Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

MAGOXX® Board

from

MAGOXX BV

Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14 Construction products (version 1.3.4)* *UN CPC code: 37520 Boards, blocks and similar articles of vegetable fibre, straw or wood waste agglomerated with mineral binders*
PCR review was conducted by: *The Technical Committee of the International EPD® System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.*
Life Cycle Assessment (LCA)
LCA accountability: *Lucia Zhang, Intertek* *lucia.zhang@intertek.com*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Silvia Vilčeková, Silcert, s.r.o.* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD:
MAGOXX BV

Contact:
Jan Engels
Jan@magoxx.com

Description of the organization:
MAGOXX BV is the producer of sustainable and fire-resistant board materials to the construction industry producing PreFab & Modular Buildings (light steel frame, structured insulated panels or wooden frame).

Product-related or management system-related certifications:
ETA 23/2060 of 07/11/2023

Name and location of production site(s):
Qingdao City in China

Product information

Product name:
MAGOXX® Board

Product description:
MAGOXX® Board is a rigid, non-textured mineral (MgO) bound matrix fire protective board without adhesive finishings. MAGOXX® Board can be used as an interior or exterior layer of a construction, >50 years lifetime. Specific sizes and square edges are available upon request.

Characteristics		Nominal value
Product thickness, mm		12.0
Product weight, kg/m^2		12.6
Product form, tiles or planks	Width, mm	900~1220
	Length, mm	2400~3050

Products application:
MAGOXX® Board is suitable for indoor and outdoor constructions where it is intended to be added as the fire protective board for fire compartmentalisation or to building services to enhance and/or preserve their resistance to fire performance.

UN CPC code:
37520 Boards, blocks and similar articles of vegetable fibre, straw or wood waste agglomerated with mineral binders

Geographical scope:
A1-A3 China; A4 From China to EU; A5 EU; C EU; D EU.

LCA information

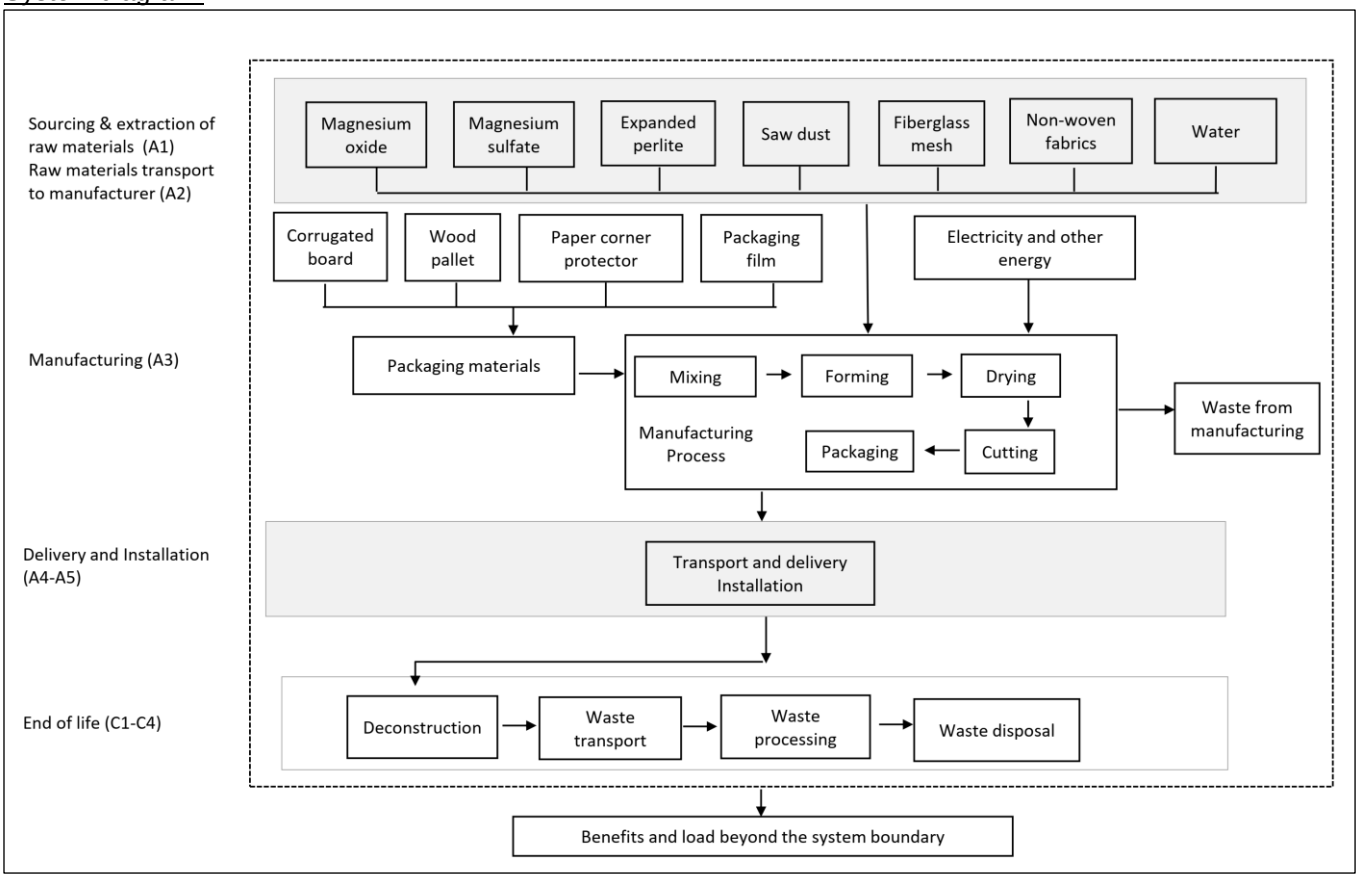
Declared unit:
1 m^2 of 12mm MAGOXX® Board (normal quality)
The conversion factor is 12.6kg per m^2 (0.0794 m^2/kg) based on the product of 12mm MAGOXX® Board (normal quality).

