

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	AGC Glass Europe
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-AGC-20240539-IBH1-EN
Issue date	25.06.2025
Valid to	24.06.2030

Pyrobel-T fire-resistant glass AGC Glass Europe

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1. General Information

AGC Glass Europe

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

EPD-AGC-20240539-IBH1-EN

This declaration is based on the product category rules:

Plate glass for construction and interlayers, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

25.06.2025

Valid to

24.06.2030



Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)



Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Pyrobel-T fire-resistant glass

Owner of the declaration

AGC Glass Europe
Avenue Jean Monnet 4
1348 Louvain-La-Neuve
Belgium

Declared product / declared unit

1 m² of fire-resistant glass used in buildings open to the public

Scope:

This EPD refers to the Pyrobel-T fire-resistant glass from AGC Glass Europe used generally in buildings open to the public such as airports, shopping centers or sports gyms.
The commercial references covered by this EPD are the following: EW30-16, EW30-20, EW60-16, EW60-20, EW90-16, EW90-20, EW120-16, EW120-20, EI30-18, EI30-22, EI30-27, EI60-28, EI30-37, EI60-34, EI60-35H.
These products are manufactured in AGC Glass Europe's plant in Sokolov, Czech Republic.
This EPD is an average EPD. The average product is calculated using the weighted average of sales.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard EN 15804 serves as the core PCR		
Independent verification of the declaration and data according to ISO 14025:2011		
☐	internally	☒ externally

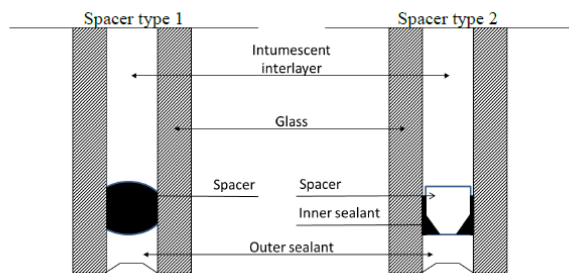


Mrs Dariya Hadzhiyska,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Pyrobel-T fire-resistant glass is an assembly of toughened sheets of float glass, combined with fire-resistant clear intumescent interlayer. This product provides an environment that allows users of a burning building to escape safely. It acts as a barrier fire-resistant glass and as a barrier to slow down the spread of fire, making it easier for the fire brigade to intervene.



The commercial references covered by this EPD are the following: EW30-16, EW30-20, EW60-16, EW60-20, EW90-16, EW90-20, EW120-16, EW120-20, EI30-18, EI30-22, EI30-27, EI60-28, EI30-37, EI60-34, EI60-35H.

The product has a life span of 30 years. The only maintenance it requires is regular cleaning.

For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) *Regulation (EU) No. 305/2011* (CPR) applies. The product needs a declaration of performance taking into consideration *EN 14449:2005 Glass in building - Laminated glass and laminated safety glass EN 13501-2:2016 Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests and the CE-marking.*

For the application and use the respective national provisions apply.

2.2 Application

This product is used in buildings open to the public such as airports, shopping centers or sports facilities.

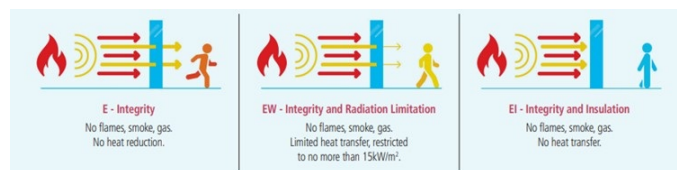
2.3 Technical Data

The glass delivers fire protection in both directions according to the standard *EN 13501-2:2016 Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests*. Pyrobel-T product is transparent and lets natural light to pass through with UV protection. It is also water and impact resistant. All products in the Pyrobel-T range are CE marked in accordance with *EN 14449:2005 Glass in building - Laminated glass and laminated safety glass*.

