ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

Prefabricated Solid Wall Element
Byggbröderna I Falkenberg

EPD HUB, HUB-0572
Publishing date 13 July 2023, last updated on 28 September 2023, valid until 13 July 2028.

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Byggbröderna I Falkenberg
Address	Kabelvägen 15, Falkenberg
Contact details	Info@byggbroderna.com
Website	www.byggbroderna.com

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804+A2:2019 and ISO 14025
PCR	EPD Hub Core PCR version 1.0, 1 Feb 2022
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, C1-C4 and Module D
EPD author	Arian Honarkar, Byggbröderna I Falkenberg
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	Magaly González Vázquez, as an authorized verifier acting for EPD Hub Limited

The manufacturer 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 and if they are not compared in a building context.

PRODUCT

Product name	Prefabricated Solid Wall Element
Additional labels	Prefab massive wall
Product reference	-
Place of production	Falkenberg, Sweden
Period for data	01/01/2022-31/12/2022
Averaging in EPD	No averaging
Variation in GWP-fossil for A1-A3	Not relevant %

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 metric ton of concrete element
Declared unit mass	1000 kg
GWP-fossil, A1-A3 (kgCO2e)	1,36E2
GWP-total, A1-A3 (kgCO2e)	1,36E2
Secondary material, inputs (%)	5.93
Secondary material, outputs (%)	80.1
Total energy use, A1-A3 (kWh)	420.0
Total water use, A1-A3 (m3e)	2,94E0

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

ByggBröderna with more than 100 years of experience in construction industry in southwest of Sweden has three main departments namely, Steel Structure, Digging and Ground works, and Precast Concrete. The company has a turnover of approximately 65 million Swedish Krona per year. Byggbröderna Precast department was established in 2021 and successfully became well-known in the market. The manufacturing process of precast elements is under control by educated engineers who are familiar with sustainability considerations. Customers are found in both construction and agriculture industries.

PRODUCT DESCRIPTION

The product is prefabricated solid concrete wall element consisting of aggregate, cement, reinforcement, and the necessary cast-in material of steel for transportation and assembling. The product is generally used as load carrier, fire protector and divider in commercial as well as residential buildings. The product fulfils the requirements of SS-EN 13369:2018 Common rules for precast concrete products and SS-EN 14992:2007+A1:2012 Precast concrete products - Wall elements. The EPD is for C35/45, however, lower strength classes may also be achieved.

Technical specifications:
-Reinforced concrete mass: 2450 kg/m3
-Concrete strength C35/45.
-Exposure classes up to XC4.
-Life length class up to L100(100 years).
-Fire class up to REI120.
-Typical thickness: 150mm, 200mm, 250mm

Further information can be found at www.byggbroderna.com.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	2,5	Europe
Minerals	97,5	Europe
Fossil materials	<0.01	Europe
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 metric ton of concrete element
Mass per declared unit	1000 kg
Functional unit	-
Reference service life	-

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

First stage of the production is to prepare stamped construction drawing. Thereafter, production process begins from carpentry, form sides and other wooden details are prepared in this stage. Meanwhile, preparation of cast-in details and rebars are simultaneously going on. Casting tables should be polished before setting the moulds up until the surface reaches the required softness. After preparing the moulds and rebars it is time to place cast-in details and casting the concrete inside the moulds. After a couple of hours, when suitable consistency has been reached, it is time to treat the surface. Each element should reach the designed lifting compression ratio while it has been cured for desired corrosion class. Finally, it is time to lift the element and do the quality control. The element will be stored in the storage yard for delivering to the construction site.

Rebar production losses has been analysed by the total amount of purchased rebar and the amount sent to recycling. As a result, 9% production losses have been identified for rebar. 1% losses for concrete are the maximum which we may have for production in worth case, and it is the amount of concrete left in the mixer or other equipment in the end of the day.

The grid electricity has been utilized as only source of power.

The waste concrete during the production of main product is used to produce an auxiliary product.

Wood incineration efficiency is assumed 73% for formworks.

The distances have been measured based on satellite information from Google Maps.

