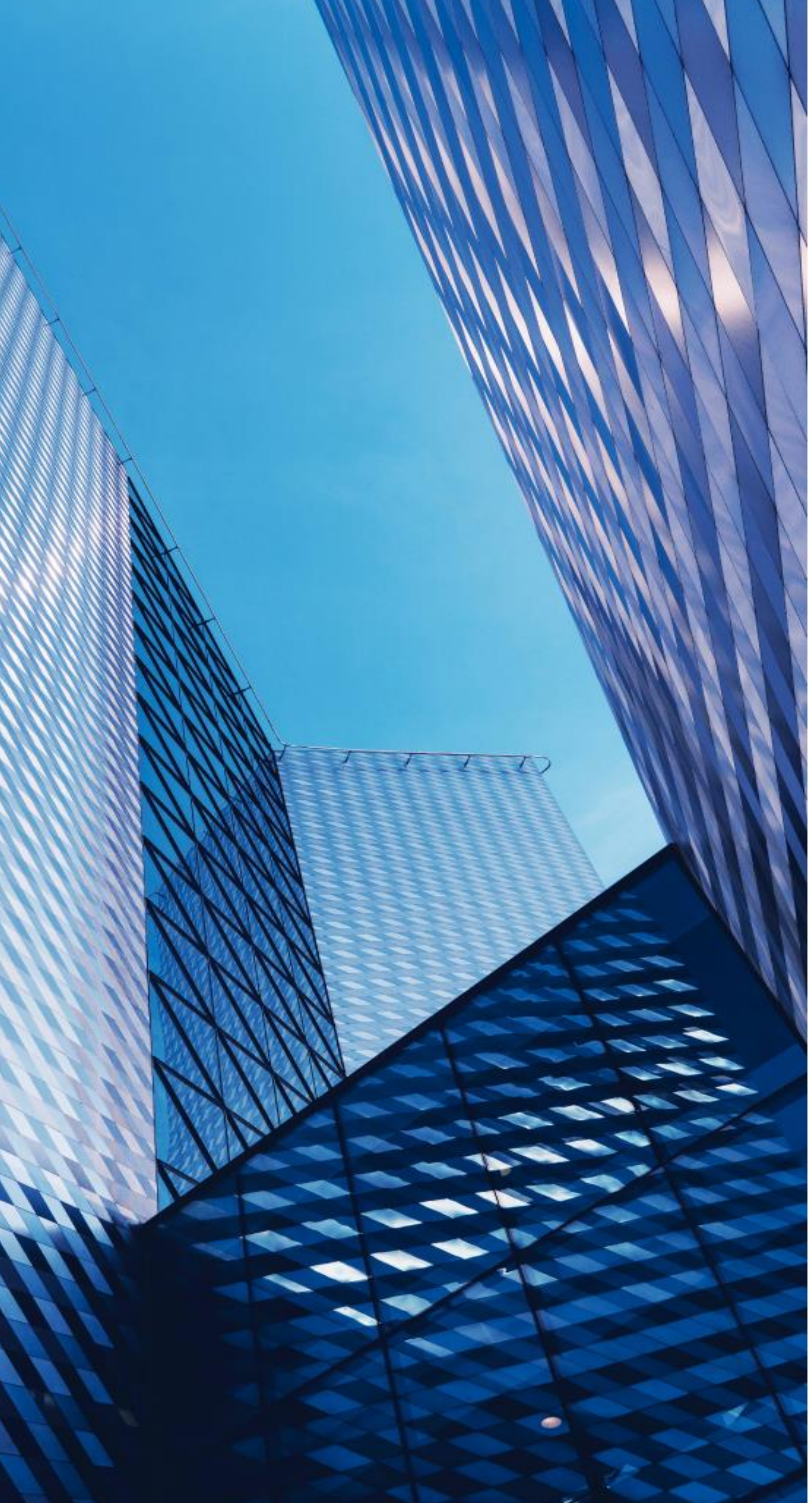


ENVIRONMENTAL PRODUCT DECLARATION

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

Prefabricated sandwich element
Vimmerby Prefab Betong AB

EPD HUB, HUB-0077
Publishing date 08 July 2022, last updated date 08 July 2022, valid until 08 July 2027

