Environmental Product Declaration

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

Sandwich panels with a polyurethane core

EPD of multiple products, based on a representative product

from

ArcelorMittal Construction

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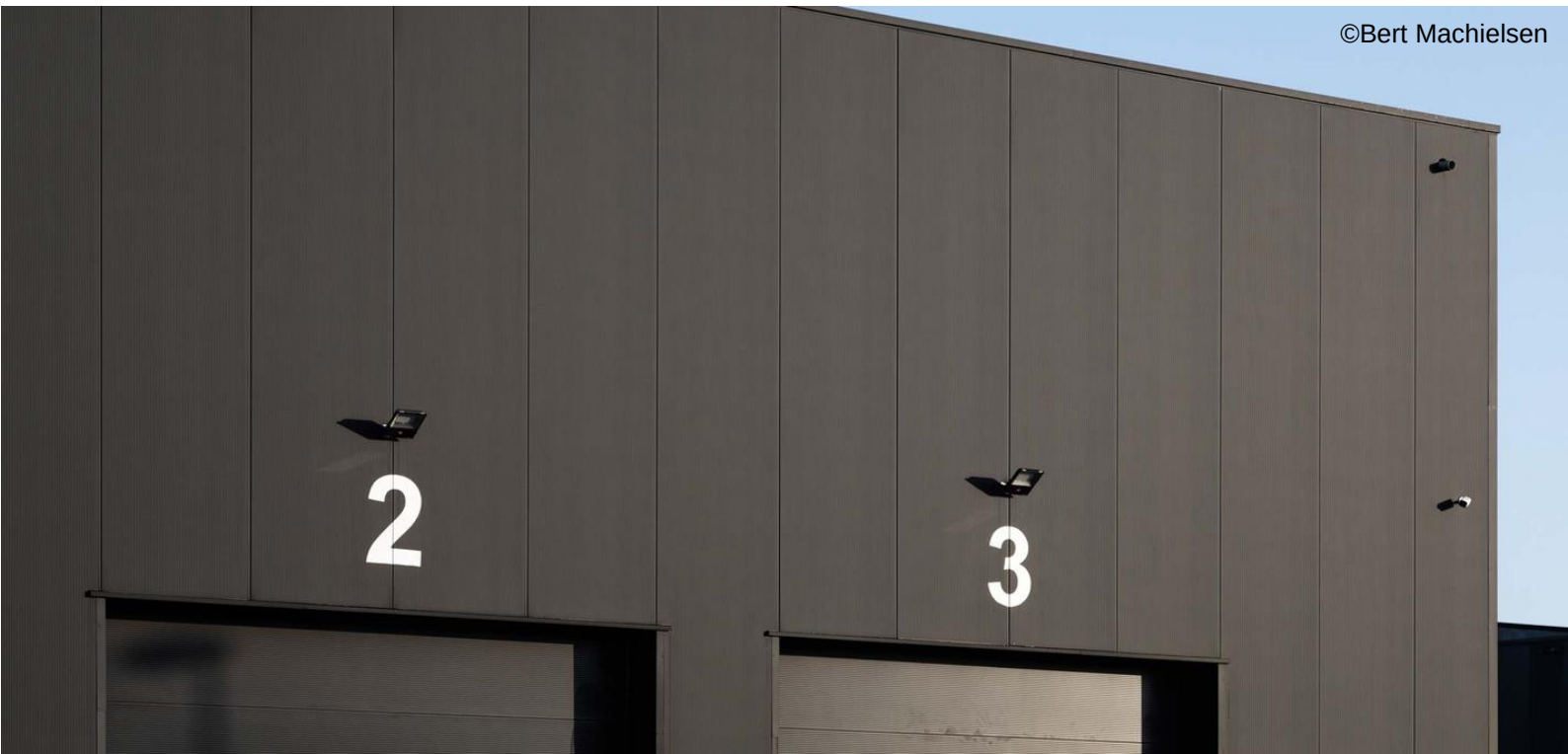
An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



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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): *EPD International Product Category Rules for construction products (PCR 2019:14 v1.3.4). The product group classification for the assessed products is UN CPC 421 Structural metal products.*
PCR review was conducted by: *Technical Committee of the International EPD® System. See https://www.environdec.com/about-us/the-international-epd-system-about-the-system for a list of members. Review chair: Claudia Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat https://www.environdec.com/contact-us.*
Life Cycle Assessment (LCA)
LCA accountability: *Ipek Goktas, One Click LCA*
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: Dr Matthew Fishwick, Fishwick Environmental Ltd 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 may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same version number up to the first two digits) 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.

