AGC GLASS EUROPE

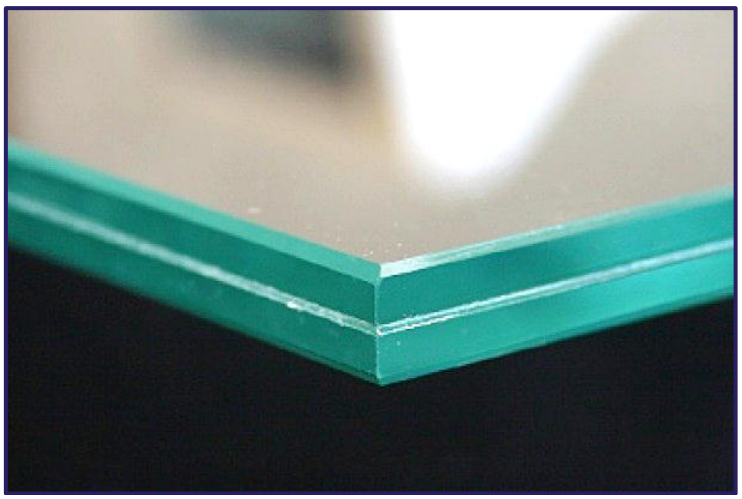
ENVIRONMENTAL AND HEALTH PRODUCT DECLARATION

Laminated glass

(Stratobel, Stratophone, ipasafe, ipaphon)

In accordance with ISO 14025, EN 15804+A1 and its French national complement NF EN15804/CN

28 May 2018



1. Warning

Information from this declaration are provided under AGC Glass Europe responsibility according to the standards EN 15804+A1 and the French national complement NF EN15804/CN.

Any total or partial use of the information provided in this document shall at least be accompanied by an explicit reference to this EPD as well as its issuer. The latter can provide the original document upon request.

EN 15804+A1 from CEN has been used as Product Category Rules (PCR).

2. Reading guide

Environmental impacts results, resource use indicators as well as waste and output flows are presented in **scientific writing with three significant digits**.

All positive values (plus sign) refer to environmental impacts, while negative values (minus sign) reflect environmental benefits. This approach applies to all modules, including module D. Hence, if module D is higher than zero, an additional impact must be added to other life cycle stages.

3. Comparability of EPD for construction products

Environmental product declarations may not be comparable if they do not comply with EN15804+A1.

Chapter *5.3 Comparability of EPD construction products* from EN15804+A1 norm defines the required conditions under which the construction products can be compared, on the basis of the information provided by the EPD:

A comparison of the environmental performance of construction products, based on their EPDs, shall be based on the use of the products and their impacts on the building, and shall account for the entire life cycle of the product (i.e. include all information modules).

4. General information

<table>
<tr><td>Name and address of the manufacturer</td><td>AGC Glass Europe
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B-1348 Louvain-la-Neuve
sustainability@eu.agc.com</td></tr>
<tr><td>Production sites</td><td>This EPD is representative for laminated glass sold by AGC Glass Europe / AGC Interpane in France. AGC Glass Europe operates 10 production sites in Europe providing laminated glass to French and European market. Results from this EPD reflects data collected from 8 of these sites, representing 97% of the production.</td></tr>
<tr><td rowspan="2">Type of EPD</td><td>☐ Cradle to factory gate
☒ Cradle to grave</td></tr>
<tr><td>☐ Collective
☒ Individual</td></tr>
<tr><td>Verifier name</td><td>Thomas Peverelli (EVEA)</td></tr>
<tr><td>Program operator</td><td>FDES INIES
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<tr><td>Publication date</td><td>28th May 2018</td></tr>
<tr><td>Expiration date</td><td>31st December 2023</td></tr>
<tr><td>Commercial references</td><td>Stratobel
Stratobel Strong
Stratobel Colour
ipasafe
Stratophone
Stratophone Colour
ipaphon</td></tr>
</table>

5. Functional unit and product description

5.1. Description of the functional unit

The functional unit is to ensure 1m² of facade glazing with laminated glass over 30 years.

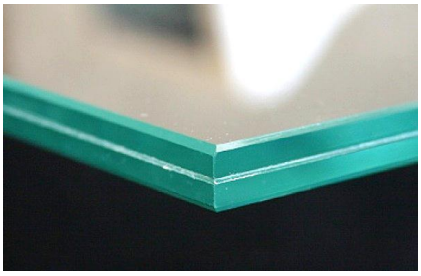
Note: The reference service life of the product is set to 30 years. This period does not reflect real product lifetime, which is generally defined by building refurbishment. This period reflect a standard duration of use considered in glazing EPDs.

