EPD®

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

ACH SANDWICH PANEL WITH MINERAL WOOL CORE

Declaration issued: 2019-08-30
Verification issued: 2019-08-19
Valid until: 2024-08-18
Based on PCR 2012:01 Construction products and construction services v. 2.3
Scope of EPD®: International
Version: 1

EPD® registration number: S-P-01605

General Information

Manufacturer: Saint-Gobain Transformados SAU Calle los Corrales, 19208 Alovera (Guadalajara) - España
Programme used: The International EPD® System. More information at www.environdec.com
EPD® registration number: S-P-01605
PCR identification: PCR 2012:01 Construction products and construction services v. 2.3
UN CPC CODE: 37990
Product name and manufacturer: ACH sandwich panel with the mineral wool core; Saint-Gobain Transformados SAU
Owner of the declaration: Saint-Gobain Transformados SAU
EPD® prepared by Gonzalo Bezos and Daniel García (Saint-Gobain Transformados SAU)
Contact: Gonzalo Bezos (Saint-Gobain Transformados SAU).
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EPD program operator	The International EPD® System. Operated by EPD® International AB. www.environdec.com.
PCR review conducted by	The Technical Committee of the International EPD® System
LCA and EPD® performed by Saint-Gobain Transformados SAU	
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010 Internal ☐ External ☒	
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www.panelesach.com	

Product description

Description of the product and its use:

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m² ACH sandwich panel with a mineral wool core.

The reference model indicated in this EPD is the non-perforated 5-hole deck sandwich panel with a 100 mm thick high-density mineral wool core (M), the results being representative for the following models since the impact of its life cycle changes by less than 10%:

- Acoustic 5-fret deck sandwich panel with 100 mm thick high-density mineral wool core (M).
- Non-perforated acoustic 2-fret deck sandwich panel with 100 mm thick high-density mineral wool core (M).
- Non-perforated acoustic facade sandwich panel with 100 mm thick high-density mineral wool core (M).

- Non-perforated acoustic sandwich panel for sectorization with 100 mm thick high-density mineral wool core (M).

- Non-perforated acoustic 5-fret deck sandwich panel with 120 mm thick high and low-density mineral wool core (M- L).

- Non-perforated acoustic facade sandwich panel with 120 mm thick high and low-density mineral wool core (M-L).

- Non-perforated acoustic sectorization sandwich panel with 120 mm thick high and low-density mineral wool core (M-L).

- Non-perforated acoustic 5-fret deck sandwich panel with 150 mm thick low-density mineral wool core (L).

- Non-perforated acoustic facade sandwich panel with a 150 mm thick low-density mineral wool core (L).

- Non-perforated acoustic sectorization sandwich panel with a 150 mm thick low-density mineral wool core (L).

In regards to the environmental results of the rest of marketed products, these are presented in the following annexes:

Annex I: The reference model adopted for the configuration of this group is the non-perforated 5-fret deck sandwich panel with a 30 mm thick high-density mineral wool core (M). Likewise, its results are representative for the following product ranges:

- Acoustic 5-fret deck sandwich panel with a 30 mm thick high-density mineral wool core (M).

- Non-perforated acoustic 2-fret deck sandwich panel with 30 mm thick high-density mineral wool core (M).

- Non-perforated acoustic 5-fret deck sandwich panel with 40 mm thick high- and low-density mineral wool core (M - L).

- Non-perforated acoustic 2-fret deck sandwich panel with 40 mm thick high- and low-density mineral wool core (M-L).

- Non-perforated acoustic 5-fret deck sandwich panel with 50 mm thick high- and low-density mineral wool core (M - L).

- Non-perforated acoustic 2-fret deck sandwich panel with 50 mm thick high- and low-density mineral wool core (M-L).

- Non-perforated acoustic facade sandwich panel with 50 mm thick high- and low-density mineral wool core (M-L).

- Non-perforated acoustic sectorization sandwich panel with 50 mm thick high- and low-density mineral wool core (M-L).

- Non-perforated acoustic 5-fret deck sandwich panel with 60 mm thick low-density mineral wool core (L).

- Non-perforated acoustic 2-fret deck sandwich panel with 60 mm thick low-density mineral wool core (L).

- Non-perforated acoustic facade sandwich panel with 60 mm thick low-density mineral wool core (L).

- Non-perforated acoustic sectorization sandwich panel with 60 mm thick low-density mineral wool core (L).

Annex II: The reference model adopted for the configuration of this group is the non-perforated 5-fret deck sandwich panel with a 60 mm thick high-density mineral wool core (M). Likewise, its results are representative for the following product ranges:

- Acoustic 5-fret deck sandwich panel with a 60 mm thick high-density mineral wool core (M).
- Non-perforated acoustic 2-fret deck sandwich panel with 60 mm thick high-density mineral wool core (M).
- Non-perforated acoustic facade sandwich panel with 60 mm thick high-density mineral wool core (M).
- Non-perforated acoustic sectorization sandwich panel with 60 mm thick high-density mineral wool core (M).
- Non-perforated acoustic 5-fret deck sandwich panel with 80 mm thick high- and low-density mineral wool core (M-L).
- Non-perforated acoustic 2-fret deck sandwich panel with 80 mm thick high- and low -density mineral wool core (M- L).
- Non-perforated acoustic facade sandwich panel with 80 mm thick high- and low -density mineral wool core (M-L).
- Non-perforated acoustic sectorization sandwich panel with 80 mm thick high- and low -density mineral wool core (M-L).
- Non-perforated acoustic 5-fret deck sandwich panel with a 100 mm thick low-density mineral wool core (L).
- Non-perforated acoustic 2-fret deck sandwich panel with 100 mm thick low-density mineral wool core (L).
- Non-perforated acoustic facade sandwich panel with 100 mm thick low -density mineral wool core (L).
- Non-perforated acoustic sectorization sandwich panel with 100 mm thick low -density mineral wool core (L).

Annex III: The reference model adopted for the configuration of this group is the non-perforated 5-fret deck sandwich panel with a 150 mm thick high-density mineral wool core (M). Likewise, its results are representative for the following product ranges:

- Non-perforated acoustic 5-fret deck sandwich panel with 150 mm thick high-density mineral wool core (M).
- Non-perforated acoustic facade sandwich panel with 150 mm thick high -density mineral wool core (M).
- Non-perforated acoustic sectorization sandwich panel with 150 mm thick high -density mineral wool core (M).
- Non-perforated acoustic 5-fret deck sandwich panel with 200 mm thick low-density mineral wool core (L).

- Non-perforated acoustic facade sandwich panel with 200 mm thick low -density mineral wool core (L).

- Non-perforated acoustic sectorization sandwich panel with 200 mm thick low-density mineral wool core (L).

Annex IV: The reference model adopted for the configuration of this group is the non-perforated 5-fret deck sandwich panel with a 200 mm thick high-density mineral wool core (M). Likewise, its results are representative for the following product ranges:

- Acoustic 5-fret deck sandwich panel with 200 mm thick high-density mineral wool core (M).
- Non-perforated acoustic facade sandwich panel with 200 mm thick high-density mineral wool core (M).
- Non-perforated acoustic sectorization sandwich panel with 200 mm thick high-density mineral wool core (M).

ACH panels are formed by two steel sheets bonded by an organic adhesive to the mineral wool core.