Company information

Owner of the EPD: ArcelorMittal Construction – Morinval – 55 800 Contrisson - France

Contact: Laura Descos laura.descos@arcelormittal.com

Description of the organisation: ArcelorMittal Construction is part of the world's leading steelmaker and mining company. It offers a comprehensive range of building envelope and solutions with the aim to inspire the construction sector to build in smarter ways. Its product range includes architectural profiles, sandwich panels for roof and walls, composite floors, cold store products. ArcelorMittal Construction and its entities are present all over Europe.

Product-related or management system-related certifications: Products covered have relevant CE-marking including Declaration of Performances. Some plants covered have ISO 9001, ISO 14001, or ISO 50001.

Name and location of production site(s):

- ArcelorMittal Construction Belgium: Geel
- ArcelorMittal Construction Germany: Brehna
- ArcelorMittal Construction France: Contrisson, Onnaing
- ArcelorMittal Construction Poland: Rawa
- ArcelorMittal Construction Portugal: Cartaxo
- ArcelorMittal Construction Spain: Berrioplano
- Europerfil: Cervera, Spain
- Trier Insulated Panels: Föhren, Germany

Product information

Product name: Sandwich panels with a polyurethane (PU) core

Product identification: Sandwich panels included into this Environmental Product Declaration are composed on two external steel sheets with an insulated polyurethane core. Several commercial names are covered such as Ondatherm®, Promisol®. An exhaustive list are found in our local website (https://construction.arcelormittal.com/select-your-country;https://www.europerfil.com/; https://italpannelli.de/en)

They have the CE-marking in accordance with the following standard:

- EN 14509:2013 Self-supporting double skin metal faced insulating panels - Factory made products - Specifications

Their technical performances (mechanical, thermal) are presented into the Declaration of Performances (DOP) based on the above mentioned standard or on the product datasheet. Both are available either on demand or our website.

Product description:
This Environmental Product Declaration covers sandwich panels with a polyurethane core (PIR or PUR)

The targeted application is roof, facade and agri-food sandwich panels.
These sandwich panels are available in different foam thickness from 30 mm to 240 mm. The self-weight varies from 6.83 kg/m² to 20.3 kg/m².

The expected service lifetime is 50 years. The lifetime depends on the application and corresponding service.

The environmental performances are indicated for a standard configuration of a sandwich panel defined as below, which was used in the EPD of multiple products as the representative product:

- Total self-weight: 11.59 kg/m²
- Foam thickness: 60 mm
- Metallic coating: zinc-magnesium-aluminium with a grammage of 60 g/m² and 100 g/m² respectively on the internal and external facings
- Organic coating: thickness of 12 µm and 25 µm respectively on the internal and external facings

A methodology to estimate environmental performances for other configurations (different weight of steel and foam thickness) is provided in the first part of the section “Additional environmental information”.

UN CPC code: 421 Structural metal products

Geographical scope: European (modules A1-A5, C, D)

More information: https://construction.arcelormittal.com/en

LCA information

Declared unit: 1 m² PU sandwich panels with a foam thickness of 60 mm and a self-weight of 11.59 kg/m² defined as a standard product.

