ENVIRONMENTAL PRODUCT DECLARATION

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

Precast prestressed concrete hollow core slab
Prefabmästarna Sverige AB

EPD HUB, HUB-0438
Publishing date 12 May 2023, last updated on 21 September 2023, valid until 12 May 2028

Created with One Click LCA

GENERAL INFORMATION

MANUFACTURER

Manufacturer	Prefabmästarna Sverige AB
Address	Gamla Älvsbyvägen 15
Contact details	jorgen.malmstrom@prefabmastarna.se
Website	www.prefabmastarna.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	3rd party verified EPD
Scope of the EPD	Cradle to gate & Module (C1-C4), D
EPD author	Jörgen Malmström, Prefabmästarna Sverige AB
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☑ External verification
EPD verifier	Haiha Nguyen, 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	Precast prestressed concrete hollow core slab
Additional labels	HDF
Product reference	-
Place of production	Öjebyn, Sweden
Period for data	Calendar year 2020
Averaging in EPD	No average value
Variation in GWP-fossil for A1-A3	- %

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 tonne of precast prestressed concrete hollow core slab
Declared unit mass	1000 kg
GWP-fossil, A1-A3 (kgCO2e)	1,42E2
GWP-total, A1-A3 (kgCO2e)	1,43E2
Secondary material, inputs (%)	3.55
Secondary material, outputs (%)	80.2
Total energy use, A1-A3 (kWh)	378.0
Total water use, A1-A3 (m3e)	1,68E+00

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Although Prefabmästarna is a young company with a short history, the business is characterized by a 100-year tradition of concrete casting.

As early as 1916, the first shovelfuls of casting gravel were taken in the ground where the factory is located today. At first, the production mainly consisted of land and VA products. As the years went by, the direction was increasingly directed towards concrete elements for houses and other facility construction.

In the beginning, all material was handled by hand and with the help of horses. Working life in the pit was hard and tiring and few managed to reach the retirement age of the time with their health intact. Looking back at the 100-year history, the factory in Öjebyn is a brilliant industrial historical example of how much has happened in terms of improving the working environment, mechanical development and other technical achievements.

Today, the factory is a modern equipped full-range factory with high efficiency without renouncing our high-quality requirements. Our goal is to constantly develop the business to be one of the leading players on the market. We humbly carry with us the long tradition and history on which our business is based.

Over the years, there have been different owners of the business in Öjebyn. During the summer of 2012, the unit in Öjebyn was acquired by the Finnish companies Lujabetoni and YBT. Both companies are among the leaders in their market areas in Finland. With their solid knowledge in the industry, strong finances and pronounced long-term perspective, their ownership guarantees a business that is set in constant development.

PRODUCT DESCRIPTION

The precast prestressed concrete hollow core slab (HDF) is made of a layer of concrete with steel wire, the precast prestressed concrete hollow core slab is an internal construction in buildings. Each precast prestressed concrete hollow core slab produced is tailored based on the customer's specific requirements.

All products are manufactured in-house, which ensures a high and consistent quality. Therefore, the precast prestressed concrete hollow core slab can have a lifespan of up to 100 years. The maintenance required for the tile is low during its lifetime and our product also meets all the necessary requirements for moisture, acoustics and fire protection.

During the use phase, cementitious materials (hydration products in the concrete) present on the exterior surface of the wall chemically reacts with the atmospheric carbon dioxide due to carbonization and calcium carbonate is formed as the result. However, the carbonization is not taken into the account in this study.

This precast prestressed concrete hollow core slab is a standard product, it can be changed from customer to customer or project and where in the country it is to be delivered to.
It can be thicker or thinner, the size and number of openings can vary.

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

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	1.1	Europe
Minerals	98.9	Sweden
Fossil materials	0	-
Bio-based materials	0	-

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 tonne of precast prestressed concrete hollow core slab
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	MND	MND	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.

Raw materials are purchased and transported to the factory. The manufacture of the hollow core begins with the preparation of the casting bed, which includes cleaning the casting platform and applying form oil. Then tension lines are pulled out by a brush machine to the end of the casting platform. When tension lines are in place, they are tensioned, after which soil-moist concrete is poured into the casting machine, which is a moving mold. After casting, the hollow core is covered and allowed to harden. When the hollow core is hardened, the tensioning lines are relaxed, then it is sawn to the right size. In finishing, hole plugs are added to the cavities at the open ends of the hollow core, holes are drilled for drainage of water, then the product is moved to the warehouse.

The production of concrete is done at the factory.

Rejected concrete is landfilled in-situ; steel scraps are sent to a local waste manager for recycling; wastewater is treated in the municipal treatment plant and wooden molds are incinerated for energy.