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Vimmerby Prefab Betong AB
Address	Krönsnäs 707, 598 92 Vimmerby
Contact details	info@prefabbetong.se
Website	www.prefabbetong.se

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 EN 16757 Product Category Rules for concrete and concrete elements
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4, D
EPD author	Pär Stålhandske, Vimmerby Prefab Betong AB
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	N.C, 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 sandwich element
Additional labels	-
Product reference	-
Place of production	Vimmerby, Sweden
Period for data	Calendar year 2021
Averaging in EPD	No averaging

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tonne of Sandwich element
Declared unit mass	1000 kg
GWP-fossil, A1-A3 (kgCO2e)	1,89E2
GWP-total, A1-A3 (kgCO2e)	2,07E2
Secondary material, inputs (%)	2,47
Secondary material, outputs (%)	8,02E1
Total energy use, A1-A3 (kWh)	5,03E2
Total water use, A1-A3 (m3e)	4,27

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Vimmerby Prefab Betong was founded in 2006 and has one factory located in Vimmerby.
We are 38 employees and provide everything from blueprints, manufacturing, transportation and assembly.
We mainly manufacture industrial buildings and agriculture.
Vimmerby prefab Betong delivers all over Sweden.

PRODUCT DESCRIPTION

This product is a prefabricated sandwich element that contains, cement, reinforcement, aggregate, insulation and various steel products for assembly and transport.
element structure: concrete-insulation-concrete.

Product application:
The sandwich element is mostly used as an exterior wall for heated buildings.
The outer panel is made to withstand harsh weather conditions.

Technical specifications
Concrete strength C35/45
Exposure class up to XD3+XF4
Life length class L50

Physical properties of the product
Typical properties
Length: 6000mm
Height: 3000mm
Thickness: 270mm
Cross section: inner panel 75mm concrete-120mm insulation-outer panel 75mm concrete.
Density: approximately 1319kg/m3

Product standards
SS-EN 13369:2018 Common rules for precast products
SS-EN 14992:2007+A1:2012 Precast concrete products

Further information can be found at www.prefabbetong.se.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	3	EU
Minerals	96	SWEDEN
Fossil materials	<1	SWEDEN
Bio-based materials	-	-

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

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

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 tonne of Sandwich 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.

The production of sandwich element begins with the preparation of the casting bed and welding the mould, which includes cleaning the casting platform, mounting the cast-in materials for assembly and applying form oil. Next the reinforcement is applied and the first layer of concrete is cast. The insulation is applied on top of the concrete. Diagonal ties are mounted between the insulation boards to connect the inner and outer panel. When this step is complete it is time for the outer panel reinforcement. Now the next layer of concrete can be cast. Once the concrete has reached the right consistency, it is time to apply the surface treatment. When the concrete has reached its desired demolding strength, the elements are lifted out of their mould and moved to a storage area where additional quality check and finishing is performed before the elements are passed on to the storage yard, ready for delivery to the construction site. Packaging materials have negligible impacts and have not been included as per the PCR

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.

The transportation distance is defined according to the PCR. Average distance of transportation from production plant to building site is assumed as 160 km and the transportation method is assumed to be lorry. Vehicle capacity utilization volume factor is assumed to be 100 % which means full load. In reality, it may vary but as role of transportation emissions in total results is small, the variety in load is assumed to be negligible. Empty returns are not taken into account as it is assumed that return trip is used by the transportation company to serve the needs of other clients. Transportation does not cause losses as product are loaded properly.

Installation includes the energy use and material consumption. Production loss at installation is assumed negligible as the precast elements are delivered ready made from the factory. Energy consumption of the construction process for a precast element is on the average 132,5 MJ/m3 of concrete with renforcement with a density of 2,24. 132,5/2,45 = 54,08 Mj/tonne (Abey and Anand, 2019). The source of energy is diesel fuel used by work machines. Joint sealant and various types of steel products are used as installation resource and the corresponding production and transportation impacts included.