Constructional data

Name	Value	Unit
Mass	37,3 - 82,2	kg/m ²
Heat transfer coefficient acc. to DIN EN 673	4.2 - 5.4	W/(m ² K)
Light transmission level acc. to DIN EN 410	78 - 90	%
Airborne sound reduction acc. to DIN EN 20140-3 (optional)	37 - 43	dB
Tg acc. DMA, 3K/min, 1Hz	-10 - 50	°C

Pyrobel-T fire-resistant glass products follow the *EN 13501-2* standard which defines different classes of fire resistance: EW and EI as explained in the diagram below.



More information is available in the Declaration of Performance (<https://agc-pyrobel.com/de-de/documents>)

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to:

- *DIN EN 673* Glass in building - Determination of thermal transmittance (U value) - Calculation method
- *DIN EN 410* Glass in building - Determination of luminous and solar characteristics of glazing
- *DIN EN 20140-3* Acoustics - Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements

2.4 Delivery status

The products are tailor-made. Dimensions are up to 2 meters wide to 4,5 meters high.

2.5 Base materials/Ancillary materials

Composition of Pyrobel-T products

Name	Value	Unit
Float glass (Glass)	72-85	%
Intumescent interlayer (Potassium silicate based)	11-26	%
Outer sealant (Polysulfide)	0,51-1,73	%
Spacer (Aluminium)	0,3-1	%
PVB (Polyvinyl butyral)	0-2	%
Inner sealant (Polyisobutylene)	0,03-0,07	%

This product contains substances listed in the *Candidate List of Substances of Very High Concern* for Authorisation (SVHC) (17.07.2023) exceeding 0.1 percentage by mass: **no**

This product contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: **no**

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012*): **no**

Additives used in the product, including interlayers or sealants, are disclosed, along with their functional roles (e.g., enhancing fire resistance, improving adhesion, etc.).

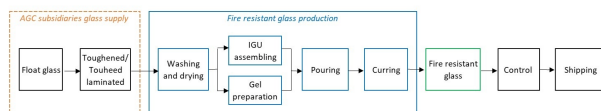
The intumescent interlayer is the main component that gives Pyrobel-T products fire-resistant properties. Its reaction to fire by expanding forms a heat and flame-resistant barrier. No other fire retardants are added to the products apart from the

components of the intumescent interlayer (Potassium silicate based).

The float glass in the Pyrobel-T products is manufactured by AGC Glass Europe in another Czech plant. Three different types of intumescent interlayer are produced T1, T2, and T3 containing different proportions of their components.

2.6 Manufacture

The main steps of production of Pyrobel-T fire-resistant glass are the following:



2.7 Environment and health during manufacturing

All necessary health protection is provided in the factory and safety measures are taken.

2.8 Product processing/Installation

As mentioned in standard *EN 17074:2017*, glass products are delivered in the final configuration and 'ready to install'. No waste other than packaging waste is generated. Auxiliaries are not taken into account because they vary depending on the structure of installation.

2.9 Packaging

The packaging materials considered for Pyrobel-T fire-resistant glass products are cardboard, plastic tape and wooden pallets. The following end-of-life routes scenarios were applied for each packaging material:

- Wood: incineration with energy recovery and recycling
- Cardboard: recycling and landfill
- Plastic tape: incineration without energy recovery

2.10 Condition of use

For indoor and outdoor use, the product can be used in temperatures ranging from -10 to +50 °C. No change in the material composition during use phase of the product occurs.

2.11 Environment and health during use

Indoor air quality: no indoor air quality tests have been carried out.

Soil and water: no soil or water contact tests were carried out.

2.12 Reference service life

A reference service life (RSL) for Pyrobel-T fire-resistant products cannot be declared according to *ISO 15686* because it would not reflect the actual life span of the product which is

usually set by the life span and renovation of a building. As recommended in *cPCR prEN 17074:2017*, a service life of 30 years is used.