These type of panels are cold-formed and are characterized by their excellent resistance and stability to fire, which is why they are shown as an ideal product for any sector where this aspect is a priority (industrial construction, public assistance facilities, residential construction, etc.). Besides, ACH sandwich panels with mineral wool core bear high sound insulation properties, thereby improving environmental quality in the industrial field.

In the case of acoustic panels, the inner face of the steel sheet has 3 mm diameter micro-perforations, although if more excellent acoustic absorption is required, it is possible to manufacture a panel with 5 mm micro-perforations on request. A fiberglass veil is placed between the perforated face and the core. Concerning the steel sheets, these can range between 0.4 mm and 0.9 mm, with 0.5 mm being the most commonly used thickness at ACH. Likewise, the panel has a standard 25 µm polyester coating, which may vary depending on the intended use of the panel. Finally, it should be noted that it is also possible to manufacture panels in other materials, mainly aluminum or stainless steel.

Regarding their functionality, ACH panels are designed for the construction of enclosures in large industrial or civil building surfaces. These can be used interchangeably for the construction of roofs, facades and interior partitions in multiple types of buildings such as heated premises, production plants, buildings where withstanding fire is a crucial requirement such as hazardous substance warehouses, and buildings where interior acoustic shielding is required, among others.

Technical data / physical characteristics (for a 100 mm thickness):

The Product Thermal Resistance, R, is: 2.8 K.m².W-1 (UNE EN 12667)
The Product Thermal Conductivity is: 0.357 W / (m · K) (UNE EN 12667)
Reaction to Fire: A2-s1, d0 (UNE EN 13501-1)
Acoustic Properties: AW 0.90 (UNE EN ISO 354)
Water vapor transmission: Not hydrophilic (UNE EN 12086)

Description of the main components and/or constituent materials of the product for the calculation of the EPD®: 1 m^2 of 5-fret non-perforated roof sandwich panel with a 100 mm thick high-density mineral wool core (M) and with a thermal resistance of 2.8 $K.m^2 * W^{-1}$

PARAMETER	VALUE
Quantity of wool per 1 m² of product	11,5 Kg
Thickness of wool	100 mm
Coating	0.5 mm thick steel sheets with polyester coating
Packaging for the transportation and distribution	Cardboard box Polyethylene film Polystyrene studs
Product used for the installation	Electric screwdriver Telescopic handler

During the life cycle of the product any hazardous substance listed in the "Candidate List of Substances of Very High Concern (SVHC[1]) for authorization" has been used in a percentage higher than 0.1% of the weight of the product.

LCA calculation information

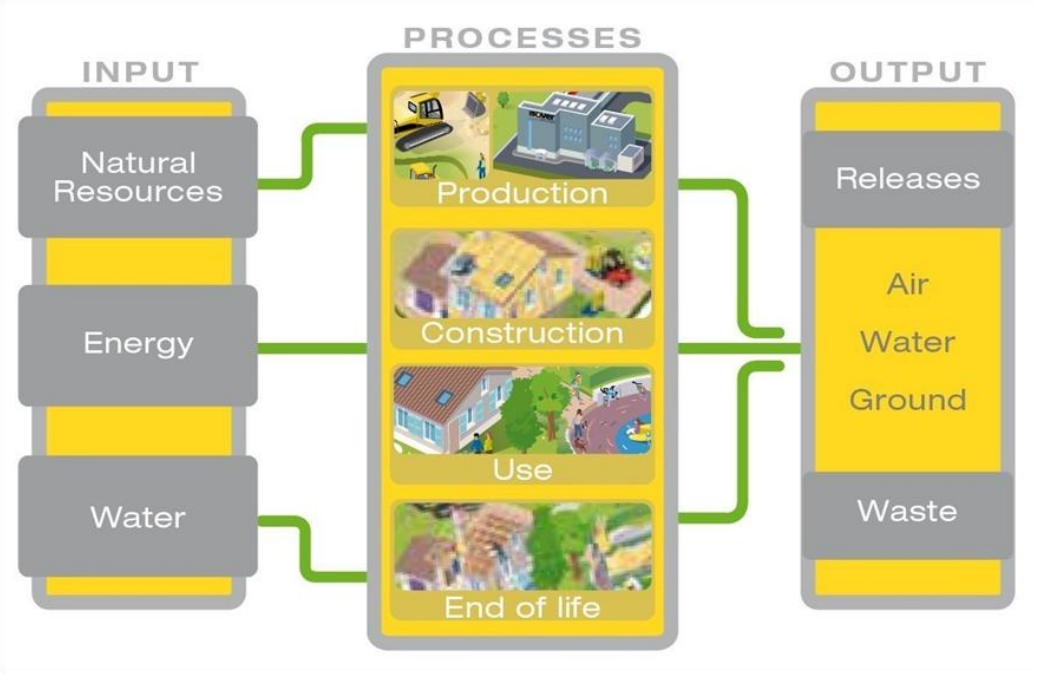
FUNCTIONAL UNIT	The lifecycle of one m² of enclosure that provides the technical requirements of thermal and acoustic insulation, water and air impermeability, resistance and reaction to fire, and mechanical properties.
SYSTEM BOUNDARIES	"Cradle to grave": Mandatory stages = A1-3, A4-5, B1-7, C1-4. Optional stage = Module D included.
REFERENCE SERVICE LIFE (RSL)	50 years
CUT-OFF- RULES	In the case that there is not enough information available, those inputs and outputs of mass and energy that account for less than 1% of the total energy and mass used in it may be excluded from the process, and as long as they do not cause relevant environmental impacts. The total sum of the inputs and outputs not included in a process will be less than 5% of the total energy and mass used per life cycle module. Flows related to human activities, such as transport employees, are excluded. Likewise, the flows related to the construction of production plants, production machines, and transport systems are excluded. The afore mentioned flows are considered negligible compared to the total life cycle impact.
ALLOCATIONS	Allocation criteria are based on mass.
GEOGRAPHIC COVERAGE **TIME PERÍOD**	International 2017

- "EPDs of construction products may not be comparable if they do not comply with EN 15804"
- "EPDs within the same product category from different programs may not be comparable"

[1] http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

Life cycle stages

Flow diagram of the Life Cycle



Product stage, A1-A3

Description of the stage: The product stage of mineral wool products is subdivided into 3 modules, A1, A2, and A3, which represent the “raw material supply,” “transportation” and “manufacturing,” respectively.

The aggregation of the modules A1, A2, and A3 is a possibility considered by EN 15804 standard. This rule is applied in this EPD®.

Description of the scenarios and other additional technical information:

A1, Raw material supply

This module considers the extraction and processing of raw materials, as well as energy consumption.

Specifically, about mineral wool, the supply of raw materials covers of binder components (resin) and sourcing (quarry) of the raw materials (such as Basalt, slag, sands ...) for wool production. Moreover, these raw materials, other recycled materials (agglomerates) are also used as inputs. On the other hand, this module includes the extraction and processing of the rest of the elements that make up the product (steel, glass veil, adhesive, and polyester)

A2, Transportation to the factory

The raw materials are transported to the manufacturing plant. In our case, the model includes road transport (average values) of each raw material.

A3, Manufacturing

This module includes the manufacture of products and packaging. Specifically, it covers resin production, mineral wool manufacturing, and panel assembly. On the other hand, it has been considering the energy consumption and waste generated in the production plant, as well as the losses derived from the manufacturing process.

