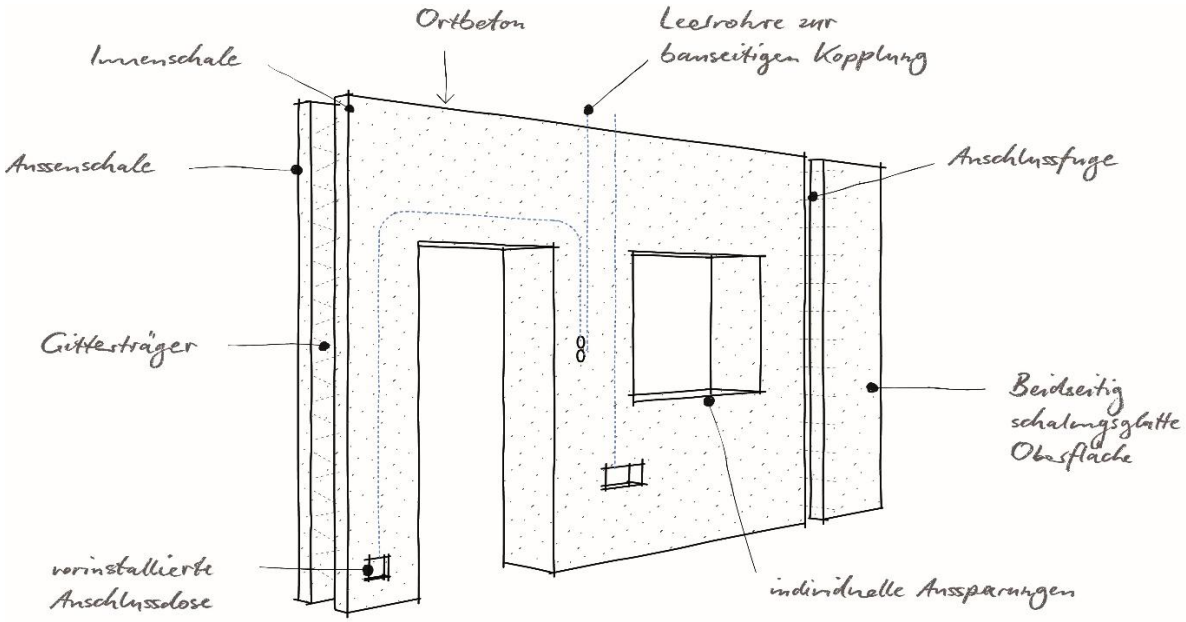
ENVIRONMENTAL PRODUCT DECLARATION

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

Double walls (Doppelwände/Elementwände)

Syspro-Gruppe Betonbauteile e. V.



EPD HUB, HUB-2118

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GENERAL INFORMATION

MANUFACTURER

Manufacturer	Syspro-Gruppe Betonbauteile e. V.
Address	Matthias-Grünewald-Straße 1-3, 53175 Bonn, Nordrhein-Westfalen, Germany
Contact details	info@syspro.org
Website	www.syspro.de

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 1.1, 5 Dec 2023
Sector	Construction product
Category of EPD	Third party verified EPD
Scope of the EPD	Cradle to gate with modules C1-C4 and D
EPD author	Marco Decker - Master Builders Solutions
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	Double walls
Place of production	Multiple (association)
Period for data	Calendar year 2023
Averaging in EPD	Multiple (association)
Variation in GWP-fossil for A1-A3	15.5 %

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m^2
Declared unit mass	296.4 kg
GWP-fossil, A1-A3 ($kgCO_2e$)	42.1
GWP-total, A1-A3 ($kgCO_2e$)	42.6
Secondary material, inputs (%)	7.7
Secondary material, outputs (%)	93.9
Total energy use, A1-A3 (kWh)	104
Total water use, A1-A3 (m^3e)	0.8

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

Syspro-Gruppe Betonbauteile e. V. is an association of mostly medium-sized manufacturers of precast concrete parts founded in 1991 for quality assurance and product development. Under the Syspro umbrella brand, the individual member companies act as local market partners for planners and developers.

In addition to double walls and floor slab elements, the product portfolio also includes heat-insulating and thermally active components such as thermal walls and climate ceilings for commercial and industrial construction, residential construction and agricultural construction.

