AGC GLASS EUROPE

FICHE DE DECLARATION ENVIRONNEMENTALE ET SANITAIRE DU PRODUIT

ENVIRONMENTAL AND HEALTH PRODUCT DECLARATION

Pyrobel 25EG, Pyrobel 33H, Pyrobel 30 EG, Pyrobel 37, Pyrobel 30 EG2, Pyrobel 37 EG, Pyrobel 37 EG2, Pyrobel 53N, Pyrobel 54, Pyrobel 53N EG, Pyrobel 54 EG

(Low-Carbon, Cut-Size, Excluding Installation Accessories)

Fire-Resistant Glass

Reference product: Pyrobel 53N Low-Carbon Cut-Size

Individual range FDES

In accordance with ISO 14025:2010, NF EN 15804+A2 and its national supplement NF EN15804+A2/CN

Registration Number: 20260249132
Publication date: 27/02/2026
FDES Version: 1

Warning

The information contained in this declaration is provided under the responsibility of AGC Glass Europe in accordance with NF EN 15804+A2 and the national supplement NF EN 15804/CN.

Any use, in whole or in part, of the information provided in this document must at least be accompanied by the full reference of the original EPDS as well as its producer, who will be able to provide a complete copy.

The CEN EN 15804+A2 standard and the national supplement NF EN 15804+A2/CN serve as Product Category Rules (PCR).

NOTE The literal translation in French of "EPD (Environmental Product Declaration)" is "DEP" (Declaration Environnementale de Produit). However, in France, the term FDES (Fiche de Déclaration Environnementale et Sanitaire, Environmental and Health Product Declaration in English) is commonly used, which includes both the Environmental Declaration and Health Information for the product that is the subject of this FDES. Therefore, the FDES is indeed an "EPD" supplemented by health information.

Reading guide

Reading example: -9.0 E -03 = -9.0 x 10-3

The following display rules apply:

- When the inventory calculation result is zero, then the value zero is displayed.
    - Abbreviation used:
    - LCA: Life Cycle Assessment
    - EPD: Environmental Product Declaration
    - RSL: Reference Service Life
    - FDES: environmental and health product declaration
    - PCR: Product Category Rules
    - FU: Functional Unit
- The units used are specified in front of each flow: the kilogram "kg", the gram "g", the kilowatt-hour "kWh", the megajoule "MJ", the square metre "m^2", the kelvin "K", the watt "W", the kilometre "km", the millimetre "mm".

The results of environmental impacts and indicators of resource use, waste categories and output flows are presented with three significant figures and in scientific format.

All positive values (greater than zero) correspond to environmental impacts, while negative values (less than zero) correspond to environmental benefits. This approach applies to all modules, including Module D. When the value of module D is greater than 0, it is therefore an additional impact to be added to the impacts of the other modules in the life cycle.

Caution of using the EPD for product comparison

The FDES of construction products may not be comparable if they do not comply with the NF EN 15804+A2 standard.

The NF EN 15804+A2 standard defined in § 5.3 Comparabilité des DEP* for construction products, the conditions under which construction products may be compared, on the basis of the information provided by the FDES:

"Therefore, a comparison of the environmental performance of construction products using EPD information should be based on the use of the products and their impacts on the building, and should take into account the entire life cycle (all information modules)."

NOTE 1

Outside the context of the environmental assessment of a building, EPDs are not tools for comparing construction products and services.

NOTE 2

For the assessment of the contribution of buildings to sustainable development, a comparison of environmental aspects and impacts should be undertaken in conjunction with the socio-economic aspects and impacts of the building.

NOTE 3

For the interpretation of a comparison, reference values are required.

General Information

1. Manufacturers' names and addresses

The information contained in this declaration is provided under the responsibility of the manufacturer, AGC Glass Europe.

Address: Avenue Jean Monnet, 4 1348 Louvain-la-Neuve | Belgium
Contact: sustainability@agc.com

2. The site(s), manufacturer or group of manufacturers or their representatives for which the EPD is representative

This FDES is representative of the fire-resistant glass of the Pyrobel/Pyrobelite range marketed by AGC Glass Europe in France. In Europe, two AGC Glass Europe sites manufacture fire-resistant glass for the European market, including the French market. The results of this FDES reflect the data collected from these two sites (Seneffe, Belgium and Olovi, Czech Republic), which represent 100% of production. The product is then cut by one of AGC's partners.
The averages used are weighted by site production. The data reflects the calendar year 2023.

3. Product Trade Reference

The reference product is Pyrobel 53N Low-Carbon Cut-Size fire-resistant glass.

The references covered by this FDES are detailed in the table below.

Table 1: Products from the Pyrobel/Pyrobelite range covered by this FDES

Products	FDES Pyrobel 53N Low-Carbon Cut-Size
Pyrobel 25 EG* Low-Carbon Cut-Size	X
Pyrobel 33H Low-Carbon Cut-Size	X
Pyrobel 30 EG Low-Carbon Cut-Size	X
Pyrobel 37 Low-Carbon Cut-Size	X
Pyrobel 30 EG2 Low-Carbon Cut-Size	X
Pyrobel 37 EG Low-Carbon Cut-Size	X
Pyrobel 37 EG2 Low-Carbon Cut-Size	X
Pyrobel 53N Low-Carbon Cut-Size	X
Pyrobel 54 Low-Carbon Cut-Size	X
Pyrobel 53N EG Low-Carbon Cut-Size	X
Pyrobel 54 EG Low-Carbon Cut-Size	X

Legend

X	Other references covered by the FDES
X	FDES reference product: representative product

*EG = PVB

4. Validity Framework

In addition to the reference product Pyrobel 53N Low-Carbon Cut-Size, other fire-resistant glass structures are also covered by this FDES via the validity framework. These are products for which the variability is less than +35% relative to the reference indicators of NF EN 15804+A2/CN:2022.

