SAINT-GOBAIN GLASS

ENVIRONMENTAL PRODUCT DECLARATION

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

STADIP® (PROTECT/SILENCE) ON ORAÉ®

44.1 / 44.2

Version: 1
Date of publication: 2025-06-12
Validity: 5 years
Date of validity: 2030-06-11
Scope of the EPD®: Europe

EPD® THE INTERNATIONAL EPD® SYSTEM

The International EPD® System
Programme operator: EPD international AB
www.environdec.com
Registration number: EPD-IES-0024289
EPD of multiple products, based on worst-case results

ECO PLATFORM EPD VERIFIED

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

SAINT-GOBAIN

Programme information

PROGRAMME:	The International EPD® System
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CEN standard **15804:2012+A2:2019/AC:2021** serves as the Core Product Category Rules (PCR)

Product category rules (PCR): PCR 2019:14 Construction Products, version 1.3.2 and its c-PCR-009 Flat glass products used in buildings and other construction works (EN17074:2019).

Prepared by: IVL Swedish Environmental Research Institute, EPD International Secretariat

UN CPC CODE: 3711 - Unworked glass, flat glass and pressed or moulded glass for construction; glass mirrors

PCR review was conducted by: The Technical Committee of the International EPD® System. See www.environdec.com for a list of members.

President: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact - Contact via info@environdec.com

Independent third-party verification of the declaration and data, according to ISO 14025:2006:

☐ EPD process certification ☒ EPD verification

Demonstration of verification: an independent verification of the declaration was made, according to ISO 14025:2010. This verification was external and conducted by the following third party based on the PCR mentioned above.

Third party verifier: ELYS CONSEIL

Pierre-Alexis DUVERNOIS – pa.duvernois@elys-conseil.com

Approved by: The International EPD© System

Procedure for follow-up of data during EPD validity involves third part verifier: ☐ Yes ☒ No

EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same version number up to the first two digits) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical DU/FU); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of Comparison. For further information about comparability, see EN 15804:2012+A2:2019/AC:2021 and ISO 14025:2006.

Product information

Company information

Manufacturer: Saint-Gobain Glass FRANCE, 12 place de l'Iris, 92096 La Défense

Production plant:

- Saint-Gobain Glass France: 249 Bd Drion, 59580 Aniche
  312 Rue des Balmes, 38150 Salaise-sur-Sanne
- Saint-Gobain Glass SL: Av. Lugo, 112, 33401 Avilés, Asturias
- Saint-Gobain Glass Germany: Poststraße 103, 51143 Köln, Germany
- Saint-Gobain Glass Flachglas Torgau GmbH: Solarstraße 1, 04860 Torgau
- Saint-Gobain Glass Italy : Via Ponte a Piglieri, 2, 56121 Pisa
- Saint-Gobain Glass România: Varianta Nord numărul 61, Călărași 910053
- Saint-Gobain Glass Ltd: Weeland Rd, Goole DN14 0FD, Eggborough
- Saint-Gobain Glass Poland: Szklanych Domów 2, 42-530 Dąbrowa Górnicza

Management system-related certification: Glass products are manufactured in production plants with an integrated management system certified according to ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2009 standards.

Owner of the declaration: Saint-Gobain Glass France

Product name and manufacturer represented: Laminated glass STADIP® (PROTECT/SILENCE) on ORAÉ® produced by SAINT-GOBAIN GLASS in corresponding countries.

EPD® prepared by: François Guillemot (Francois.guillemot@saint-gobain.com), and Laura Hoffmann (Saint-Gobain LCA central team).

The intended use of this EPD is for B2B communication.

Geographical scope of the EPD®: Europe, cradle to grave, and module D

EPD® registration number: EPD-IES-0024289

Declaration issued: 2025-06-12, **Date of validity:** 2030-06-11

Demonstration of verification: An independent verification of the declaration was made, according to ISO 14025:2010. This verification was external and conducted by the following third party based on the PCR mentioned above.