2.13 Extraordinary effects

Fire

Information on the fire performance according to *EN 13501:1* or established national standards. According to *EN 13501:1*:

- The classes of building products regarding their fire performance are predefined as: A1, A2, B, C, D, E, and F;
- The classes of flaming droplets/particles are pre-defined as: d0, d1, or d2;
- The classes for smoke density are pre-defined as: s1, s2, or s3

Fire protection

Name	Value
Building material class	A2
Burning droplets	d0
Smoke gas development	s1

Water

The declared product is intended to be used in buildings under normal conditions (indoor or outdoor use). The product shall not emit hazardous substances and its composition does not change as a result of unforeseen water exposure such as flooding.

Mechanical destruction

Mechanical destruction of the declared product does not materially alter its composition or have any adverse effect on the environment.

2.14 Re-use phase

Manufacturing losses of float glass are recycled and used as inputs in the process production of float.

2.15 Disposal

The product is considered 100 % landfilled at its end of life. *The European Waste Code (EWC)* for fire-resistant glass is 17 02 02: Glass (non-hazardous waste from construction and demolition).

2.16 Further information

<https://agc-pyrobel.com/de-de/datas-sheets>

<https://agc-pyrobel.com/de-de/documents>

3. LCA: Calculation rules

3.1 Declared Unit

This EPD provides results based on the following functional unit:

To provide fire resistance over an area of 1 m² with a minimum performance of EI ≥ 30 minutes according to *EN 13501-2* and a minimum performance of light transmission ≥ 78% over a lifespan of 30 years.

The environmental profile is based on a weighted average, as the LCA results refer to the specified functional unit and a reference flow of 57,74kg/m².

Functional unit and mass reference

Name	Value	Unit
Functional unit	1	m ²
Declared unit	1	m ²
Layer thickness	0.02562	m
Grammage	57.74	kg/m ²

3.2 System boundary

The whole life cycle (cradle-to-grave) is considered for the fire-resistant glass Pyrobel-T products in the scope of this EPD. The system boundaries correspond to the table in section 5, in

line with the requirements of *EN 15804+A2*.

Modules A1-A3 include all raw materials (extraction and production) inputs for manufacturing in the Czech plant (Sokolov) and packaging, including their transports. End of life of losses occurring at this stage are accounted for in A3.

A4 accounts for the transport of the final product to the construction site, a distance of 500 km.

In A5 no auxiliaries are considered, only end of life of packaging.

Module B includes washing of glass with water and detergent.

Modules C1-C4 include transport to disposal of 50 km and disposal. No demolition, or waste processing was accounted for.

Module D includes energy recovery and recycling of packaging.

3.3 Estimates and assumptions

Beyond the assumptions and estimates mentioned in sections 3 and 4, no other assumptions were made that would be of significance for the interpretation of the LCA.

3.4 Cut-off criteria

All data from the detailed plant data survey were taken into account in the life cycle assessment. The data from the plant were cross-checked for plausibility and checked for incorrect or missing values.

This approach considers also material and energy flows with a share of less than 1 % of the total material and energy flows used in the manufacturing.

The production of any packaging for the raw materials was neglected, as it was estimated to represent less than 1 % of product mass. Furthermore, no material or energy flows were neglected in the LCA that were known to the project managers and that could be expected to have a significant environmental impact with regard to the indicators shown. It can therefore also be assumed that the sum of the neglected processes does not exceed 5 % of the impact categories.

3.5 Background data

Background data for float glass were provided by AGC Europe, the dataset was already published in a verified French EPD (Planibel 8 mm - Flat glass – excluding installation accessories - FDES INIES - <https://base-inies.fr/consultation/infos-produit/36345>). Whenever possible, the most suitable data were selected from *Sphera* database. When corresponding dataset were not available on *Sphera*, *Ecoinvent* 3.9 datasets were used. GWP for the Czech residual electricity mix balanced in modules A1-A3 is 0,66 kg CO₂ eq./kWh. GWP for the Czech gas mix balanced in modules A1-A3 is 0,02 kg CO₂ eq./MJ.