Our members come from Germany, Austria, northern Italy and Belgium. They produce in a resource-saving manner using fully automated and optimized production processes using the latest plant technology. In conjunction with the constant optimization of the use of raw materials and concrete mix designs, this creates innovative components that more than meet all the requirements for statics, building physics and appearance.

PRODUCT DESCRIPTION

The Syspro double walls (also “Syspro element walls”) are solid wall constructions that consist of two reinforced concrete shells connected to each other by lattice girders. A space remains between the shells, which is filled with in-situ concrete after assembly. As soon as the filling concrete has hardened, the overall cross-section appears like a monolithic wall.

Typical areas of application are load-bearing external and internal walls in residential, commercial and industrial constructions. It is also possible and common to use them as a water-impermeable reinforced concrete structure (WU, “Weiße Wanne”) when there is groundwater or pressing water. The Syspro double wall is convincing, on the one hand, due to its cost-effectiveness (no extensive formwork work or costs for formwork purchase, transport, cleaning, and storage; double wall elements are delivered "just-in-time," etc.) and, on the other hand, when special requirements arise from a demanding geometry regarding the arrangement and execution of joints, recesses, and installation components. Weather-independent production in the factory allows for high design freedom, flexibility, and precision of the products.

In this EPD, one square meter of a double wall is modelled with 5 or 6 cm thick inner shells and 6 cm thick outer shells.

A double wall is only the intermediate product and not the complete wall: This EPD does not include the additional in-situ concrete that is poured between the prefabricated shells of the double wall.

The application of this document is limited to double walls that are manufactured by the member companies of the Syspro-Group Betonbauteile e.V.

Data from 2023 from all member companies was made available for this declaration.

Further information can be found at
https://syspro.de/bausystem/doppelwand

PLACES OF PRODUCTION

City	Country
Langkampfen	Austria
Gerasdorf	Austria
Grobbendonk	Belgium
Andernach	Germany
Bedburg	Germany
Dülmen	Germany
Geisingen	Germany
Halle/Westfalen	Germany
Kirchardt	Germany
Kißlegg	Germany
Lauterhofen	Germany
Nordhorn	Germany
Oschatz	Germany
Sasbach	Germany
Tübingen	Germany
Brixen	Italy

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	5-6%	Germany, EU
Minerals	94-95%	Germany, EU
Fossil materials	<1%	Germany, EU
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 m²
Mass per declared unit	296.354 kg
Reference service life	50 years

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 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 double-shell wall elements are produced in a circulation system. Here for the first shell of the wall, the formwork is set one after the other in separate stations in a robot-controlled manner, the required reinforcement is also laid with the help of robots, and then the concrete is installed and compacted at the concreting station using computer calculations.

After these steps, the switching table with the finished first shell of the element moves into the drying chamber, where the concrete is post-treated at approx. 30 degrees and high humidity (approx. 85%).

After the first shell of the wall has hardened, the second shell is made in the same way. Before compaction, the finished first shell is rotated by 180 degrees via a turning station and immersed in the freshly concreted second shell with the lattice girders. The element is then compacted and transported to the drying chamber for post-treatment and curing.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final product delivery to the construction site (A4) and installation phase (A5) are not modelled.

PRODUCT USE AND MAINTENANCE (B1-B7)