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

Product description and description of use

This Environmental Product Declaration (EPD®) describes the environmental impacts of 1 m² of STADIP® (PROTECT/SILENCE) glass on ORAÉ® in the configuration 44.2, with a light transmittance of 89%*, for an expected average service life of 30 years.
*Check Table 1, below, with all the performance data according to the thickness

This EPD is an average of 9 laminated glass production sites in Europe. All the sites producing the STADIP® (PROTECT/SILENCE) glass are considered.

For the flat glass ORAÉ® the average calculated is a weighted arithmetic mean. For the lamination process, the average calculated is an area arithmetic mean.

Laminated safety and security glass, comprises two or more sheets of glass bonded with one single PVB sheet in case of STADIP® range whereas STADIP® (PROTECT/SILENCE) range comprise two or more interlayers of polyvinyl butyral (PVB) film. It is meant to be used in building, furniture and industrial applications.

STADIP® SILENCE glass incorporates a special PVB sheet with particular acoustic properties. For the same thickness of glass, STADIP® SILENCE achieves an average increase, expressed in Rw (EN ISO 717), of between 3 dB compared with conventional STADIP® or STADIP® PROTECT laminated glass and 5 dB compared with monolithic clear flat glass.

Laminated glasses with different levels of safety and security can be obtained by varying the number and/or thickness of each of the components. If the glass breaks, the fragments of glass are held in place by the PVB interlayer(s). In fully framed installations the broken glass retains a residual strength while awaiting replacement.

Products STADIP®, STADIP® PROTECT ranges comply with standards EN 12543 and EN 14449. Products in the STADIP® SILENCE ranges comply with standards EN 12543.

Performances data presented in the table below correspond to monolithic panels for STADIP® (PROTECT/SILENCE) 44.2. You can obtain the precise performances data of your product by reaching https://calumen.com.

PARAMETER	STADIP® ORAÉ® 44.2	STADIP® ORAÉ® 44.1
Visible parameters		
Light transmittance (LT) %	89	89
External Light Reflexion (RLE) (%)	8	8
Energetic parameters		
Energy Transmittance (ET) %	76	78
Solar factor g	0.80	0.81

Table 1: Performance data of STADIP® (PROTECT/SILENCE) ORAÉ® in configuration 44.2 and 44.1

Declaration of the main product components and/or materials

Description of the main components and/or materials for 1 m² of STADIP® (PROTECT/SILENCE) ORAÉ® 44.2 for an expected average service life of 30 years.

PARAMETER	VALUE	
Total weight of glass for 1 m² of product	20,8 kg	
Including glass	> 96 %	CAS number 65997-17-3
Including PVB interlayers	< 4 %	EINECS number 266-046-0
Thickness	8.8 mm	
Packaging for the transportation and distribution	NA	
Product used for the Installation	NA	

The percentages are given for a 44.2 laminated glass; the % may vary depending on the glazing configuration.

There is no “Substance of Very High Concern” (SVHC) in concentration above 0.1% by weight, and neither does their packaging, following the European REACH regulation (Registration, Evaluation, Authorization and Restriction of Chemicals).

The verifier and the program operator do not make any claim nor have any responsibility of the legality of the product.

