

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

LTKH®-Thermowand
B. Lütkenhaus GmbH



EPD HUB, HUB-0985

Publishing on 05.01.2024, last updated on 05.01.2024, valid until 05.01.2029.

GENERAL INFORMATION

MANUFACTURER

Manufacturer	B. Lütkenhaus GmbH
Address	Börnste 64, 48249 Dülmen, Germany
Contact details	info@luetkenhaus.com
Website	www.luetkenhaus.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 modules C1-C4 and D
EPD author	Shirin Fataei - Master Builders Solutions
EPD verification	Independent verification of this EPD and data, according to ISO 14025: ☐ Internal certification ☒ External verification
EPD verifier	Edis Glogic, 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	LTKH®-Thermowand
Place of production	Dülmen, Germany
Period for data	2022
Averaging in EPD	No averaging

ENVIRONMENTAL DATA SUMMARY

Declared unit	1 m ²
Declared unit mass	333.1 kg
GWP-fossil, A1-A3 (kgCO ₂ e)	54.0
GWP-total, A1-A3 (kgCO ₂ e)	54.2
Secondary material, inputs (%)	7.57
Secondary material, outputs (%)	92.8
Total energy use, A1-A3 (kWh)	138.0
Total water use, A1-A3 (m ³ e)	0.568

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

B. Lütkenhaus GmbH is one of the most efficient and innovative concrete and precast plants in Germany. With Lütkenhaus you can rely on first-class service and leading quality. They open up completely new possibilities for construction project with precast concrete parts. They can produce practically anything that can be cast in concrete using prefabrication – from ceiling systems to facades and walls to balconies, stairs or special parts.

For the highest precision and maximum efficiency, they use computer-controlled circulation production systems. This is how they promptly produce precast concrete parts for building projects, even for major projects – of high quality, individually planned and dimensioned. Their precast concrete parts are used in office and commercial construction as well as in industrial and classic residential construction.

PRODUCT DESCRIPTION

Advanced wall systems for special construction requirements: the LTKH®-Thermowand – the core-insulated double wall system.

The ever-increasing demands in floor plan design continually present planners and executors with challenges. The trend towards individualized buildings with high geometric requirements and symbolic designs requires wall systems that enable Lütkenhaus to support its customers in realizing their structural wishes.

- The double-shell wall system is supplemented by factory-integrated core insulation with 7 cm thick outer wall and 6 cm thick inner wall. Concrete weights are respectively 167.25 kg/m² and 143.35 kg/m².
- The thermal wall is the economically optimal solution as it combines maximum environmental protection, short construction times, high requirements for fire, sound and heat protection as well as high mechanical resilience with individual architectural facade design.

- The choice of insulation panels depends on the specifications of the specialist planners - insulation panel thicknesses from 4 cm to 20 cm are available. Insulation panel thickness for this EPD is 16 cm.
- High cold and heat protection (U values up to 0.13 W/m²K).
- High sound insulation.

Within this EPD, one square meter of LTKH®-Thermowand is modelled.

Further information can be found at

<https://www.luetkenhaus.com/index.php/produkte/waende>.

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass- %	Material origin
Metals	5-6%	Germany, EU
Minerals	93-94%	Germany, EU
Fossil materials	1-2%	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 m ²
Mass per declared unit	333.10 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 precast core-insulated double wall systems are produced in a circulation system. Here for the first shell (7 cm) 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. The insulation (16 cm) is then laid on the fresh concrete and fixed. 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)