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)

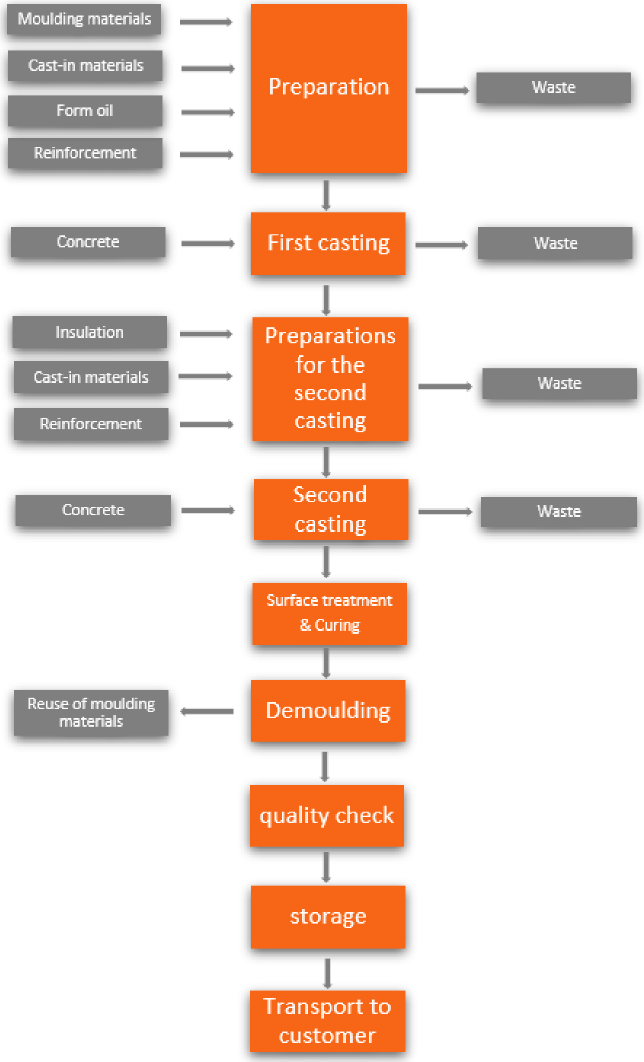
Energy consumption of a demolition process is on the average 10 kWh/ton (Bozdağ, Ö & Seçer, M. 2007). Basing on a Level(s) project, an average mass of a reinforced concrete building is about 1000 kg/m2. Therefore, energy consumption demolition is assumed to be 10 kWh/1000 kg = 0,01 kWh/kg. The source of energy is diesel fuel used by work machines (C1).

100% of the dismantled sandwich element along with the installation resources, is assumed to be collected as separate construction waste and transported to the nearest construction waste treatment plant. 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 50 km and the transportation method is assumed to be lorry (C2)

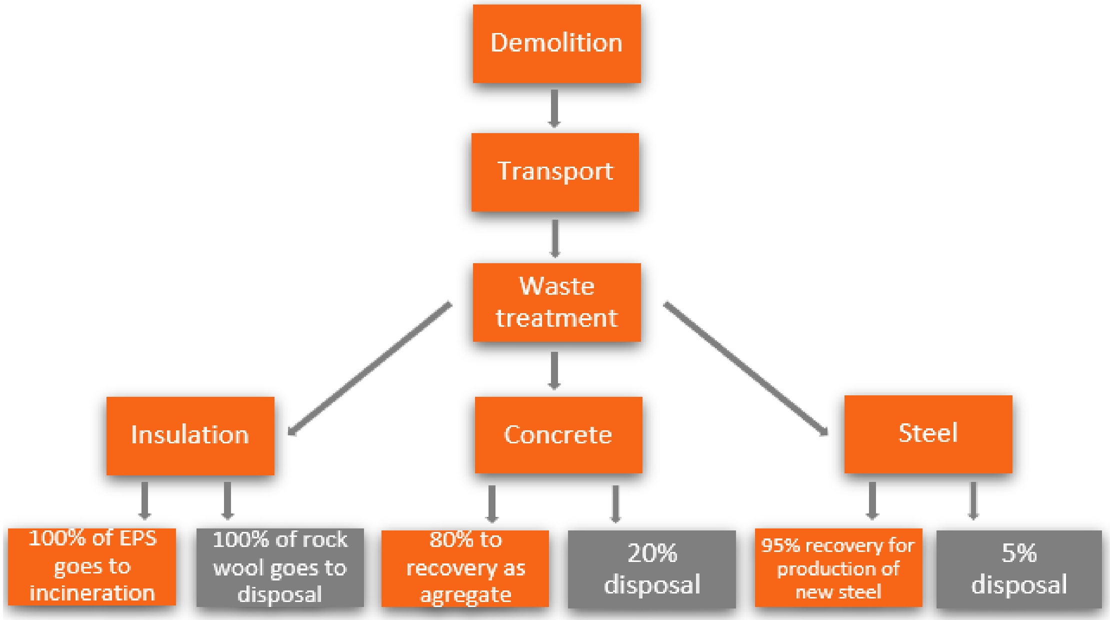
At the waste treatment plant, waste that can be reused, recycled or recovered for energy is separated and diverted for further use. It can be assumed that 100% of sandwich elements are transported to a waste treatment plant, where the slabs are crushed and steel is separated. About 95% of steel (World Steel Association. 2020) and 80% of concrete (Betoniteollisuus ry, 2020) are recycled. 100% of the EPS insulation and the plastic is assumed to be incinerated. The process losses of the waste treatment plant are assumed to be negligible (C3). The remaining 20% of concrete, 100% of stone wool insulation and 5% 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 95% of steel going to waste processing are converted into secondary raw materials after recycling. The recycled material content in the concrete itself is assumed to be 0 % but in steel is is assumed to be 30% (D). Materials incinerated for energy recovery have the benefits of thermal and electric energy included in Module D.

