



Precast concrete products

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804:2012+A1:2013 for:
Kvarnbäckens betongfabrik AB, Myravägen 85, 434 98 Kungsbacka, Sweden


| | |
|--------------------------|---|
| Programme: | The International EPD® System, www.environdec.com |
| Programme operator: | EPD International AB |
| EPD registration number: | S-P-05209 |
| Publication date: | 2022-02-16 |
| Valid until: | 2027-02-16 |

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

| | |
|-------------------|---|
| Programme: | The International EPD® System |
| Address: | EPD International AB Box 210 60 SE-100 31 Stockholm Sweden |
| Website: | www.environdec.com |
| E-mail: | info@environdec.com |

| |
|---|
| CEN standard EN 15804 serves as the Core Product Category Rules (PCR) |
| <p>Product category rules (PCR):</p> <p>PCR 2012:01. Construction products and construction services. Version 2.3, the International EPD System, Date 2018-11-15</p> <p>Sub-PCR to PCR 2012:01 Concrete and concrete elements (EN 16757:2017), PCR 2012:01-SUB-PCR-G, the International EPD System, Date 2018-11-22</p> |
| PCR review was conducted by: <i>The Technical Committee of the International EPD® System. Chair: Claudia A. Peña. Contact via info@environdec.com</i> |
| <p>Independent third-party verification of the declaration and data, according to ISO 14025:2006:</p> <p><input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification</p> |
| <p>Third party verifier:</p> <p>Martyna Mikusinska, Sweco Environment AB, Martyna.Mikusinska@sweco.se, +46 (0)19-168178</p> <p>Approved by: The International EPD® System</p> |
| <p>Procedure for follow-up of data during EPD validity involves third party verifier:</p> <p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> |
| <p>LCA practitioner: Viktor Hakkarainen, Miljögiraff AB</p>  |

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:

Kvarnbäckens Betongfabrik AB

Contact:

Andreas Thorelund

Email: andreas@thorelundconsulting.se

Phone: +46 736-25 99 17

Description:

Kvarnbäckens Betongfabrik AB is a concrete product manufacturer located in Kungsbacka, Sweden. Kvarnbäcken manufactures many kinds of different concrete products from pre-cast elements to fresh concrete. We are an experienced and ambitious concrete company that will make your construction dreams come true. Whether it's a house, a barn, a silo or a sports center - We are the right choice for you!

Product information

Product family:

Concrete

Product description:

Concrete is a composite material composed of fine and coarse aggregate bonded together with a fluid cement (cement paste) that hardens (cures) over time. Steel reinforcement is added before curing to increase the stress tolerance of the product. Due to the large variety of products that require different amount of cement and reinforcement, a “best-average-worst case” range is presented in the results table.

Product category & UN CPC code:

Concrete and concrete elements for building and civil engineering.

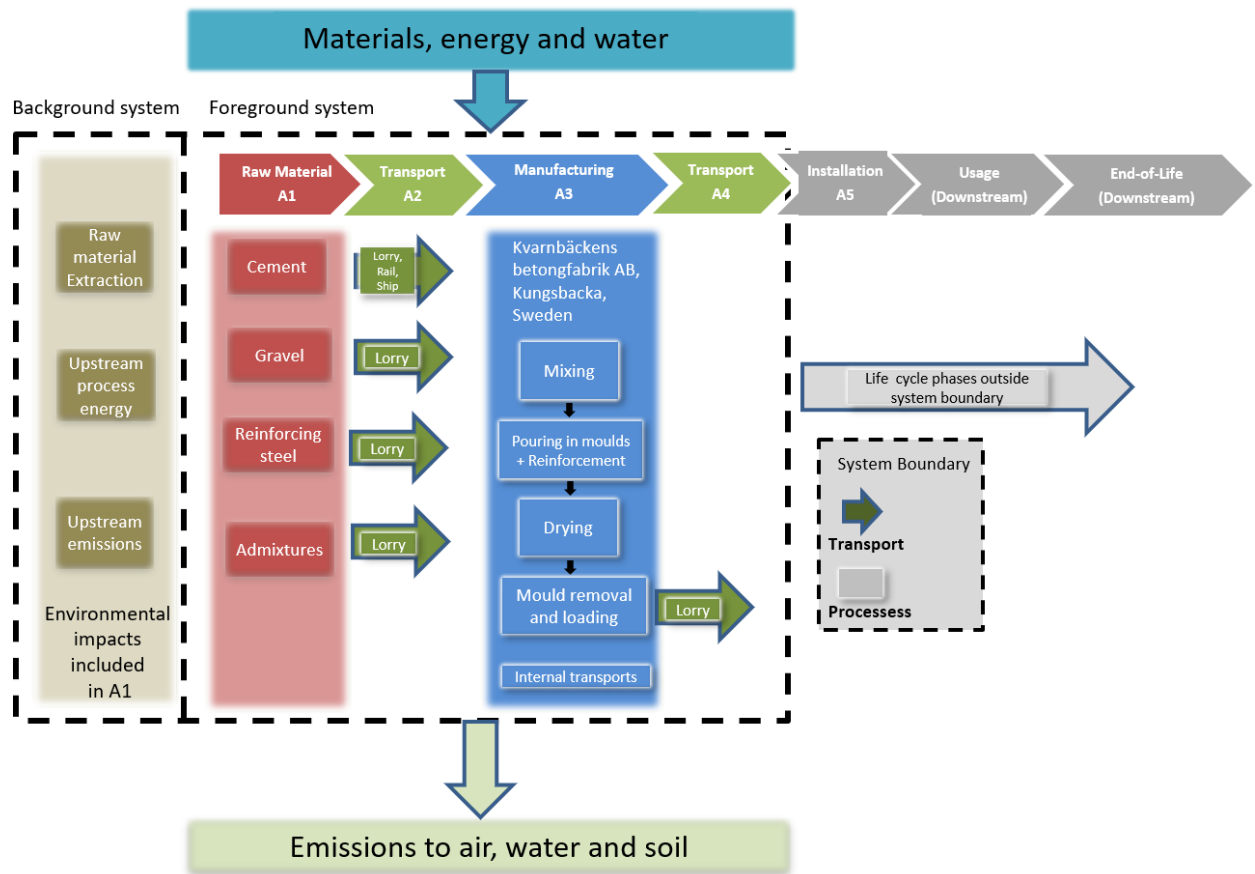
37550 – Articles of concrete, cement and plaster

