Insulated concrete sandwich elements

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-05208
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

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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
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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 2.3, the International EPD System, Date 2018-11-15 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
PCR review was conducted by: *The Technical Committee of the International EPD® System. Chair: Claudia A. Peña. 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: Martyna Mikusinska, Sweco Environment AB, Martyna.Mikusinska@sweco.se, +46 (0)19-168178 Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No
LCA practitioner: Viktor Hakkarainen, Miljögiraff AB

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

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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, reinforcement and insulation a “best-average-worst case” range is presented in the results table.

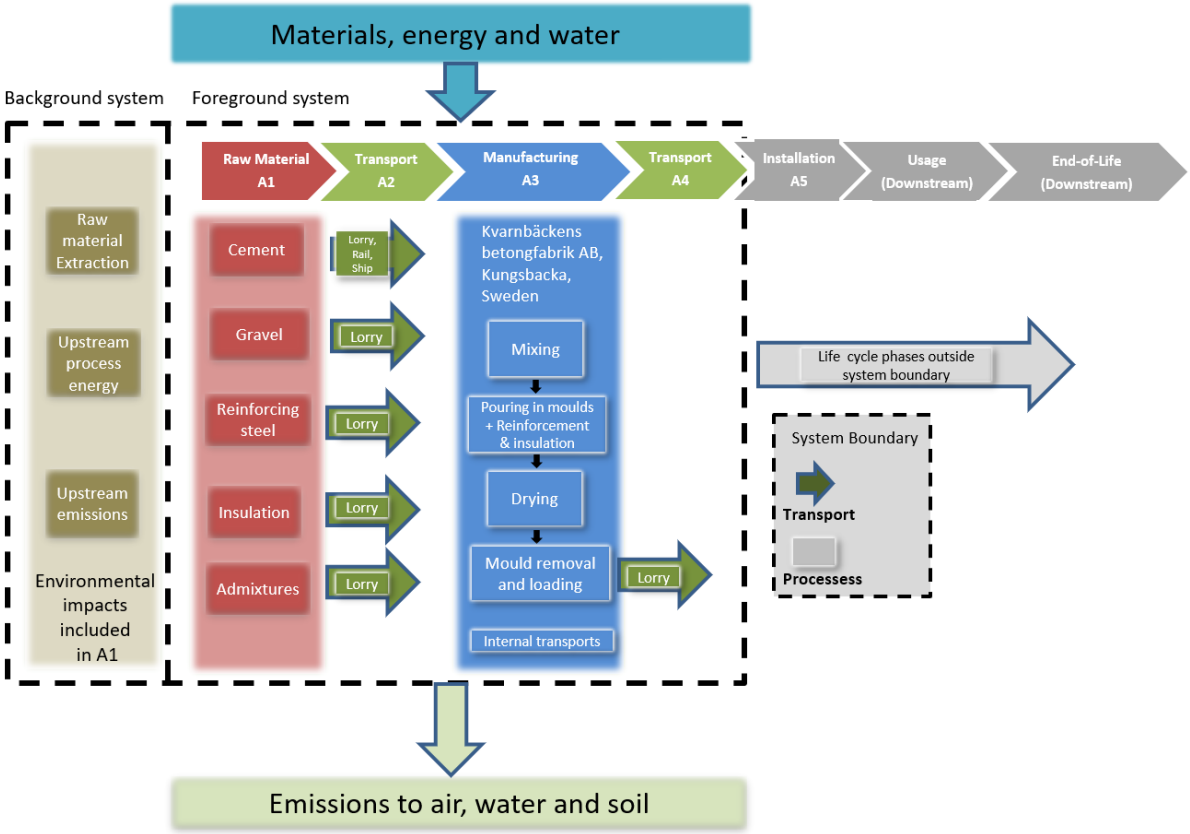
Product category & UN CPC code:
Concrete and concrete elements for building and civil engineering.
37550 – Articles of concrete, cement and plaster

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	The procedure below is followed for the exclusion of inputs and outputs according to the EN 15804:2012+ A1:2013 standard: Packaging of incoming materials is not modelled due to being below cut-off Capital goods are not included (Machines and facilities) as per PCR specifications
Assumptions	Road transports are assumed to be carried out by EURO 5 standard vehicles Distance assumption in module A4 is based on customers of Kvarnbäcken commonly being located in the Gothenburg region.
Allocation	Polluter Pays / Allocation by Classification Two allocation rules are applied: 1) the raw material necessary for the manufacture is allocated by mass of the declared unit. 2) the energy necessary for the manufacturing is allocated in MJ by total production mass during the period Jan 1st 2020 – Dec 31 2020.
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	Average The material content of the sandwich elements depends on customer specifications. The range of materials is presented in the product content declaration.

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)			Comments
	Best Case	Average Case	Worst Case	
Aggregate	765	679	594	
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
EPS Insulation	4	12	20	
Mineral wool insulation	10	34	57	
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 Agency[2].

[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)

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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.

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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 CO2 eq	144,96	239,06	300,85	14,81	18,56	22,73	5,35	8,22
Ozone depletion	kg CFC11 eq	3,28E-06	6,00E-06	9,10E-06	2,87E-06	2,90E-06	4,42E-06	8,53E-07	1,49E-06
Acidification	SO_2 eq	2,84E-01	4,98E-01	8,48E-01	7,65E-02	7,35E-02	1,14E-01	1,41E-02	2,57E-02
Eutrophication, freshwater	kg PO_4^{-3} eq	1,74E-01	1,30E-01	5,07E-01	8,35E-03	1,92E-02	1,23E-02	4,57E-03	5,89E-03
Photochemical ozone formation	kg ethene eq	8,66E-02	6,08E-02	2,80E-01	5,83E-02	2,54E-03	8,67E-02	9,49E-04	1,04E-03
Resource use, minerals and metals	kg Sb eq	3,22E-04	5,28E-04	1,06E-03	4,76E-05	4,76E-05	7,71E-05	1,54E-05	2,99E-05
Resource use, fossils	MJ	1114,54	1814,65	3785,70	224,76	199,69	343,57	53,74	122,80

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	142,06	305,13	468,19	8,23	10,21	12,18	201,17	1,69
PERM	MJ	0,06	0,14	0,23	0,00	0,00	0,00	0,00	0,00
PERT	MJ	142,12	305,27	468,42	8,23	10,21	12,18	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	1029,34	2188,82	3348,30	238,31	301,31	364,30	122,27	133,25
PENRM	MJ	165,10	390,70	616,29	0,00	0,00	0,00	0,00	0,00
PENRT	MJ	1194,45	2579,52	3964,59	238,31	301,31	364,30	122,27	133,25
SM	Kg	24,33	50,78	77,22	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	2,61	3,41	0,30	0,90	1,06	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								

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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	0,21	0,35	0,00	0,00	0,00	0,00	0,00
Non-Hazardous waste	Kg	5,36	7,77	10,18	0,00	0,00	0,00	0,00	0,00
Radioactive waste	Kg	0,00	0,01	0,02	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

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