3.6 Data quality

The foreground data was collected for the year 2022 without significant data gaps and linked to used background data. All background data are from *Sphera* LCA for Experts 10.7.1.28 (1992-2024) and *Ecoinvent* 3.9.1 (2023) databases and all data used are valid for a period from 2 to 10 years.

No methodological decisions had to be made that are not supported by *EN 15804*.

Data quality assessment was done for principal primary data and secondary datasets based on hotspot analysis assessment. Hotspot analysis is done according to PEF methodology for three main indicators: climate change, total non-renewable primary energy and non-hazardous waste disposed. Hotspot datasets are those that contribute cumulatively to more than 80% of the three indicators separately.

Principal primary data (float glass, intumescent interlayer composition, electricity) were graded from *Very good* (1) to *Satisfactory* (2). All quantities from the plant were provided by AGC and the residual mix of the Czech Republic of 2022 was modeled according to the Association of Issuing Bodies (AIB) data. Background data for float glass were provided by AGC Europe, the dataset was already published in a verified French EPD (Planibel 8 mm - Flat glass – excluding installation accessories - FDES INIES - <https://base-inies.fr/consultation/infos-produit/36345>)

Secondary datasets were graded from *Very good* to *Satisfactory*. For Climate Change and Total use of non-renewable primary energy resources, the main datasets were float Glass, electricity and the potassium-based component of the intumescent interlayer. For Non-hazardous waste disposed the main dataset is Inert matter landfill.

The production of all products under this EPD is located in one plant through the same process, therefore there is no geographical and process variability to impact considerably the final LCA results of this average EPD. The main variability on the impacts is linked to the thickness of the products (amount of Float Glass). This variability was assessed and reported in the Results section.

3.7 Period under review

The period under review for the data collection of the Czech manufacturing site is 2022.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Europe

3.9 Allocation

No co-product allocation occurs in the product foreground system. No multi-input allocation occurs in the product system. The allocations from the *Sphera* LCA for Experts 10.7.1.28 background database are used without any change.

For quantities of electricity, water, natural gas, packaging and wastes in A3 a mass allocation was used to allocate the impacts per kilogram of Pyrobel-T products.

3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. **Background data base**
Sphera LCA for Experts 10.7.1.28
Ecoinvent 3.9.1

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

The Pyrobel-T products covered in this EPD do not contain biogenic carbon. Only the packaging associated with the product (cardboard, wooden pallets) contains biogenic carbon.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	3.12	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO₂.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	500	km
Capacity utilisation (including empty runs)	61	%
Gross density of products transported	2271.5	kg/m ³

Installation into the building (A5)

As mentioned in standard EN 17074:2017, glass products are delivered in the final configuration and 'ready to install'. No waste other than packaging waste is generated in A5.

Name	Value	Unit
Wood	3,7	kg/m ²
Cardboard	9,5E-03	kg/m ²
Plastic tape	7,95E-03	kg/m ²

The following end of life route scenarios were applied for each packaging material:

- Wood: 69 % incineration, 1 % landfill, 30 % recycling
- Cardboard: 75 % recycling, 25 % landfill
- Plastic tape: 100 % incineration

The data and scenarios used for the end of life of packaging for 1 m² of Pyrobel-T products are based on Annex C of the PEF method.

Maintenance (B2)

All modules (B1), (B2), (B3), (B4), (B5) are considered in the life cycle stage.

Fire-resistant glass does not cause any consumption or emissions during its use (B1).

Fire-resistant glass does not require repair (B3), replacement (B4) and rehabilitation (B5) operations during its lifetime in normal use.

For the maintenance stage (B2), the product must be cleaned with detergent and water. The data for this maintenance stage were used according to the *EN 17074:2017* Product category rules for flat glass products, 0,2 L of water per year and 0,1 dL of detergent per year, for a lifespan of 30 years.