Some oils have been used for lubricating of machineries during the production of final product in A1-A3 stages. Wooden forms have been used as auxiliary material in A3. It has been assumed that the form works will last for at least 50 times usage. Water has been used for cleaning the equipment's as auxiliary in A3.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

By confirming the installation plan, waybills will be issued in the most optimized set. Average distance between construction site and production hall is assumed as 100 km. The transportation method is assumed to be lorry. Transportation does not cause losses.

The installation energy consumption has been considered in the A5.

Amount of energy spent by the building machines used in construction is assumed to be 132.5 MJ/m3 (Abey and Anand, 2019). For a wall with thickness of 0.150 m, (132.5)/2,45 = 54.081 MJ/ton.
No waste have been assumed during the installation.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase.
Air, soil, and water impacts during the use phase have not been studied.

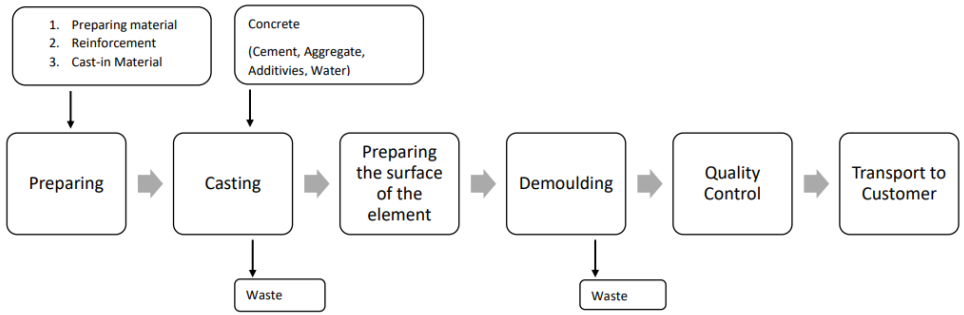
PRODUCT END OF LIFE (C1-C4, D)

Energy consumption of a demolition process assumed to be 1 litter diesel/ton.
100% of the dismantled prefabricated solid wall, is assumed to be collected as separate construction waste and transported to the nearest construction waste treatment plant (C1).
It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed that it has the same weight with the declared product. Transportation distance to treatment is assumed as 50km and the transportation method is assumed to be lorry (C2).

At the waste treatment plant, waste that can be reused, recycled or recovered for energy is separated and diverted for further use. It can be assumed that 100% of prefabricated solid walls are transported to a waste treatment plant, where the walls are crushed, and steel is separated. About 85% of steel (World Steel Association. 2020) and 80% of concrete (Betoniteollisuus ry, 2020) are recycled. The process losses of the waste treatment plant are assumed to be negligible (C3). The remaining 20% of concrete and 15% of steel are assumed to be sent to the landfill (C4).

Due to the recycling potential of reinforcement steel and concrete, they can be used as secondary raw material, which avoids the use of virgin raw materials. 80% of concrete and 85% of steel going to waste processing are converted into secondary raw materials after recycling.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	Partly allocated by mass or volume
Packaging materials	Not applicable
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

Type of average	No averaging
Averaging method	Not applicable
Variation in GWP-fossil for A1-A3	Not relevant %

There is no average result considered in this study since this EPD refers to one specific product produced in one production plant.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. Ecoinvent(3.8) and One Click LCA databases were used as sources of environmental data.