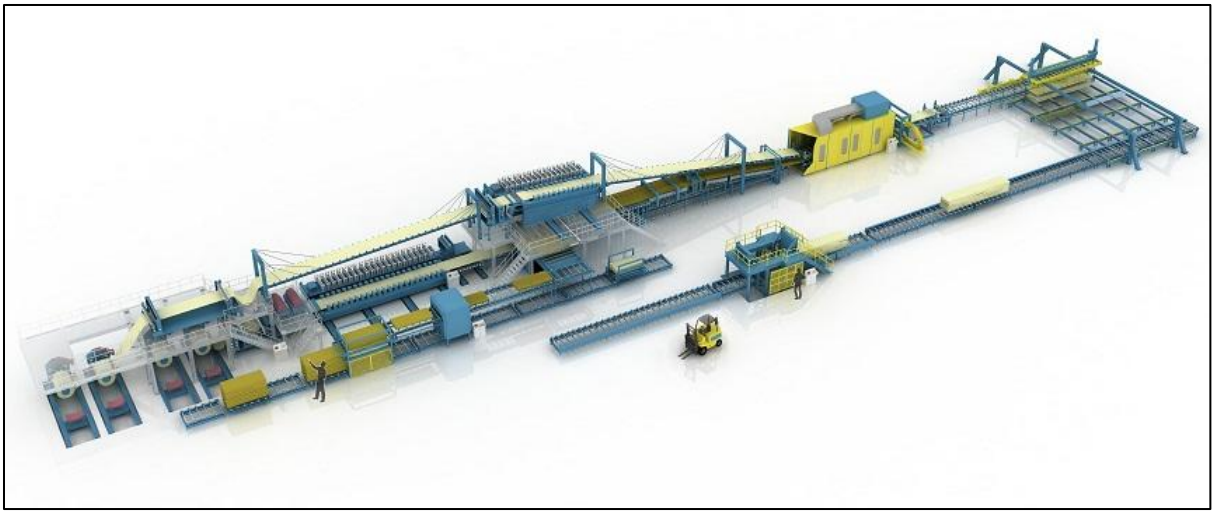
Production process description

The production process of the sandwich panels with mineral wool core starts with the unwinding of the sheets, which are driven to a profiling machine to mold them by rollers into the different forms sold.

Once the sheets leave the profiler, they enter the wool insertion zone. This sector has a parallel line through which the pallets with the insulator are introduced, where it is cut with a saw, and subsequently inserted between the panel sheets.

In the third phase of the process, the panel is transported to the press and adhesive area. In this sector, the product is preheated, and glue is applied to fix the mineral wool. Subsequently, the panel is pressed and heated again to allow optimum sheet bonding.

Finally, the panel is moved to the cutting area, where it is trimmed to the desired measures using a bandsaw. The finished product is stacked in packages by a turner, and finally, it is packed and labeled for later distribution to the customer.



Construction process stage, A4-A5

Description of the stage: The construction process is divided into 2 modules: “transport to the building site,” A4, and “installation,” A5.

A4, Transport to the building site: This module includes transport from the production gate to the building site where the product will be installed.

Transport is calculated based on a scenario with the parameters described in the following table.

PARAMETER	VALUE/DESCRIPTION
Fuel type and consumption of vehicle or vehicle type used for transport, e.g. long-distance truck, boat, etc.	EURO 6 truck with a trailer with an average load of 32t and diesel consumption of 31 liters per 100 km. Transoceanic cargo ship
Distance	Truck: 485 km Cargo ship: 238 km
Capacity utilization (including empty returns)	100 % of the capacity in volume 0 % of empty returns
Bulk density of transported products	Mass of the transported product
Volume capacity utilization factor	1 (default)

A5, Installation in the building: this module includes:

- Residues or waste derived from the installation of the product (see the percentage value in the table shown below). These losses are sent to a landfill (see the model of landfill for mineral wool at the End of Life chapter).
- Additional production processes to compensate for losses.
- Processing of waste derived from packaging (cardboard, polyethylene film, and polystyrene studs), which are 100% collected and 100% processed and reduced to their elementary components (recovered material)
- Auxiliary materials for product installation (stainless steel screws).
- Electrical consumption derived from the installation process of the sandwich panel (electric screwdriver).
- Diesel consumption from the use of the telescopic manipulator required to place the panels at the installation site.

PARAMETER	VALUE/DESCRIPTION
Wastage of materials on the building site before waste processing, generated by the product's installation (specified by type)	2 %
Output materials (specified by type) as results of waste processing at the building site e.g. of collection for recycling, for energy recovering, disposal (specified by route)	The product packaging waste is 100% collected and transformed into recovered material. It has been considered, following a conservative principle, that losses or wastes of mineral wool, as well as much of the other materials that make up the sandwich panel (steel, glass veil, and polyester), are taken to a landfill, although these products are 100% recyclable and / or reusable.
Auxiliary materials necessary for the installation process	An electric screwdriver and stainless-steel screws
Quantitative description of the type of energy used (regional mix) and electricity consumption during the installation process	3,00E-05 kWh

Use stage (excluding potential savings), B1-B7

Description of the stage: the use stage is divided into the following modules:

- B1: Use
- B2: Maintenance
- B3: Repair
- B4: Replacement
- B5: Refurbishment
- B6: Operational energy use
- B7: Operational water use

Scenario Description and Additional Technical Information:

Once the installation is complete, the product does not require any technical action or operation until the end of life stage. Therefore, the sandwich panel understudy has no impact (excluding possible energy savings) at this stage.

End of Life Stage, C1-C4

Description of the stage: this stage includes the next modules:

C1, Deconstruction, dismantling, demolition.

Deconstruction and / or dismantling of sandwich panels is part of the entire demolition of a building. In our case, it is assumed that the associated environmental impact is negligible.

C2, Transport of the discarded product to the processing site

Panel elements made of steel are transported to the recycling plant, while the rest of the materials that make up the panel are sent to a landfill. In both cases, the materials are transported by truck with a 16-32-ton trailer. A transport distance of 50 km has been considered.

C3, Waste processing for reuse, recovery and / or recycling

Waste containing steel is separated from the rest of the panel materials for subsequent recycling. The impacts generated during this stage have been considered negligible.

C4, Disposal

Panel elements made of steel (metal sheets with polyester coating and screws) are transformed into secondary material at a recycling plant, while the rest of the materials that make up the panel are deposited in a landfill as inert waste (mineral wool, glass veil, and adhesive).

Scenario description and other additional technical information: (see table below)

End of life:

PARAMETER	VALUE/DESCRIPTION
Waste collection process specified by the type	20,681 kg sandwich panel and stainless-steel screws (mixed with the rest of the construction waste)
Recovery system specified by the type	Panel elements containing steel are transformed into secondary material. 8,734 kg sent to a recycling plant (steel sheets and screws)
Dump specified by the type	11,947 kg sent to landfill (mineral wool, glass veil, adhesive)
Assumptions for scenario development (e.g., in transport)	Trailer truck with an average load of 16-32 tons and diesel consumption of 25 liters per 100 km. Average distance 50km to the waste management site (landfill and recycling plant).

Reuse/recovery/recycling potential, D

Stage description: Module D reflects the environmental benefits derived from the reuse, recovery or recycling of sandwich panel materials at the end of their life cycle, which will be integrated into the life cycle of a new product as secondary source materials. Module D has been taken into account in this study, whose positive environmental impacts come from obtaining recycled steel from all the steel elements in the panel (sheets and screws). To carry out the modeling of this module, the hypothesis has been followed that all the steel material subject to recycling comes from the primary origin. Finally, it should be noted that the environmental benefits derived from the module do not compute over the total impacts of the product's life cycle, as this is considered separately.