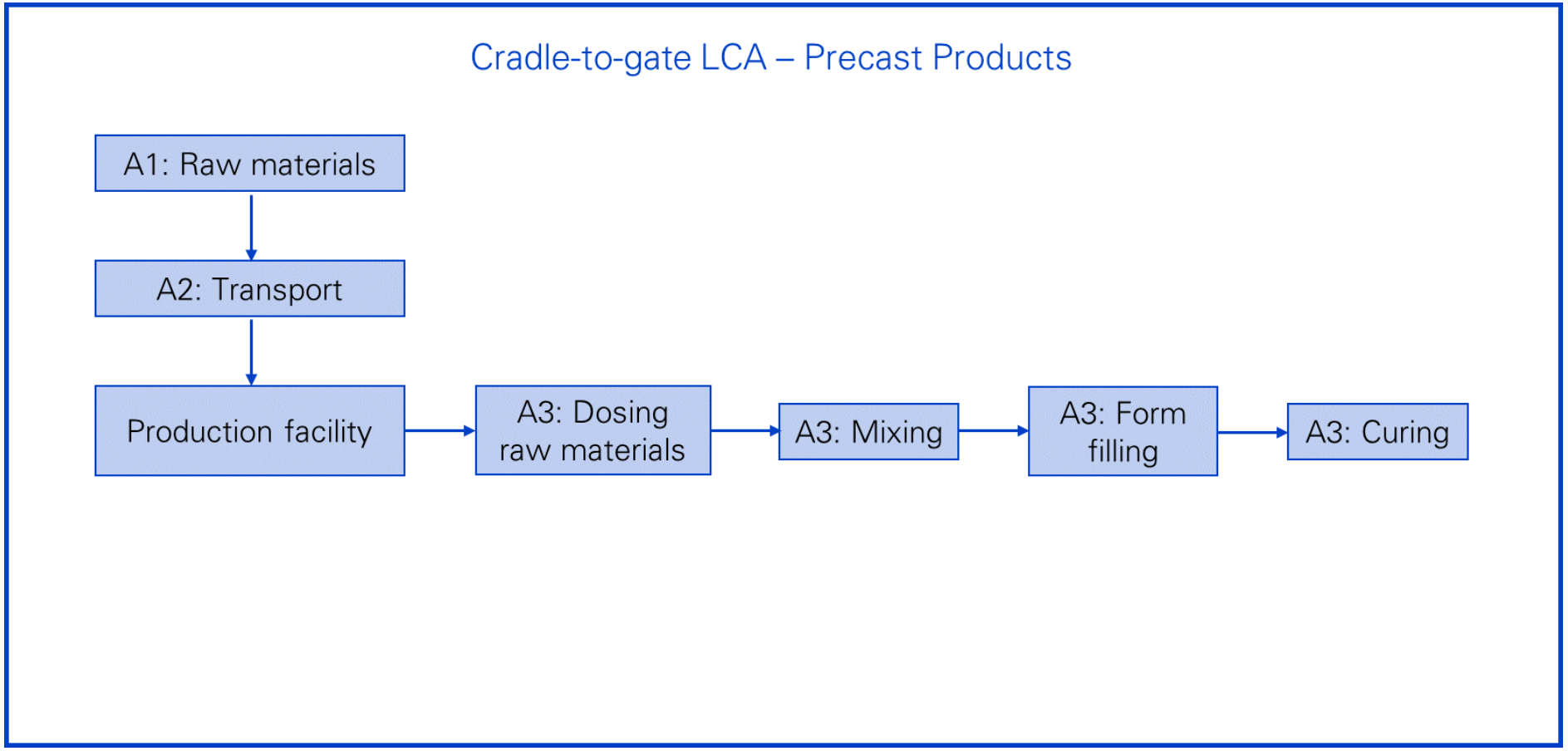
This EPD does not cover the use phase. Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

The deconstruction takes place in C1 module which considers energy for dismantling and handling. After the demolition, the debris are transported to the end-of-life processing (C2) where all the impacts related to the transport processes are considered. The double walls are demolished into two components: concrete and reinforcement steel. 94.5% of concrete waste and 85% of steel waste are recycled to be reused as construction materials (mainly in Germany). The rest (5.5% of concrete waste and 15% of steel waste) is treated as inert material for landfill (C4).

The benefits and loads of recycled aggregates and recycled steel (C3) are modelled and included beyond the system boundary (D).

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.

Maintenance and transport impacts during the re-using period of wooden pallets are cut-off. Manufacture of machinery, buildings, and other infrastructure was not included in the LCA. Resources and material losses during installation (A5) are construction dependent. Thus, they are cut-off.

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	No allocation
Packaging materials	No allocation
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

The following assumptions were made:

- Transport distance for coil cut-off and concrete waste at the end-of-life (C2) is considered 100 km as the worst-case scenario.
- Consumed energy for demolition (C1) is 0.07 MJ / kg [Source: EUR 29123 EN Model for Life Cycle Assessment (LCA) of buildings].
- End-of-life waste processing ratio for concrete (i.e., 94.5% as recycled concrete and 5.5% as landfill) (C3 and C4) [Source: Germany Mineralische Bauabfälle Monitoring 2020].
- End-of-life waste recycling ratio of steel for Europe is 85%. [Source: International Stainless-Steel Forum – The Global Life Cycle of Stainless steel 2023].