LCA information

| | |
|-------------------------------------|---|
| Declared Unit | One ton of concrete product |
| Reference Service Life (RSL) | Not specified |
| Product group classification | UN CPC |
| Goal | The result will be used to understand the environmental impact of the product up until factory gate with delivery. This will be useful during product development to reduce this impact and to our customer during the decision process of selecting concrete. The result will be published by the International EPD system. The audience are construction companies and infrastructure developers. |
| Scope | Cradle to gate with delivery |
| Time | Data represent the year 2020 |
| Manufacturing Sites | Myravägen 85, 434 98 Kungsbacka, Sweden |
| Geographical Area | Sweden |
| Compliant with | This EPD follows the “Book-keeping” LCA approach which is defined as an attributional LCA in the ISO 14040 standard. ISO 14025 EN 15804:2012+A1:2013 |

| | |
|--------------------------------|---|
| | EN 16757:2017 |
| Cut-Off Rules | <p>The procedure below is followed for the exclusion of inputs and outputs according to the EN 15804:2012+ A1:2013 standard:</p> <p>Packaging of incoming materials is not modelled due to being below cut-off</p> <p>Capital goods are not included (Machines and facilities) as per PCR specifications</p> |
| Assumptions | <p>Road transports are assumed to be carried out by EURO 5 standard vehicles</p> <p>Distance assumption in module A4 is based on customers of Kvarnbäcken commonly being located in the Gothenburg region.</p> |
| Allocation | <p>Polluter Pays / Allocation by Classification</p> <p>Two allocation rules are applied:</p> <p>1) the raw material necessary for the manufacture is allocated by mass of the declared unit.</p> <p>2) the energy necessary for the manufacturing is allocated in MJ by total production mass during the period Jan 1st 2020 – Dec 31 2020.</p> |
| Background Data | The background data from ecoinvent 3.7 are from 2016-2020. |
| Electricity data | Electricity consumption in the A3 module is average Swedish medium voltage market mix |
| LCA software | SimaPro 9.2.0.2 |
| Average or specific EPD | <p>Average</p> <p>This EPD is for a collection of products produced by kvarnbäcken that can be summarized as “Precast concrete products”. These products include:</p> <ul style="list-style-type: none"> - Balcony & attic corridors - Foundation elements - Stairs - Gray walls - Slack-reinforced floor slabs - Retaining wall elements - Pillars - Beams |

System diagram:



Modules declared (X included, ND not declared), geographical scope, share of specific data (in GWP-GHG indicator) and data variation: EPD modules included (G = generic data, S = Specific data).

| | Raw material | | Manufacturing | | | Use | | | | | | | End of life | | | | Reuse |
|-----------------|--------------|-----------|---------------|-----------|--------------|-----|-------------|--------|-------------|------------|-------------------|-----------|-------------|-----------|---------------|----------------|---|
| | Raw material | Transport | Manufacturing | Transport | Installation | Use | Maintenance | Repair | Replacement | Renovation | Energy during use | Water use | Demolition | Transport | Waste process | Final disposal | Benefits and loads beyond the system boundary |
| Module | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Module declared | X | X | X | X | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |
| Geography | SE | SE | SE | SE | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |
| Type of data | G | G | S | G | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND | MND |