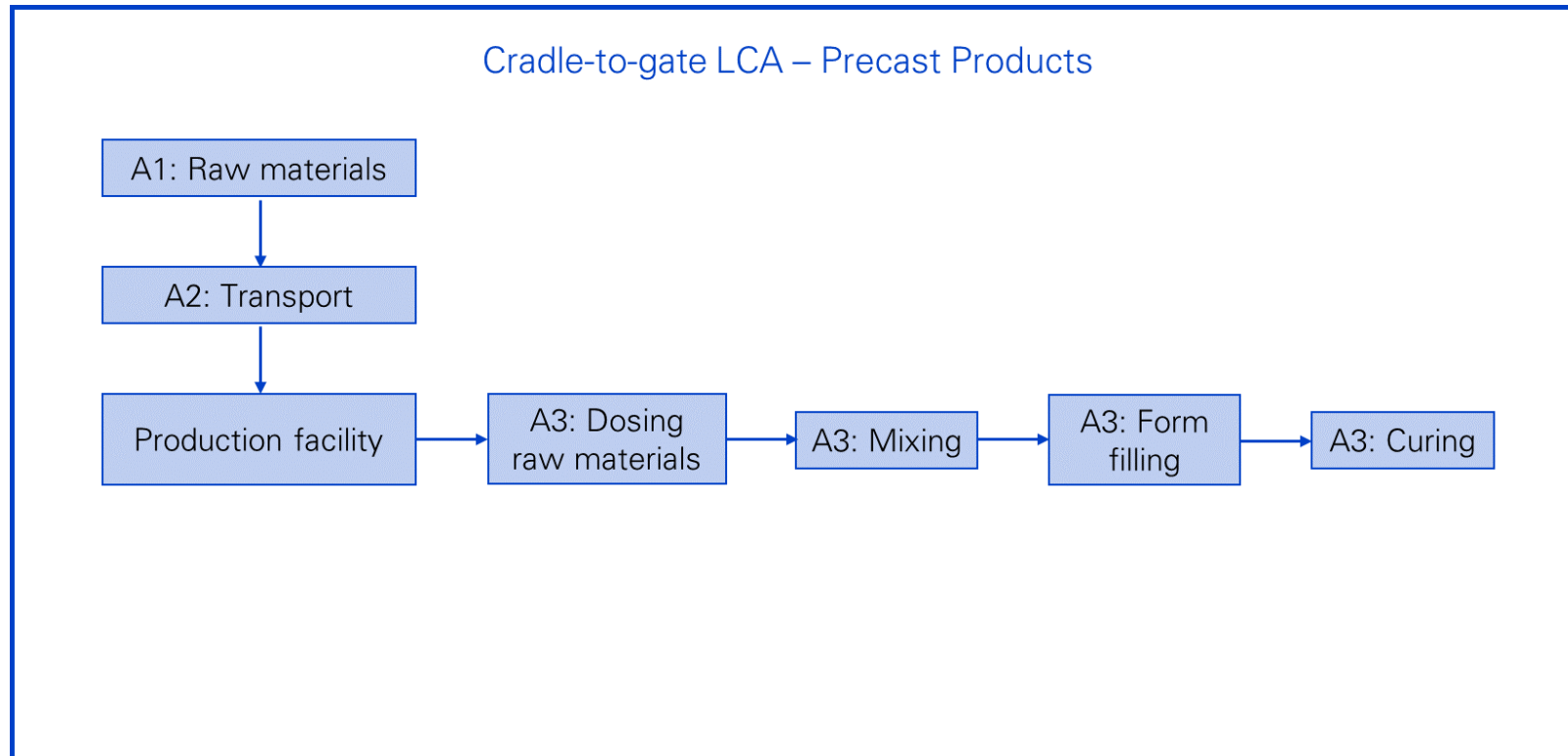
This EPD does not cover the use phase. Air, soil, and water impacts during the use phase have not been studied.

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 thermal walls are demolished into three components: concrete, steel and EPS isolation. 94.5% of concrete waste and 85% of steel waste are recycled to be reused as construction materials. The rest (5.5% of concrete waste and 15% of steel waste) is treated as inert material for landfill (C4). The EPS isolation is 100% incinerated to produce electricity and thermal energy.