ENVIRONMENTAL IMPACT DATA

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	1,3E2	1,43E0	4,84E0	1,36E2	8,99E0	4,97E0	MND	MND	MND	MND	MND	MND	MND	3,31E0	4,69E0	-3,35E1	-6,01E0	-6,27E0
GWP – fossil	kg CO_2e	1,3E2	1,43E0	4,85E0	1,36E2	9,08E0	4,97E0	MND	MND	MND	MND	MND	MND	MND	3,31E0	4,69E0	9,32E0	1,05E0	-6,27E0
GWP – biogenic	kg CO_2e	5,38E-2	0E0	-5,38E-2	-2,26E-17	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-4,28E1	-7,06E0	0E0
GWP – LULUC	kg CO_2e	2,93E-2	5,26E-4	4,52E-2	7,5E-2	3,26E-3	4,95E-4	MND	MND	MND	MND	MND	MND	MND	3,3E-4	1,73E-3	1,3E-2	9,88E-4	-8,62E-3
Ozone depletion pot.	kg $CFC_{-11}e$	1,19E-6	3,43E-7	9,08E-7	2,44E-6	2,17E-6	1,06E-6	MND	MND	MND	MND	MND	MND	MND	7,07E-7	1,08E-6	1,6E-6	4,23E-7	-5,11E-7
Acidification potential	mol H^+e	2,48E-1	5,49E-3	4,03E-2	2,94E-1	3,79E-2	5,17E-2	MND	MND	MND	MND	MND	MND	MND	3,44E-2	1,99E-2	7,97E-2	9,84E-3	-4,06E-2
EP-freshwater[2)]	kg Pe	2,58E0	1,05E-5	4,88E-5	2,58E0	6,21E-5	1,65E-5	MND	MND	MND	MND	MND	MND	MND	1,1E-5	3,84E-5	1,77E-4	1,1E-5	-3,56E-4
EP-marine	kg Ne	6,67E-2	1,52E-3	1,26E-2	8,08E-2	1,15E-2	2,29E-2	MND	MND	MND	MND	MND	MND	MND	1,52E-2	5,9E-3	2,94E-2	3,41E-3	-8,79E-3
EP-terrestrial	mol Ne	6,02E-1	1,68E-2	1,39E-1	7,58E-1	1,26E-1	2,51E-1	MND	MND	MND	MND	MND	MND	MND	1,67E-1	6,51E-2	3,24E-1	3,75E-2	-1,14E-1
POCP ("smog")[3)]	kg NMVOCe	1,89E-1	5,67E-3	4,07E-2	2,36E-1	4,07E-2	6,9E-2	MND	MND	MND	MND	MND	MND	MND	4,59E-2	2,08E-2	8,95E-2	1,09E-2	-2,94E-2
ADP-minerals & metals[4)]	kg Sbe	2,04E-4	3,41E-6	2,05E-5	2,28E-4	2,13E-5	2,52E-6	MND	MND	MND	MND	MND	MND	MND	1,68E-6	1,1E-5	8,24E-5	2,4E-6	-6,1E-5
ADP-fossil resources	MJ	3,94E2	2,21E1	1,42E2	5,59E2	1,39E2	6,69E1	MND	MND	MND	MND	MND	MND	MND	4,45E1	7,05E1	1,33E2	2,87E1	-9,06E1
Water use[5)]	m^3e depr.	1,69E3	1,01E-1	3,62E0	1,69E3	6,41E-1	1,8E-1	MND	MND	MND	MND	MND	MND	MND	1,2E-1	3,15E-1	1,06E0	9,1E-2	-1,2E1

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

USE OF NATURAL RESOURCES

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[8)]	MJ	1,71E2	2,97E-1	3,68E1	2,08E2	1,8E0	3,82E-1	MND	MND	MND	MND	MND	MND	MND	2,54E-1	7,94E-1	5,54E0	2,49E-1	-8,14E0
Renew. PER as material	MJ	5,58E-1	0E0	-2,69E-2	5,31E-1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-4,39E-1	-9,25E-2	0E0
Total use of renew. PER	MJ	1,72E2	2,97E-1	3,68E1	2,09E2	1,8E0	3,82E-1	MND	MND	MND	MND	MND	MND	MND	2,54E-1	7,94E-1	5,1E0	1,57E-1	-8,14E0
Non-re. PER as energy	MJ	6,08E2	2,41E1	1,38E2	7,7E2	1,39E2	6,69E1	MND	MND	MND	MND	MND	MND	MND	4,45E1	7,05E1	1,33E2	2,87E1	-9,06E1
Non-re. PER as material	MJ	1,31E1	0E0	3,82E0	1,7E1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-1,36E1	-3,4E0	0E0
Total use of non-re. PER	MJ	6,22E2	2,41E1	1,42E2	7,87E2	1,39E2	6,69E1	MND	MND	MND	MND	MND	MND	MND	4,45E1	7,05E1	1,19E2	2,53E1	-9,06E1
Secondary materials	kg	5,93E1	6,75E-3	2,12E-2	5,93E1	3,91E-2	2,62E-2	MND	MND	MND	MND	MND	MND	MND	1,74E-2	1,96E-2	5,18E-2	6,03E-3	-9,96E-2
Renew. secondary fuels	MJ	4,35E1	6,26E-5	1,87E-4	4,35E1	3,45E-4	8,56E-5	MND	MND	MND	MND	MND	MND	MND	5,7E-5	1,97E-4	8,45E-4	1,58E-4	-7,13E-4