Data quality indicators (DQI):

| | |
|-----------------------------------|--|
| Time period | 2020 and after |
| Geography | Europe, Western |
| Technology | Average technology or BAT ¹ |
| Representativeness | Average from a specific process |
| Multiple output allocation | Physical causality Economic basis in upstream ecoinvent material processes |
| Substitution allocation | Not applicable |
| Waste treatment allocation | Not applicable |
| Cut-off rules | Less than 1% environmental relevance |
| System boundary | Second order (material/energy flows including operations) |
| Boundary with nature | Not applicable |

Content information

The product weight is 1 ton

| Product components | Weight per ton product (kg) | | | Comment |
|---|-----------------------------|--------------|------------|--|
| | Best Case | Average Case | Worst Case | |
| Aggregate | 779 | 746 | 671 | |
| Cement | 142 | 173 | 204 | Chrome reduced cement, <2 ppm chrome(VI) |
| Water | 78 | 80 | 82 | |
| Plasticiser | 1 | 1 | 1 | |
| Steel Reinforcement | 0 | 21 | 42 | 98% recycled steel |
| Substances of Very High Concern (SVHC) | < 284 mg | < 346 mg | < 408 mg | This comes from the chrome (IV) present in the cement, amount is lower than 0,1% in all cases. |

SVHC and the Candidate List of SVHC are available via the European Chemicals Agency².

¹ BAT (Best Available Technology or Best Available Techniques) signifies the latest stage in development of activities, processes and their method of operation which indicate the practical suitability of particular techniques as the basis of emission limit values, linked to environmental regulations, such as the European Industrial Emissions Directive (IED, 2010/75/EU) . In determining whether operational methods are BAT, consideration is given to economic feasibility and the availability of techniques to carry out the required function. The BAT concept is closely related to BEP (Best Environmental Practice), which is the best environment-friendly company practice.

² [Candidate List of substances of very high concern for Authorisation - ECHA \(europa.eu\)](https://echa.europa.eu/candidate-list-table)

Production process description

Draft drawings undergo a reception check before being released production, then ingredient materials other than concrete are ordered. The elements are scheduled where they will be produced and at what date as well as which staff will manufacture the element. Drawings and planning are reviewed with relevant personnel before production starts.

Production begins with work on form, reinforcement and castings. When this is done, concrete is ordered from the concrete division. The concrete is produced in about 10 minutes and a concrete truck transports the concrete about 200m from the mixer to the prefab production.

A concrete mixer is used to handle the concrete between the concrete truck and mold. When the concrete is in place in the mold, it is treated with a vibrator rod to remove unwanted air. The surface of the concrete is congested and weighed off with a straight plate. The casting usually takes about 30 min per element.

When the concrete has reached a certain degree of maturity, the surface of the concrete is treated with tools such as scrubbing boards, swords, rollers, etc. to achieve the desired end result on the surface. After the surface is finished, the element is allowed to harden overnight, usually at least 15 hours.

The element is then deformed and lifted out of the mold to make the final finish and place it in storage. The finished elements are handled with a crane, truck and wheel loader.

When the customer calls up for delivery of the elements, the loaded elements are compiled together in the same batch. When the load is determined, transport is ordered. When the lorry arrives the elements are loaded by truck which usually takes about 45 min.

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

Some numbers are presented in scientific notation, example: 5,2E-03 equals 0,0052

| Impact category | Unit | Raw materials A1 | | | Transports to site A2 | | | Production A3 | Transports to customer A4 |
|-----------------------------------|-------------------------------------|------------------|--------------|------------|-----------------------|--------------|------------|---------------|---------------------------|
| | | Best Case | Average Case | Worst Case | Best Case | Average Case | Worst Case | | |
| Climate change | kg CO ₂ eq | 115,94 | 150,98 | 186,01 | 5,91 | 6,94 | 7,96 | 5,35 | 8,30 |
| Ozone depletion | kg CFC11 eq | 2,12E-06 | 3,26E-06 | 4,41E-06 | 1,14E-06 | 1,32E-06 | 1,50E-06 | 1,07E-06 | 1,88E-06 |
| Acidification | SO ₂ eq | 1,46E-01 | 2,17E-01 | 2,88E-01 | 3,11E-02 | 3,71E-02 | 4,30E-02 | 1,82E-02 | 2,54E-02 |
| Eutrophication, freshwater | kg PO ₄ ⁻³ eq | 9,82E-02 | 1,57E-01 | 2,15E-01 | 3,43E-03 | 4,13E-03 | 4,83E-03 | 1,82E-03 | 1,71E-03 |
| Photochemical ozone formation | kg ethene eq | 2,51E-02 | 2,88E-02 | 3,24E-02 | 2,37E-02 | 2,81E-02 | 3,26E-02 | 1,45E-02 | 2,01E-02 |
| Resource use, minerals and metals | kg Sb eq | 1,03E-04 | 1,34E-04 | 1,65E-04 | 1,88E-05 | 2,25E-05 | 2,61E-05 | 2,01E-05 | 2,99E-05 |
| Resource use, fossils | MJ | 327,52 | 544,50 | 761,49 | 89,77 | 105,17 | 120,56 | 117,78 | 125,51 |