AVERAGES AND VARIABILITY

Type of average	Multiple manufacturers
Averaging method	Averaged by shares of total mass
Variation in GWP-fossil for A1-A3	15.5 %

This EPD covers one square meter of a double wall, modelled with 5 or 6 cm thick inner shells and 6 cm thick outer shells, produced in the plants of the Syspro member companies.

LCA calculations have been carried out for each producer and production site. The results were then averaged based by shares of total mass, leading to a maximal variation of 15.5% for GWP-fossil for A1-A3.

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	3,75E+01	1,53E+00	3,56E+00	4,26E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,91E+00	2,70E+00	1,95E+00	2,27E-01	-1,93E+01
GWP – fossil	kg CO_2e	3,71E+01	1,52E+00	3,56E+00	4,21E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,91E+00	2,69E+00	2,32E+00	2,50E-01	-1,93E+01
GWP – biogenic	kg CO_2e	3,95E-01	0,00E+00	0,00E+00	3,95E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	-3,71E-01	-2,35E-02	7,87E-03
GWP – LULUC	kg CO_2e	1,36E-02	5,56E-04	2,04E-03	1,62E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,90E-04	9,70E-04	2,31E-04	1,45E-04	-1,33E-03
Ozone depletion pot.	kg CFC_{-11}e	1,07E-05	3,57E-07	3,83E-07	1,15E-05	MND	MND	MND	MND	MND	MND	MND	MND	MND	4,08E-07	6,42E-07	4,96E-07	7,14E-08	-7,85E-07
Acidification potential	mol H^+e	9,00E-02	6,41E-03	9,59E-03	1,06E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,98E-02	1,13E-02	2,41E-02	2,47E-03	-6,80E-02
EP-freshwater[2)]	kg Pe	4,18E-04	1,15E-05	2,01E-04	6,30E-04	MND	MND	MND	MND	MND	MND	MND	MND	MND	6,32E-06	1,87E-05	7,69E-06	1,59E-06	-8,38E-04
EP-marine	kg Ne	2,12E-02	1,92E-03	2,46E-03	2,56E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	8,77E-03	3,40E-03	1,07E-02	1,01E-03	-1,59E-02
EP-terrestrial	mol Ne	5,57E+00	2,12E-02	2,73E-02	5,62E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	9,62E-02	3,75E-02	1,17E-01	1,10E-02	-1,91E-01
POCP ("smog")[3)]	kg NMVOCe	7,66E-02	6,80E-03	8,03E-03	9,14E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,64E-02	1,21E-02	3,22E-02	3,09E-03	-1,05E-01
ADP-minerals & metals[4)]	kg Sbe	7,62E-02	3,58E-06	1,14E-05	7,62E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	9,67E-07	6,32E-06	1,18E-06	3,21E-07	-2,28E-05
ADP-fossil resources	MJ	2,69E+02	2,31E+01	5,33E+01	3,45E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,57E+01	4,12E+01	3,12E+01	4,69E+00	-1,66E+02
Water use[5)]	m^3e depr.	8,61E+00	1,05E-01	4,80E-01	9,19E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	6,90E-02	1,90E-01	8,40E-02	1,49E-02	-6,69E+00

[1)] GWP = Global Warming Potential; [2)] EP = Eutrophication potential; [3)] POCP = Photochemical ozone formation; [4)] ADP = Abiotic depletion potential
For EP-freshwater, the required characterization method and data are in kg P-eq. Multiply by 3,07 to get PO4e
[4,5)] 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 experienced with the indicator