LCA calculation information

TYPE OF EPD	Cradle to grave with options and optional module (A+B+C+D)
FUNCTIONAL UNIT/DECLARED UNIT	1m² of STADIP® (PROTECT/SILENCE) ORAÉ® 44.2 with a light transmittance of 89% for an expected average service life of 30 years.
SYSTEM BOUNDARIES	Mandatory module = A1-A3; C1-C4 and D Optional stages = A4-A5 ; B1-B7
REFERENCE SERVICE LIFE (RSL)	According to PCR EN 17074:2019, the reference service life is 30 years
CUT-OFF RULES	In the case that there is not enough information, the process energy and materials representing less than 1% of the whole energy and mass used can be excluded (if they do not cause significant impacts). The addition of all the inputs and outputs excluded cannot be bigger than 5% of the whole mass and energy used, as well as the emissions to the environment occurred. Therefore, according to EN 15804+A2, the energy used for the installation of 1m² of glass and the transport glass racks are included in the cut-off rules. Flows related to human activities such as employee transport are excluded. The construction of plants, production of machines and transportation systems are excluded since the related flows are supposed to be negligible compared to the production of the building product when compared at these systems' lifetime level.
ALLOCATIONS	Pre-consumer cullet from downstream processing has a contribution to overall income less than 1%. Thus, according to § 6.4.3.2 of the EN 15804+A2 standard, no other impact is considered. Except from pre-consumer cullet which benefits from a particular status, no other co-products are taken into account therefore, there is no other allocation. The polluter pays and the modularity principles as well have been followed
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Scope: Europe Data are collected from the Europe sites producing ORAÉ® over the year 2022 and 2023. Data are collected from the European sites (Spain, France, Germany, Italy, Poland, United Kingdom and Romania) producing STADIP® (PROTECT/SILENCE) over the year 2022.
BACKGROUND DATA SOURCE	Database from Sphera 2023.2 and ecoinvent v.3.9.1
SOFTWARE	LCA for Expert (Gabi) 10

According to EN 15804+A2, the EPD of construction products may not be comparable if they do not comply with this standard. According to ISO 21930:2017, EPD might not be comparable if they are from different programs.

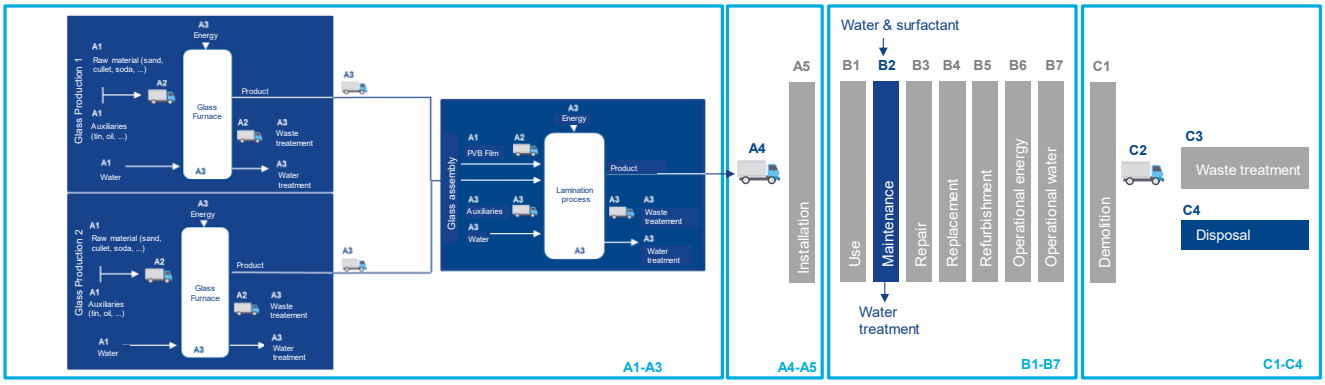
LCA scope

System boundaries (X=included. MND=module not declared)

	PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM
	Raw material supply	Transport	Manufacturing	Transport	Construction-Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-recovery
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	Europe																
Specific data used	>90% GWP- GHG																
Variation products	-12%																
Variation sites	-4,2% to +7,8%																

According to the PCR, the variation for the GWP indicators (GWP-GHG) has been calculated for the different sites and products. The value has been compared to the declared product. The variation between the different manufacturing sites and the reference product average is from -4,2% to 7,8%. The variation of the sites comes from energy efficiency and the energy mix of the countries.
The variation between the declared product (worst case product) and the best-case product is about -12% on GWP-GHG indicator.

Life cycle stages



Note: The entire life cycle is taken into account, but only the stages shown in blue in the above diagram have a non-zero contribution to the various indicators reported.

A1-A3, Product stage

Description of the stage:

For laminated glass A1 to A3 represents the production of glass, coating process (if concerned) and the laminating line, usually located in the same facility, from cradle to gate.

The product stage includes the extraction and processing of raw materials and energies, transport to the manufacturer, manufacturing, and processing of flat glass.