5. System boundaries

From cradle to grave, with module D.

6. Type of EPD

Individual range.

7. Independent External Verification

Independent external verification carried out according to the ISO 14025 (2010) environmental declaration programme by Guillaume Audard (Solinnen)

The CEN standard NF EN 15804+A2 of October 2022 serves as a PCR.
Independent verification of the declaration and data in accordance with EN ISO 14025:2010 ☐ Internal ☒ External
Third-Party Verification: Guillaume Audard
Numéro d'enregistrement au programme INIES conforme ISO 14025 : 20260249132
Date of 1st publication: 27/02/2026
Date of verification: 27/02/2026
Validity period : ☒ 5 years ☐ 2 years from 1st publication date
Programme INIES Avenue du Recteur Poincaré – 75016 PARIS – www.inies.fr

Description of the functional unit and the product

1. Description of the Functional Unit

Ensure the fire resistance function on 1 m² with the performance shown in Table 2, in accordance with EN 13501-2 for 30 years.

The EN 13501-2 standard defines different fire resistance classes: EW and EI as explained in the opposite diagram. Table 2 shows the fire resistance classification of the products in the Pyrobel/Pyrobelite range covered by this FDES.

The number associated with these resistance classes corresponds to the amount of time in minutes that the product performs this fire resistance function.

An EI15 and EW60 product will therefore have integrity and provide an insulating function for 15 minutes and integrity and radiation limitation for 60 minutes.

EW 'Intégrité et Contrôle de rayonnement'

Pas de passage de flammes, de fumées, de gaz. Limitation du transfert thermique à max. 15 kW/m².

EI – Intégrité et Isolation

Pas de passage de flammes, de fumées, de gaz. Empêche le transfert thermique.

The reference flow is a 1 m² Pyrobel 53N Low-Carbon Cut-Size fire-resistant glass.

The lifespan is set at 30 years, in accordance with the national supplement NF EN 15804+A2/CN.

Note: The reference Service life (RSL) of the product is set at 30 years. This duration does not reflect the actual lifespan which is usually set by the lifespan and renovation of a building. It is simply a matter of taking into consideration that beyond 30 years it is legitimate to consider that rearrangements can take place. The RSL does not refer to the warranty either.

2. Core performance of the functional unit

The thermal performance Ug is 4.5 W/m². K

Table 2 : Fire resistance performance of products covered by this EPD

Products	Fire resistance classification (EN 13501-2)
Pyrobel 25 EG Low-Carbon Cut-Size	**EI60/EW60**
Pyrobel 33H Low-Carbon Cut-Size	**EI60/EW60**
Pyrobel 30 EG Low-Carbon Cut-Size	**EI90/EW90**
Pyrobel 37 Low-Carbon Cut-Size	**EI60/EW60**
Pyrobel 30 EG2 Low-Carbon Cut-Size	**EI90/EW90**
Pyrobel 37 EG Low-Carbon Cut-Size	**EI60/EW60**
Pyrobel 37 EG2 Low-Carbon Cut-Size	**EI60/EW60**
Pyrobel 53N Low-Carbon Cut-Size	**EI120/EW120**
Pyrobel 54 Low-Carbon Cut-Size	**EI120/EW120**
Pyrobel 53N EG Low-Carbon Cut-Size	**EI120/EW120**
Pyrobel 54 EG Low-Carbon Cut-Size	**EI120/EW120**

3. Product and Packaging Description

The AGC product that is the subject of this declaration is a Pyrobel 53N Low-Carbon Cut-Size fire-resistant glass, which consists of ten sheets of soda-lime glass, silicate glass composed mainly of silica, sodium and calcium carbonate, widely used in common glazing, and eight intumescent layers, which in the event of a fire swell to form a rigid barrier, ensuring fireproofeness and thermal insulation of the fire-resistant glazing and a layer of PVB.

Pyrobel 53N Low-Carbon Cut-Size comes in a smaller form than the 3.21 x 2.25 m panel, with no defined minimum size.
Pyrobel Low-Carbon products are based on a Planibel Low-Carbon. The difference between Planibel Low-Carbon and standard Planibel lies in the production process that uses a high percentage of cullet, electricity for which guarantees of renewable origin have been purchased and production made only in high-efficiency furnaces implementing recent technologies.

Figure 1 shows the structure of the reference product only.