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.

Transportation, A4 and A5 Assembly is not included in the EPD.

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)

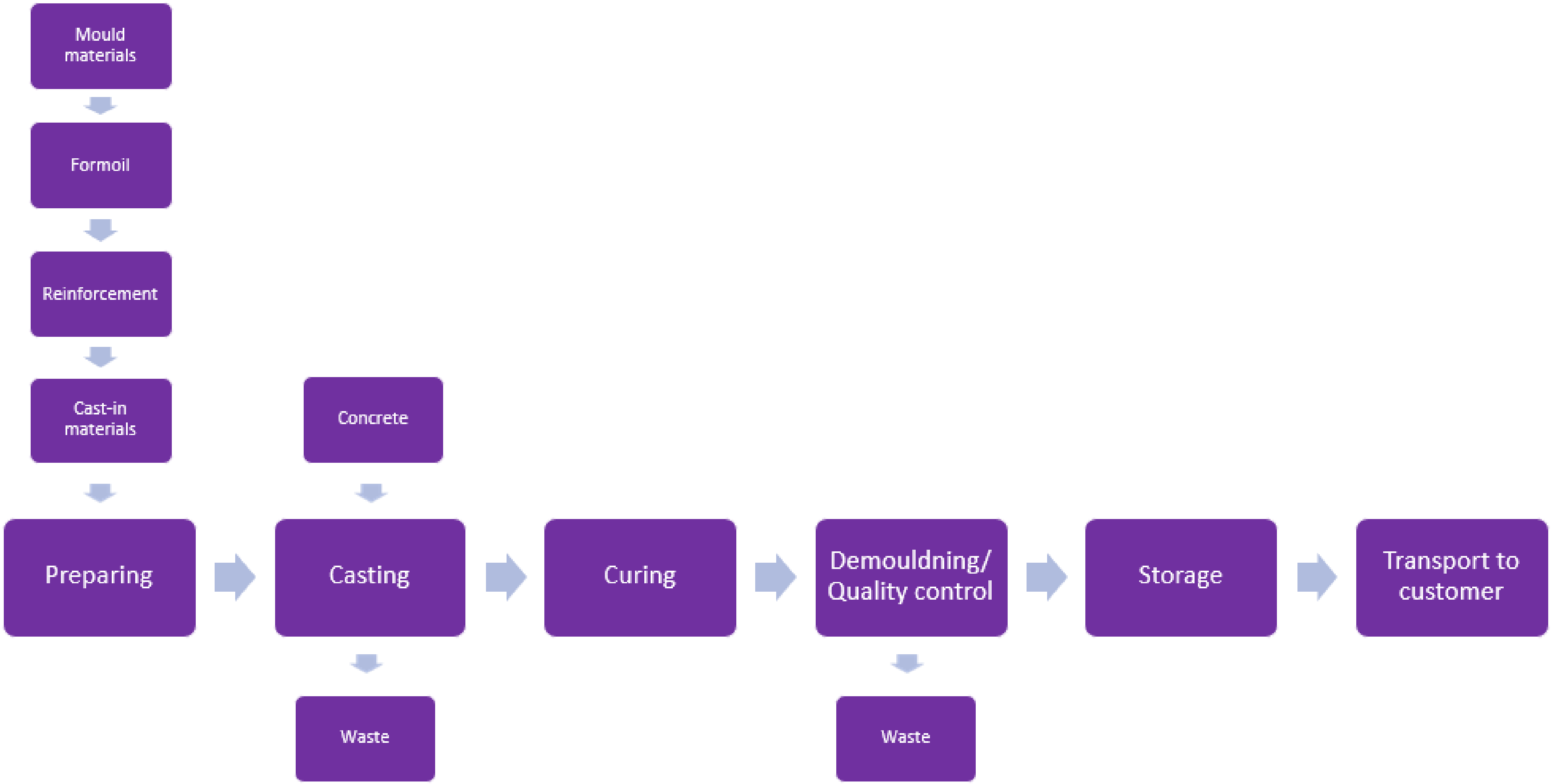
At the end of the service life, it is assumed that 100% of the waste in the demolition phase is collected as separate construction waste. The demolition process consumes energy in the form of diesel fuel used in construction machinery. The energy consumption for a demolition process is on average 10 kWh / m2 (Bozdağ, Ö & Seçer, M., Energy consumption of RC buildings during their life cycle. Izmr, Dokuz University (2007). Based on a Level project, the average mass of a reinforced concrete building is approximately 1000 kg / m2. Therefore, demolition of energy consumption is assumed to be 10 kWh / 1000 kg = 0.01 kWh / kg. The energy source is diesel fuel used by work machines (C1).