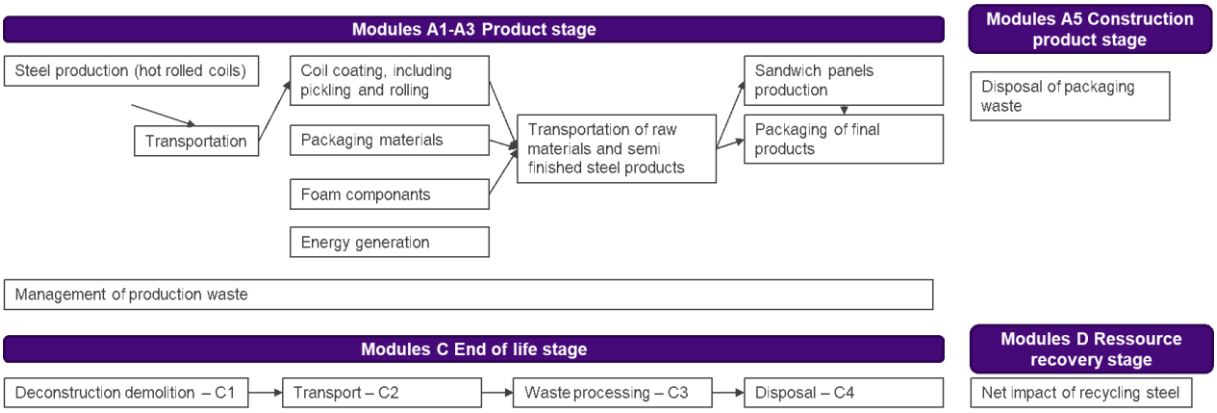
Reference service life: 50 years

Time representativeness: 2021

Database(s) and LCA software used: The database ‘ecoinvent v3.10, cut-off version’, World Steel, 2023, and one of ArcelorMittal’s critical reviewed LCAs are used as background data. ‘One Click LCA - EPD Generator’ is used as the LCA software. The “EN 15804 reference package” based on EF 3.1 has been used.

Description of system boundaries: cradle-to-gate with modules C1–C4, module D and optional modules A4-A5

System diagram:



- *Module A1 to A3:*

The product stage includes provision of all materials, products, energy, co-product allocation, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage.

Sandwich panels production covers the following process: the two facings are cold rolled formed (profiling), a liquid polyurethane foam is injected in between the two facings and cured in a double belt press. Then the panels enter in a cooling device to reach their final state.

The losses from the product itself are allocated as by-products. The generated waste in the production is because of the ancillary materials and, the packaging materials of the supplied products, and, declared in Module A3.

Ecoinvent v3.10, Electricity, medium voltage, residual mix, 2023, Belgium, France, Germany, Poland, Portugal, Spain have used for the electricity used in the manufacturing process in A3. Accordingly, the weighted average climate impact (GWP-GHG) of the electricity in A3 is 0.477 kg CO_2 eq./kWh.

- *Module A4 to A5:*

Transportation impacts occurred from final products delivery to construction site cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions. The transportation distance is assumed to be an average of 100 km. 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 product losses.

Installation impacts cover the losses, energy consumption, auxiliary material consumption and waste treatment in the construction area. Installation losses are estimated at 2% and, as well as packaging, are included as installation waste. The installation scenario assumes steel fixing as 0.002 kg screw per 1 kg steel in the product.

- *Module C1 to C4:*

These modules consider the dismantling of the considered product (C1), the transportation of the dismantled components to their final end-of-life destination (C2), the waste processing for recovery or recycling (C3) as well as the disposal (C4), if given.

For the module C2, the transportation of the dismantled components is considered by truck over 100 km for all recovery applications such as reuse, recycling, incineration, and 50 km for the disposal applications such as landfilling.

Based on common practices, steel and foam are separated and the following end of life scenario is considered for the steel part of the sandwich panels:

- 89% of the steel is recycled
- 10% of the steel is reused
- 1% of the steel is sent to landfill
- 100% of the foam is incinerated with energy recovery

At end-of-life the steel material leaves the product system in C3 for recycling and reuse in module D as well as disposal in module C4. Environmental burdens of the incineration of the polyurethane foam are assigned to module C3; resulting potential benefits and loads for thermal and electrical energy are declared in module D.

Processes	Values per declared unit
Collection process specified by type	11.608 kg collected separately (including screw installed in A5)
Recovery system specified by type	0.905 kg for re-use
	8.053 kg for recycling
	2.560 kg for energy recovery
Disposal specified by type	0.090 kg for landfill
Assumptions for scenario development	Transportation of the dismantled components is considered by truck over 100 km

The second part of the section “Additional environmental information” provides the environmental performances considering that 100% of foam is landfilled at the end of life.

- *Module D:*

Module D includes any declared benefits and loads from net flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state in the form of reuse, recovery and/or recycling potentials.

Metals are assumed to reach the end of waste status directly at the construction site. The treatment as well as net impacts and benefits of reuse or recycling potentials (for the net scrap amount only) are grouped to module D.

Potential environmental benefits are given for the net steel scrap that is produced at the end of a final product’s life. This net scrap is determined as follows:
Net scrap = Amount of steel recycled at end-of-life – Scrap input from previous product life cycles

The considered average incineration efficiency is 30% and 10% to generate heat and electricity from PU foam respectively.

Cut-off criteria: More than 95% of the total inflows (mass and energy) per modules are considered, in compliance with the used PCR. All reported data were incorporated and modelled using best available LCI data. Infrastructure/capital goods for upstream, core and downstream processes regarding the inventory data are excluded.

Data quality and sources: Data quality is compliant with ISO 14025:2006. All primary data were collected for 2021. All background data come from the One Click LCA - EPD Generator and the databases are representative for the years 2021-2023.