The benefits and loads of recycled aggregates, recycled steel, and incineration of EPS isolation (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 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](#)].
- End-of-life waste processing for EPS isolation is defined as 100% incineration with net energy production of 4.07 MJ/kg electric energy and 7.88 MJ/kg thermal energy [Source: [Umwelt Bundesamt: Grundlagen und Empfehlungen zur Beschreibung der Rückbau-, Nachnutzungs- und Entsorgungsphase von Bauprodukten in Umweltproduktdeklarationen](#)].

AVERAGES AND VARIABILITY

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

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 3.8 and One Click LCA databases were used as sources of environmental data. Further EPDs to Ecoinvent databases are:

- EFCA Generic EPD for “Concrete admixture - plasticisers and superplasticizers” (EPD number: EPD-EFC-20210198-IBG1-EN).
- Product-specific EPD for “Hot-rolled reinforcement steel (rebar)” (EPD number: EPD-RIVA-133-DE).
- Product-specific EPD for “Reinforcement steel (rebar) rings” (EPD number: EPD-RIVA-132-DE).
- Product-specific EPD for “EPS hard foam, white, for flat roof and floor insulation, high pressure resistance, $L = 0.035 \text{ W/mK}$, 25 kg/m^3 , $\Lambda = 0.035 \text{ W/(m.K)}$ ” (EPD number: EPD-IVH-20220131-CBG1-DE).