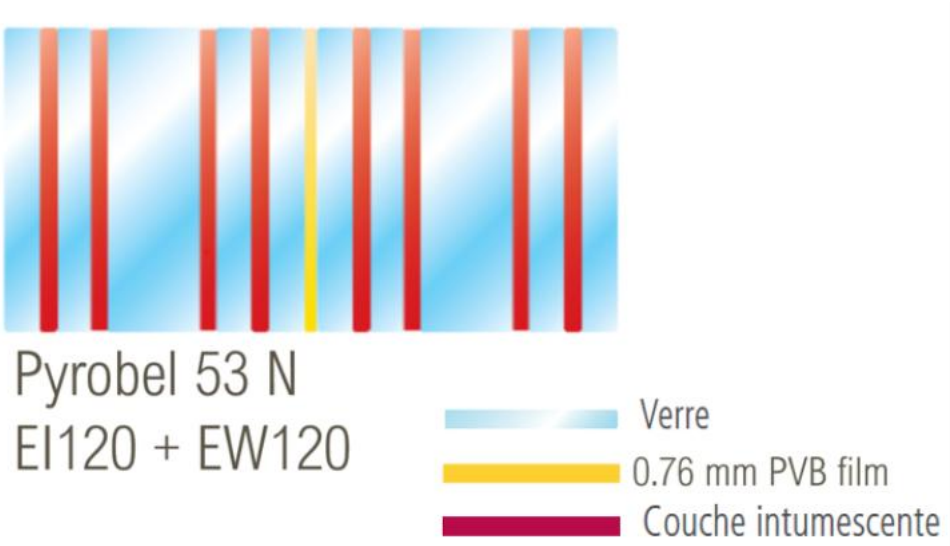


Figure 1: Structure of a Pyrobel 53N Cut-Size

4. Description of the use of the product (field of application)

Fire-resistant glass can be used either as a component of exterior glazing or for interior partitions. This product provides a safe environment for users of a burning building to evacuate safely. The fire-resistant glass also acts as a barrier, slowing the spread of fire and making it easier for firefighters to respond.
Unlike other fire-resistant products, glass provides a visual connection to the outdoors and allows natural light to pass through.
This product is CE marked, and its performance is detailed below.

5. Other technical characteristics not included in the functional unit

Table 3: Performance of the Pyrobel 53N Low-Carbon Cut-Size

Properties	Unit	Pyrobel 53N Low-Carbon Cut-Size
Thermal transmission (EN 673)	Ug (W/m². K)	4.5
Light transmission (EN 410)	TV (%)	75
Light reflection (EN 410)	ρv (%)	7
Solar factor (EN 410)	g (%)	55
Acoustic insulation (EN 12578)	Rw (C;Ctr) (dB)	48 (-2;-7)
Fire resistance (EN13501-2)		EI120 / EW120
Reaction to fire (EN 13501-1)		NDP
Resistance to firearm fire (EN 1063)		NDP
Burglary resistance (EN 356)		P2A
Impact resistance (EN 12600)		1B1

The performances of the products included in the FDES are available here.

6. Description of the main components and/or materials of the product

Pyrobel 53N Low-Carbon Cut-Size is composed of ten sheets of soda-lime glass, eight intumescent layers. These are composed of sodium silicate and water and one layer of PVB.

Table 4: Composition of Pyrobel 53N Low-Carbon Cut-Size

Product composition	Pyrobel 53N Low-Carbon Cut-Size
Total Mass (Product and Packaging)	137.3 kg
Soda-lime flat glass	
Mass (kg)	100 kg
Mass (% final product)	79%
Intumescent layers (sodium silicate and water)	
Mass (kg)	25.6 kg
Mass (% final product)	20%
PVB	
Mass (kg)	0.09 kg
Mass (% final product)	1%
Packaging	
Wood	7.6 kg
Steel	4 kg

7. Substances on the candidate list according to the REACH Regulation (if greater than 0.1% by mass)

The products in the Pyrobel/Pyrobelite range that are the subject of this declaration do not contain substances from the candidate list according to the REACH regulation that are incorporated at more than 0.1%.

8. Proof of fitness for use

The products in the Pyrobel/Pyrobelite range have the CE marking in accordance with the NF EN 14449:2005 Verre dans la construction - Verre feuilleté et verre feuilleté de sécurité - Évaluation de la conformité/norme de produit.

9. Distribution channel

This declaration relates to fire-resistant glazing for professional customers (B2B). The target audience is therefore mainly B2B, although this document can also be used by end consumers (B2C).

10. Description of the reference service life

The reference service life (RSL) of glass is 30 years.

Table 5: Parameters describing the reference conditions for the use of the product and justify the RSL

Parameter	Value
Reference life	30 years
Declared product properties (e.g. factory) and finishes, etc.	Defined in accordance with EN ISO 12543:2011 - Glass in construction - Laminated glass and laminated safety glass.
Theoretical application parameters (if mandated by the manufacturer), including references to appropriate practices	Compliant with NF DTU 39:2006 "Travaux de bâtiment - Travaux de vitrerie-miroiterie."
Assumed quality of work, when the installation complies with the manufacturer's instructions	Compliant with NF DTU 39:2006 "Travaux de bâtiment - Travaux de vitrerie-miroiterie."
Outdoor environment (for outdoor applications), e.g. weather, pollutants, UV and wind exposure, building orientation, shading, temperature	Not applicable
Indoor environment (for indoor applications), e.g. temperature, humidity, chemical exposure	Not applicable
Conditions of use, e.g. frequency of use, mechanical exposure	Compliant with NF DTU 39:2006 "Travaux de bâtiment - Travaux de vitrerie-miroiterie."
Maintenance, e.g. frequency required, type and quality and replacement of replaceable components	Cleaning with water (0.2 L/year) and detergent (0.1 dL/year)

11. Biogenic carbon content (Stock C)

Pyrobel 53N Low-Carbon Cut-Size does not contain biogenic carbon. The biogenic carbon stock is therefore 0 kg C/FU. However, the wood packaging associated with the product contains 3.34 kg C/FU.
The calculations were carried out with a moisture content of 12% and a carbon content of wood of 50%.

$$Mass\ biogenic\ C02 = \frac{moist\ mass}{1 + moisture\ content\ (\%)} * carbon\ content(\%) * \frac{molar\ mass\ CO2}{molar\ mass\ C}$$

Table 6: Biogenic carbon content.

Biogenic carbon content	Value per functional unit
Biogenic carbon content of the product (ex-factory)	0 kg C
Biogenic carbon content of the associated packaging (ex factory)	3.34 kg C

Life Cycle Stages

Environmental assessment is cradle-to-grave, with Module D.