Non-ren. secondary fuels	MJ	4,88E2	0E0	0E0	4,88E2	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	2,84E0	3,17E-3	9,08E-2	2,94E0	1,84E-2	4,06E-3	MND	MND	MND	MND	MND	MND	MND	2,7E-3	9,13E-3	4,89E-2	3,14E-2	-2,88E-1

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	1,21E1	2,8E-2	2,26E-1	1,24E1	1,49E-1	8,95E-2	MND	MND	MND	MND	MND	MND	MND	5,96E-2	9,34E-2	4,07E-1	0E0	-5,3E-1
Non-hazardous waste	kg	5,62E1	4,76E-1	2,63E0	5,93E1	2,59E0	6,29E-1	MND	MND	MND	MND	MND	MND	MND	4,19E-1	1,54E0	1,03E2	1,99E2	-1,56E1
Radioactive waste	kg	7,8E-3	1,64E-4	1,71E-3	9,67E-3	9,58E-4	4,71E-4	MND	MND	MND	MND	MND	MND	MND	3,13E-4	4,71E-4	7,66E-4	0E0	-4,52E-4

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0E0	0E0	9,75E0	9,75E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	4,67E0	0E0	1,79E0	6,46E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	8,01E2	0E0	0E0
Materials for energy rec	kg	1,23E-1	0E0	0E0	1,23E-1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	1,47E-1	0E0	0E0	1,47E-1	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	1,34E2	1,42E0	4,85E0	1,4E2	8,99E0	4,92E0	MND	MND	MND	MND	MND	MND	MND	3,27E0	4,64E0	9,19E0	1,03E0	-6,11E0
Ozone depletion Pot.	kg CFC_{-11}e	2,05E-6	2,72E-7	7,22E-7	3,04E-6	1,72E-6	8,42E-7	MND	MND	MND	MND	MND	MND	MND	5,6E-7	8,55E-7	1,27E-6	3,35E-7	-4,23E-7
Acidification	kg SO_2e	9,31E-2	4,39E-3	3,1E-2	1,28E-1	2,93E-2	3,68E-2	MND	MND	MND	MND	MND	MND	MND	2,45E-2	1,54E-2	5,93E-2	7,44E-3	-3,14E-2
Eutrophication	kg PO_4^3e	1,46E-1	9,77E-4	6,44E-3	1,54E-1	6,56E-3	8,54E-3	MND	MND	MND	MND	MND	MND	MND	5,69E-3	3,52E-3	1,65E-2	1,6E-3	-1,48E-2
POCP (“smog”)	kg C_2H_4e	2,41E-2	1,81E-4	9,6E-4	2,52E-2	1,15E-3	8,06E-4	MND	MND	MND	MND	MND	MND	MND	5,36E-4	6,03E-4	1,74E-3	3,12E-4	-2,14E-3
ADP-elements	kg Sbe	2,83E-4	3,32E-6	2,06E-5	3,07E-4	2,07E-5	2,48E-6	MND	MND	MND	MND	MND	MND	MND	1,65E-6	1,07E-5	8,21E-5	2,37E-6	-6,04E-5
ADP-fossil	MJ	5,01E2	2,21E1	1,42E2	6,65E2	1,39E2	6,69E1	MND	MND	MND	MND	MND	MND	MND	4,45E1	7,05E1	1,33E2	2,87E1	-9,06E1

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with reference standard, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The digital background data for this EPD

Why does verification transparency matter? Read more online
This EPD has been generated by One Click LCA EPD generator, which has been verified and approved by the EPD Hub.

THIRD-PARTY VERIFICATION STATEMENT

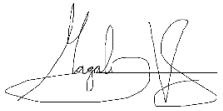
I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of the data collected and used in the LCA calculations, the way the LCA-based calculations have been carried out, the presentation of environmental data in the EPD, and other additional environmental information, as present with respect to the procedural and methodological requirements in ISO 14025:2010 and reference standard.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Magaly González Vázquez, as an authorized verifier acting for EPD Hub Limited
Updated 28.09.2023



VERIFIED ISO 14025