg collected with mixed construction waste | 0 |
| Recovery system specified by type | kg for reuse | 0 |
| | kg for recycling | 1000 |
| | kg for energy recovery | 0 |
| Disposal specified by type | kg product or material for final deposition | 0 |
| Assumptions for scenario development, e.g. transportation | km (truck, EURO 6, load factor: 0,5) | 20[1] |
| | | 50[2] |

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.

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

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

| PARAMETER | UNIT | TOTAL A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Climate change - Fossil | kg $CO_2$ eq | 1,27E+02 | 1,16E+01 | 4,00E+00 | 1,79E+00 | 0,00E+00 | 1,75E+00 | -5,05E+00 |
| Climate change - Biogenic | kg $CO_2$ eq | 1,24E+00 | 1,17E-02 | 1,41E-03 | 1,81E-03 | 0,00E+00 | 5,55E-03 | 1,62E-01 |
| Climate change - Land use and LU change | kg $CO_2$ eq | 4,94E-02 | 4,34E-03 | 3,99E-04 | 6,71E-04 | 0,00E+00 | 8,30E-04 | -2,91E-03 |
| Climate change - total | kg $CO_2$ eq | 1,28E+02 | 1,16E+01 | 4,00E+00 | 1,79E+00 | 0,00E+00 | 1,75E+00 | -5,24E+00 |
| Ozone depletion | kg CFC11 eq | 4,15E-06 | 2,88E-06 | 8,55E-07 | 4,46E-07 | 0,00E+00 | 3,16E-07 | -8,76E-07 |
| Acidification | mol H+ eq | 3,08E-01 | 3,69E-02 | 4,15E-02 | 5,70E-03 | 0,00E+00 | 2,14E-02 | -6,39E-02 |
| Eutrophication, freshwater | kg P eq | 9,68E-03 | 7,52E-04 | 1,24E-04 | 1,16E-04 | 0,00E+00 | 2,67E-05 | -7,27E-04 |
| Eutrophication, marine | kg N eq | 4,14E-02 | 8,25E-03 | 1,84E-02 | 1,28E-03 | 0,00E+00 | 9,75E-03 | -2,12E-02 |
| Eutrophication, terrestrial | mol N eq | 4,52E-01 | 9,01E-02 | 2,02E-01 | 1,39E-02 | 0,00E+00 | 6,71E-02 | -2,86E-01 |
| Photochemical ozone formation | kg NMVOC eq | 3,00E-01 | 3,55E-02 | 5,55E-02 | 5,49E-03 | 0,00E+00 | 2,62E-02 | -6,62E-02 |
| Resource use, minerals and metals*2,3 | kg Sb eq | 1,35E-04 | 2,77E-05 | 2,06E-06 | 4,28E-06 | 0,00E+00 | 1,01E-05 | -2,21E-05 |
| Resource use, fossils*2 | MJ | 6,31E+02 | 1,88E+02 | 5,49E+01 | 2,91E+01 | 0,00E+00 | 2,40E+01 | -6,65E+01 |
| Water deprivation potential*2 | m3 depriv. | 7,94E+00 | 6,47E-01 | 8,58E-02 | 1,00E-01 | 0,00E+00 | 2,08E-01 | -3,61E+00 |

* The use of the results of modules A1-A3 without considering the results of module C is discouraged.
*2 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.
*3 The results of the impact categories abiotic depletion of minerals and metals, may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

| PARAMETER | UNIT | TOTAL A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| GWP-GHG* | kg $CO_2$ eq | 1,27E+02 | 1,16E+01 | 4,00E+00 | 1,79E+00 | 0,00E+00 | 1,75E+00 | -5,05E+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.

* The indicator GWP-GHG includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013