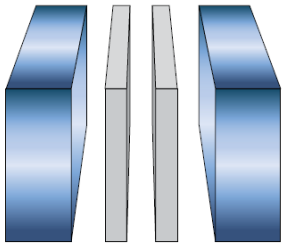
RSL does not refer to product guarantee neither.

5.2. Product description

AGC Laminated glass range covered by this EPD is a 44.2 laminated glass (reference configuration) clear, extra-clear or coloured:

- Stratobel
- Stratobel Strong
- Stratobel Colour
- ipasafe
- Stratophone
- Stratophone Colour
- ipaphon





This product is defined by the standard EN 14449:2005 "*Glass in building. Laminated and laminated safety glass. Evaluation of conformity*".

All Stratobel/ipasafe and Stratophone/ipaphon products are CE marked in accordance with EN 14449 and are produced in ISO 9001 and ISO 14001 certified factories.

More information available on www.yourglass.com.

5.3. Description of the product usage

Laminated glass is meant to be used for building facades and construction projects. It can also be used in a wide range of other construction applications. In that case, glass can be delivered with technical properties fitting with specific use requirements.

Table 1 : Product characteristics Laminated glass 44.2

Product specification	Symbol	Value
Thermal transmission (according to EN 673)	U_g (W/m².K)	5.5
Light Transmission (EN 410)	Tv (%)	max 89
Light Reflection (EN 410)	ρv (%)	8
Solar factor	g (%)	80
Direct airborne sound insulation (EN 12578)	Rw (C;Ctr) (dB)	Stratobel → 35 (-1;-3) Stratophone → 37 (-0;-2)
Reaction to fire (EN 13501-1)		No performance declared
Resistance to fire (EN 13501-2)		No performance declared
Burglar resistance (EN 356)		P1A-P2A
Pendulum body impact (EN 12600)		1B1
Bullet resistance (EN 1063)		No performance declared
Resistance to explosion (EN 13541)		No performance declared

Products from Stratobel/ipasafe and Stratophone/ipaphon range have no specific properties as regards fire resistance fire arms or explosion. No performance is declared for these aspects.
Such products are available in Stratobel Security range, which is not covered by this EPD.

5.4. Other technical features not included in the functional unit

Not applicable.

5.5. Description of the product main components and/or material

Laminated glass from Stratobel/ipasafe and Stratophone/ipahon range are composed of two soda-lime float glass panes and polyvinyl butyral (PVB) interlayers.

Table 2 : Laminated glass composition

Product composition	44.2
Float glass	
Number of panes	2 panes
Mass (kg)	20 kg
Mass (% final product)	96%
PVB	
Number of interlayers	2 interlayers
Mass (kg)	0.79 kg
Mass (% final product)	4%
Packaging	
Wood	11.7 g/m²
Cardboard	7.5 g/m²
Interleavant powder	0.33 g/m²
Metallic stillage	3 g/m² (depreciation of reusable stillages)

5.6. Substances from REACH candidate list

Laminated glass does not contain any substance from REACH candidate list according to REACH regulation (more than 0.1%)

5.7. Reference service life description

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

Table 3 : Reference conditions of product use justifying RSL

Parameter	Value
Reference service life	30 years
Declared product properties (when leaving the production site) and finishing	These properties are defined in laminated glass definition standard EN 14449:2005 *Glass in building. Laminated and laminated safety glass. Evaluation of conformity*
Theoretical application parameters (if imposed by the producer), including references to the appropriate use practices	These information are detailed in the standard NF DTU 39:2006 *Building works – Glazing and Mirror Glass Works*, which defines the specifications for the implementation of glazing and installation of glazing products (new construction, renovation, refurbishment, maintenance) performed on site in all types of buildings.
Alleged quality of the construction work, when the installation is made in accordance with the manufacturer's instructions	
Exterior environment (for exterior applications), e.g. weather resistance, pollutants, UV and wind exposure, building orientation, shade, temperature	
Interior environment (for interior applications), e.g. temperature, humidity, chemicals exposure	
Use conditions, e.g. usage frequency, mechanical exposure	
Maintenance, e.g. required frequency, type and quality and replacement of replaceable components	

6. Life cycle stages

This EPD is a cradle to grave study including module D, benefits beyond the system boundaries.