Name	Value	Unit
Water consumption	0.006	m ³
Detergent	3	dL

Name	Value	Unit
Service life acc. to cPCR prEN 17074:2017	30	a
Declared product properties (at the gate) and finishes	Fire resistance according to EN 13501-2 depending on the product reference : EW30, EW60, EW120, EI30, EI60.	-
Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices and application codes	acc. to AGC Glazing and handling guidelines	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Assumes the product is installed by qualified professionals in accordance with manufacturer instructions and relevant standards, ensuring the glass maintains its fire performance and durability.	-
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	-20/+50 °C	-
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure	-20/+50 °C	-
Usage conditions, e.g. frequency of use, mechanical exposure	Not applicable	-
Maintenance e.g. required frequency, type and quality and replacement of components	Cleaning 4 times/year (water and detergent)	-

End-of-life (C1-C4)

Name	Value	Unit
Collected separately waste type waste type	57.75	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	-	kg
Energy recovery	-	kg
Landfilling	57.75	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Recycling and incineration of packaging with energy recovery are considered as a benefit beyond the boundaries of the system. Credits for incineration with energy recovery are associated with electricity and heat, using generic data from the German electricity mix and heat from natural gas. The efficiencies used are described in the following table.

Name	Value	Unit
Cardboard recycling rate	75	%
Cardboard heat efficiency	14.3	%
Cardboard electricity efficiency	25.9	%
Wood recycling rate	30	%
Wood heat efficiency	10.3	%
Wood electricity efficiency	32.7	%

5. LCA: Results

In Table 1 "Description of the system boundary", the declared modules are indicated with an "X".

The set of characterisation factors EF3.1 has been used for the life cycle assessment.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Module not relevant																
Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² Pyrobel-T average product

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq	1.11E+02	2.48E+00	-5.28E+00	0	2.87E-02	0	0	0	0	0	0	2.32E-01	0	8.69E-01	-2.16E+00
GWP-fossil	kg CO ₂ eq	1.06E+02	2.43E+00	1.15E-01	0	2.87E-02	0	0	0	0	0	0	2.28E-01	0	8.64E-01	-2.16E+00
GWP-biogenic	kg CO ₂ eq	5.39E+00	0	-5.39E+00	0	0	0	0	0	0	0	0	0	0	0	0
GWP-luluc	kg CO ₂ eq	6.4E-02	4.4E-02	4.19E-04	0	4.53E-06	0	0	0	0	0	0	4.13E-03	0	5.18E-03	-3.34E-04
ODP	kg CFC11 eq	5.96E-07	7.87E-13	4.82E-13	0	2.51E-13	0	0	0	0	0	0	7.38E-14	0	2.33E-12	4.28E-10
AP	mol H ⁺ eq	4.22E-01	7.56E-03	7.78E-04	0	2.89E-05	0	0	0	0	0	0	7.08E-04	0	6.14E-03	-2.74E-03
EP-freshwater	kg P eq	6.14E-03	6.27E-06	2.65E-07	0	1.96E-07	0	0	0	0	0	0	5.87E-07	0	1.96E-06	1.57E-06
EP-marine	kg N eq	9.16E-02	3.53E-03	2.41E-04	0	1.08E-05	0	0	0	0	0	0	3.31E-04	0	1.58E-03	-7.36E-04
EP-terrestrial	mol N eq	1.04E+00	3.94E-02	3.33E-03	0	1.1E-04	0	0	0	0	0	0	3.7E-03	0	1.74E-02	-7.99E-03
POCP	kg NMVOC eq	2.65E-01	7.17E-03	6.57E-04	0	3.12E-05	0	0	0	0	0	0	6.72E-04	0	4.83E-03	-2.4E-03
ADPE	kg Sb eq	1.77E-04	3.9E-07	8.4E-09	0	2.36E-09	0	0	0	0	0	0	3.66E-08	0	5.59E-08	-2.11E-07
ADPF	MJ	1.67E+03	3.04E+01	1.33E+00	0	5.08E-01	0	0	0	0	0	0	2.85E+00	0	1.14E+01	-2.76E+01
WDP	m ³ world eq deprived	1.1E+01	1.75E-02	4.66E-01	0	9.18E-03	0	0	0	0	0	0	1.64E-03	0	9.89E-02	-1.51E-02