The dismantled prestressed slab is delivered to the nearest construction waste treatment plant. It is estimated that there is no mass loss when using the product, therefore the final product is assumed to have the same weight as the declared product. The transport distance to the nearest landfill is estimated at 50 km and the transport method is the most common truck (C2).

At the waste treatment plant, waste that can be reused, recycled or recycled for energy is separated for further use. At the beginning of 2020, waste restrictions were tightened in Sweden and the amount of waste that goes to landfill is limited compared to recent years, so it can be assumed that 100% of prestressed slab are transported to a waste treatment plant, where the slab are crushed and steel is separated. About 95% of steel (World Steel Association. 2020) and 80% of concrete (Betoniteollisuus ry, 2020) are recycled. Steel scrap are sent to a local waste manager for recycling; wastewater is treated in the municipal treatment plant and wooden molds are incinerated for energy.
The process losses of the waste treatment plant are assumed to be negligible (C3). The remaining 20% concrete and 5% steel are assumed to be sent to the landfill (C4).

Due to the recycling potential of reinforcing steel and concrete, they can be used as a secondary raw material, which avoids the use of virgin raw materials, 80% concrete and 95% steel.

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	Allocated by mass or volume
Packaging materials	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

AVERAGES AND VARIABILITY

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

N/A

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[1)]	kg CO_2e	1,36E2	1,05E0	6,45E0	1,43E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,31E0	0E0	3,41E0	1,05E0	-6,36E0
GWP – fossil	kg CO_2e	1,35E2	1,05E0	4,96E0	1,42E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,31E0	0E0	3,41E0	1,04E0	-6,35E0
GWP – biogenic	kg CO_2e	0E0	0E0	0E0	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
GWP – LULUC	kg CO_2e	4,37E-2	3,76E-4	1,5E0	1,54E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,3E-4	0E0	6,16E-4	9,86E-4	-8,74E-3
Ozone depletion pot.	kg $CFC_{11}e$	3,82E-6	2,5E-7	1,11E-6	5,18E-6	MND	MND	MND	MND	MND	MND	MND	MND	MND	7,07E-7	0E0	7,08E-7	4,23E-7	-5,18E-7
Acidification potential	mol H^+e	3,27E-1	4,37E-3	5,17E-2	3,83E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,44E-2	0E0	3,59E-2	9,82E-3	-4,12E-2
EP-freshwater[2)]	kg Pe	1,02E-2	7,16E-6	7,52E-5	1,03E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,1E-5	0E0	2,28E-5	1,09E-5	-3,61E-4
EP-marine	kg Ne	3,8E-2	1,32E-3	1,89E-2	5,82E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,52E-2	0E0	1,52E-2	3,4E-3	-8,92E-3
EP-terrestrial	mol Ne	1E0	1,46E-2	2,34E-1	1,25E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,67E-1	0E0	1,67E-1	3,74E-2	-1,16E-1
POCP (“smog”)[3)]	kg NMVOCe	3,11E-1	4,69E-3	5,63E-2	3,72E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,59E-2	0E0	4,6E-2	1,09E-2	-2,98E-2
ADP-minerals & metals[4)]	kg Sbe	2,87E-4	2,46E-6	6,79E-6	2,96E-4	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,68E-6	0E0	3,24E-5	2,4E-6	-6,19E-5
ADP-fossil resources	MJ	5,57E2	1,6E1	6,85E1	6,41E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,45E1	0E0	4,59E1	2,86E1	-9,19E1
Water use[5)]	m^3e depr.	2,12E1	7,39E-2	4,88E1	7,01E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,2E-1	0E0	1,75E-1	9,09E-2	-1,21E1

ADDITIONAL (OPTIONAL) 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
Particulate matter	Incidence	5,06E-6	1,23E-7	1,07E-6	6,25E-6	MND	MND	MND	MND	MND	MND	MND	MND	MND	9,22E-7	0E0	6,81E-6	1,98E-7	-5,3E-7
Ionizing radiation[6)]	kBq U235e	6,96E3	8,25E-2	3,49E-1	6,96E3	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,05E-1	0E0	2,31E-1	1,3E-1	-1,37E0
Ecotoxicity (freshwater)	CTUe	7,33E2	1,33E1	2,11E2	9,57E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,68E1	0E0	3,97E1	1,87E1	-1,16E2
Human toxicity, cancer	CTUh	3,53E-7	3,51E-10	3,82E-9	3,58E-7	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,03E-9	0E0	1,41E-9	4,67E-10	-6,4E-9
Human tox. non-cancer	CTUh	5,07E-6	1,41E-8	9,57E-8	5,18E-6	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,94E-8	0E0	3,78E-8	1,22E-8	-1,18E-7
SQP[7)]	-	1,37E3	1,87E1	3,5E2	1,74E3	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,79E0	0E0	1,18E1	6,12E1	-8,82E1