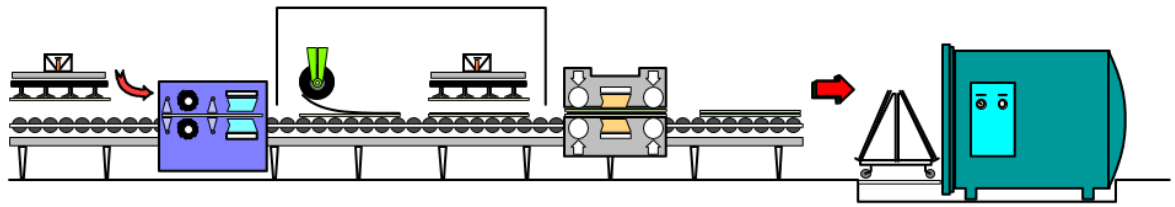
Life cycle stages regarding product installation (A5) and product use (B1-B7) are modelled based on Glass in building product category rules prEN17074:2017.

6.1. Production stage, modules A1-A3

Module A1-A3 covers the production and transport of raw materials used for laminated glass production. It also covers consumptions and emissions from lamination process such as energy and water consumption, water effluents, wastes treatment.

Laminated glass production process involves the following steps:

- Float glass loading
- Float washing in order to prevent any impurity and to remove interleavant powder used for float transport
- Application of PVB interlayers
- Second glass pane deposition (preliminary washed)
- Calendaring, to remove air and ensure a good adhesion of the different components
- Autoclave, (hight temperature and very low pressure) to remove residual air bubbles and ensure perfect adhesion between float panes and PVB interlayers.



1. Automatic loading
2. Washing
3. Application of PVB
4. Second glass pane deposition
5. Calendaring
6. Loading on stillage
7. Autoclave

6.2. Construction process stage, modules A4-A5

Transport distance to construction sites (module A4) considers the weighted average distance between AGC plants producing laminated glass and Paris.

As regards installation on site (module A5), no ancillary materials is considered for the glass to be installed in

accordance with prEN17074:2017.
No breakage during transport and installation has been considered, following prEN17074:2017.

1. Transport to the construction site

Transport to construction site considers an average distance of 960 km. This value reflects the weighted average distance between AGC plants and Paris. Lamianted glass is transported by road in diesel trucks of 24.7 tonnes net load.

Table 4 : Transport to construction site

Parameter	Value	Unit
Vehicle description	25	Tonne | Diesel truck - EURO 5 – cargo, 40 t gross payload
Distance to construction site	960	km
Utilisation rate (including empty return)	50%	%
Volumetric mass	2500	kg/m^3
Coefficient of utilisation of the volume capacity	0.6	

Average load and utilisation rate correspond to the use of “inloaders” trucks dedicated to glass transportation. These trucks are loaded at full capacity when leaving factories but have no possibility to transport other goods than glass when traveling back. The utilisation rate of 50% reflects thus a 100% utilisation for the outbound journey and an utilisation rate of 0% for the inbound journey.

2. Installation on site

No ancillary materials is considered for the glass to be installed in accordance with prEN17074:2017. Packaging end of life is accounted in module A3 as detailed in prEN17074:2017 product category rule.

6.3. Use stage, modules B1-B7

1. Description

The only module from the use stage considered is B2 “maintenance”. This stage corresponds to glass cleaning with water and detergent.

Repair (B3), replacement (B4) and refurbishment (B5) are not considered. Under normal conditions of use, float glass does not need any of these operations.

Finally, laminated glass does not emit any substances neither to the air nor to water during its use (B1).

2. Maintenance parameters

Following prEN17074:2017, the average annual water consumption is 0.2 litres per square meter of glass (i.e. 6 litres/m² over the whole life cycle) and an annual consumption of detergents of 10 g/m² (300 g/m² over the whole life cycle). The majority of this water (75%) is considered as discharged to sewer grid and

further treated in a wastewater treatment plant. The remaining 25% is considered as evaporated.

Table 5 : Glass maintenance

Parameter (whole life cycle)	Value	Unit
Water consumption for maintenance	6	litres
Detergent consumption	300	g
Waste water discharge to WWTP	4.5	litres

6.4. End of life stage, modules C1-C4

No mechanical operation is considered as regards dismantling and demolition (module C1).
End of life includes:

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

End of life scenario is based on worst case scenario, considering that 100% of the laminated glass is sent to landfill for inert material in the end of life.