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² Pyrobel-T average product

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	2.15E+02	3.36E+00	3.25E-01	0	1.22E-01	0	0	0	0	0	0	3.15E-01	0	1.99E+00	-1.07E+01
PERM	MJ	5.46E+01	0	-1.97E+01	0	0	0	0	0	0	0	0	0	0	0	0
PERT	MJ	2.15E+02	3.36E+00	3.25E-01	0	1.22E-01	0	0	0	0	0	0	3.15E-01	0	1.99E+00	-1.07E+01
PENRE	MJ	1.67E+03	3.04E+01	1.33E+00	0	5.08E-01	0	0	0	0	0	0	2.85E+00	0	1.14E+01	-2.76E+01
PENRM	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PENRT	MJ	1.67E+03	3.04E+01	1.33E+00	0	5.08E-01	0	0	0	0	0	0	2.85E+00	0	1.14E+01	-2.76E+01
SM	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW	m ³	5.57E-01	3.17E-03	1.1E-02	0	6.14E-03	0	0	0	0	0	0	2.97E-04	0	3.02E-03	-2.74E-03

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² Pyrobel-T average product

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	7.16E-03	1.52E-09	6.28E-10	0	2.85E-10	0	0	0	0	0	0	1.43E-10	0	2.83E-09	-1.99E-08
NHWD	kg	5.57E+00	5.2E-03	1.02E-01	0	2.32E-03	0	0	0	0	0	0	4.87E-04	0	5.78E+01	-1.08E-02
RWD	kg	9.23E-02	5.12E-05	5.66E-05	0	1.16E-05	0	0	0	0	0	0	4.79E-06	0	1.19E-04	-5.32E-04
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	3.85E+00	0	1.12E+00	0	0	0	0	0	0	0	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	3.5E-02	0	4.67E+00	0	0	0	0	0	0	0	0	0	0	0	0
EET	MJ	6.34E-02	0	1.48E+01	0	0	0	0	0	0	0	0	0	0	0	0

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m² Pyrobel-T average product

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PM	Disease incidence	3.63E-06	5.04E-08	5.25E-09	0	2.31E-10	0	0	0	0	0	0	4.73E-09	0	7.7E-08	-2.77E-08
IR	kBq U235 eq	9.7E+00	5.4E-03	8.94E-03	0	1.29E-03	0	0	0	0	0	0	5.06E-04	0	1.38E-02	-6.24E-02
ETP-fw	CTUe	3.01E+03	2.35E+01	6.62E-01	0	1.12E-01	0	0	0	0	0	0	2.2E+00	0	6.56E+00	-1.86E+01
HTP-c	CTUh	2.93E-08	4.68E-10	4.92E-11	0	5.55E-12	0	0	0	0	0	0	4.38E-11	0	1.57E-10	-7.04E-10
HTP-nc	CTUh	9.1E-07	1.97E-08	2.63E-09	0	2.77E-10	0	0	0	0	0	0	1.85E-09	0	6.21E-09	-1.09E-08
SQP	SQP	7.06E+02	2E+01	5.02E-01	0	8.03E-02	0	0	0	0	0	0	1.88E+00	0	3.14E+00	-1.42E+01

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator 'Potential Human exposure efficiency relative to U235'. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators 'abiotic depletion potential for non-fossil resources', 'abiotic depletion potential for fossil resources', 'water (user) deprivation potential, deprivation-weighted water consumption', 'potential comparative toxic unit for ecosystems', 'potential comparative toxic unit for humans – cancerogenic', 'Potential comparative toxic unit for humans - not cancerogenic', 'potential soil quality index'. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

This EPD was created using a software tool.