The life cycle stages for the installation (A5) and use stages (B1-B7) are modelled on the basis of scenarios defined in EN 17074:2019.

Figure 2: System Overview

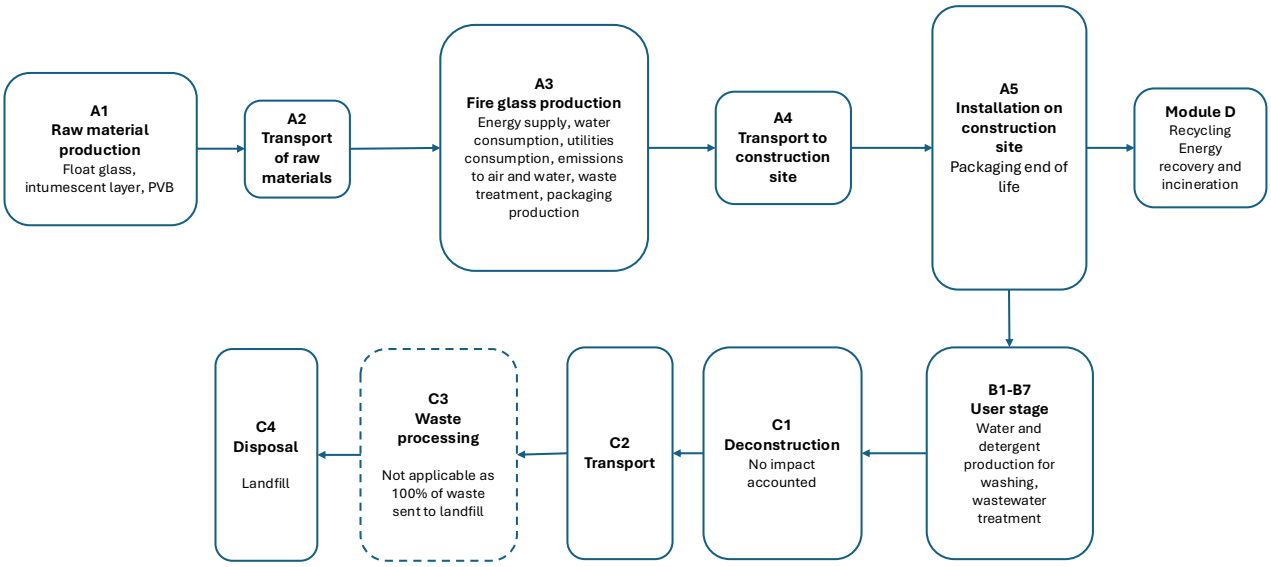


Table 7 - System boundaries

	Production stage		Construction stage		Use stage							End of Life Stage				Benefits and loads beyond the system boundaries
	Total production A1-A3		A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B4 Refurbishment	B6 Energy use	B7 Water Use	C1 Deconstruction /demolition	C2 Transport	C3 waste processing	C4 Disposal	D
Declared modules	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X

Production stage, A1-A3

➔ **A1 Production of raw materials**

Module A1 takes into account the production of the materials used for the production of fire-resistant glass. It includes the raw materials for the production of :

- intumescent layers
- flat glass
- PVB

➔ **A2 Transport of raw materials**

The raw materials are transported to the manufacturing site by lorry (Euro 5), and the distances correspond to the average distances to the two manufacturing sites.

➔ **A3 Production of fire-resistant glass**

Module A3 includes the various consumption and discharges related to the production process of the two sites, such as energy (electricity, natural gas), water and waste. It also includes the production of packaging.
The approach to the modelling of electricity used for manufacturing is market-based.
The electricity mixes used are as follows: BE: Electricity from wind power Sphera, BE: Electricity from photovoltaic Sphera, BE: Thermal energy from natural gas and SK: Thermal energy from natural gas (proxy for the Czech Republic).

The manufacturing process of fire-resistant glass involves the following steps:

- Loading a flat glass
- Washing
- Pouring of the precursors of the intumescent layer
- Cooking
- Assembly of several intumescent panels, glass sheets and possibly PVB sheets
- Autoclave
- Panel cutting

Pyrobel 53N Low-Carbon Cut-Size is cut by one of AGC's partners. The different consumptions and waste are included in this module. It also includes the processing of packaging waste from the panel, as well as the production of packaging for the final product. The electricity mix used for the cutting is "RER: Electricity grid mix (production mix) Sphera"

Construction Stage, A4-A5

➔ **A4 Transport to the construction site**

The transport to the construction site (A4) considers the weighted average distance between the two production sites of AGC Glass Europe and the individual stockists. Transport is carried out by a conventional semi-trailer lorry, with the panels in wooden and steel packaging.

Table 8: Parameters for transport to the construction site

Parameter	Value	Unity | Description
Vehicle	24,7	Ton | Diesel truck - Euro 5 – cargo, 40 t

		DE: Diesel mix at filling station
Distance to the construction site	294	km
Capacity utilisation (including empty returns)	87	%
Bulk density of transported products	NA	kg/m³
Utilisation cycle of density	1	Mass transport

The load rate and the empty return correspond to European averages for international transport[1].

➔ **A5 Installation in the building**

As stated in EN 17074:2019, module A5 is not applicable. Glass products are delivered in their final configuration and "ready to install". No waste other than packaging waste is generated. The end-of-life scenario of the packaging follows the INIES documentation and company-specific information, as shown in the table below. The distances considered are 150, 100 and 50 km respectively for recycling, incineration and landfill.

Table 9: End-of-life parameters of packaging waste.