MANUFACTURING PROCESS



WASTE 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.

All industrial processes from raw material acquisition and pre-processing, production, product distribution and installation, and end-of-life management are included. For easier modelling and because of lack of accuracy in available modelling resources many constituents under 0,1% of product mass are excluded. These include some concrete admixtures which are all present in the product only in very small amounts and have no serious impact on the emissions of the product. Further, water used for cleaning and maintenance of the equipment, transportation and waste streams of the packaging materials used for delivering the raw materials to the factory are omitted since the quantified mass contribution is less than 0.1%.

The production of capital equipment, construction activities, and infrastructure, personnel-related activities, energy and water use related to company management and sales activities are excluded.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. In this study, as per the reference standard, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g., mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

In this study allocation could not be avoided for raw materials, ancillary material, energy consumption and waste production as the information was only measured on factory or production process level. The inputs were allocated to studied product based on annual production volume (mass).

The values for 1 tonne of element are calculated by considering the total product weight per annual production. In the factory, several kinds of concrete elements are produced; since the production processes of these products are similar, the annual production percentages are taken into consideration for allocation. According to this, the total energy consumption, and product-based waste are divided by the total annual production. Since the formulation of each product is certain, base materials do not need to be allocated. Subsequently, the product output is fixed to 1000 kg and the corresponding amount of product is used in the calculations.

Distribution distance was calculated as a sales volume-based weighted average according to the percentage ratios for each destination point.

This LCA study is conducted in accordance with all methodological considerations, such as performance, system boundaries, data quality, allocation procedures, and decision rules to evaluate inputs and outputs.

All estimations and assumptions are given below.

▪ Modules A2, A4 & C2: Vehicle capacity utilization volume factor is assumed to be 1 which means full load. It may vary but as the role of transportation emission in total results is small and so the variety in load assumed to be negligible. Empty returns are not considered as it is assumed that return trip is used by transportation companies to serve the needs of other clients.

▪ Module A4: Transportation doesn't cause losses as products are loaded properly. Additionally, transportation distances and vehicle types are assumed according to the delivery in the last year.

▪ Module A5: Installation resources and energy is included to account for product installation at site.

▪ Module C1: Consumed energy for demolition process is assumed as 0.01 kWh/kg.

▪ Module C2: Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is assumed as lorry which is the most common.

▪ Modules C3, C4: 80% of concrete and 95% of steel, both reinforcement and the steel installation resourse is sent for recycling while the remaining materials are assumed to be landfilled. 100% of the plastic installation resource and the EPS insulation is assumed to be incinerated for energy recovery. The materials incinerated for energy recovery displaces electricity and heat production, while recycled materials displace the need for virgin material production.

Allocation used in environmental data sources is aligned with the above.