6. LCA: Interpretation

Figure 1 illustrates the relative contributions of the different modules along the life cycle of the average product per FU.

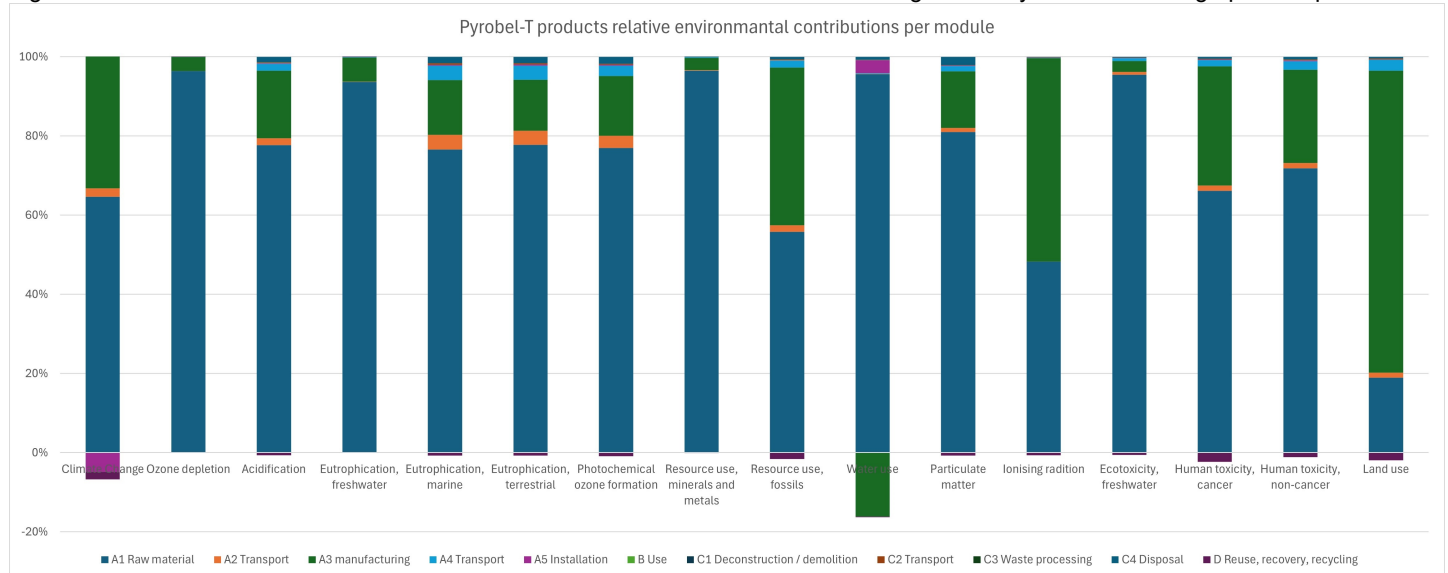


Figure 1: Environmental impacts of Pyrobel-T fire-resistant glass average product along its life cycle per FU.

Figure 1 shows that the first hotspot for most indicators is the raw material step (A1) which is coherent because it mainly comes from the Float Glass in the product. Float Glass is the main component in the product in mass. The second hotspot for most indicators is the manufacturing phase (A3) which is linked to energy consumption. The benefits for the climate change indicator are linked to high incineration with energy recovery rates for packaging and an electricity mix that is carbon-

intensive.

Since this EPD is an average EPD, the variability of results for the different products was assessed for the following indicators
 Climate change (between -36 % and +50 %)
 Total use of non-renewable primary energy resources (between -36 % and +55 %)
 Non-hazardous waste disposed of (between -34 % and +40 %)
 All products are manufactured in the same site, therefore no variability is due to geographical aspects. Main variability is due to the different thickness of products.