Time representativeness:
1st August 2023 to 31st July 2024 (12 months)

Database(s) and LCA software used:
Ecoinvent 3.10 (Allocation, cut-off by classification) and Simapro 9.6.0.1 software

Description of system boundaries:
The system boundary is type b) cradle to gate with options, module C1-C4, module D and optional modules, which include the A1-A3 product stage, A4-A5 construction process stage, C1-C4 end-of-life stage, and D benefits and loads beyond the system boundary.

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	CN	CN	CN	CN to EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data used	37%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

More information:
Electricity data source used in the manufacturing process in A3: Market group for electricity, low voltage, CN-ECGC, in Ecoinvent 3.10 (cut-off)
GWP-GHG: 0.884 kg CO_2 eq./kWh

Product stage (A1-A3)

A1, Raw material supply takes into account the extraction and processing of all raw materials and energy which occur upstream of the studied manufacturing process. Specifically, raw material supply covers the sourcing of magnesium oxide, magnesium sulfate, expanded perlite, fiberglass mesh, non-woven fabrics, sawdust and water.

A2, Transport to the manufacturer. The transportation of raw materials to the manufacturing site is studied in this module.

A3, Manufacturing. The manufacturing process of MAGOXX® Board (normal quality) mainly includes:

Mix all the above raw materials with water to create a cementitious slurry. This slurry is then formed into wet panels and the fiberglass mesh is applied to both sides of the panel. The non-woven fabric is coated on the surface of the panel. These panels are then stored in the drying room under proper conditions to fully cure. The cured panels are then sent for cutting. The finished panels are stacked on the wood pallet with the corrugated board on top and corner for protection and wrapped around with packaging film. Electricity and natural gas are consumed during the manufacturing process.

Quality checks are made at each step of the production process.

Packaging-related flows in the production process are included in the manufacturing module, i.e. wood pallets, corrugated board boxes, paper corner protectors, and packaging film. Apart from production of packaging material, the supply and transport of packaging material are also considered in the LCA model.

Construction process stage (A4-A5)

A4, Transport to the building site. This module includes transport from the production gate to the building site. Transport is calculated on the basis of a scenario with the parameters described. The average transportation distance from the production plant to the building site is 610 km transported by lorry and 10802 nautical miles (i.e., 20005 km) transported by ship.

A5, Installation into the buildings. The installation of the MAGOXX® Board is accomplished using an electrical cutting tool. The electricity usage for drilling screws and sawing panels is about 0.1 kWh per declared unit. A total of 6 pieces screws per declared unit are used, the mass of screws is 0.03kg, which is less than 0.25% of the mass input. The input of the screws is considered to be cut-off flow.

During installation, approximately 2% of the product is lost as off-cuts. The additional production processes to compensate for the loss are considered in this study, so the elementary flow with 2% waste should be 1.02m^2 when the declared unit is defined as 1m^2 of installed MAGOXX® Board. All board losses are collected for landfill disposal.

The impacts associated with packaging disposal are included with the installation phase. The packaging waste includes wood pallets, corrugated board boxes, paper corner protectors, and packaging film in A5. The end-of-life scenario of packaging followed the EU 27 waste management scenario.

Packaging	Recycling	Landfill	Incineration
Wood pallet	32.1%	38.4%	29.5%
Corrugated board box	82.8%	8.9%	8.3%
Paper corner protector	82.8%	8.9%	8.3%
Packaging film	40.3%	22.8%	36.9%

End-of-Life Stage (C1-C4):

C1, De-construction. According to the owner, the product can be removed using the electrical tool and consumes about 0.1 kWh of electricity per declared unit.