Allocation: All allocations are done as per EN15804+A2 and the applied PCR. For all background data used in the model, the standard allocation assumptions of the used datasets were maintained. Co-product allocation was applied based on the economic values.

To prepare a scaling table from which all variations can be calculated, all input/output are allocated per two components which are steel sheet and PU foam. Accordingly, energy consumptions and co-product generations are allocated specifically based on the production lines. On the other hand, packaging, ancillary materials and waste flows due to the ancillary materials are allocated based on the mass shares of the steel and foam in the product. The impacts are scaled to 1 kg steel and 1 kg PU foam in the scaling table provided in the first part of the section “Additional environmental information”.

The end-of-life (EOL) product is evaluated based on two components 'organic coated steel with installed steel screws in A5' and 'PU foam' separately. Accordingly, 99% of organic coated steel and steel screws and 100% of PU foam are allocated for sorting plant and incineration plant respectively in C3. Remaining organic coated steel and steel screws is allocated for landfill in C4. An alternative EOL scenario which is 100% landfilling for PU foam is provided in the second part of the section "Additional environmental information".

Mass balance approaches (MBAs), to claim, for example, biobased, renewable, and/or recycled product content, are not applied.

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	EU	EU	EU	EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data used	60%*			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	78.7%**			-	-	-	-	-	-	-	-	-	-	-	-	-	-
	115.5%** (A1-C4, excluding use stage)																
Variation – sites	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X: Module declared
ND: Not declared

* The data considered in A1-A3 are gathered from the actual manufacturing plants where product-specific processes are carried out. However, considering the limitation on some of the background data such as the EPD, the percentage of specific data is assumed to be at least 60%.

** The first part of the section "Additional environmental information" is available to propose a methodology to calculate the environmental indicators for the different configurations of products.

Content declaration

Product components	Mass, kg in declared product*	Post-consumer recycled material, weight-% of declared product*	Biogenic material, mass-% of declared product*	Biogenic material kg C/ declared product*
Steel	8.790	7.73%	0.0%	0.000
Metallic coating	0.160	0.0%	0.0%	0.000
Organic coating	0.080	0.0%	0.0%	0.000
Foam components	2.560	0.0%	0.0%	0.000
TOTAL	**11.590**	**7.73%**	**0.0%**	**0.000**

Packaging materials	Mass, kg in declared product*	Mass-% (versus the declared product*)	Biogenic material, kg C/ declared product*
Wood pallets	0.018	0.16%	0.008
Plastic	0.084	0.72%	0.000
Paper/Cardboard	0.012	0.10%	0.005
Steel	0.017	0.15%	0.000
TOTAL	**0.131**	**1.13%**	**0.013**

The product does not contain any REACH “candidate list of substances of very high concern for authorisation” in amounts greater than 0.1 % (1000 ppm). The product contains <0.1% bio-based material.

Results of the environmental performance indicators

The environmental performance of the declared unit of one square meter of a sandwich panels with a 60 mm thick polyurethane core with a total self-weight of 11.59 kg/m² (the representative product) are reported below using the parameters and units as specified in PCR 2019:14 v1.3.4.

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.

Mandatory impact category indicators according to EN 15804+A2

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO_2 eq.	3.31E+1	1.26E-1	1.65E+0	1.05E-3	2.24E-1	7.13E+0	5.66E-4	-1.55E+1
GWP – total	kg CO_2 eq.	3.30E+1	1.26E-1	1.70E+0	1.05E-3	2.24E-1	7.13E+0	5.66E-4	-1.55E+1
GWP-fossil	kg CO_2 eq.	3.30E+1	1.26E-1	1.65E+0	1.05E-3	2.24E-1	7.13E+0	5.66E-4	-1.55E+1
GWP-biogenic	kg CO_2 eq.	-2.69E-2	2.05E-5	5.32E-2	8.33E-8	3.60E-5	4.95E-4	1.38E-7	-2.55E-3
GWP- luluc	kg CO_2 eq.	1.14E-2	4.31E-5	3.42E-4	9.10E-8	7.33E-5	2.20E-4	2.94E-7	-1.51E-3
ODP	kg CFC 11 eq.	4.80E-8	2.53E-9	1.17E-8	1.60E-11	4.45E-9	7.59E-9	1.64E-11	-1.20E-7
AP	mol H^+ eq.	9.25E-2	4.06E-4	8.01E-3	9.45E-6	7.01E-4	6.81E-3	4.01E-6	-5.62E-2
EP-freshwater	kg P eq.	1.24E-3	9.80E-7	3.14E-5	3.69E-9	1.72E-6	1.15E-5	5.56E-9	-6.00E-4
EP- marine	kg N eq.	2.47E-2	1.36E-4	3.29E-3	4.38E-6	2.34E-4	3.64E-3	1.52E-6	-1.17E-2
EP-terrestrial	mol N eq.	2.66E-1	1.50E-3	3.57E-2	4.80E-5	2.57E-3	3.42E-2	1.67E-5	-1.38E-1
POCP	kg NMVOC eq.	8.77E-2	6.61E-4	1.08E-2	1.43E-5	1.10E-3	8.47E-3	5.98E-6	-4.83E-2
ADP-minerals&metals*	kg Sb eq.	2.60E-4	3.39E-7	5.97E-6	3.66E-10	7.15E-7	4.11E-6	8.79E-10	-1.31E-4
ADP-fossil*	MJ	4.95E+2	1.82E+0	1.93E+1	1.37E-2	3.14E+0	5.39E+0	1.39E-2	-1.72E+2
WDP*	m^3	1.59E+0	9.15E-3	1.03E-1	3.35E-5	1.52E-2	5.44E-1	3.88E-5	-2.70E+0