LCA results

The LCA model, data recording, and environmental impact have been calculated using TEAM ™ 5.1 software. The CML impact method has been used, together with the ACV DEAM (2006) and Ecoinvent 2.3 databases to obtain the inventory data of the generic processes.

Data on the number of raw materials used, as well as energy consumption and transport distances, have been taken directly from the manufacturing plant of Saint-Gobain Transformados SAU (Alovera, Guadalajara) in 2017.

ACH sandwich panels with mineral wool core are structured by two steel sheets, of which the top layer has a thickness variation between 0.4 mm and 0.9 mm depending on the purchased panel model. To determine an environmental assessment as accurate as possible, all the panels have been modeled in their different steel thicknesses, and the ratio between the environmental impacts obtained for each of the life cycle stages has been made on all the indicators to be studied. Following a conservative method, the scenario with the most significant impact has been considered, so the highest value ratios have been adopted.

The resulting calculations are attached in table format following the results of the environmental performance of the product for each of the groups in which the impact assessment has been structured (reference panel and Annexes I, II, III, and IV).

Below are the tables that summarize the results of the LCA in detail.

ENVIRONMENTAL IMPACTS - SANDWICH PANEL WITH MINERAL WOOL CORE - 100 mm (M density)

Parameters	Product stage	Construction Stage		Use Stage							End of Life Stage				D Reuse, Recovery and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Waste disposal	
Global Warming Potential (GWP) *kg CO_2 equiv/UF*	4,05E+01	8,10E-01	9,67E-01	0	0	0	0	0	0	0	Irrelevant	1,65E-01	Irrelevant	5,13E-02	-1,72E+01
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion Potential (ODP) *kg CFC 11 equiv/UF*	2,90E-06	1,66E-07	1,21E-07	0	0	0	0	0	0	0	Irrelevant	3,07E-08	Irrelevant	2,04E-08	-6,38E-07
	Destruction of the stratospheric ozone layer that protects the earth from ultraviolet rays (harmful to life). This ozone destruction process is due to the breakdown of certain c (chlorofluorocarbons or halons) when they reach the stratosphere, causing the catalytic breakdown of ozone molecules.														
Acidification Potential of soil and Water Resources (AP) *kg SO_2 equiv/UF*	2,69E-01	2,43E-03	6,40E-03	0	0	0	0	0	0	0	Irrelevant	3,87E-04	Irrelevant	3,78E-04	-7,74E-02
	Acid rain has negative impacts on natural ecosystems and the environment. The main sources of acidifying substance emissions are agriculture and fossil fuels combustion used for electricity production, heating, and transport.														
Eutrophication Potential (EP) *kg $(PO_4)^{3-}$ equiv/UF*	5,72E-02	4,60E-04	1,37E-03	0	0	0	0	0	0	0	Irrelevant	8,25E-05	Irrelevant	8,26E-05	-6,78E-02
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	1,84E-02	1,35E-04	4,32E-04	0	0	0	0	0	0	0	Irrelevant	2,50E-05	Irrelevant	1,44E-05	-1,15E-02
	Chemical reactions caused by sunlight energy. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	1,17E-04	1,61E-06	4,74E-06	0	0	0	0	0	0	0	Irrelevant	5,12E-07	Irrelevant	5,51E-08	-3,09E-04
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	3,71E+02	1,32E+01	1,29E+01	0	0	0	0	0	0	0	Irrelevant	2,49E+00	Irrelevant	1,67E+00	-1,53E+02
	Consumption of non-renewable resources with the consequent reduction of availability for future generations														

RESOURCE SOURCE - SANDWICH PANEL WITH MINERAL WOOL CORE - 100 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw material - *MJ/UF*	3,32E+01	2,41E-01	9,24E-01	0	0	0	0	0	0	0	Irrelevant	3,76E-02	Irrelevant	2,23E-02	-1,36E+01
Use of renewable primary energy used as raw material - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy (primary energy and renewable primary energy resources used as raw material)- *MJ/UF*	3,32E+01	2,41E-01	9,24E-01	0	0	0	0	0	0	0	Irrelevant	3,76E-02	Irrelevant	2,23E-02	-1,36E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material - *MJ/UF*	3,71E+02	1,32E+01	1,29E+01	0	0	0	0	0	0	0	Irrelevant	2,49E+00	Irrelevant	1,67E+00	-1,53E+02
Use of non-renewable primary energy used as raw material - MJ/UF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy (primary energy and non-renewable primary energy resources used as raw material). - *MJ/UF*	3,71E+02	1,32E+01	1,29E+01	0	0	0	0	0	0	0	Irrelevant	2,49E+00	Irrelevant	1,67E+00	-1,53E+02
Use of secondary materials. - *kg/UF*	6,91E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Use of renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of net fresh water resources - *m^3/UF*	1,77E-01	3,16E-03	4,43E-03	0	0	0	0	0	0	0	Irrelevant	4,82E-04	Irrelevant	1,92E-03	-9,70E-02

WASTE CATEGORY - SANDWICH PANEL WITH MINERAL WOOL CORE - 100 mm (M density)															
Parameters	**Product stage**	**Construction Process Stage**		**Use Stage**							**End of Life Stage**				**D Reuse, Recovery and Recycling**
	A1 / A2 / A3	Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Hazardous waste discharged *kg/FU*	5,19E-02	6,94E-06	1,04E-03	0	0	0	0	0	0	0	Irrelevant	1,50E-06	Irrelevant	5,83E-07	-1,40E-03
Non-hazardous waste discharged *kg/FU*	7,99E+00	1,16E+00	7,02E-01	0	0	0	0	0	0	0	Irrelevant	1,23E-01	Irrelevant	1,19E+01	-6,66E+00
Radioactive waste discharged *kg/FU*	1,45E-03	9,57E-05	6,44E-05	0	0	0	0	0	0	0	Irrelevant	1,75E-05	Irrelevant	1,16E-05	-4,27E-05

OTHER OUTPUT FLOWS - SANDWICH PANEL WITH MINERAL WOOL CORE - 100 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Components for reuse *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling *kg/FU*	4,20E-01	0	1,54E-01	0	0	0	0	0	0	0	0	0	8,65E+00	0	-
Materials for energy recovery (energy recovery) *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exported Energy (electrical, thermal, ...) *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ACH SANDWICH PANEL WITH MINERAL WOOL CORE - 100 mm (M density)										
Steel sheet thickness (mm)	TOTAL	Product stage	Distribution	Installation	Use	End of life				MODULE D
		A1-A3	A4	A5	B	C1	C2	C3	C4	
0,4 mm	0,99	0,99	0,96	0,99	-	-	0,96	-	1,00	0,90
0,5 mm (Reference thickness)	1,00	1,00	1,00	1,00	-	-	1,00	-	1,00	1,00
0,6 mm	1,06	1,07	1,04	1,04	-	-	1,04	-	1,00	1,10
0,7 mm	1,13	1,13	1,08	1,07	-	-	1,08	-	1,00	1,20
0,8 mm	1,19	1,20	1,12	1,11	-	-	1,13	-	1,00	1,30
0,9 mm	1,26	1,26	1,17	1,14	-	-	1,17	-	1,00	1,40

Conversion factors related to the 1 m^2 life cycle of the product. ACOUSTIC 5-FRET DECK ACH SANDWICH PANEL WITH A 100 MM THICK HIGH-DENSITY MINERAL WOOL CORE (M). Depending on the thickness of the steel sheet purchased.
Results expressed as a ratio of the life cycle of the panel to the thickness of the reference steel sheet (0.5 mm).