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	8,13E1	2,07E-1	1,58E2	2,39E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,54E-1	0E0	7,93E-1	2,49E-1	-8,25E0
Renew. PER as material	MJ	0E0	0E0	-6,75E-4	-6,75E-4	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Total use of renew. PER	MJ	8,13E1	2,07E-1	1,58E2	2,39E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,54E-1	0E0	7,93E-1	2,49E-1	-8,25E0
Non-re. PER as energy	MJ	6,85E2	1,6E1	6,42E1	7,65E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,45E1	0E0	4,59E1	2,86E1	-9,19E1
Non-re. PER as material	MJ	5,03E0	0E0	8,04E-4	5,03E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-4,02E0	-1,01E0	0E0
Total use of non-re. PER	MJ	6,9E2	1,6E1	6,42E1	7,7E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,45E1	0E0	4,18E1	2,76E1	-9,19E1
Secondary materials	kg	3,55E1	4,51E-3	2,58E-2	3,55E1	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,74E-2	0E0	2,02E-2	6,02E-3	-1,01E-1
Renew. secondary fuels	MJ	1,06E2	3,98E-5	1,15E-4	1,06E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,7E-5	0E0	2,34E-4	1,57E-4	-7,23E-4
Non-ren. secondary fuels	MJ	1,74E2	0E0	0E0	1,74E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Use of net fresh water	m^3	5,88E-1	2,12E-3	1,08E0	1,67E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,7E-3	0E0	4,41E-3	3,14E-2	-2,93E-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	9,27E-1	1,72E-2	9,38E-2	1,04E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,96E-2	0E0	7,82E-2	0E0	-5,38E-1
Non-hazardous waste	kg	7,02E2	2,99E-1	4,82E1	7,5E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,19E-1	0E0	1,07E0	1,98E2	-1,58E1
Radioactive waste	kg	4,68E-4	1,1E-4	4,04E-4	9,82E-4	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,13E-4	0E0	3,19E-4	0E0	-4,58E-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	5,2E-2	0E0	0E0	5,2E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Materials for recycling	kg	0E0	0E0	1,71E-3	1,71E-3	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	8,02E2	0E0	0E0
Materials for energy rec	kg	0E0	0E0	2,21E-1	2,21E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported energy	MJ	0E0	0E0	0E0	0E0	MND	MND	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	1,6E2	1,87E0	6,26E0	1,68E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,27E0	0E0	3,37E0	1,02E0	-6,2E0
Ozone depletion Pot.	kg $CFC_{-11}e$	5,1E-6	3,43E-7	7,97E-7	6,24E-6	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,6E-7	0E0	5,61E-7	3,34E-7	-4,29E-7
Acidification	kg SO_2e	3,53E-1	6,2E-3	2,69E-2	3,86E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,45E-2	0E0	2,59E-2	7,42E-3	-3,19E-2
Eutrophication	kg $PO_4^{3}e$	1,3E-1	1,41E-3	6,3E-3	1,38E-1	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,69E-3	0E0	6,23E-3	1,6E-3	-1,5E-2
POCP ("smog")	kg C_2H_4e	2,12E-2	2,42E-4	8,43E-4	2,23E-2	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,36E-4	0E0	6,04E-4	3,11E-4	-2,17E-3
ADP-elements	kg Sbe	3,91E-4	4,28E-6	5,13E-6	4E-4	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,65E-6	0E0	3,23E-5	2,37E-6	-6,12E-5
ADP-fossil	MJ	8,49E2	2,83E1	6,4E1	9,41E2	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,45E1	0E0	4,59E1	2,86E1	-9,19E1

ANNEX 1

Environmental impact (GWP-fossil) A1-A3 for different hollow core slab

Type	High	Reinforcement	GWP/ton	Weight
	mm	kg/ton	kg CO_2-e/ton	kg/m
HDF19	185	10,9	142	332
HDF27	**265**	**11,0**	**142**	**386**
HDF32	320	12,6	145	460
HDF40	400	11,7	143	498
HDF42	420	14,4	149	546

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.

HaiHa Nguyen, as an authorized verifier acting for EPD Hub Limited
21.09.2023

EPD Hub
VERIFIED ISO 14025