Table 6 : End of life scenarios

Parameter	Value	Unit
Waste glass sent to landfill	100	%
Transport to landfill (truck)	30	km
Waste glass recycled	0	%

All glass wastes are transported by diesel truck with a net payload of 22 tonnes.

6.5. Benefits and loads beyond the system boundaries (module D)

Laminated glass production generates PVB trimmings and glass losses as well as packaging wastes (wood, cardboard) that are sent to recycling.
Module D consider benefits and loads beyond the system boundaries for such recycled waste and recycled content of the product.
Note that in case of glass, Module D accounts for the difference between secondary material provided by the system during all life cycle stages and the secondary material consumption of the product system. As AGC float glass plants introduce more extremal cullet than the laminated glass production process provides, it results in an additional load to compensate net withdrawal of external cullet that is not compensated by glass losses.

In the end of life formula, these impacts are referred as *IV - IS*.
This additional impact is calculated as the sum of:

- An additional production of virgin raw materials (silica sand, sodium carbonate, dolomite etc.).
- An additional energy consumption due to the substitution of cullet by virgin raw materials. Cullet requires 25% less energy than virgin raw materials to melt. The higher energy consumption from virgin raw materials also means higher CO_2 emissions from fossil fuel combustion.
- An additional CO2 emissions due to decarbonation of virgin raw materials used instead of cullet. Indeed, cullet does not go to decarbonation as opposed to virgin raw materials.

7. Information regarding life cycle assessment calculation

PCR used	NF EN 15804+A1 NF EN 15804/CN prEN 17074 :2017
System boundaries	Cradle to gate including module D
Allocations	Mass allocation (energy) Surface allocation (water and VOC emissions)
	Geographical representativeness: 8 pf the 10 AGC laminated glass production sites, representing 97% of the production. Distribution in France. Time representativeness: input/output primary data as well as transport data from 2016 GaBi 8.6.0.20 software and database service pack 35 have been used for secondary data and calculation of the LCI and LCIA.

8. Life cycle assessment results

8.1. Description of the system boundaries

	Product stage	Construction process stage		Use stage							End of life				Benefits and loads beyond the system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Reparation	B4 Replacement	B4 Refurbishment	B6 Use of energy	B7 Use of water	C1 Deconstruction /demolition	C2 Transport	C3 Waste processing	C4 Disposal	D
Module declared	X	X	X	NR	X	NR	NR	NR	NR	NR	NR	X	X	X	X

X: included in the LCA *NR: Not relevant for the product studied*

8.2. Environmental impact indicators

The life cycle impact assessment methods recommend by EN 15804+A1 were used. The impact indicators are presented in the following tables for the different AGC float glass thicknesses available.

Environmental impacts of 44.2 laminated glass

Environmental impacts	Production stage	Construction process		Use stage							End of life stage				Benefits and loads beyond system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Reparation	B4 Replacement	B4 Refurbishment	B6 Use of energy	B7 Use of water	C1 Deconstruction /demolition	C2 Transport	C3 Waste processing	C4 Disposal	D
Global warming potential *(kg CO_2 eq./FU)*	2.88E+01	1.61E+00	NR	NR	6.87E-03	NR	NR	NR	NR	NR	NR	1.05E-01	NRE+00	3.74E-01	1.22E+00
Ozone depletion *(kg CFC-11 eq./FU)*	2.58E-08	4.38E-14	NR	NR	2.69E-09	NR	NR	NR	NR	NR	NR	2.90E-15	NRE+00	8.71E-14	1.52E-09
Acidification of land and water *(kg SO_2 eq./FU)*	1.09E-01	3.90E-03	NR	NR	2.32E-04	NR	NR	NR	NR	NR	NR	6.20E-04	NRE+00	2.02E-03	2.30E-03
Eutrophication *(kg PO_4 eq./FU)*	1.60E-02	9.45E-04	NR	NR	1.65E-04	NR	NR	NR	NR	NR	NR	1.57E-04	NRE+00	4.11E-04	4.37E-04
Photochemical ozone creation *(kg C_2H_4 eq./FU)*	7.67E-03	3.89E-04	NR	NR	9.54E-05	NR	NR	NR	NR	NR	NR	4.90E-05	NRE+00	1.63E-04	1.77E-04
Depletion of abiotic resources-elements *(kg Sb eq./FU)*	2.36E-05	1.20E-07	NR	NR	1.77E-07	NR	NR	NR	NR	NR	NR	7.94E-09	NRE+00	4.98E-08	1.27E-07
Depletion of abiotic resources-fossil fuels *(MJ/FU)*	4.03E+02	2.18E+01	NR	NR	3.88E-01	NR	NR	NR	NR	NR	NR	1.45E+00	NRE+00	4.92E+00	1.20E+01