ANNEX I - ENVIRONMENTAL IMPACTS - SANDWICH PANEL WITH MINERAL WOOL CORE - 30 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Global Warming Potential (GWP) *kg CO_2 equiv/UF*	2,26E+01	4,97E-01	6,00E-01	0	0	0	0	0	0	0	Irrelevant	1,01E-01	Irrelevant	1,67E-02	-1,72E+01
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion Potential (ODP) *kg CFC 11 equiv/UF*	1,94E-06	1,02E-07	1,00E-07	0	0	0	0	0	0	0	Irrelevant	1,87E-08	Irrelevant	6,64E-09	-6,38E-07
	Destruction of the stratospheric ozone layer that protects the earth from ultraviolet rays (harmful to life). This ozone destruction process is due to the breakdown of certain com (chlorofluorocarbons or halons) when they reach the stratosphere, causing the catalytic breakdown of ozone molecules.														
Acidification Potential of s**oil** and Water Resources (AP) *kg SO_2 equiv/UF*	1,26E-01	1,49E-03	3,50E-03	0	0	0	0	0	0	0	Irrelevant	2,37E-04	Irrelevant	1,23E-04	-7,74E-02
	Acid rain has negative impacts on natural ecosystems and the environment. The main sources of acidifying substance emissions are agriculture and fossil fuels combustion used for electricity production, heating, and transport.														
Eutrophication Potential (EP) *kg $(PO_4)^{3-}$ equiv/UF*	4,09E-02	2,82E-04	1,04E-03	0	0	0	0	0	0	0	Irrelevant	5,04E-05	Irrelevant	2,70E-05	-6,78E-02
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	9,63E-03	8,27E-05	2,56E-04	0	0	0	0	0	0	0	Irrelevant	1,52E-05	Irrelevant	4,70E-06	-1,15E-02
	Chemical reactions caused by sunlight energy. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	1,04E-04	9,88E-07	4,46E-06	0	0	0	0	0	0	0	Irrelevant	3,13E-07	Irrelevant	1,80E-08	-3,09E-04
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	2,45E+02	8,11E+00	1,03E+01	0	0	0	0	0	0	0	Irrelevant	1,52E+00	Irrelevant	5,44E-01	-1,53E+02
	Consumption of non-renewable resources with the consequent reduction of availability for future generations														

ANNEX I -RESOURCE SOURCE - SANDWICH PANEL WITH MINERAL WOOL CORE - 30 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw material - *MJ/UF*	2,39E+01	1,48E-01	7,35E-01	0	0	0	0	0	0	0	Irrelevant	2,30E-02	Irrelevant	7,29E-03	-1,36E+01
Use of renewable primary energy used as raw material - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy (primary energy and renewable primary energy resources used as raw material)- *MJ/UF*	2,39E+01	1,48E-01	7,35E-01	0	0	0	0	0	0	0	Irrelevant	2,30E-02	Irrelevant	7,29E-03	-1,36E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material - *MJ/UF*	2,45E+02	8,11E+00	1,03E+01	0	0	0	0	0	0	0	Irrelevant	1,52E+00	Irrelevant	5,44E-01	-1,53E+02
Use of non-renewable primary energy used as raw material - MJ/UF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy (primary energy and non-renewable primary energy resources used as raw material). - *MJ/UF*	2,45E+02	8,11E+00	1,03E+01	0	0	0	0	0	0	0	Irrelevant	1,52E+00	Irrelevant	5,44E-01	-1,53E+02
Use of secondary materials. - *kg/UF*	6,91E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Use of renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of net fresh water resources - *m^3/UF*	1,22E-01	1,94E-03	3,27E-03	0	0	0	0	0	0	0	Irrelevant	2,94E-04	Irrelevant	6,26E-04	-9,70E-02

ANNEX I - WASTE CATEGORY- SANDWICH PANEL WITH MINERAL WOOL CORE - 30 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Hazardous waste discharged *kg/FU*	1,63E-02	4,26E-06	3,30E-04	0	0	0	0	0	0	0	Irrelevant	9,17E-07	Irrelevant	1,90E-07	-1,40E-03
Non-hazardous waste discharged *kg/FU*	6,11E+00	7,11E-01	4,94E-01	0	0	0	0	0	0	0	Irrelevant	7,51E-02	Irrelevant	3,89E+00	-6,66E+00
Radioactive waste discharged *kg/FU*	9,70E-04	5,87E-05	5,38E-05	0	0	0	0	0	0	0	Irrelevant	1,07E-05	Irrelevant	3,80E-06	-4,27E-05

ANNEX I - OTHER OUTPUT FLOWS - SANDWICH PANEL WITH MINERAL WOOL CORE - 30 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Components for reuse *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling *kg/FU*	4,20E-01	0	1,54E-01	0	0	0	0	0	0	0	0	0	8,65E+00	0	-
Materials for energy recovery (energy recovery) *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exported Energy (electrical, thermal, ...) *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ANNEX I - ACH SANDWICH PANEL WITH MINERAL WOOL CORE - 30 mm (M density)										
Steel sheet thickness (mm)	TOTAL	Product stage	Distribution	Installation	Use	End of life				MODULE D
		A1-A3	A4	A5	B	C1	C2	C3	C4	
0,4 mm	0,97	0,97	0,93	0,99	-	-	0,93	-	1,00	0,90
0,5 mm (Reference thickness)	1,00	1,00	1,00	1,00	-	-	1,00	-	1,00	1,00
0,6 mm	1,07	1,07	1,07	1,05	-	-	1,07	-	1,00	1,10
0,7 mm	1,14	1,15	1,14	1,10	-	-	1,14	-	1,00	1,20
0,8 mm	1,22	1,22	1,20	1,14	-	-	1,21	-	1,00	1,30
0,9 mm	1,29	1,29	1,27	1,19	-	-	1,28	-	1,00	1,40

Conversion factors related to the 1 m^2 life cycle of the product. ACOUSTIC 5-FRET DECK ACH SANDWICH PANEL WITH A 30 MM THICK HIGH-DENSITY MINERAL WOOL CORE (M). Depending on the thickness of the steel sheet purchased.
Results expressed as a ratio of the life cycle of the panel to the thickness of the reference steel sheet (0.5 mm).