AVERAGES AND VARIABILITY

This EPD is product and factory specific and does not contain average calculations.

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 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	kg CO_2e	1,75E2	1,22E1	2,04E1	2,07E2	1,44E1	7,08E0	MND	MND	MND	MND	MND	MND	MND	3,3E0	8,35E0	2,53E1	1,03E0	-2,57E1
GWP – fossil	kg CO_2e	1,73E2	1,22E1	3,24E0	1,89E2	1,45E1	7,07E0	MND	MND	MND	MND	MND	MND	MND	3,3E0	8,34E0	2,53E1	1,03E0	-2,57E1
GWP – biogenic	kg CO_2e	1,35E0	-5,1E-2	1,72E1	1,85E1	1,06E-2	5,74E-3	MND	MND	MND	MND	MND	MND	MND	9,17E-4	4,45E-3	9,24E-3	2,03E-3	-5,75E-2
GWP – LULUC	kg CO_2e	8,24E-2	5,1E-3	8,48E-3	9,59E-2	4,38E-3	1,36E-3	MND	MND	MND	MND	MND	MND	MND	2,79E-4	2,96E-3	5,24E-3	3,05E-4	-3,39E-2
Ozone depletion pot.	kg CFC_{11}e	8,25E-6	2,72E-6	3,47E-7	1,13E-5	3,42E-6	1,15E-6	MND	MND	MND	MND	MND	MND	MND	7,12E-7	1,9E-6	1,82E-6	4,23E-7	-1,67E-6
Acidification potential	mol H^+e	6,02E-1	1,3E-1	3,29E-2	7,65E-1	6,11E-2	6,17E-2	MND	MND	MND	MND	MND	MND	MND	3,45E-2	3,41E-2	8,29E-2	9,74E-3	-1,75E-1
EP-freshwater[3)]	kg Pe	4,11E-3	9,73E-5	5,42E-4	4,75E-3	1,18E-4	1,27E-4	MND	MND	MND	MND	MND	MND	MND	1,33E-5	6,98E-5	2,42E-4	1,24E-5	-1,37E-3
EP-marine	kg Ne	1,53E-1	3,52E-2	1,21E-2	2E-1	1,84E-2	2,47E-2	MND	MND	MND	MND	MND	MND	MND	1,52E-2	1,01E-2	3,07E-2	3,35E-3	-2,67E-2
EP-terrestrial	mol Ne	1,78E0	3,9E-1	1,25E-1	2,29E0	2,03E-1	2,72E-1	MND	MND	MND	MND	MND	MND	MND	1,67E-1	1,12E-1	3,4E-1	3,69E-2	-3,24E-1
POCP (“smog”)	kg NMVOCe	5,07E-1	1,09E-1	3,73E-2	6,53E-1	6,54E-2	7,9E-2	MND	MND	MND	MND	MND	MND	MND	4,59E-2	3,42E-2	9,37E-2	1,07E-2	-9,95E-2
ADP-minerals & metals	kg Sbe	9,84E-3	2,1E-4	5,04E-5	1,01E-2	2,48E-4	3,92E-5	MND	MND	MND	MND	MND	MND	MND	5,03E-6	2,26E-4	9,51E-5	9,38E-6	-8,27E-4
ADP-fossil resources	MJ	1,6E3	1,8E2	5,08E1	1,83E3	2,26E2	1,07E2	MND	MND	MND	MND	MND	MND	MND	4,54E1	1,26E2	1,46E2	2,87E1	-3,09E2
Water use[2)]	m^3e depr.	4,65E1	6,51E-1	1,03E0	4,82E1	8,41E-1	1,51E0	MND	MND	MND	MND	MND	MND	MND	8,46E-2	4,05E-1	2,22E0	1,33E0	-1,54E1