Description of the stage: the product stage of laminated glass is subdivided into 3 modules A1, A2 and A3 respectively “Raw material supply”, “transport to manufacturer” and “manufacturing”.

Description of the scenarios and other additional technical information:

A1, Raw materials supply

This includes the extraction and processing of all raw materials and energy which occur upstream from the manufacturing process.

A2, Transport to the manufacturer

The raw materials are transported to the manufacturing site. The modelling includes road, boat and/or train transportations of each raw material.

A3, Manufacturing

This module includes the manufacture of products and the manufacture of packaging. The production of packaging material is taken into account at this stage. The processing of any waste arising from this stage is also included.

Float glass process

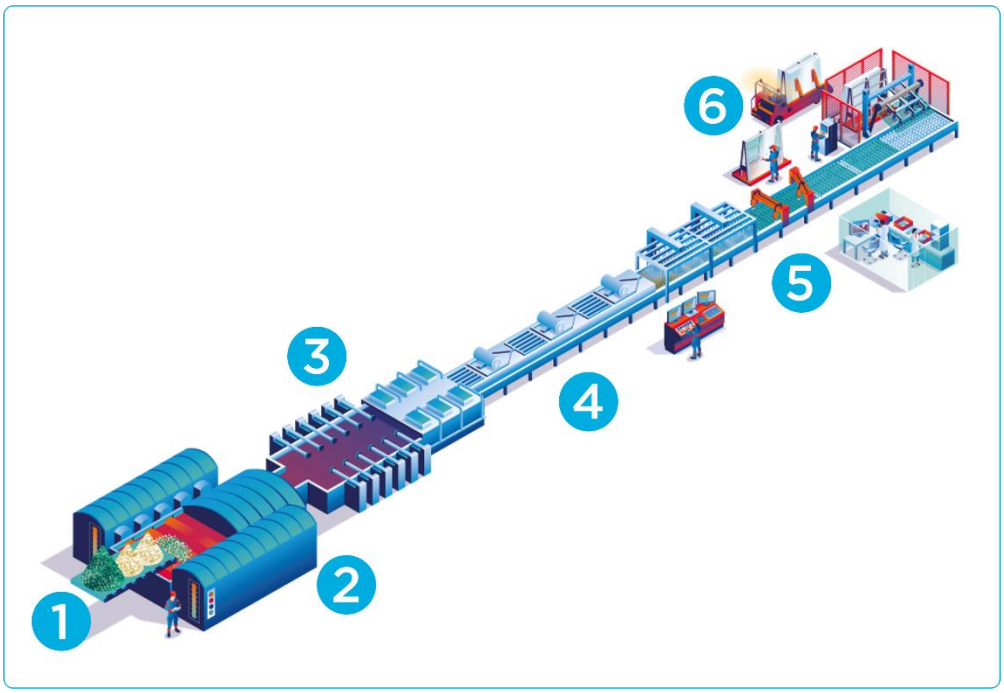
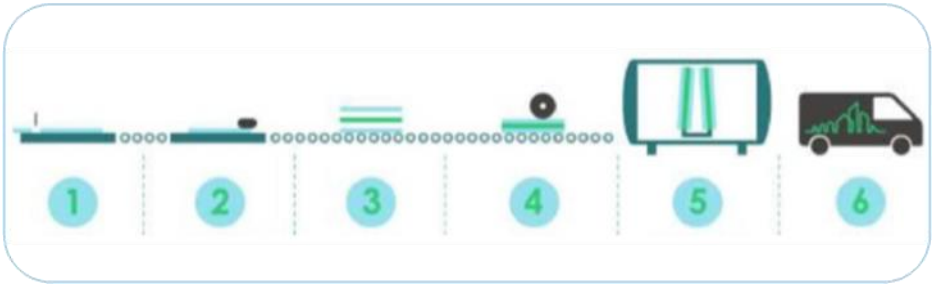