ANNEX II - ENVIRONMENTAL IMPACTS - SANDWICH PANEL WITH MINERAL WOOL CORE -60 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Global Warming Potential (GWP) *kg CO_2 equiv/UF*	3,03E+01	6,31E-01	7,57E-01	0	0	0	0	0	0	0	Irrelevant	1,28E-01	Irrelevant	3,16E-02	-1,72E+01
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion Potential (ODP) *kg CFC 11 equiv/UF*	2,35E-06	1,29E-07	1,09E-07	0	0	0	0	0	0	0	Irrelevant	2,38E-08	Irrelevant	1,25E-08	-6,38E-07
	Destruction of the stratospheric ozone layer that protects the earth from ultraviolet rays (harmful to life). This ozone destruction process is due to the breakdown of certain com (chlorofluorocarbons or halons) when they reach the stratosphere, causing the catalytic breakdown of ozone molecules.														
Acidification Potential of soil and water Resources (AP) *kg SO_2 equiv/UF*	1,87E-01	1,89E-03	4,74E-03	0	0	0	0	0	0	0	Irrelevant	3,01E-04	Irrelevant	2,32E-04	-7,74E-02
	Acid rain has negative impacts on natural ecosystems and the environment. The main sources of acidifying substance emissions are agriculture and fossil fuels combustion used for electricity production, heating, and transport.														
Eutrophication Potential (EP) *kg $(PO_4)^{3-}$ equiv/UF*	4,78E-02	3,58E-04	1,18E-03	0	0	0	0	0	0	0	Irrelevant	6,42E-05	Irrelevant	5,08E-05	-6,78E-02
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	1,34E-02	1,05E-04	3,31E-04	0	0	0	0	0	0	0	Irrelevant	1,94E-05	Irrelevant	8,87E-06	-1,15E-02
	Chemical reactions caused by sunlight energy. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	1,09E-04	1,26E-06	4,58E-06	0	0	0	0	0	0	0	Irrelevant	3,98E-07	Irrelevant	3,39E-08	-3,09E-04
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	2,99E+02	1,03E+01	1,14E+01	0	0	0	0	0	0	0	Irrelevant	1,94E+00	Irrelevant	1,03E+00	-1,53E+02
	Consumption of non-renewable resources with the consequent reduction of availability for future generations														

ANNEX II - RESOURCE SOURCE - SANDWICH PANEL WITH MINERAL WOOL CORE - 60 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw material - *MJ/UF*	2,79E+01	1,88E-01	8,16E-01	0	0	0	0	0	0	0	Irrelevant	2,92E-02	Irrelevant	1,37E-02	-1,36E+01
Use of renewable primary energy used as raw material - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy (primary energy and renewable primary energy resources used as raw material)- *MJ/UF*	2,79E+01	1,88E-01	8,16E-01	0	0	0	0	0	0	0	Irrelevant	2,92E-02	Irrelevant	1,37E-02	-1,36E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material - *MJ/UF*	2,99E+02	1,03E+01	1,14E+01	0	0	0	0	0	0	0	Irrelevant	1,94E+00	Irrelevant	1,03E+00	-1,53E+02
Use of non-renewable primary energy used as raw material - MJ/UF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy (primary energy and non-renewable primary energy resources used as raw material). - *MJ/UF*	2,99E+02	1,03E+01	1,14E+01	0	0	0	0	0	0	0	Irrelevant	1,94E+00	Irrelevant	1,03E+00	-1,53E+02
Use of secondary materials. - *kg/UF*	6,91E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Use of renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of net fresh water resources - *m^3/UF*	1,45E-01	2,46E-03	3,77E-03	0	0	0	0	0	0	0	Irrelevant	3,75E-04	Irrelevant	1,18E-03	-9,70E-02

ANNEX II - WASTE CATEGORY - SANDWICH PANEL WITH MINERAL WOOL CORE - 60 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Hazardous waste discharged *kg/FU*	3,16E-02	5,41E-06	6,36E-04	0	0	0	0	0	0	0	Irrelevant	1,17E-06	Irrelevant	3,59E-07	-1,40E-03
Non-hazardous waste discharged *kg/FU*	6,91E+00	9,03E-01	5,84E-01	0	0	0	0	0	0	0	Irrelevant	9,57E-02	Irrelevant	7,34E+00	-6,66E+00
Radioactive waste discharged *kg/FU*	1,17E-03	7,45E-05	5,83E-05	0	0	0	0	0	0	0	Irrelevant	1,36E-05	Irrelevant	7,16E-06	-4,27E-05

ANNEX II - OTHER OUTPUT FLOWS - SANDWICH PANEL WITH MINERAL WOOL CORE - 60 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Components for reuse *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling *kg/FU*	4,20E-01	0	1,54E-01	0	0	0	0	0	0	0	0	0	8,65E+00	0	-
Materials for energy recovery (energy recovery) *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exported Energy (electrical, thermal, ...) *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ANNEX II - ACH SANDWICH PANEL WITH MINERAL WOOL CORE - 60 mm (M density)										
Steel sheet thickness (mm)	**TOTAL**	**Product stage**	**Distribution**	**Installation**	**Use**	**End of life**				**MODULE D**
		A1-A3	**A4**	**A5**	**B**	**C1**	**C2**	**C3**	**C4**	
0,4 mm	**0,98**	**0,98**	**0,95**	**0,99**	**-**	**-**	**0,95**	**-**	**1,00**	**0,90**
0,5 mm (Reference thickness)	**1,00**	**1,00**	**1,00**	**1,00**	**-**	**-**	**1,00**	**-**	**1,00**	**1,00**
0,6 mm	**1,07**	**1,07**	**1,06**	**1,04**	**-**	**-**	**1,06**	**-**	**1,00**	**1,10**
0,7 mm	**1,13**	**1,14**	**1,11**	**1,08**	**-**	**-**	**1,11**	**-**	**1,00**	**1,20**
0,8 mm	**1,20**	**1,21**	**1,16**	**1,13**	**-**	**-**	**1,16**	**-**	**1,00**	**1,30**
0,9 mm	**1,27**	**1,28**	**1,22**	**1,17**	**-**	**-**	**1,22**	**-**	**1,00**	**1,40**

Conversion factors related to the 1 m^2 life cycle of the product. ACOUSTIC 5-FRET DECK ACH SANDWICH PANEL WITH A 60 MM THICK HIGH-DENSITY MINERAL WOOL CORE (M). Depending on the thickness of the steel sheet purchased.
Results expressed as a ratio of the life cycle of the panel to the thickness of the reference steel sheet (0.5 mm).

ANNEX III - ENVIRONMENTAL IMPACTS - SANDWICH PANEL WITH MINERAL WOOL CORE - 150 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Global Warming Potential (GWP) *kg CO_2 equiv/UF*	5,33E+01	1,03E+00	1,23E+00	0	0	0	0	0	0	0	Irrelevant	2,11E-01	Irrelevant	7,60E-02	-1,72E+01
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion Potential (ODP) *kg CFC 11 equiv/UF*	3,58E-06	2,11E-07	1,36E-07	0	0	0	0	0	0	0	Irrelevant	3,92E-08	Irrelevant	3,02E-08	-6,38E-07
	Destruction of the stratospheric ozone layer that protects the earth from ultraviolet rays (harmful to life). This ozone destruction process is due to the breakdown of certain com (chlorofluorocarbons or halons) when they reach the stratosphere, causing the catalytic breakdown of ozone molecules.														
Acidification Potential of soil and Water Resources (AP) *kg SO_2 equiv/UF*	3,72E-01	3,10E-03	8,48E-03	0	0	0	0	0	0	0	Irrelevant	4,95E-04	Irrelevant	5,60E-04	-7,74E-02
	Acid rain has negative impacts on natural ecosystems and the environment. The main sources of acidifying substance emissions are agriculture and fossil fuels combustion used for electricity production, heating, and transport.														
Eutrophication Potential (EP) *kg $(PO_4)^{3-}$ equiv/UF*	6,88E-02	5,87E-04	1,61E-03	0	0	0	0	0	0	0	Irrelevant	1,05E-04	Irrelevant	1,22E-04	-6,78E-02
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	2,46E-02	1,72E-04	5,58E-04	0	0	0	0	0	0	0	Irrelevant	3,19E-05	Irrelevant	2,14E-05	-1,15E-02
	Chemical reactions caused by sunlight energy. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	1,26E-04	2,06E-06	4,95E-06	0	0	0	0	0	0	0	Irrelevant	6,55E-07	Irrelevant	8,17E-08	-3,09E-04
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	4,60E+02	1,69E+01	1,48E+01	0	0	0	0	0	0	0	Irrelevant	3,18E+00	Irrelevant	2,47E+00	-1,53E+02
	Consumption of non-renewable resources with the consequent reduction of availability for future generations														