** 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.*
We discourage the use of the results of modules A1-A3 without considering the results of module C.

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

Resource use indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	2.20E+1	2.89E-2	8.78E-1	8.37E-5	5.33E-2	3.56E-1	1.29E-4	-1.10E+1
PERM	MJ	4.38E-1	0.00E+0	-4.38E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	2.25E+1	2.89E-2	4.40E-1	8.37E-5	5.33E-2	3.56E-1	1.29E-4	-1.10E+1
PENRE	MJ	4.24E+2	1.82E+0	2.23E+1	1.37E-2	3.14E+0	4.47E+1	1.39E-2	-1.72E+2
PENRM	MJ	6.91E+1	0.00E+0	-3.57E+0	0.00E+0	0.00E+0	-6.55E+1	0.00E+0	0.00E+0
PENRT	MJ	4.93E+2	1.82E+0	1.87E+1	1.37E-2	3.14E+0	-2.08E+1	1.39E-2	-1.72E+2
SM	kg	9.75E-1	7.88E-4	3.15E-2	5.68E-6	1.43E-3	4.35E-3	3.49E-6	7.93E+0
RSF	MJ	1.59E-2	9.93E-6	3.55E-4	1.49E-8	1.82E-5	2.70E-4	7.21E-8	-1.19E-3
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	5.27E-1	2.65E-4	1.19E-2	8.89E-7	4.17E-4	1.07E-2	1.44E-5	-4.25E-2

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

Note: Option A based on the Annex 3 of the PCR is followed for the balance of the indicators that are primary energy resources used as raw materials.

Waste indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.48E-1	2.65E-3	3.75E-2	1.53E-5	4.52E-3	1.46E-1	1.54E-5	-4.76E+0
Non-hazardous waste disposed	kg	5.60E+0	5.31E-2	9.78E-1	2.09E-4	9.56E-2	4.17E+0	3.52E-4	-3.57E+1
Radioactive waste disposed	kg	7.62E-3	5.47E-7	1.55E-4	1.50E-9	1.00E-6	6.28E-6	2.15E-9	-1.63E-4

Output flow indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+0	0.00E+0	1.81E-2	0.00E+0	0.00E+0	9.05E-1	0.00E+0	0.00E+0
Material for recycling	kg	1.29E-2	1.38E-5	1.77E-1	3.70E-8	2.36E-5	8.05E+0	6.04E-8	-9.10E-4
Materials for energy recovery	kg	2.42E-6	7.97E-8	3.77E-7	1.87E-10	1.99E-7	7.60E-7	2.71E-10	-8.02E-5
Exported energy, electricity	MJ	5.96E-3	1.52E-4	1.32E-1	2.37E-7	3.27E-4	6.55E+0	3.47E-7	-8.27E-3
Exported energy, thermal	MJ	1.79E-2	4.56E-4	3.96E-1	7.10E-7	9.80E-4	1.97E+1	1.04E-6	-2.48E-2

Information on biogenic carbon content

Biogenic carbon content	Unit	Quantity
In product	kg C	0.000
In packaging	kg C	0.013 (due to wood and paper/cardboard)

References

- PCR: EPD International Product Category Rules for construction products (PCR 2019:14 v1.3.4, valid until: 2025-06-20)
- General Programme Instructions of the International EPD® System. Version 5.0.0
- EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products
- EN ISO 14025:2006: Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040:2009-11: Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14040:2009-11: Environmental management - Life cycle assessment - Principles and framework

Additional environmental information

1/ Methodology to calculate environmental performances indicators for different configurations (EN15804+A2)

To enable the user of the EPD to calculate the environmental indicators for sandwich panels with different steel and foam weights in the product, the table below provides the methodology.
‘s‘ is the self-weight of the steel part of the sandwich panels (in kg/m²)
‘f‘ is the self-weight of the insulated material (foam) part of the sandwich panels (in kg/m²)

For each indicator and modules, the performances are calculated by summing the impact of steel and foam proportional to their self-weights.