End of life (%)	Recycling	Incineration	Landfill
Steel	98 %	0 %	2 %
Wood	38 %	62 %	0 %

Table 10: Installation parameters

Settings	Values
Ancillary inputs for installation	Not applicable
Water use	0 m³
Use of other resources	0 kg
Quantitative description of the type of energy and consumption during the installation process	0 kWh
Waste materials at the construction site prior to the treatment of waste generated by the product installation (specified by type)	Steel 4 kg/FU Wooden pallet 7.6 kg/FU
Outgoing materials (specified by type) generated by waste treatment at the construction site (specified by route)	6.81 kg recycling/FU 0 kg reuse/FU 4.71 kg incineration/FU 0.08 kg landfill/FU
Direct emissions to air, soil and water	0 kg

- **Use Stage (excluding potential savings), B1-B7**

The only module relevant at the use stage is the one relating to maintenance (B2); the product should be cleaned with soapy water for maintenance.

[1] *Road freight transport vademecum – 2010 report*, European Commission, 2011

Repair (B3), replacement (B4) and refurbishment (B5) are not considered. Fire-resistant glass does not require these operations during its service life in normal use. Finally, the product is not the source of any consumption or emission in terms of its use (B1).

➔ **B2 Maintenance**

The maintenance scenario follows PCR EN 17074:2019. The average annual consumption of water in the network is 0.2 litres per m² of glass (i.e. 6 L/m² litres during the reference life), to which is added a quantity of 10 g/m² of detergent (300 g/m² during the reference life). The majority (75%) of this water is considered to be discharged to a treatment plant, with the remaining 25% considered to have evaporated.

Table 11: Maintenance parameters

Parameter (for the whole lifetime)	Value
Maintenance process	Washing with water and detergent
Maintenance cycle	1 time a year for 50 years
Net Fresh Water Consumption During Maintenance	Freshwater: 6 L/FU Detergent: 300 g/FU
Waste from maintenance	Water waste 4.5 L/FU
Net use of freshwater during maintenance	0.01 m^3
Energy input during maintenance	0 kWh

- **End-of-life stage, C1-C4**

No mechanical steps are included for dismantling and demolition (C1).
The end of life therefore includes:

- C2: transport to the treatment site;
- C3: waste treatment;
- C4: landfilling of demolition waste.

The FDES is calculated by considering a conservative scenario. At the end of life, all fire-resistant glass is landfilled.

Table 12: End-of-life parameters

Parameter	Value	Unity | Description
Individually collected waste	1.27E+02	kg /FU
Mixed collected waste	0	kg
Reuse	0	kg
Recycling	0	kg
Energy recovery	0	kg
Elimination	1.27E+02	kg /FU
End-of-life transportation	Landfill 50 km	

It is considered that this transport is carried out by diesel-powered lorries with a payload of 22 tons.

- **Benefits and loads beyond the System Boundaries (Module D)**

The reuse, recycling and incineration with energy recovery of packaging are considered as benefits and loads beyond the system boundaries. Incineration credits with energy recovery are associated with electricity and heat using generic data from the French electricity mix and heat from natural gas. The latter being the cleanest fossil fuel, the results are conservative. The efficiencies used are described in the following table.

Table 13: Module D parameters.

Materials	lhv (MJ/kg)	Heat efficiency	Electrical efficiency
Wood	16	25,5%	14,1%

Table 14 : Quantities associated with module D

Materials recovered outside the system boundaries	Recycling processes beyond system boundaries	Avoided Materials/Energy	Associated quantities
Wood pallets	Recycling	Wood chips	2.89 kg/FU
Wood pallets	Incineration	Electricity	10.63 MJ/FU
Wood pallets	Incineration	Warmth	19.22 MJ/FU
Steel	Recycling	Steel	3.92 kg/FU

• Information for Life Cycle Assessment Calculation

Table 15 : Information for Life Cycle Assessment Calculation

PCR used	ISO14025:2010; NF EN 15804+A2:2019; EN 15804+A2/CN:2022; EN17074:2019 (as a source of information)
System boundaries	From cradle to grave with module D. The system boundaries set by the EN 15804+A2 standard, as well as the national supplement NF EN 15804+A2/CN have been respected.
Allocations	The allocation rules set by the standard were respected. Mass allocation at the production site level. Recycled content allocation (attribution) and/or BMB (biomass balance) approaches such as the "mass balance credits method" and/or the "Book and Claim" method in accordance with ISO 22095 cannot be used in the context of ECO EPDs.
Geographical representativeness and temporal representativeness of primary data	Country of production: Belgium and Czech Republic Installation: France Year of production data: 2023 Secondary database: Sphera, Ecoinvent 3.9.1 Software: LCA for Experts 10.9.0.31
Geographical representativeness and temporal representativeness of background data	Secondary data is mainly from the 2023.2 database of LCA software LCA for Experts 10.9.0.31 and Ecoinvent 3.9.1 when no Sphera inventory was available. LCA for Experts was also used for lifecycle modeling and indicator calculation. For this purpose, the EN 15804+A2 indicator set with characterisation factors based on EF 3.1 was used. The background data used mainly has a collection date of less than 10 years.
Cut-off criteria	All known flows of the product and its packaging were taken into account. The impacts of property and infrastructure have been excluded. Flows related to human activities, such as employee transport and administrative activities are excluded in accordance with EN 15804+A2/CN.