Use of resources

The consumption of resources in terms of energy is measured as primary energy demand with the method CED 1.11.

| Parameter | Unit | Raw materials A1 | | | Transports to site A2 | | | Production A3 | Transports to customer A4 |
|-----------|------|------------------|--------------|------------|-----------------------|--------------|------------|---------------|---------------------------|
| | | Best Case | Average Case | Worst Case | Best Case | Average Case | Worst Case | | |
| PERE | MJ | 52,30 | 86,72 | 121,14 | 3,38 | 4,07 | 4,76 | 201,17 | 1,69 |
| PERM | MJ | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| PERT | MJ | 52,30 | 86,72 | 121,14 | 3,38 | 4,07 | 4,76 | 201,17 | 1,69 |

| Parameter | Unit | Raw materials A1 | | | Transports to site A2 | | | Production A3 | Transports to customer A4 |
|---------------|---|------------------|--------------|------------|-----------------------|--------------|------------|---------------|---------------------------|
| | | Best Case | Average Case | Worst Case | Best Case | Average Case | Worst Case | | |
| PENRE | MJ | 381,92 | 611,43 | 840,93 | 95,18 | 111,49 | 127,80 | 122,27 | 133,25 |
| PENRM | MJ | 0,75 | 1,03 | 1,31 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| PENRT | MJ | 382,67 | 612,46 | 842,24 | 95,18 | 111,49 | 127,80 | 122,27 | 133,25 |
| SM | Kg | 24,31 | 50,72 | 77,13 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| RSF | MJ | 73,83 | 90,15 | 106,48 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| NRSF | MJ | 397,59 | 487,00 | 576,42 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| FW | M3 | 1,32 | 1,40 | 1,47 | 0,30 | 0,36 | 0,42 | 0,11 | 0,21 |
| Abbreviations | 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 – Both sites

The production of waste in terms of final waste and the output of materials for recycling, is measured from the calculation of selected inventory results. Final waste and output flows, refers to flows that are leaving the system of the LCA.

Waste production:

| Parameter | Unit | Raw materials A1 | | | Transports to site A2 | | | Production A3 | Transports to customer A4 |
|---------------------|------|------------------|--------------|------------|-----------------------|--------------|------------|---------------|---------------------------|
| | | Best Case | Average Case | Worst Case | Best Case | Average Case | Worst Case | | |
| Hazardous waste | Kg | 0,07 | 0,20 | 0,34 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Non-Hazardous waste | Kg | 5,07 | 7,08 | 9,08 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |
| Radioactive waste | Kg | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 | 0,00 |

Output flows:

Output flows are same for all cases

| Indicator | Unit | Raw materials A1 | Transports to site A2 | Production A3 | Transport to customer A4 |
|-------------------------------|------|------------------|-----------------------|---------------|--------------------------|
| Components for reuse | kg | 0,0 | 0,0 | 0,0 | 0,0 |
| Material for recycling | kg | 0,0 | 0,0 | 0,0 | 0,0 |
| Materials for energy recovery | kg | 0,0 | 0,0 | 0,0 | 0,0 |
| Exported energy, electricity | MJ | 0,0 | 0,0 | 0,0 | 0,0 |
| Exported energy, thermal | MJ | 0,0 | 0,0 | 0,0 | 0,0 |

References

CEN - EUROPEAN COMMITTEE FOR STANDARDIZATION, EN 15804:2012+A1:2013, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products

EPD international. (2020). construction products pcr 2012:01 version 2.33.

EPD international. (2020). concrete and concrete elements (en 16757:2017)

General Programme Instructions of the International EPD® System. Version 3.01.

Hakkarainen, V. (Miljögiraff ab). (2021). Report 891 Life Cycle Assessment of concrete products

ISO. (2006a). ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures. International Organisation for Standardization

ISO. (2006b). ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework. 1–28. International Organization for Standardization

ISO. (2006c). ISO 14044:2006, Environmental management — Life cycle assessment — Requirements and guidelines. <https://doi.org/10.1007/s11367-011-0297-3>