Figure 1 : *Synthetic diagram of float glass process*

1. BATCH: Glass is made of silica, soda ash, lime, dolomite, recycled glass (cullet) and additives adjusted according to desired color and properties.
2. MELTING: Raw materials are melted in a furnace at more than 1500°C. The thermal energy of the flames is recovered in the regenerators, while that of the fumes can be used to produce electricity or to heat the industrial site.
3. FORMING: Molten glass is poured onto a bath of liquid tin. Gear wheels stretch or push the glass to obtain the required thickness (2 to 19 mm) and width (3 to 5m).
4. COOLING: The glass passes through a cooling tunnel over 100 meters long, to drop from 600°C to room temperature while controlling the product's thermal and mechanical stresses.
5. INSPECTION AND CUTTING: Regular checks are made and samples taken to verify the quality of the glass, which is automatically cut into sheets of 1 to 20 square meters.
6. STACKING AND STORAGE: the glass sheets are lifted by suction-cup stackers or by robots and placed on stillages to be stored in the warehouse.

It should be noted that no losses are observed during stage A1-A3. In fact, all the losses are reinjected into the float glass production system.

Lamination process



1. CUTTING: Flat glass is manufactured in sheets up to 6*3,21m. Before lamination, each sheet is lifted using suction-cup and placed on a cutting table where a diamond glass cutter scores the glass at required size. Each piece is then automatically or manually broken out.
2. PROCESSING AND EDGEWORKING: Once cut to the required size, the glass can be treated to improve its functionality, highlight its appearance, or personalize it even further. There are many types of decorative processing: edgeworking, polishing, shaping, drilling of holes and notches, sand blasting, engraving …
3. ASSEMBLY: The assembly of the two sheets of glass and the PVB interlayer takes place in a protective environment. The PVB is rolled out onto one glass sheet and cut to the same size. The second sheet is then positioned on top.
4. PRE-NIP: The glass is nipped together with a pre-nip roller to force any air out from between the PVB and the glass. The glass assembly is then pre-heat in the pre-nip oven to around 100°C to bond the PVB to the glass and prevent any air from returning back in. At this stage the PVB film has become less opaque, and the assembly is stacked ready for transferal to the autoclave.
5. AUTOCLAVE: to ensure total adhesion between the glass and film, and to remove any final bubbles, the assembly is one more placed in a 100°C for around 2-3 hours. The time can vary depending on the thickness and composition of the laminated glass.
6. STACKING AND STORAGE: a stacking system lifts the glass sheets vertically using suction cups, placing a thin layer of interleafing Lucite power between each sheet for protection against scratches. These are then safely transported in special vans.

The laminated glass is transported on dedicated racks, used many times. These racks are not considered according to the cut-off rules requirements.

A4-A5, Construction process stage

The construction process is divided into 2 modules: A4, transport to the building site and A5, installation in the building.

Description of the scenarios and additional technical information:

A4, Transport to the building site:

This module includes transport from the production gate to the building site.
Transport is calculated on the basis of a scenario with the parameters described in the following table

PARAMETER	VALUE
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Truck-trailer - “GLO: Truck-trailer ts”: EURO 6 A-C, 34-40 t gross weight / 27 t payload capacity, 85% average utilisation by mass; Reference year of data set: 2022. Data from Sphera Profesionnal Database.
Distance	507 km
Capacity utilisation (including empty returns)	100 % of the capacity in volume
Bulk density of transported products*	30 % of empty returns in mass
Volume capacity utilisation factor	2500 kg/m^3

A5, Installation in the building:

The accompanying table quantifies the parameters for installing the product at the building site. All installation materials and their waste processing are included.