Resource use	Production stage	Construction process		Use stage							End of life stage				Benefits and loads beyond system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Reparation	B4 Replacement	B4 Refurbishment	B6 Use of energy	B7 Use of water	C1 Deconstruction /demolition	C2 Transport	C3 Waste processing	C4 Disposal	D
Renewable primary energy as energy carrier *(MJ/FU)*	1.99E+01	1.21E+00	NR	NR	1.33E+00	NR	NR	NR	NR	NR	NR	8.01E-02	NRE+00	5.91E-01	2.36E-01
Renewable primary energy resources used as raw materials *(MJ/FU)*	NRE+00	NRE+00	NR	NR	NRE+00	NR	NR	NR	NR	NR	NR	NRE+00	NRE+00	NRE+00	NRE+00
Total use of renewable primary energy resources *(MJ/FU)*	1.99E+01	1.21E+00	NR	NR	1.33E+00	NR	NR	NR	NR	NR	NR	8.01E-02	NRE+00	5.91E-01	2.36E-01
Non-renewable primary energy resources as energy carrier *(MJ/FU)*	4.08E+02	2.19E+01	NR	NR	6.18E-01	NR	NR	NR	NR	NR	NR	1.45E+00	NRE+00	5.10E+00	1.22E+01
Non-renewable primary energy resources used as raw materials *(MJ/FU)*	2.27E+01	NRE+00	NR	NR	NRE+00	NR	NR	NR	NR	NR	NR	NRE+00	NRE+00	NRE+00	NRE+00
Total use of non-renewable primary energy resources *(MJ/FU)*	4.30E+02	2.19E+01	NR	NR	6.18E-01	NR	NR	NR	NR	NR	NR	1.45E+00	NRE+00	5.10E+00	1.22E+01
Use of secondary material *(kg/FU)*	1.83E+00	NRE+00	NR	NR	NRE+00	NR	NR	NR	NR	NR	NR	NRE+00	NRE+00	NRE+00	NRE+00
Use of renewable secondary fuels *(MJ/FU)*	1.01E-09	1.18E-28	NR	NR	2.63E-24	NR	NR	NR	NR	NR	NR	7.84E-30	NRE+00	6.95E-23	3.86E-21
Use of non-renewable secondary fuels *(MJ/FU)*	1.18E-08	1.79E-27	NR	NR	3.09E-23	NR	NR	NR	NR	NR	NR	1.19E-28	NRE+00	8.17E-22	4.53E-20
Use of net fresh water *(m^3/FU)*	7.33E-02	2.22E-03	NR	NR	8.52E-03	NR	NR	NR	NR	NR	NR	1.48E-04	NRE+00	8.14E-04	2.73E-03

Wastes	Production stage	Construction process		Use stage							End of life stage				Benefits and loads beyond system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Reparation	B4 Replacement	B4 Refurbishment	B6 Use of energy	B7 Use of water	C1 Deconstruction /demolition	C2 Transport	C3 Waste processing	C4 Disposal	D
Hazardous waste disposed *(kg/FU)*	8.59E-07	1.27E-06	NR	NR	1.74E-10	NR	NR	NR	NR	NR	NR	8.39E-08	NRE+00	7.71E-08	3.39E-08
Non-hazardous waste disposed *(kg/FU)*	5.18E-01	1.83E-03	NR	NR	7.68E-03	NR	NR	NR	NR	NR	NR	1.22E-04	NRE+00	2.08E+01	3.97E-02
Radioactive waste disposed *(kg/FU)*	1.03E-02	2.99E-05	NR	NR	3.18E-06	NR	NR	NR	NR	NR	NR	1.99E-06	NRE+00	7.36E-05	5.72E-05