Data quality

Table 16 : Quality of the main data used for the production of this FDES

Data	Description of data quality
Specific data	90% of the data with an average rating of "very good" 10% of data with an average rating of "good"
Generic data	80% of data with an average rating of "very good" 20% of the data with an average rating of "good"

Table 17 : Representativeness of the FDES

Geographic	This FDES is representative for the Pyrobel 53N Low-Carbon Cut-Size product, manufactured at two sites (Seneffe, Belgium and Olovi, Czech Republic), and used in France
Technological	This EPD is representative of the Pyrobel 53N Low-Carbon Cut-Size product.
Temporal	This FDES is representative of a production in 2023
Variability	-Climate change: -48% to 8% -Total use of non-renewable primary energy resources -59% to 7% -Non-hazardous waste disposed: -93% to 10%

Life Cycle Assessment Results

Table 18: Environmental impacts

Environmental impacts	Production	Construction		Use							End of life				D Benefits and loads beyond the system boundaries
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy consumption	B7 Water Use	C1 Deconstruction / Demolition	C2 Transport	C3 Waste treatment	C4 Disposal	
Climate change - total kg CO2 equiv/FU	1.59E+02	3.19E+00	1.26E+01	0.00E+00	7.51E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.43E-01	0.00E+00	2.25E+00	-3.05E+00
Climate change – fossil fuels kg CO2 equiv/FU	1.71E+02	3.16E+00	1.73E-01	0.00E+00	3.25E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.39E-01	0.00E+00	2.24E+00	-3.05E+00
Climate change – biogenic kg CO2 equiv/FU	-1.24E+01	0.00E+00	1.24E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Climate change - land use and land use change kg CO2 equiv/FU	6.19E-01	3.25E-02	7.57E-04	0.00E+00	4.26E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.51E-03	0.00E+00	7.47E-03	3.76E-03
Ozone depletion kg of CFC 11 equiv/FU	2.84E-08	5.24E-13	6.96E-13	0.00E+00	3.15E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.26E-14	0.00E+00	6.32E-12	2.15E-08
Acidification mole of H+ equiv/FU	8.23E-01	1.12E-02	1.27E-03	0.00E+00	4.10E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.56E-03	0.00E+00	1.52E-02	-2.57E-03
Eutrophication, freshwater kg P equiv/FU	3.98E-03	8.51E-06	3.59E-07	0.00E+00	1.53E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-06	0.00E+00	4.39E-04	6.74E-04
Eutrophication, marine kg N equiv/FU	2.27E-01	5.33E-03	4.14E-04	0.00E+00	4.38E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.39E-04	0.00E+00	3.73E-03	2.46E-04
Eutrophication, terrestrial mole of N equiv/FU	2.58E+00	5.76E-02	5.52E-03	0.00E+00	1.50E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.99E-03	0.00E+00	4.10E-02	2.15E-03
Photochemical ozone formation kg NMCOV equiv/FU	5.29E-01	1.02E-02	1.05E-03	0.00E+00	2.14E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.42E-03	0.00E+00	1.14E-02	7.17E-04

Resource use (minerals and metals) kg Sb equiv/FU	1.09E-04	2.10E-07	1.18E-08	0.00E+00	5.04E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.91E-08	0.00E+00	1.20E-07	9.30E-06
Resource use (fossil fuels)[1] MJ/FU	2.37E+03	4.04E+01	2.39E+00	0.00E+00	3.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E+00	0.00E+00	3.28E+01	-5.10E+01
Water use m3 of equivalent deprivation in the world /FU	1.21E+01	1.44E-02	6.77E-01	0.00E+00	2.30E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-03	0.00E+00	2.63E-01	1.36E-01

Table 19 - Additional indicators

Environmental impacts	Production	Construction		Use							End of life				
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy consumption	B7 Water Use	C1 Deconstruction / Demolition	C2 Transport	C3 Waste treatment	C4 Elimination	D Benefits and loads beyond the system boundaries
Particulate matter – disease incidences/FU	9.12E-06	7.73E-08	8.57E-09	0.00E+00	6.23E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-08	0.00E+00	1.78E-07	-1.69E-07
Ionizing radiation – kBq U235 eq/FU	2.61E+00	1.10E-02	1.31E-02	0.00E+00	2.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.52E-03	0.00E+00	5.11E-02	-1.29E+00
Ecotoxicity - CTUe/FU	1.94E+03	5.26E+01	1.78E+00	0.00E+00	1.96E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.29E+00	0.00E+00	3.86E+01	-1.14E+01
Human toxicity, cancer - CTUh/FU	7.60E-08	7.09E-10	8.02E-11	0.00E+00	1.24E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.84E-11	0.00E+00	2.09E-09	9.58E-09
Human toxicity, non-cancer – CTUh/FU	4.02E-06	3.97E-08	4.29E-09	0.00E+00	2.39E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-09	0.00E+00	1.86E-07	1.10E-08
Land Use – Pt/FU	3.78E+03	1.79E+01	8.62E-01	0.00E+00	3.20E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.48E+00	0.00E+00	7.04E+00	2.69E+02

Table 20: Resource Use

Resource Use	Production	Construction		Use							End of life				D Benefits and loads beyond the system boundaries
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy consumption	B7 Water Use	C1 Deconstruction / Demolition	C2 Transport	C3 Waste treatment	C4 Elimination	
Use of renewable primary energy excluding renewable primary energy resources used as raw materials MJ/FU	1.67E+03	3.05E+00	7.55E+01	0.00E+00	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.23E-01	0.00E+00	5,20E+00	4.11E+01
Use of renewable primary energy resources used as raw materials MJ/FU	1.32E+02	0.00E+00	-7.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources MJ/FU	1.81E+03	3.05E+00	4.93E-01	0.00E+00	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.23E-01	0.00E+00	5,20E+00	4.11E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials MJ/FU	2.37E+03	4.04E+01	2.39E+00	0.00E+00	3.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E+00	0.00E+00	3.28E+01	-5.10E+01
Use of non-renewable primary energy resources used as raw materials MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources MJ/FU	2.37E+03	4.04E+01	2.39E+00	0.00E+00	3.93E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.61E+00	0.00E+00	3.28E+01	-5.10E+01
Use of secondary materials kg/FU	2.68E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of secondary renewable fuels MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of freshwater[2] m3/FU	1.23E+00	1.51E-03	1.59E-02	0.00E+00	5.36E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.09E-04	0.00E+00	7.99E-03	-2.05E-01