Indicator	Unit	steel/ foam	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO_2 eq.	s	2.87E+0	1.09E-2	1.33E-1	9.04E-5	1.93E-2	2.17E-2	6.27E-5	-1.53E+0
		f	2.79E+0	1.09E-2	1.77E-1	9.02E-5	1.94E-2	2.71E+0	0.00E+0	-6.51E-1
GWP – total	kg CO_2 eq.	s	2.86E+0	1.09E-2	1.37E-1	9.04E-5	1.93E-2	2.17E-2	6.27E-5	-1.53E+0
		f	2.79E+0	1.09E-2	1.81E-1	9.02E-5	1.94E-2	2.71E+0	0.00E+0	-6.51E-1
GWP-fossil	kg CO_2 eq.	s	2.87E+0	1.08E-2	1.33E-1	9.04E-5	1.93E-2	2.17E-2	6.27E-5	-1.53E+0
		f	2.78E+0	1.08E-2	1.77E-1	9.02E-5	1.94E-2	2.71E+0	0.00E+0	-6.51E-1
GWP-biogenic	kg CO_2 eq.	s	-3.47E-3	1.77E-6	4.59E-3	7.19E-9	3.10E-6	0.00E+0	1.52E-8	-2.50E-4
		f	1.71E-3	1.77E-6	4.60E-3	7.17E-9	3.11E-6	1.93E-4	0.00E+0	-1.13E-4
GWP- luluc	kg CO_2 eq.	s	7.47E-4	3.72E-6	2.61E-5	7.85E-9	6.32E-6	1.73E-5	3.26E-8	-1.51E-4
		f	1.80E-3	3.72E-6	4.16E-5	7.84E-9	6.34E-6	2.51E-5	0.00E+0	-5.75E-5
ODP	kg CFC 11 eq.	s	2.20E-9	2.18E-10	9.75E-10	1.38E-12	3.84E-10	1.46E-10	1.81E-12	-5.43E-9
		f	1.10E-8	2.18E-10	1.12E-9	1.38E-12	3.85E-10	2.45E-9	0.00E+0	-2.76E-8
AP	mol H^+ eq.	s	8.31E-3	3.50E-5	6.95E-4	8.15E-7	6.04E-5	9.59E-5	4.44E-7	-6.06E-3
		f	6.82E-3	3.50E-5	6.78E-4	8.14E-7	6.06E-5	2.32E-3	0.00E+0	-6.00E-4
EP-freshwater	kg P eq.	s	3.36E-6	8.45E-8	7.27E-7	3.18E-10	1.49E-7	8.77E-7	6.15E-10	-6.59E-5
		f	4.74E-4	8.45E-8	9.70E-6	3.18E-10	1.49E-7	1.38E-6	0.00E+0	-1.89E-6
EP- marine	kg N eq.	s	2.28E-3	1.17E-5	2.82E-4	3.78E-7	2.01E-5	3.40E-5	1.68E-7	-1.25E-3
		f	1.61E-3	1.17E-5	2.88E-4	3.77E-7	2.02E-5	1.30E-3	0.00E+0	-1.92E-4
EP-terrestrial	mol N eq.	s	2.48E-2	1.29E-4	3.08E-3	4.14E-6	2.21E-4	2.53E-4	1.85E-6	-1.47E-2
		f	1.66E-2	1.29E-4	3.09E-3	4.13E-6	2.22E-4	1.25E-2	0.00E+0	-2.03E-3
POCP	kg NMVOC eq.	s	7.86E-3	5.70E-5	9.34E-4	1.23E-6	9.45E-5	7.51E-5	6.62E-7	-5.00E-3
		f	6.52E-3	5.70E-5	9.41E-4	1.23E-6	9.48E-5	3.04E-3	0.00E+0	-1.23E-3
ADP-minerals& metals	kg Sb eq.	s	2.73E-5	2.92E-8	6.25E-7	3.16E-11	6.16E-8	3.88E-7	9.74E-11	-1.44E-5
		f	5.18E-6	2.92E-8	1.30E-7	3.15E-11	6.18E-8	2.38E-7	0.00E+0	-2.86E-7
ADP-fossil	MJ	s	3.33E+1	1.57E-1	1.49E+0	1.18E-3	2.71E-1	1.62E-1	1.54E-3	-1.41E+1
		f	7.58E+1	1.57E-1	2.27E+0	1.18E-3	2.72E-1	1.54E+0	0.00E+0	-1.74E+1
WDP	m^3	s	1.87E-1	7.90E-4	9.77E-3	2.89E-6	1.31E-3	5.05E-3	4.30E-6	-2.69E-1
		f	-3.92E-2	7.90E-4	5.70E-3	2.89E-6	1.31E-3	1.95E-1	0.00E+0	-1.03E-1