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	MJ	9,71E1	3,06E0	1,58E2	2,59E2	2,85E0	2,47E0	MND	MND	MND	MND	MND	MND	MND	2,45E-1	1,78E0	7,66E0	2,32E-1	-6,51E1
Renew. PER as material	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	9,71E1	3,06E0	1,58E2	2,59E2	2,85E0	2,47E0	MND	MND	MND	MND	MND	MND	MND	2,45E-1	1,78E0	7,66E0	2,32E-1	-6,51E1
Non-re. PER as energy	MJ	1,32E3	1,8E2	4,9E1	1,55E3	2,26E2	9,08E1	MND	MND	MND	MND	MND	MND	MND	4,54E1	1,26E2	1,46E2	2,87E1	-3,09E2
Non-re. PER as material	MJ	2,78E2	0E0	7,09E-5	2,78E2	0E0	1,63E1	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-2,69E2	0E0	0E0
Total use of non-re. PER	MJ	1,6E3	1,8E2	4,9E1	1,83E3	2,26E2	1,07E2	MND	MND	MND	MND	MND	MND	MND	4,54E1	1,26E2	-1,24E2	2,87E1	-3,09E2
Secondary materials	kg	2,47E1	0E0	1,36E-3	2,47E1	0E0	8,44E-2	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	2,38E0
Renew. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Non-ren. secondary fuels	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	4,11E0	3,38E-2	1,28E-1	4,27E0	4,71E-2	1,77E-2	MND	MND	MND	MND	MND	MND	MND	4,01E-3	2,15E-2	6,33E-2	3,14E-2	-9,84E-1

6) 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	1,23E1	2,12E-1	2,05E-1	1,28E1	2,2E-1	6,27E-1	MND	MND	MND	MND	MND	MND	MND	4,88E-2	1,28E-1	0E0	2,68E-2	-3,8E0
Non-hazardous waste	kg	1,85E2	1,58E1	2,75E1	2,28E2	2,43E1	6,25E0	MND	MND	MND	MND	MND	MND	MND	5,22E-1	8,77E0	0E0	1,95E2	-6,01E1
Radioactive waste	kg	4,42E-3	1,23E-3	2,67E-4	5,92E-3	1,55E-3	5,23E-4	MND	MND	MND	MND	MND	MND	MND	3,18E-4	8,62E-4	0E0	1,9E-4	-1,36E-3

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	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	0E0	0E0	1,11E0	1,11E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	8,02E2	0E0	0E0
Materials for energy rec	kg	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	1,97E2	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	1,71E2	1,21E1	3,28E0	1,86E2	1,44E1	6,93E0	MND	MND	MND	MND	MND	MND	MND	3,27E0	8,27E0	2,52E1	1,01E0	-2,49E1
Ozone depletion Pot.	kg $CFC_{-11}e$	7,25E-6	2,16E-6	3,19E-7	9,73E-6	2,72E-6	9,26E-7	MND	MND	MND	MND	MND	MND	MND	5,63E-7	1,51E-6	1,5E-6	3,35E-7	-1,58E-6
Acidification	kg SO_2e	3,98E-1	9,18E-2	2,31E-2	5,13E-1	2,96E-2	1,53E-2	MND	MND	MND	MND	MND	MND	MND	4,87E-3	1,67E-2	1,16E-1	4,06E-3	-1,41E-1
Eutrophication	kg $PO_4^{3}e$	1,65E-1	1,29E-2	1,1E-2	1,89E-1	5,98E-3	5,89E-3	MND	MND	MND	MND	MND	MND	MND	8,57E-4	3,44E-3	1,4E-2	7,86E-4	-4,87E-2
POCP ("smog")	kg C_2H_4e	2,99E-2	3,11E-3	1,05E-3	3,41E-2	1,87E-3	2,06E-3	MND	MND	MND	MND	MND	MND	MND	5,01E-4	1,1E-3	1,74E-3	2,98E-4	-9,71E-3
ADP-elements	kg Sbe	9,84E-3	2,1E-4	5,04E-5	1,01E-2	2,48E-4	3,92E-5	MND	MND	MND	MND	MND	MND	MND	5,03E-6	2,26E-4	9,51E-5	9,38E-6	-8,27E-4
ADP-fossil	MJ	1,6E3	1,8E2	5,08E1	1,83E3	2,26E2	1,07E2	MND	MND	MND	MND	MND	MND	MND	4,54E1	1,26E2	1,46E2	2,87E1	-3,09E2

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.

Neena Chandramathy, as an authorized verifier acting for EPD Hub Limited
08.07.2022

EPD Hub

VERIFIED ISO 14025