7. Requisite evidence

According to the underlying PCR, no evidences are required.

8. References

Product category rules of IBU

IBU (2021)

IBU (2021): General Instructions for the EPD Programme of the Institut Bauen und Umwelt e.V. (General Instructions for the IBU EPD Programme). Version 2.0, Institut Bauen und Umwelt, Berlin.

PCR part A

Product category rules for building-related products and services. Part A: Calculation Rules for Life Cycle Assessment and Project Report Requirements, Version 1.4. Berlin: Institut Bauen und Umwelt e.V. (ed.), 15.04.2024.

PCR Part B

Product category rules for building-related products and services. Part B: Requirements on the EPD for Plate glass for construction and interlayers, Version 1.7 Berlin: Institut Bauen und Umwelt e.V. (ed.), 11.07.2023.

REACH Regulation

Candidate List of Substances of Very High Concern for Authorisation.

Standards and regulations

EN 15804

EN 15804:2012+A2:2019, Sustainability of construction works - Environmental Product

Declarations - Core rules for the product category of construction products.

ISO 14025

EN ISO 14025:2011, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

ISO 15686-8:2008

Buildings and constructed assets - Service life planning.

EN 17074:2017

EN 17074:2017 Glass in building - Environmental product declaration - Product category rules for flat glass products.

EN 13501-2

EN 13501-2 Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance and/or smoke control tests, excluding ventilation services.

ECHA candidate list

Candidate List of substances of very high concern for Authorisation, 17.04.2023, published in accordance with Article 59(10) of the REACH Regulation. European Chemicals Agency, Brussels.

EN 14449

EN 14449, Glass in Building – Laminated and laminated safety glass – product standard.

DIN EN 673

DIN EN 673, Glass in building - Determination of thermal transmittance (U value) - Calculation method.

DIN EN 410

DIN EN 410, Glass in building - Determination of luminous and solar characteristics of glazing.

DIN EN 20140-3

DIN EN 20140-3, Acoustics - Measurement of sound insulation in buildings and of building elements - Part 3: Laboratory measurements of airborne sound insulation of building elements.

Further References**Association of Issuing Bodies (AIB)**

Association of Issuing Bodies (AIB), 2022. *European Residual Mixes – Results of the calculation of Residual Mixes for the calendar year 2021*. Available at: <https://www.aib-net.org/facts/european-residual-mix>

EPD: Flat glass (Planibel 8 mm)

Environmental Product Declaration Flat glass – excluding installation accessories (AGC Glass Europe) FDES-INIES-20240136345-UIPC-FR. Paris: INIES (ed.), 01.01.2024

European Waste Code (EWC)**Regulation (EU) No. 305/2011 (CPR)**

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of March 9, 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

Regulation (EU) No 528/2012

REGULATION (EU) No 528/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of May 22, 2012 on the making available on the market and use of biocidal products

Software/database**Sphera LCA for Experts**

Sphera LCA for Experts 10.7.1.28
Software System and Database for Life Cycle Engineering
Version 10.7.1.28, Sphera Solutions GmbH, Leinfelden-Echterdingen 1992-2024 © Sphera Solutions GmbH [accessed 02.07.2024]

Ecoinvent 3.9

ecoinvent 3.9. Life Cycle Inventory Database, Version 3.9.1, ecoinvent Association, Zurich, Switzerland, January 2023. [accessed 02.07.2024]

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Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

**Programme holder**

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

**Author of the Life Cycle Assessment**

WeLOOP
Rue du Bourg 254
59130 Lambersart
France

(+33) 9 81 85 76 82
info@weloop.org
www.weloop.org

**Owner of the Declaration**

AGC Glass Europe
Avenue Jean Monnet 4
1348 Louvain-La-Neuve
Belgium

(+32) 2 409 30 00
sustainability@eu.agc.com
<https://www.agc-glass.eu/>