As per example, to calculate the GWP total of modules A1-A3 for a sandwich panel with self-weights of steel and foam as s and f:
$GWP - GHG_{A1-A3} = 2.87 * s + 2.79 * f$

Validation of the scaling formula for the declared product:
$GWP - GHG_{A1-A3} = 2.87 * 9.03 + 2.79 * 2.56 = 33.06\ kg\ CO2\ eq.$

When determining the representative product, a weighted average product has been calculated based on the annual production rates of each factory considered in the EPD. Consequently, the market product closest to the weighted average product has been chosen as the representative product. Accordingly, the representative product '1 m² PU sandwich panel' includes 9.03 kg steel 2.56 kg PU foam.

For 1 m² PU sandwich panel, the weight of steel varies from 5.54 kg to 10.63 kg, and the weight of PU foam varies from 1.28 kg to 10.24 kg, due to thickness and shape changes. The variations are provided in the table below.

Indicator	Variation between Lowest Case Product and the Representative Product		Variation between Highest Case Product and the Representative Product	
	A1-A3	A1-C4	A1-A3	A1-C4
GWP - GHG	-41.10%	-42.58%	78.74%	115.46%
GWP – total	-41.10%	-42.58%	78.74%	115.46%
GWP-fossil	-41.10%	-42.58%	78.63%	115.41%
GWP-biogenic	-36.80%	-45.70%	-28.26%	193.05%
GWP- luluc	-43.26%	-43.19%	132.42%	130.56%
ODP	-45.31%	-44.58%	183.33%	165.34%
AP	-40.79%	-41.31%	71.02%	83.82%
EP-freshwater	-49.72%	-49.59%	293.11%	289.72%
EP- marine	-40.54%	-41.58%	64.76%	90.66%
EP-terrestrial	-40.46%	-41.43%	62.86%	86.82%
POCP	-40.81%	-41.50%	71.47%	88.55%
ADP- minerals&metals	-39.23%	-39.25%	32.13%	32.76%
ADP-fossil	-43.10%	-43.08%	128.37%	127.96%
WDP	-37.93%	-40.75%	-0.06%	69.90%

Note: The variation is calculated by dividing the difference 'obtained by subtracting the impact of the representative product from the impact of the lowest/highest case product' by the impact of the representative product. For example,
(GWP-GHG $_{\text{lowest case}}$ – GWP-GHG $_{\text{representative}}$) / GWP-GHG $_{\text{representative}}$

2/ Environmental performance indicators considering different end-of-life scenario for PU foam (EN15804+A2)

The table below provide environmental performance indicators for the declared product considering the following end of life scenario: foam is 100% landfilled at the end of life instead of incineration. The results of the modules A5, C2, C3, C4 and D are affected with this scenario. Please note that the same end-of-life scenario for steel (89% recycling, 10% reuse, 1% landfill) used in the base case results is also applied here.