ADDITIONAL 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	3,09E+01	1,77E-07	1,05E-07	3,09E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,31E-07	3,17E-07	2,61E-06	6,00E-08	-1,12E-06
Ionizing radiation[6)]	kBq U235e	2,48E+02	1,14E-01	3,99E-01	2,49E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,18E-01	2,11E-01	1,44E-01	2,15E-02	7,64E-01
Ecotoxicity (freshwater)	CTUe	6,01E+02	2,00E+01	2,92E+01	6,50E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,54E+01	3,44E+01	1,88E+01	3,00E+00	-5,94E+02
Human toxicity, cancer	CTUh	4,37E-01	5,09E-10	8,28E-10	4,37E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	5,91E-10	9,04E-10	7,20E-10	9,31E-11	2,37E-07
Human tox. non-cancer	CTUh	7,71E-06	2,05E-08	2,50E-08	7,76E-06	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,12E-08	3,63E-08	1,36E-08	2,08E-09	-3,83E-07
SQP[7)]	-	1,05E+02	2,68E+01	5,16E+00	1,37E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,34E+00	4,80E+01	4,06E+00	5,90E+00	-5,53E+01

[6)] EN 15804+A2 disclaimer for Ionizing radiation, human health: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator
[7)] SQP = Land use related impacts/soil quality

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	1,71E+01	2,79E-01	5,50E+00	2,29E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,47E-01	5,29E-01	1,79E-01	3,65E-02	3,44E+00
Renew. PER as material	MJ	1,85E+01	0,00E+00	0,00E+00	1,85E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	-1,58E+01	-2,75E+00	0,00E+00
Total use of renew. PER	MJ	3,56E+01	2,79E-01	5,50E+00	4,14E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,47E-01	5,29E-01	-1,56E+01	-2,71E+00	3,44E+00
Non-re. PER as energy	MJ	2,27E+02	2,31E+01	5,21E+01	3,02E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,57E+01	4,12E+01	3,12E+01	4,69E+00	-1,66E+02
Non-re. PER as material	MJ	4,17E+01	0,00E+00	0,00E+00	4,17E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	-3,56E+01	-6,09E+00	0,00E+00
Total use of non-re. PER	MJ	2,69E+02	2,31E+01	5,21E+01	3,44E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,57E+01	4,12E+01	-4,36E+00	-1,39E+00	-1,66E+02
Secondary materials	kg	2,29E+01	6,46E-03	3,67E-03	2,29E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,00E-02	1,16E-02	1,22E-02	1,42E-03	1,30E+01
Renew. secondary fuels	MJ	1,59E+01	6,13E-05	3,86E-03	1,59E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,28E-05	1,03E-04	4,00E-05	1,73E-05	3,70E-04
Non-ren. secondary fuels	MJ	3,77E+01	0,00E+00	4,05E-02	3,77E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m^3	7,86E-01	3,03E-03	1,28E-02	8,02E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,56E-03	5,46E-03	1,90E-03	2,97E-03	-1,03E-01

[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	2,06E-01	2,79E-02	1,17E-01	3,51E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	3,43E-02	4,48E-02	4,18E-02	3,31E-03	7,70E-01
Non-hazardous waste	kg	5,21E+00	4,69E-01	9,00E+00	1,47E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	2,41E-01	7,76E-01	2,94E-01	1,54E+01	-3,05E+01
Radioactive waste	kg	4,91E-02	1,57E-04	1,55E-04	4,94E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,81E-04	2,84E-04	2,20E-04	1,72E-05	7,14E-05

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	2,40E-03	0,00E+00	0,00E+00	2,40E-03	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	2,39E+00	0,00E+00	0,00E+00	2,39E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	2,78E+02	0,00E+00	0,00E+00
Materials for energy rec	kg	2,68E-05	0,00E+00	0,00E+00	2,68E-05	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	7,73E-03	0,00E+00	0,00E+00	7,73E-03	MND	MND	MND	MND	MND	MND	MND	MND	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG[9)]	kg CO_2e	3,71E+01	1,52E+00	3,56E+00	4,21E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1,91E+00	2,69E+00	2,32E+00	2,50E-01	-1,93E+01

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product as defined by IPCC AR 5 (IPCC 2013). In addition. the characterisation factors for the flows - CH4 fossil. CH4 biogenic and Dinitrogen monoxide - were updated in line with the guidance of IES PCR 1.2.5 Annex 1. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterization factor for biogenic CO_2 is set to zero.

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.

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 association-specific and 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
08.11.2024