ANNEX III - RESOURCE SOURCE - SANDWICH PANEL WITH MINERAL WOOL CORE - 150 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw material - *MJ/UF*	3,99E+01	3,07E-01	1,06E+00	0	0	0	0	0	0	0	Irrelevant	4,81E-02	Irrelevant	3,31E-02	-1,36E+01
Use of renewable primary energy used as raw material - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy (primary energy and renewable primary energy resources used as raw material)- *MJ/UF*	3,99E+01	3,07E-01	1,06E+00	0	0	0	0	0	0	0	Irrelevant	4,81E-02	Irrelevant	3,31E-02	-1,36E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material - *MJ/UF*	4,60E+02	1,69E+01	1,48E+01	0	0	0	0	0	0	0	Irrelevant	3,18E+00	Irrelevant	2,47E+00	-1,53E+02
Use of non-renewable primary energy used as raw material - MJ/UF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy (primary energy and non-renewable primary energy resources used as raw material). - *MJ/UF*	4,60E+02	1,69E+01	1,48E+01	0	0	0	0	0	0	0	Irrelevant	3,18E+00	Irrelevant	2,47E+00	-1,53E+02
Use of secondary materials. - *kg/UF*	6,91E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Use of renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of net fresh water resources - *m^3/UF*	2,16E-01	4,03E-03	5,26E-03	0	0	0	0	0	0	0	Irrelevant	6,16E-04	Irrelevant	2,84E-03	-9,70E-02

ANNEX III - WASTE CATEGORY - SANDWICH PANEL WITH MINERAL WOOL CORE - 150 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Hazardous waste discharged *kg/FU*	7,74E-02	8,86E-06	1,55E-03	0	0	0	0	0	0	0	Irrelevant	1,92E-06	Irrelevant	8,64E-07	-1,40E-03
Non-hazardous waste discharged *kg/FU*	9,34E+00	1,48E+00	8,56E-01	0	0	0	0	0	0	0	Irrelevant	1,57E-01	Irrelevant	1,77E+01	-6,66E+00
Radioactive waste discharged *kg/FU*	1,79E-03	1,22E-04	7,19E-05	0	0	0	0	0	0	0	Irrelevant	2,23E-05	Irrelevant	1,73E-05	-4,27E-05

ANNEX III - OTHER OUTPUT FLOWS - SANDWICH PANEL WITH MINERAL WOOL CORE - 150 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Components for reuse *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling *kg/FU*	4,20E-01	0	1,54E-01	0	0	0	0	0	0	0	0	0	8,65E+00	0	-
Materials for energy recovery (energy recovery) *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exported Energy (electrical, thermal, ...) *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ANNEX III - ACH SANDWICH PANEL WITH MINERAL WOOL CORE - 150 mm (M density)										
Steel sheet thickness (mm)	TOTAL	Product stage	Distribution	Installation	Use	End of life				MODULE D
		A1-A3	A4	A5	B	C1	C2	C3	C4	
0,4 mm	0,99	0,99	0,97	0,99	-	-	0,97	-	1,00	0,90
0,5 mm (Reference thickness)	1,00	1,00	1,00	1,00	-	-	1,00	-	1,00	1,00
0,6 mm	1,06	1,06	1,04	1,03	-	-	1,03	-	1,00	1,10
0,7 mm	1,12	1,13	1,07	1,06	-	-	1,07	-	1,00	1,20
0,8 mm	1,18	1,19	1,10	1,09	-	-	1,10	-	1,00	1,30
0,9 mm	1,24	1,25	1,13	1,12	-	-	1,13	-	1,00	1,40

Conversion factors related to the 1 m^2 life cycle of the product. ACOUSTIC 5-FRET DECK ACH SANDWICH PANEL WITH A 150 MM THICK HIGH-DENSITY MINERAL WOOL CORE (M). Depending on the thickness of the steel sheet purchased.
Results expressed as a ratio of the life cycle of the panel to the thickness of the reference steel sheet (0.5 mm).

ANNEX IV - ENVIRONMENTAL IMPACTS - SANDWICH PANEL WITH MINERAL WOOL CORE - 200 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Global Warming Potential (GWP) *kg CO_2 equiv/UF*	6,61E+01	1,26E+00	1,49E+00	0	0	0	0	0	0	0	Irrelevant	2,57E-01	Irrelevant	1,01E-01	-1,72E+01
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1.														
Ozone Depletion Potential (ODP) *kg CFC 11 equiv/UF*	4,26E-06	2,57E-07	1,51E-07	0	0	0	0	0	0	0	Irrelevant	4,77E-08	Irrelevant	3,99E-08	-6,38E-07
	Destruction of the stratospheric ozone layer that protects the earth from ultraviolet rays (harmful to life). This ozone destruction process is due to the breakdown of certain compounds that contain chlorine and bromine (chlorofluorocarbons or halons) when they reach the stratosphere, causing the catalytic breakdown of ozone molecules.														
Acidification Potential - Soil and Water Resources (AP) *kg SO_2 equiv/UF*	4,75E-01	3,77E-03	1,05E-02	0	0	0	0	0	0	0	Irrelevant	6,03E-04	Irrelevant	7,42E-04	-7,74E-02
	Acid rain has negative impacts on natural ecosystems and the environment. The main sources of acidifying substance emissions are agriculture and fossil fuels combustion used for electricity production, heating, and transport.														
Eutrophication Potential (EP) *kg $(PO_4)^{3-}$ equiv/UF*	8,04E-02	7,14E-04	1,84E-03	0	0	0	0	0	0	0	Irrelevant	1,28E-04	Irrelevant	1,62E-04	-6,78E-02
	Excessive enrichment of waters and continental surfaces with nutrients, and the associated adverse biological effects.														
Photochemical ozone creation (POPC) *kg Ethene equiv/FU*	3,08E-02	2,09E-04	6,83E-04	0	0	0	0	0	0	0	Irrelevant	3,88E-05	Irrelevant	2,83E-05	-1,15E-02
	Chemical reactions caused by sunlight energy. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	1,36E-04	2,50E-06	5,15E-06	0	0	0	0	0	0	0	Irrelevant	7,97E-07	Irrelevant	1,08E-07	-3,09E-04
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	5,50E+02	2,05E+01	1,67E+01	0	0	0	0	0	0	0	Irrelevant	3,87E+00	Irrelevant	3,27E+00	-1,53E+02
	Consumption of non-renewable resources with the consequent reduction of availability for future generations														