Output flows	Production stage	Construction process		Use stage							End of life stage				Benefits and loads beyond system boundaries
	Total A1-A3 Production	A4 Transport	A5 Installation	B1 Usage	B2 Maintenance	B3 Reparation	B4 Replacement	B4 Refurbishment	B6 Use of energy	B7 Use of water	C1 Deconstruction /demolition	C2 Transport	C3 Waste processing	C4 Disposal	D
Components for re-use (kg/FU)	0.00E+00	0.00E+00	NR	NR	0.00E+00	NR	NR	NR	NR	NR	NR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (kg/FU)	1.06E+00	0.00E+00	NR	NR	0.00E+00	NR	NR	NR	NR	NR	NR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (kg/FU)	0.00E+00	0.00E+00	NR	NR	0.00E+00	NR	NR	NR	NR	NR	NR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electrical energy (MJ/FU)	0.00E+00	0.00E+00	NR	NR	0.00E+00	NR	NR	NR	NR	NR	NR	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported thermal energy (MJ/FU)	0.00E+00	0.00E+00	NR	NR	0.00E+00	NR	NR	NR	NR	NR	NR	0.00E+00	0.00E+00	0.00E+00	0.00E+00

9. Additional information

9.1. Release of hazardous substances into indoor air. soil and water during the use stage

9.1.1. Indoor air

- **VOC and formaldehyde emissions**

VOC and formaldehyde emission tests have been realized according to EN 7375:2005 and EN ISO 16000-9:2009. Based on these tests and considering their exposition scenario. Stratobel/ipasafe and Stratophone/ipaphon range have been rated A+ against the French national rating system.

- **Reaction to fungal and bacterial growth**

Not tested. Glass is a mineral inert material. It is not by itself a medium for micro-organisms growth.

- **Natural radioactive emissions from construction products**

Not tested.

- **Emission of particulates and fibres emissions**

Not tested.

9.1.2. Water and soil

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

9.2. Product contribution to indoor wellbeing

9.2.1. Product characteristics regarding hygrothermal comfort

The relevant technical characteristics are given for a 4 mm float glass:

- Thermal coefficient U_g = 5.8 W/(m².K). according to EN 673 ;
- Direct energy transmission : 89 % ;
- Energy reflection : 8 % ;
- Solar factor: 80 %.

Source: CE marking

9.2.2. Product characteristics regarding acoustics

Direct airborne sound insulation depends on the type of laminated product:

- Stratobel 44.2 → R_w (C; Ctr) = 35 (-1 ; -3) dB
- Stratophone 44.2 → R_w (C; C_{tr}) = 37 (-0 ; -2) dB

This characteristic can be further improved by using thicker float panes or by adding additional PVB interlayers. For example. Stratophone 1212.2 has a direct airborne sound insulation R_w (C; C_{tr}) = 43 (-3 ; -4) dB.

Source: CE marking

9.2.3. Product characteristics regarding visual comfort

Being part of the building envelope. glass contributes to visual comfort by providing natural light and reducing artificial lighting needs. The light transmission value of a 44.2 laminated glass is 89%. This value varies depending on the laminated glass configuration and ranges from 83% to 91% for clear/extra-clear laminated glass from Stratobel/ipasafe and Stratophone/ipaphon ranges.

Source: CE marking

9.2.4. Product characteristics as regarding odours

Laminated glass has been tested against EN ISO 16000-9:2009. Such glass is not likely to release any odour during its use.

9.3. Extrapolation rules

Results from this EPD can be extrapolated to any laminated glass from Stratobel/ipasafe and Stratophone/ipaphon range.

Extreme values from the product portfolio are given in the table below.

Table 7 : Min and max values from laminated glass range covered by extrapolation rules

Product composition	Minimum Stratobel / Stratophone range	Maximum Stratobel / Stratophone range
Float glass		
Number of panes	2 panes	2 panes
Mass (kg)	10 kg	60 kg
Mass (% final product)	89%	99%
PVB		
Number of interlayers	1 interlayer	6 interlayers
Mass (kg)	0.39 kg	2.37 kg
Mass (% final product)	1%	11%
Packaging		
Wood	11.7 g/m²	
Cardboard	7.5 g/m²	
Interleavant powder	0.33 g/m²	
Metallic stillage	3 g/m² (depreciation of reusable stillages)	

Environmental impacts of laminated glass depend on the combination of three parameters:

- A fix impact
- An impact proportional to the total float thickness
- An impact proportional to the number of PVB interlayers

The environmental impacts are thus:

$$Env = I_{fix} + (FT * I_{1mm\ float}) + (N_{interlayers} * I_{interlayer})$$

With:

Env	Environmental impacts of a specific laminated glass configuration
I_{fix}	Fix impacts
FT	Float thickness (in mm)
$I_{1mm\ float}$	Impacts of any additional mm of float in the laminated glass
$N_{interlayers}$	Number of PVB interlayers
$I_{interlayer}$	Impacts of any additional PVB interlayer

For example. in case of a 66.4.laminated glass. environmental impacts will be calculated as:

$$Env = I_{fix} + (12 * I_{1mm\ float}) + (4 * I_{interlayer})$$

Environmental impacts I_{fix} . $I_{1mm\ float}$ and $I_{interlayer}$ are presented in the next tables. Note that only modules to which laminated glass contributes are presented; All other module are considered as null (A5.B1. B3. B4. B5. B6. B7. C1).

Extrapolation values for any laminated glass configuration

Environmental impacts		Production stage	Construction process	Use stage	End of life stage			Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste processing	C4 Disposal	D
Global warming potential *(kg CO_2 eq./FU)*	Fix impacts	7.35E-02	1.45E-03	6.87E-03	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	3.10E+00	1.93E-01	0.00	1.26E-02	0.00	3.98E-02	1.53E-01
	Impacts per PVB interlayer	2.00E+00	3.14E-02	0.00	1.99E-03	0.00	2.77E-02	0.00
Ozone depletion *(kg CFC-11 eq./FU)*	Fix impacts	3.09E-09	3.93E-17	2.69E-09	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	2.83E-09	5.25E-15	0.00	3.49E-16	0.00	9.01E-15	1.90E-10
	Impacts per PVB interlayer	4.38E-11	8.55E-16	0.00	5.51E-17	0.00	7.48E-15	0.00
Acidification of land and water *(kg SO_2 eq./FU)*	Fix impacts	6.83E-04	3.50E-06	2.32E-04	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	1.29E-02	4.68E-04	0.00	7.45E-05	0.00	2.34E-04	2.87E-04
	Impacts per PVB interlayer	2.60E-03	7.61E-05	0.00	1.18E-05	0.00	7.37E-05	0.00
Eutrophication *(kg PO_4 eq./FU)*	Fix impacts	5.48E-05	8.50E-07	1.65E-04	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	1.93E-03	1.13E-04	0.00	1.88E-05	0.00	3.21E-05	5.46E-05
	Impacts per PVB interlayer	2.83E-04	1.85E-05	0.00	2.97E-06	0.00	7.71E-05	0.00
Photochemical ozone creation *(kg C_2H_4 eq./FU)*	Fix impacts	3.94E-05	3.49E-07	9.54E-05	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	8.28E-04	4.66E-05	0.00	5.90E-06	0.00	1.83E-05	2.21E-05
	Impacts per PVB interlayer	5.06E-04	7.58E-06	0.00	9.31E-07	0.00	8.27E-06	0.00
Depletion of abiotic resources-elements *(kg Sb eq./FU)*	Fix impacts	6.50E-06	1.07E-10	1.77E-07	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	2.08E-06	1.43E-08	0.00	9.50E-10	0.00	5.06E-09	1.57E-08
	Impacts per PVB interlayer	2.16E-07	2.32E-09	0.00	1.50E-10	0.00	2.87E-09	0.00
Depletion of abiotic resources-fossil fuels *(MJ/FU)*	Fix impacts	7.80E-01	1.96E-02	3.88E-01	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	4.05E+01	2.62E+00	0.00	1.74E-01	0.00	5.14E-01	1.50E+00
	Impacts per PVB interlayer	3.92E+01	4.26E-01	0.00	2.74E-02	0.00	4.02E-01	0.00