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 ₂ e	4.86E+01	2.69E+00	2.95E+00	5.42E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.14E+00	3.03E+00	1.51E+01	2.53E-01	-2.35E+01
GWP – fossil	kg CO ₂ e	4.84E+01	2.69E+00	2.95E+00	5.40E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.14E+00	3.03E+00	1.53E+01	2.72E-01	-2.35E+01
GWP – biogenic	kg CO ₂ e	2.00E-01	0.00E+00	0.00E+00	2.00E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	-1.81E-01	-1.90E-02	7.85E-03
GWP – LULUC	kg CO ₂ e	2.09E-02	9.75E-04	2.77E-03	2.46E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.13E-04	1.09E-03	2.99E-04	1.59E-04	-1.61E-03
Ozone depletion pot.	kg CFC ₁₁ e	1.84E-06	6.34E-07	4.55E-07	2.93E-06	MND	MND	MND	MND	MND	MND	MND	MND	MND	4.58E-07	7.22E-07	5.57E-07	7.79E-08	-1.34E-06
Acidification potential	mol H ⁺ e	1.49E-01	1.13E-02	8.54E-03	1.69E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.23E-02	1.27E-02	2.82E-02	2.68E-03	-7.70E-02
EP-freshwater ²⁾	kg Pe	9.29E-04	1.96E-05	3.17E-04	1.27E-03	MND	MND	MND	MND	MND	MND	MND	MND	MND	7.10E-06	2.10E-05	9.93E-06	1.74E-06	-9.12E-04
EP-marine	kg Ne	3.76E-02	3.39E-03	1.50E-03	4.25E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	9.86E-03	3.82E-03	1.25E-02	1.09E-03	-1.81E-02
EP-terrestrial	mol Ne	4.51E-01	3.74E-02	1.74E-02	5.05E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.08E-01	4.22E-02	1.37E-01	1.19E-02	-2.16E-01
POCP (“smog”) ³⁾	kg NMVOCe	2.69E-01	1.20E-02	5.04E-03	2.86E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.97E-02	1.36E-02	3.74E-02	3.35E-03	-1.17E-01
ADP-minerals & metals ⁴⁾	kg Sbe	1.25E-04	6.31E-06	4.89E-06	1.36E-04	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.09E-06	7.11E-06	1.72E-06	3.52E-07	-2.61E-05
ADP-fossil resources	MJ	6.41E+02	4.09E+01	5.41E+01	7.36E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.88E+01	4.63E+01	3.56E+01	5.12E+00	-2.24E+02
Water use ⁵⁾	m ³ e depr.	5.74E+00	1.87E-01	4.70E-01	6.40E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	7.75E-02	2.13E-01	3.82E-01	1.62E-02	-7.53E+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	1.30E-06	3.14E-07	4.09E-08	1.66E-06	MND	MND	MND	MND	MND	MND	MND	MND	MND	5.97E-07	3.56E-07	2.90E-06	6.49E-08	-1.22E-06
Ionizing radiation ⁶⁾	kBq U235e	2.18E+00	2.05E-01	4.71E-01	2.85E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.33E-01	2.37E-01	1.61E-01	2.34E-02	8.06E-01
Ecotoxicity (freshwater)	CTUe	6.44E+02	3.49E+01	3.20E+01	7.11E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.73E+01	3.87E+01	8.64E+01	3.28E+00	-6.46E+02
Human toxicity, cancer	CTUh	3.98E-08	8.99E-10	9.05E-10	4.16E-08	MND	MND	MND	MND	MND	MND	MND	MND	MND	6.64E-10	1.02E-09	1.63E-09	1.01E-10	2.56E-07
Human tox. non-cancer	CTUh	5.31E-07	3.61E-08	2.65E-08	5.94E-07	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.25E-08	4.08E-08	4.71E-08	2.27E-09	-4.17E-07
SQP ⁷⁾	-	1.97E+02	4.75E+01	6.89E+00	2.52E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	3.75E+00	5.39E+01	4.86E+00	6.51E+00	-6.14E+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	1.76E+01	5.07E-01	4.31E+00	2.25E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.65E-01	5.95E-01	2.25E-01	4.00E-02	3.57E+00
Renew. PER as material	MJ	5.04E+01	0.00E+00	0.00E+00	5.04E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	-4.29E+01	-7.55E+00	0.00E+00
Total use of renew. PER	MJ	6.81E+01	5.07E-01	4.31E+00	7.29E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.65E-01	5.95E-01	-4.27E+01	-7.51E+00	3.57E+00
Non-re. PER as energy	MJ	3.93E+02	4.09E+01	4.15E+01	4.75E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.88E+01	4.63E+01	3.56E+01	5.12E+00	-2.24E+02
Non-re. PER as material	MJ	2.74E+02	0.00E+00	0.00E+00	2.74E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	-2.56E+02	-1.79E+01	0.00E+00
Total use of non-re. PER	MJ	6.67E+02	4.09E+01	4.15E+01	7.49E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.88E+01	4.63E+01	-2.21E+02	-1.28E+01	-2.24E+02
Secondary materials	kg	2.52E+01	1.15E-02	4.58E-03	2.52E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.13E-02	1.30E-02	1.49E-02	1.55E-03	1.41E+01
Renew. secondary fuels	MJ	3.23E-04	1.06E-04	4.17E-05	4.71E-04	MND	MND	MND	MND	MND	MND	MND	MND	MND	3.69E-05	1.16E-04	5.55E-05	1.90E-05	3.90E-04
Non-ren. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	5.50E-01	5.38E-03	1.27E-02	5.68E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	1.75E-03	6.13E-03	5.34E-03	3.28E-03	-1.19E-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	7.11E-01	4.73E-02	1.59E-01	9.17E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	3.86E-02	5.03E-02	4.60E-02	3.55E-03	8.12E-01
Non-hazardous waste	kg	2.18E+01	8.05E-01	1.47E+01	3.73E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.71E-01	8.72E-01	4.32E+00	1.71E+01	-3.32E+01
Radioactive waste	kg	3.63E-03	2.79E-04	2.75E-04	4.18E-03	MND	MND	MND	MND	MND	MND	MND	MND	MND	2.03E-04	3.19E-04	2.42E-04	1.85E-05	6.99E-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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	3.98E+00	0.00E+00	0.00E+00	3.98E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	3.09E+02	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	2.51E-02	0.00E+00	0.00E+00	2.51E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	4.78E+01	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 ₂ e	4.84E+01	2.69E+00	2.95E+00	5.40E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.35E+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 CO₂ 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.

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.

Edis Glogic, as an authorized verifier acting for EPD Hub Limited
05.01.2024