ANNEX IV - RESOURCE SOURCE - SANDWICH PANEL WITH MINERAL WOOL CORE - 200 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Use of renewable primary energy excluding renewable primary energy resources used as raw material - *MJ/UF*	4,66E+01	3,74E-01	1,19E+00	0	0	0	0	0	0	0	Irrelevant	5,85E-02	Irrelevant	4,38E-02	-1,36E+01
Use of renewable primary energy used as raw material - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of renewable primary energy (primary energy and renewable primary energy resources used as raw material)- *MJ/UF*	4,66E+01	3,74E-01	1,19E+00	0	0	0	0	0	0	0	Irrelevant	5,85E-02	Irrelevant	4,38E-02	-1,36E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw material - *MJ/UF*	5,50E+02	2,05E+01	1,67E+01	0	0	0	0	0	0	0	Irrelevant	3,87E+00	Irrelevant	3,27E+00	-1,53E+02
Use of non-renewable primary energy used as raw material - MJ/UF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total use of non-renewable primary energy (primary energy and non-renewable primary energy resources used as raw material). - *MJ/UF*	5,50E+02	2,05E+01	1,67E+01	0	0	0	0	0	0	0	Irrelevant	3,87E+00	Irrelevant	3,27E+00	-1,53E+02
Use of secondary materials. - *kg/UF*	6,91E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Use of renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of non-renewable secondary fuels - *MJ/UF*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Use of net fresh water resources - *m^3/UF*	2,56E-01	4,90E-03	6,08E-03	0	0	0	0	0	0	0	Irrelevant	7,50E-04	Irrelevant	3,77E-03	-9,70E-02

ANNEX IV -WASTE CATEGORY - SANDWICH PANEL WITH MINERAL WOOL CORE - 200 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery, and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Hazardous waste discharged *kg/FU*	1,03E-01	1,08E-05	2,06E-03	0	0	0	0	0	0	0	Irrelevant	2,34E-06	Irrelevant	1,14E-06	-1,40E-03
Non-hazardous waste discharged *kg/FU*	1,07E+01	1,80E+00	9,99E-01	0	0	0	0	0	0	0	Irrelevant	1,91E-01	Irrelevant	2,34E+01	-6,66E+00
Radioactive waste discharged *kg/FU*	2,13E-03	1,49E-04	7,95E-05	0	0	0	0	0	0	0	Irrelevant	2,72E-05	Irrelevant	2,29E-05	-4,27E-05

ANNEX IV - OTHER OUTPUT FLOWS OF THE SANDWICH PANEL WITH MINERAL WOOL CORE - 200 mm (M density)

Parameters	Product stage	Construction Process Stage		Use Stage							End of Life Stage				D Reuse, Recovery and Recycling
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Demolition	C2 Transport	C3 Waste treatment	C4 Waste disposal	
Components for reuse *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Materials for recycling *kg/FU*	4,20E-01	0	1,54E-01	0	0	0	0	0	0	0	0	0	8,65E+00	0	-
Materials for energy recovery (energy recovery) *kg/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exported Energy (electrical, thermal, ...) *MJ/FU*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ANNEX IV - ACH SANDWICH PANEL WITH MINERAL WOOL CORE - 200 mm (M density)										
Steel sheet thickness (mm)	TOTAL	Product stage	Distribution	Installation	Use	End of life				MODULE D
		A1-A3	A4	A5	B	C1	C2	C3	C4	
0,4 mm	0,99	0,99	0,97	0,99	-	-	0,98	-	1,00	0,90
0,5 mm (Reference thickness)	1,00	1,00	1,00	1,00	-	-	1,00	-	1,00	1,00
0,6 mm	1,05	1,06	1,03	1,03	-	-	1,03	-	1,00	1,10
0,7 mm	1,11	1,11	1,06	1,06	-	-	1,06	-	1,00	1,20
0,8 mm	1,16	1,17	1,08	1,09	-	-	1,08	-	1,00	1,30
0,9 mm	1,22	1,23	1,11	1,12	-	-	1,11	-	1,00	1,40

Conversion factors related to the 1 m2 life cycle of the product. ACOUSTIC 5-FRET DECK ACH SANDWICH PANEL WITH A 200 MM THICK HIGH-DENSITY MINERAL WOOL CORE (M). Depending on the thickness of the steel sheet purchased.
Results expressed as a ratio of the life cycle of the panel to the thickness of the reference steel sheet (0.5 mm).

LCA interpretation

Note: The interpretation of the following environmental results refers to the product range on which this EPD® has been based (Non-perforated 5-fret ACH sandwich panel with a 100 mm thick high-density mineral wool core (M))

The Product stage (A1-A3) is the one that yields the most significant environmental contribution to the product life cycle, since its impacts account for over 88% of all the indicators evaluated, except the production of non-hazardous waste.

Waste production is mainly attributed to the end-of-life stage of the product (55% of the total impact). This happens because a significant part of the product is deposited in landfills (controlled) at the end of its useful life.

[1] This indicator corresponds to the abiotic depletion potential of fossil resources.

[2] This indicator corresponds to the total use of primary energy.

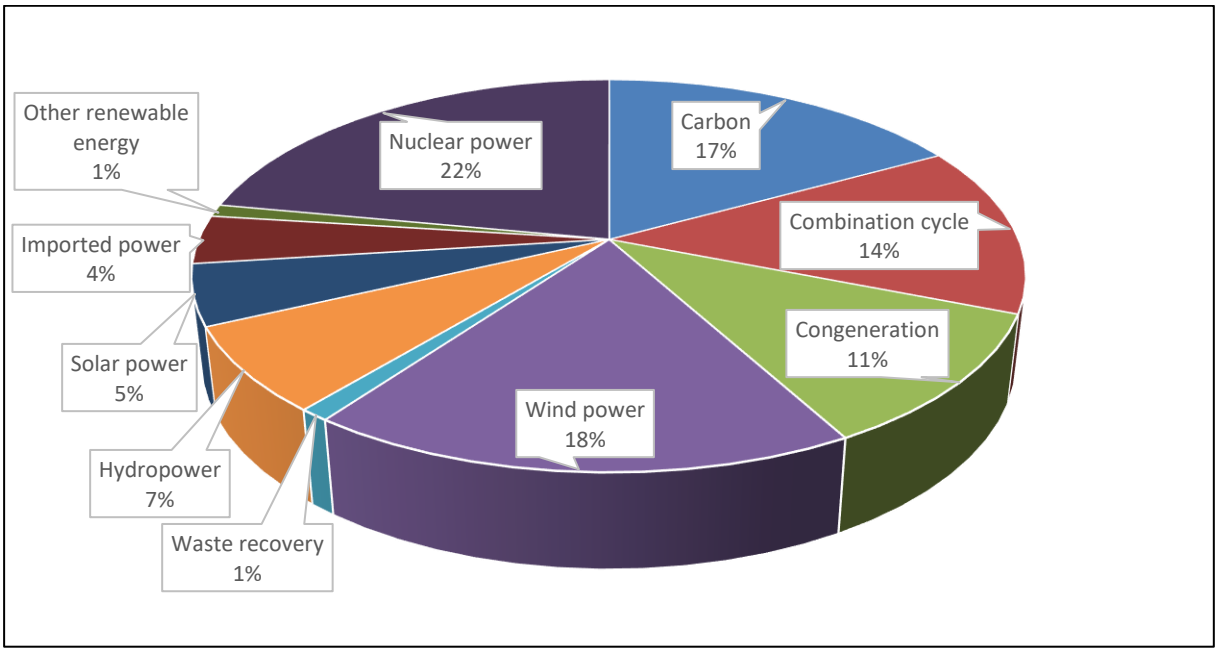
[3] This indicator corresponds to the use of net fresh water.

[4] This indicator corresponds to the sum of hazardous, non-hazardous and radioactive waste disposed.

Additional information

The electric power production model considered for the plant ACH Saint-Gobain (Alovera, Guadalajara) is the mix of production in Spain corresponding to 2017[2].

The following graph shows the composition of electricity production used.



[2] Source: Red Eléctrica de España

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