C2, Transport to waste processing. It is estimated that there is no mass loss during the use of the product, therefore the end-of-life product is assumed to have the same weight as the declared product. All of the

end-of-life product is assumed to be transported as separate construction waste to the closest facilities. Transportation distance to the closest disposal area is 100km by lorry, which is the most common.
C3, Waste processing for reuse, recovery and/or recycling. It is assumed 100% of the deconstructed products (C1) to be sent to landfill. Hence, no waste processing is required.
C4, Disposal. The 100% of the deconstructed products are assumed to be sent to landfill.

Resource Recovery Stage (D)
D, Reuse/recovery/recycling potential.
100% of the products are assumed to be sent to landfill. Hence, no benefit or load resulting from reuse/recovery/recycling beyond the product system boundary.
Need to add that, the benefits and loads regarding recycling potential and energy recovery from the incineration of packaging materials were calculated.

CUT-OFF CRITERIA

The study does not exclude any modules or processes that are stated mandatory in EN 15804:2012+A2:2019 and the applied PCR. The study does not exclude any hazardous materials or substances.
The study includes all major raw materials and energy consumption. All inputs and outputs of the unit processes, for which data is available, 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.

In module A5, during installation into the buildings, a total of 6 pieces screws per declared unit are used, the mass of screws is 0.03kg, which is less than 0.25% of the mass input. The input of the screws is considered to be cut-off flow.

ALLOCATION

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.
In this study, as per EN 15804, 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.

Allocation used in Ecoinvent 3.10 environmental data sources follows the methodology “allocation, cut-off by classification”. This methodology is in line with the requirements of the EN 15804 standard.
During the production process of the board product, there was pre-consumer scrap leaving the product system from modules A1-A3, which should be allocated as a co-product. Furthermore, the pre-consumer scrap has no economic value in this study, which shall still be considered economic allocation but with a value of zero. Thereby no environmental burden will be allocated to the product scrap.

In this study one allocation occurs on product production, in allocating the input, i.e. energy within the production site such as electricity, heat, and auxiliary material such as water, among the various series of board products, allocation is done via total production of all products produced on a yearly average.
For the allocation of waste, this study strictly follows the PCR. Specifically, the waste allocation is based on the polluter pay principle. For environmental burden from the waste generated from the

manufacturing process, it is allocated to the studied product. For the environmental burden of the end-of-life stage, it is allocated to the studied product.

Key assumptions

1.100 km transportation distance is assumed for the disposal of the deconstructed products.
2. 100% of the deconstructed products are assumed to be sent to landfill.
3. For missing background data, the substitution of missing data using a similar background data approach was taken to shorten the gap. A sensitivity analysis was conducted.
--- Permethrin in non-woven fabrics was replaced by 2,4-dichlorotoluene.
--- Triethanolamine Lauryl Sulfate in non-woven fabrics was replaced by Triethanolamine.

Inclusion or exclusion of Infrastructure and/or Capital goods

Depending on the PCR, in general, the production and end-of-life processes of infrastructure or capital goods used in the product system should be excluded, unless there is evidence that they are relevant in terms of their environmental impact, or when a generic LCI dataset includes infrastructure/capital goods, and it is not possible, within reasonable effort, to subtract the data on infrastructure/capital goods from this dataset (directly citation from section 4.3.2 of PCR 1.3.4). In this study, the infrastructure and capital goods are not included in the LCA analysis since they are used plenty of times for several years for the product manufacturing. According to the PCR, it should be excluded.

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/ declared unit
Magnesium oxide	5.6880	0%	0%
Magnesium sulfate	4.5640	0%	0%
Expanded Perlite	0.3140	0%	0%
Saw dust	0.2660	0%	100% 0.0730 kg C/declared unit
Fiberglass mesh	0.2160	0%	0%
Non-woven fabrics	0.0400	0%	0%
Water	1.5120	0%	0%
TOTAL	12.600	0%	2.1111% 0.0730 kg C/declared unit
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/declared unit**
Wood pallet	0.1393	1.1052%	0.0546
Corrugated board box	0.0156	0.1238%	0.0066
Paper corner protector	0.0513	0.4071%	0.0218
Packaging film	0.0096	0.0764%	0
TOTAL	0.2158	1.7125%	0.083

Substances, REACH – Very High Concern

The product does not contain any substances in the "Candidate List of SVHC" document issued by the European Chemicals Agency (http://echa.europa.eu/candidate-list-table).