Resource use		Production stage	Construction process	Use stage	End of life stage			Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste processing	C4 Disposal	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials MJ/FU	Fix impacts	5.92E-01	1.08E-03	1.33E+00	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	1.98E+00	1.45E-01	0.00	9.63E-03	0.00	6.61E-02	2.95E-02
	Impacts per PVB interlayer	1.75E+00	2.36E-02	0.00	1.52E-03	0.00	3.10E-02	0.00
Use of renewable primary energy resources used as raw materials MJ/FU	Fix impacts	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per PVB interlayer	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) MJ/FU	Fix impacts	5.92E-01	1.08E-03	1.33E+00	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	1.98E+00	1.45E-01	0.00	9.63E-03	0.00	6.61E-02	2.95E-02
	Impacts per PVB interlayer	1.75E+00	2.36E-02	0.00	1.52E-03	0.00	3.10E-02	0.00
Use of renewable primary energy excluding renewable primary energy resources used as raw materials MJ/FU	Fix impacts	9.17E-01	1.97E-02	6.18E-01	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	4.35E+01	2.63E+00	0.00	1.75E-01	0.00	5.34E-01	1.53E+00
	Impacts per PVB interlayer	2.94E+01	4.27E-01	0.00	2.75E-02	0.00	4.17E-01	0.00
Use of renewable primary energy resources used as raw materials MJ/FU	Fix impacts	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per PVB interlayer	1.14E+01	0.00	0.00	0.00	0.00	0.00	0.00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) MJ/FU	Fix impacts	9.17E-01	1.97E-02	6.18E-01	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	4.35E+01	2.63E+00	0.00	1.75E-01	0.00	5.34E-01	1.53E+00
	Impacts per PVB interlayer	4.08E+01	4.27E-01	0.00	2.75E-02	0.00	4.17E-01	0.00

Resource use		Production stage	Construction process	Use stage	End of life stage			Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste processing	C4 Disposal	D
Use of secondary material kg/FU	Fix impacts	6.29E-03	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	2.28E-01	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per PVB interlayer	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Use of renewable secondary fuels MJ/FU	Fix impacts	1.01E-09	1.06E-31	2.63E-24	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	5.17E-21	1.42E-29	0.00	9.43E-31	0.00	8.09E-24	4.82E-22
	Impacts per PVB interlayer	0.00	2.31E-30	0.00	1.49E-31	0.00	2.40E-24	0.00
Use of non-renewable secondary fuels MJ/FU	Fix impacts	1.18E-08	1.61E-30	3.09E-23	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	6.07E-20	2.15E-28	0.00	1.43E-29	0.00	9.50E-23	5.66E-21
	Impacts per PVB interlayer	0.00	3.50E-29	0.00	2.26E-30	0.00	2.82E-23	0.00
Use of net fresh water m3/FU	Fix impacts	1.66E-03	2.00E-06	8.52E-03	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	6.50E-03	2.67E-04	0.00	1.77E-05	0.00	1.02E-04	3.42E-04
	Impacts per PVB interlayer	9.83E-03	4.34E-05	0.00	2.80E-06	0.00	-1.07E-06	0.00

Waste production		Production stage	Construction process	Use stage	End of life stage			Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste processing	C4 Disposal	D
Hazardous waste disposed kg/FU	Fix impacts	5.40E-09	1.14E-09	1.74E-10	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	9.98E-08	1.52E-07	0.00	1.01E-08	0.00	9.19E-09	4.23E-09
	Impacts per PVB interlayer	2.74E-08	2.47E-08	0.00	1.59E-09	0.00	1.78E-09	0.00
Non-hazardous waste disposed kg/FU	Fix impacts	4.77E-03	1.65E-06	7.68E-03	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	6.20E-02	2.20E-04	0.00	1.46E-05	0.00	2.50E+00	4.96E-03
	Impacts per PVB interlayer	8.81E-03	3.58E-05	0.00	2.31E-06	0.00	3.93E-01	0.00
Radioactive waste disposed kg/FU	Fix impacts	4.10E-05	2.69E-08	3.18E-06	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	1.13E-03	3.59E-06	0.00	2.39E-07	0.00	7.72E-06	7.15E-06
	Impacts per PVB interlayer	5.95E-04	5.85E-07	0.00	3.77E-08	0.00	5.92E-06	0.00

As regards output flows. only Material For Recycling flow (MFR) is presented as all others indicators are null. Indeed. none of the life cycle stage from laminated glass produce material for energy valorisation. nor energy to be sold externally.

Waste production		Production stage	Construction process	Use stage	End of life stage			Benefits and loads beyond system boundaries
		Total A1-A3 Production	A4 Transport	B2 Maintenance	C2 Transport	C3 Waste processing	C4 Disposal	D
Materials for recycling kg/FU	Fix impacts	9.20E-03	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per 1 mm float thickness	1.28E-01	0.00	0.00	0.00	0.00	0.00	0.00
	Impacts per PVB interlayer	1.04E-02	0.00	0.00	0.00	0.00	0.00	0.00

More information available on www.yourglass.com

And in the « Sustainability » section of our environmental website www.agc-glass.eu/en/sustainability