[2] The "*Net use of freshwater*" is calculated from the quantities in the Gabi software "Blue Water Consumption"

Table 21: Waste categories

Waste category	Production	Construction		Use							End of life				D Benefits and loads beyond the system boundaries
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy consumption	B7 Water Use	C1 Deconstruction / Demolition	C2 Transport	C3 Waste treatment	C4 Elimination	
Hazardous waste disposed kg/FU	6.06E-06	1.62E-09	9.23E-10	0.00E+00	2.29E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-10	0.00E+00	3.61E-09	5.96E-01
Non-hazardous waste disposed kg/FU	5.25E+01	5.65E-03	2.00E-01	0.00E+00	5.34E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.83E-04	0.00E+00	1.26E+02	-2.71E-02
Radioactive waste disposed kg/FU	1.71E-02	7.63E-05	8.29E-05	0.00E+00	2.11E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-05	0.00E+00	4.09E-04	-6.23E-03

Table 22: Output flows

Output flows	Production	Construction		Use							End of life				D Benefits and costs beyond the boundaries of the system
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Energy consumption	B7 Water Use	C1 Deconstruction / Demolition	C2 Transport	C3 Waste treatment	C4 Elimination	
Components for reuse kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling kg/FU	1.10E+00	0.00E+00	6.76E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.88E+00
Materials for energy recovery kg/FU	1.09E+00	0.00E+00	4.69E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy – electricity MJ/FU	8.12E-02	0.00E+00	1.06E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy – steam MJ/FU	1.47E-01	0.00E+00	1.91E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy – process gas MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 23 - Aggregation of the different modules to achieve a "Total Stage" or "Total Life Cycle"

Aggregation of the different modules to achieve a "Total Stage" or "Total Life Cycle"						
Impacts/Flows	**Production stage**	**Construction stage**	**Use stage**	**End-of-life stage**	**Total Life Cycle**	**D Benefits and loads beyond the system boundaries**
Baseline Environmental Impact Indicators						
Climate change - total kg CO2 equiv/FU	1.59E+02	1.58E+01	7.51E-02	2.69E+00	1.78E+02	-3.05E+00
Climate change – fossil fuels kg CO2 equiv/FU	1.71E+02	3.33E+00	3.25E-02	2.68E+00	1.77E+02	-3.05E+00
Climate change – biogenic kg CO2 equiv/FU	-1.24E+01	1.24E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Climate change - land use and land use change kg CO2 equiv/FU	6.19E-01	3.32E-02	4.26E-02	1.20E-02	7.07E-01	3.76E-03
Ozone depletion kg of CFC 11 equiv/FU	2.84E-08	1.22E-12	3.15E-09	6.40E-12	3.15E-08	2.15E-08
Acidification mole of H+ equiv/FU	8.23E-01	1.25E-02	4.10E-04	1.68E-02	8.53E-01	-2.57E-03
Eutrophication, freshwater kg P equiv/FU	3.98E-03	8.87E-06	1.53E-05	4.40E-04	4.45E-03	6.74E-04
Eutrophication, marine kg N equiv/FU	2.27E-01	5.74E-03	4.38E-04	4.47E-03	2.37E-01	2.46E-04
Eutrophication, terrestrial mole of N equiv/FU	2.58E+00	6.31E-02	1.50E-03	4.90E-02	2.69E+00	2.15E-03
Photochemical ozone formation kg NMCOV equiv/FU	5.29E-01	1.13E-02	2.14E-04	1.29E-02	5.53E-01	7.17E-04
Resource use (minerals and metals) kg Sb equiv/FU	1.09E-04	2.22E-07	5.04E-07	1.49E-07	1.10E-04	9.30E-06
Resource use (fossil fuels)[1] MJ/FU	2.37E+03	4.28E+01	3.93E-01	3.85E+01	2.45E+03	-5.10E+01
Water use m3 of equivalent deprivation in the world /FU	1.21E+01	6.91E-01	2.30E-01	2.65E-01	1.32E+01	1.36E-01
Resource Use						
Use of renewable primary energy excluding renewable primary energy resources used as raw materials MJ/FU	1.67E+03	7.86E+01	1.80E+00	5.62E+00	1.76E+03	4.11E+01
Use of renewable primary energy resources used as raw materials MJ/FU	1.32E+02	-7.50E+01	0.00E+00	0.00E+00	5.66E+01	0.00E+00
Total use of renewable primary energy resources MJ/FU	1.81E+03	3.54E+00	1.80E+00	5.62E+00	1.82E+03	4.11E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials MJ/FU	2.37E+03	4.28E+01	3.93E-01	3.85E+01	2.45E+03	-5.10E+01

Aggregation of the different modules to achieve a "Total Stage" or "Total Life Cycle"