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Results per declaration unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	2.53E+01	3.45E+00	6.56E-01	ND	3.28E-02	1.35E-01	0.00E+00	1.26E-01	-4.72E-02
GWP-biogenic	kg CO_2 eq.	-5.55E-01	5.38E-04	3.18E-01	ND	8.02E-05	2.45E-05	0.00E+00	2.68E-01	8.13E-05
GWP-luluc	kg CO_2 eq.	1.46E-02	1.67E-03	4.40E-04	ND	9.97E-05	4.62E-05	0.00E+00	3.06E-05	3.58E-04
GWP-total	kg CO_2 eq.	2.47E+01	3.45E+00	9.74E-01	ND	3.29E-02	1.35E-01	0.00E+00	3.94E-01	-4.68E-02
ODP	kg CFC 11 eq.	1.90E-04	5.29E-08	3.80E-06	ND	6.04E-10	2.72E-09	0.00E+00	3.95E-09	-7.48E-10
AP	mol H^+ eq.	7.87E-02	7.96E-02	3.50E-03	ND	1.92E-04	4.36E-04	0.00E+00	1.39E-03	-3.14E-04
EP-freshwater	kg P eq.	2.70E-03	1.43E-04	9.55E-05	ND	3.05E-05	9.19E-06	0.00E+00	2.12E-04	-3.55E-05
EP-marine	kg N eq.	1.75E-02	2.01E-02	8.56E-04	ND	3.02E-05	1.48E-04	0.00E+00	3.47E-04	-5.18E-05
EP-terrestrial	mol N eq.	1.87E-01	2.23E-01	8.97E-03	ND	2.71E-04	1.61E-03	0.00E+00	3.73E-03	-5.35E-04
POCP	kg NMVOC eq.	5.93E-02	6.19E-02	2.72E-03	ND	8.91E-05	7.11E-04	0.00E+00	1.36E-03	-2.21E-04
ADP-minerals&metals*	kg Sb eq.	1.10E-04	4.79E-06	2.88E-06	ND	4.40E-07	3.65E-07	0.00E+00	2.41E-07	-1.16E-07
ADP-fossil*	MJ	1.46E+02	4.41E+01	5.10E+00	ND	7.62E-01	1.96E+00	0.00E+00	2.93E+00	-1.09E+00
WDP*	m^3	2.17E+00	1.33E-01	1.53E-02	ND	9.45E-03	9.33E-03	0.00E+00	-1.65E+00	-8.27E-03
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*
Statement: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Additional mandatory impact category indicators

Results per declaration unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	2.53E+01	3.45E+00	6.69E-01	ND	3.29E-02	1.35E-01	0.00E+00	1.27E-01	-4.68E-02

Resource use indicators

Results per declaration unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.30E+01	4.05E-01	3.27E+00	ND	2.05E-01	3.02E-02	0.00E+00	5.90E-02	-2.07E+00
PERM	MJ	2.73E+00	0.00E+00	-2.73E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	1.57E+01	4.05E-01	5.42E-01	ND	2.05E-01	3.02E-02	0.00E+00	5.90E-02	-2.07E+00
PENRE	MJ	1.43E+02	4.41E+01	5.51E+00	ND	7.62E-01	1.96E+00	0.00E+00	5.54E+00	-1.09E+00
PENRM	MJ	3.02E+00	0.00E+00	-4.09E-01	ND	0.00E+00	0.00E+00	0.00E+00	-2.61E+00	0.00E+00
PENRT	MJ	1.46E+02	4.41E+01	5.10E+00	ND	7.62E-01	1.96E+00	0.00E+00	2.93E+00	-1.09E+00
SM	kg	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	5.69E-02	4.16E-03	1.04E-03	ND	6.59E-04	2.93E-04	0.00E+00	-3.54E-02	-6.25E-04
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

[1] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Waste indicators

Results per declaration unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	4.62E-03	7.83E-04	7.19E-04	ND	4.30E-05	5.48E-05	0.00E+00	1.48E-03	5.33E-05
Non-hazardous waste disposed	kg	6.60E-01	1.08E+00	3.67E-01	ND	2.45E-03	1.67E-01	0.00E+00	1.26E+01	-3.00E-03
Radioactive waste disposed	kg	7.37E-05	6.86E-06	7.32E-06	ND	5.40E-06	5.88E-07	0.00E+00	9.62E-07	-5.51E-06

Output flow indicators

Results per declaration unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	1.06E-01	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	5.12E-02	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	1.02E-01	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	2.04E-01	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Disclaimer: it is discouraging the use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C

References

General Programme Instructions of the International EPD® System. Version 4.0.

PCR 2019:14 Construction products, version 1.3.4

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations Principles and procedures.

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

EN 15804:2012+A2:2019/AC:2021 Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.

Ecoinvent 3.10 database.

MAGOXX BV LCA background report (version: 2025-04-15).

EPD®

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