## Use of resources**

| PARAMETER | | UNIT | TOTAL A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|
| Primary energy resources – Renewable | PERE - Use as energy carrier | MJ, net calorific value | 4,30E+02 | 2,00E+02 | 3,07E-01 | 3,65E-01 | 0,00E+00 | 0,00E+00 | -2,61E+00 |
| | PERM - Used as raw materials | MJ, net calorific value | 2,81E-01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PERT - TOTAL | MJ, net calorific value | 4,08E+02 | 2,00E+02 | 3,07E-01 | 3,65E-01 | 0,00E+00 | 0,00E+00 | -2,61E+00 |
| Primary energy resources – Non-renewable | PENRE - Use as energy carrier | MJ, net calorific value | 7,06E+02 | 2,39E+00 | 5,83E+01 | 3,09E+01 | 0,00E+00 | 0,00E+00 | -7,54E+01 |
| | PENRM - Used as raw materials | MJ, net calorific value | 3,57E-02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| | PENRT - TOTAL | MJ, net calorific value | 7,06E+02 | 2,39E+00 | 5,83E+01 | 3,09E+01 | 0,00E+00 | 0,00E+00 | -7,54E+01 |
| SM - Secondary material | | kg | 3,97E+01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| RSF - Renewable secondary fuels | | MJ, net calorific value | 7,02E+01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| NRSF - Non-renewable secondary fuels | | MJ, net calorific value | 1,43E+02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| FW - Net use of fresh water | | $m^3$ | 8,92E+00 | 6,51E-01 | 8,91E-02 | 1,01E-01 | 0,00E+00 | 0,00E+00 | -3,69E+00 |

** The energy carriers have been calculated according to alternative A in the PCR version 1.3.3.
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 | TOTAL A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Hazardous waste disposed | kg | 0,00E-00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Non-hazardous waste disposed | kg | 9,58E-02 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Radioactive waste disposed | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

## Output flows

| PARAMETER | UNIT | TOTAL A1-A3 | A4 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|
| Components for reuse | kg | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Material for recycling | kg | 5,44E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 1,00E+03 | 0,00E+00 | 0,00E+00 |
| Materials for energy recovery | kg | 0,00E+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 |
| Exported energy, thermal | MJ | 4,21E+01 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

The additional impact categories particulate matter, ionising radiation, ecotoxicity – freshwater, human toxicity – cancer and non-cancer and land use is not declared in this EPD.

# Interpretation and differences versus previous versions

Environmental impact for 1 tonne of precast product is mainly caused by extraction and processing of cement and iron reinforcement used in the products (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 85-90 % of the greenhouse warming potential for module A stem from raw the materials used 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 60-70 % of the total. For the impact factors for eutrophication potential: freshwater, the raw material accounts for approximately 60-70 % of the total.

Impact for extraction of fuel oil and generation of electricity are also calculated in module A1.  The electricity is modelled as 100 % hydro power.

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 % for the impact category Climate change – total.

In module A3, environmental impact from energy use is calculated. Impact is mainly stemming from use of fuel oil and pellets in the manufacturing process.

The main difference between this EPD and the previous from 2022 is that emissions for GWP – fossil has increased for A1-A3 from 126 kg $CO_2$ eq/tonne of solid pre-cast product to 127 kg $CO_2$ eq/tonne of solid precast product, a 0,79 % increase in emissions. The reason for the increase is because the cement mixtures that is used have been updated, resulting in a small change in transport distances and emissions. Finally, there is a change in what categories of waste from production that has been reported. The category waste for disposal has been added and furthering adding to the increase.

# 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<br><br>www.environdec.com<br>info@environdec.com | EPD International AB<br>Box 210 60<br>SE-100 31 Stockholm<br>Sweden |
| EPD registration number: | S-P-01454 | |
| Published: | 2018-12-19 | |
| Revised: | 2024-08-21 Version 3 | |
| Valid until: | 2029-08-21 | |
| Product Category Rules: | PCR 2019:14 Construction products (1.3.3)<br>c-PCR-003 Concrete and concrete elements | |
| Product group classification: | UN CPC 37550 | |
| Reference year for data: | 2023 | |
| 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:<br>PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.<br><br>☐ EPD process certification ☒ EPD verification |
| Third party verifier: Marcus Wendin, Miljögiraff<br><br>Approved by: The International EPD® System |
| Procedure for follow-up of data during EPD validity involves third party verifier:<br><br>☒ Yes ☐ No |

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

# References

## General Programme Instructions of the International EPD® System. Version 4.0.

PCR 2019:14 Construction products (1.3.3)
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

LCA Report Precast concrete products from K-Prefab, 2024. WSP Sverige AB.
Ecoinvent 3.8 database, http://econivent.org/
LCA software SimaPro Analys 9.3.0.3

## Contact information:

| | |
|---|---|
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| Programme operator: | EPD International AB<br>info@environdec.com |

Aug 2024

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

K - P R E F A B

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