Impacts/Flows	Production stage	Construction stage	Use stage	End-of-life stage	Total Life Cycle	D Benefits and loads beyond the system boundaries
Use of non-renewable primary energy resources used as raw materials MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources MJ/FU	2.37E+03	4.28E+01	3.93E-01	3.85E+01	2.45E+03	-5.10E+01
Use of secondary materials kg/FU	2.68E+00	0.00E+00	0.00E+00	0.00E+00	2.68E+00	0.00E+00
Use of secondary renewable fuels MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of freshwater[3] m3/FU	1.23E+00	1.74E-02	5.36E-03	8.20E-03	1.26E+00	-2.05E-01
Waste category						
Hazardous waste disposed kg/FU	6.06E-06	2.55E-09	2.29E-11	3.83E-09	6.06E-06	5.96E-01
Non-hazardous waste disposed kg/FU	5.25E+01	2.06E-01	5.34E-03	1.26E+02	1.79E+02	-2.71E-02
Radioactive waste disposed kg/FU	1.71E-02	1.59E-04	2.11E-06	4.19E-04	1.77E-02	-6.23E-03
Output flows						
Components for reuse kg/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling kg/FU	1.10E+00	6.76E+00	0.00E+00	0.00E+00	7.85E+00	3.88E+00
Materials for energy recovery kg/FU	1.09E+00	4.69E+00	0.00E+00	0.00E+00	5.78E+00	0.00E+00
Exported energy – electricity MJ/FU	8.12E-02	1.06E+01	0.00E+00	0.00E+00	1.07E+01	0.00E+00
Exported energy – steam MJ/FU	1.47E-01	1.91E+01	0.00E+00	0.00E+00	1.93E+01	0.00E+00
Exported energy – process gas MJ/FU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Additional indicators						
Particulate matter – disease incidences/FU	9.12E-06	8.58E-08	6.23E-09	1.89E-07	9,40E-06	-1.69E-07
Ionizing radiation – kBq U235 eq/FU	2.61E+00	2.41E-02	2.00E-03	5.26E-02	2.69E+00	-1.29E+00
Ecotoxicity - CTUe/FU	1.94E+03	5.44E+01	1.96E+00	4.59E+01	2.04E+03	-1.14E+01
Human toxicity, cancer - CTUh/FU	7.60E-08	7.89E-10	1.24E-10	2.19E-09	7.91E-08	9.58E-09
Human toxicity, non-cancer – CTUh/FU	4.02E-06	4.39E-08	2.39E-09	1.92E-07	4.26E-06	1.10E-08
Land Use – Pt/FU	3.78E+03	1.87E+01	3.20E+00	9.52E+00	3.81E+03	2.69E+02

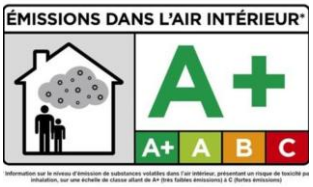
[3] The "*Net use of freshwater*" is calculated from the quantities in the Gabi software "Blue Water Consumption"

Additional information on the release of hazardous substances into indoor air, soil and water during the use stage

1. Indoor air

- **VOC and formaldehyde emissions**

VOC and formaldehyde emission measurements were carried out in accordance with EN 737.2005 and NF EN ISO 16000-9:2009 standards. Based on these tests, and under the conditions of the selected exposure scenario, the fire-resistant glass of the Pyrobel/Pyrobelite range has obtained the A+ emission level.



- **Behaviour towards fungal and bacterial growth**

No tests have been conducted on the behaviour of the product in the face of fungal and bacterial growth.

In addition, the product is made of glass, a mineral and inert material. It does not, in itself, constitute a growth medium for microorganisms.

- **Natural radioactive emissions from construction products**

No tests for naturally occurring radioactive emissions have been conducted.

- **Fibre and particulate emissions**

No tests for fibre and particulate matter emissions were conducted.

2. Soil and water

The product is not in contact with water intended for human consumption.

No tests concerning the sanitary quality of the water in contact with the product during its service life have been carried out.

Contribution of the product to quality of life inside buildings

1. Product characteristics that contribute to the creation of hygrothermal comfort in the building

The relevant technical characteristics concerning the hygrothermal comfort of a Pyrobel 53N Low-Carbon Cut-Size are:

- the coefficient U_g = 4.5 W/(m². K), calculated according to EN 673
- the solar factor g = 75%, calculated according to EN 410

Source: CE marking

2. Product characteristics that contribute to the creation of acoustic comfort in the building

The relevant technical feature for acoustic comfort is the sound attenuation index. For the reference product, Pyrobel 53N Low-Carbon Cut-Size, the performance is R_w (C; C_{tr}) = 48 (-2; -7) dB.

Source: CE marking

3. Product characteristics that contribute to the creation of visual comfort in the building

Placed at the interface between the interior and exterior of the building or as an interior partition, glass contributes to visual comfort in the building. It contributes to the provision of natural light into the building and limits the use of artificial lighting. The light transmittance coefficient (Tv) of a Pyrobel 53N Low-Carbon Cut-Size is 55%.
Source: CE marking

4. Product characteristics that contribute to the creation of olfactory comfort in the building

No tests for olfactory comfort have been conducted.
In addition, the product is made of glass, a mineral and inert material. It is not likely to emit odours during use.

Owner of the FDES Accountable for data, LCA and information	AGC 4 Avenue Jean Monnet 1348 Louvain-La-Neuve Belgium
Program Operator Publisher of the FDES	HQE-GBC 4 avenue du Recteur Poincaré 75016 PARIS
EPDF Program Database	INIES
Author of the LCA and the FDES	WeLOOP 254 Rue du Bourg 59130 Lambersart France
Verification Name of the verifier Date of verification	NF EN 15804+A2 and NF EN 15804+A2/CN Guillaume Audard 27/02/2026