Mandatory impact category indicators according to EN 15804+A2

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO_2 eq.	3.31E+1	1.26E-1	1.52E+0	1.05E-3	1.99E-1	1.96E-1	2.56E-1	-1.38E+1
GWP – total	kg CO_2 eq.	3.30E+1	1.26E-1	1.57E+0	1.05E-3	1.99E-1	1.96E-1	2.56E-1	-1.38E+1
GWP-fossil	kg CO_2 eq.	3.30E+1	1.26E-1	1.51E+0	1.05E-3	1.99E-1	1.96E-1	2.56E-1	-1.38E+1
GWP-biogenic	kg CO_2 eq.	-2.69E-2	2.05E-5	5.32E-2	8.33E-8	3.20E-5	0.00E+0	1.64E-4	-2.26E-3
GWP- luluc	kg CO_2 eq.	1.14E-2	4.31E-5	3.41E-4	9.10E-8	6.52E-5	1.56E-4	3.06E-5	-1.36E-3
ODP	kg CFC 11 eq.	4.80E-8	2.53E-9	1.15E-8	1.60E-11	3.96E-9	1.32E-9	8.38E-10	-4.90E-8
AP	mol H^+ eq.	9.25E-2	4.06E-4	7.90E-3	9.45E-6	6.23E-4	8.66E-4	3.26E-4	-5.47E-2
EP-freshwater	kg P eq.	1.24E-3	9.80E-7	3.13E-5	3.69E-9	1.53E-6	7.92E-6	7.63E-7	-5.95E-4
EP- marine	kg N eq.	2.47E-2	1.36E-4	3.26E-3	4.38E-6	2.08E-4	3.07E-4	2.25E-3	-1.13E-2
EP-terrestrial	mol N eq.	2.66E-1	1.50E-3	3.51E-2	4.80E-5	2.28E-3	2.28E-3	1.30E-3	-1.33E-1
POCP	kg NMVOC eq.	8.77E-2	6.61E-4	1.07E-2	1.43E-5	9.75E-4	6.78E-4	4.01E-4	-4.51E-2
ADP-minerals&metals*	kg Sb eq.	2.60E-4	3.39E-7	5.96E-6	3.66E-10	6.35E-7	3.50E-6	7.82E-8	-1.30E-4
ADP-fossil*	MJ	4.95E+2	1.82E+0	1.92E+1	1.37E-2	2.79E+0	1.46E+0	7.81E-1	-1.28E+2
WDP*	m^3	1.59E+0	9.15E-3	9.29E-2	3.35E-5	1.35E-2	4.56E-2	6.23E-3	-2.43E+0

** 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.*

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

Resource use indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	2.20E+1	2.89E-2	8.77E-1	8.37E-5	4.74E-2	2.75E-1	2.26E-2	-9.24E+0
PERM	MJ	4.38E-1	0.00E+0	-4.38E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	2.25E+1	2.89E-2	4.39E-1	8.37E-5	4.74E-2	2.75E-1	2.26E-2	-9.24E+0
PENRE	MJ	4.24E+2	1.82E+0	2.27E+1	1.37E-2	2.80E+0	1.46E+0	6.63E+1	-1.28E+2
PENRM	MJ	6.91E+1	0.00E+0	-3.57E+0	0.00E+0	0.00E+0	0.00E+0	-6.55E+1	0.00E+0
PENRT	MJ	4.93E+2	1.82E+0	1.91E+1	1.37E-2	2.80E+0	1.46E+0	7.80E-1	-1.28E+2
SM	kg	9.75E-1	7.88E-4	3.15E-2	5.68E-6	1.28E-3	2.79E-3	2.58E-4	7.93E+0
RSF	MJ	1.59E-2	9.93E-6	3.54E-4	1.49E-8	1.61E-5	2.17E-4	4.55E-6	-1.19E-3
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	5.27E-1	2.65E-4	1.15E-2	8.89E-7	3.71E-4	7.37E-4	-9.43E-3	-3.61E-2

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

Waste indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.48E-1	2.65E-3	3.50E-2	1.53E-5	4.02E-3	2.07E-2	1.89E-3	-4.74E+0
Non-hazardous waste disposed	kg	5.60E+0	5.31E-2	1.17E+0	2.09E-4	8.50E-2	1.17E+0	1.28E+1	-3.54E+1
Radioactive waste disposed	kg	7.62E-3	5.47E-7	1.55E-4	1.50E-9	8.90E-7	5.37E-6	4.30E-7	1.02E-4

Output flow indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+0	0.00E+0	1.81E-2	0.00E+0	0.00E+0	9.05E-1	0.00E+0	0.00E+0
Material for recycling	kg	1.29E-2	1.38E-5	1.77E-1	3.70E-8	2.10E-5	8.05E+0	1.48E-5	-8.03E-4
Materials for energy recovery	kg	2.42E-6	7.97E-8	3.67E-7	1.87E-10	1.77E-7	2.58E-7	5.17E-8	-7.98E-5
Exported energy, electricity	MJ	5.96E-3	1.52E-4	8.34E-4	2.37E-7	2.90E-4	9.23E-4	1.75E-4	-7.66E-3
Exported energy, thermal	MJ	1.79E-2	4.56E-4	2.50E-3	7.10E-7	8.71E-4	2.77E-3	5.25E-4	-2.30E-2

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