PARAMETER	VALUE / DESCRIPTION
Ancillary materials for installation (specified by materials)	According to PCR NF EN 17074, nonancillary materials considered
Water use	None
Other resource use	According to EN 15804+A2, the energy needed during the installation is less than 0.1% of the total life cycle energy. It’s included in the cut-off-rules.
Quantitative description of energy type (regional mix) and consumption during the installation process	None
Wastage of materials on the building site before waste processing, generated by the product’s installation (specified by type)	According to PCR EN 17074, no waste is considered as well as no packaging waste.
Output materials (specified by type) as results of waste processing at the building site e.g., of collection for recycling, for energy recovering, disposal (specified by route)	None
Direct emissions to ambient air, soil and water	None

B1-B7, Use stage (excluding potential savings)

The use stage is divided into the following modules:

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

Description of the scenarios and additional technical information:

B2, Maintenance:

PARAMETER	VALUE
Maintenance process	Water and cleaning agent
Maintenance cycle	Annual average
Ancillary materials for maintenance (e.g. cleaning agent, specify materials)	Cleaning agent: 0,01 kg/m² of glass/year
Wastage material during maintenance (specify materials)	0 kg
Net fresh water consumption during maintenance	0.2 kg/m² of glass/year
Energy input during maintenance	None required during product lifetime

The product has a reference service life of 30 years. This assumes that the product will last in situ with no requirements for repair, replacement or refurbishment throughout this period. Therefore, it has no impact at this stage, except for maintenance.

According to PCR EN 17074, only the maintenance by cleaning glass with water and cleaning agent is included in this study.

C1-C4, End of Life Stage

This stage includes the next modules:

- C1, Deconstruction, demolition
- C2, Transport to waste processing
- C3, Waste processing for reuse, recovery and/or recycling
- C4, Disposal

Description of the scenarios and additional technical information:

End of life scenario used in this study is:

100% of glass is landfilled and the distance to the landfill site considered is 50 km.

PARAMETER	VALUE/DESCRIPTION
Thickness (mm)	8
Collection process specified by type	20.8 kg
Recovery system specified by type	0 kg
Disposal specified by type	20.8 kg
Assumptions for scenario development (e.g. transportation)	50 km to landfill

D, Reuse/recovery/recycling potential

Module D quantifies the potential costs and benefits of end-of-life recovery. The end-of-life scenario used is 100% landfill. The declared module D is null.

LCA results

As specified in EN 15804:2012+A2:2019/AC:2021 and the PCR 2019:14 Construction Products, version 1.3.2. The environmental impacts are declared and reported using the baseline characterization factors from the EC-JRC. Raw materials and energy consumption, as well as transport distances, have been taken directly from the manufacturing plant (Production data of 2019 and 2022). Characterization factors EN15804 based on EF 3.1.

According to the EN 15804:2012+A2:2019/AC:2021 standard, the LCIA results are relative expressions translating impacts into environmental indicators (midpoint impact categories). Thus, the estimated impact results are only relative statements, that do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins, and/or risks

All emissions to air, water, and soil, and all materials and energy used have been included.

Disclaimer 1: The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experience with the following indicators:

- Resource use, mineral and metals [kg Sb eq.]
- Resource use, energy carriers [MJ]
- Water deprivation potential [m^3 world equiv.]

Disclaimer 2: The following optional indicators are not declared:

- Ecotoxicity freshwater [CTUe]
- Particulate Matter emissions [Disease incidence]
- Cancer human health effects [CTUh]
- Ionizing radiation - human health [kBq U235 eq.]
- Non-cancer human health effects [CTUh]
- Land Use [Pt]

Disclaimer 3: It is recommended to not use the results of modules A1-A3 (A1-A5 for services) without considering the results of module C.

All results tables refer to a functional unit/declared unit of 1 m^2 of STADIP® (PROTECT/SILENCE) 44.2 on ORAÉ®, and an expected average service life of 30 years.

Environmental Impacts

Environmental indicators	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				REUSE, RECOVERY RECYCLING
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Climate Change - total [kg CO_2 eq.]	1,68E+01	6,24E-01	0	0	1,45E-01	0	0	0	0	0	0	6,15E-02	0	3,28E-01	0
Climate Change (fossil) [kg CO_2 eq.]	1,67E+01	6,17E-01	0	0	1,31E-01	0	0	0	0	0	0	6,08E-02	0	3,11E-01	0
Climate Change (biogenic) [kg CO_2 eq.]	2,63E-02	1,44E-03	0	0	4,51E-03	0	0	0	0	0	0	1,42E-04	0	1,64E-02	0
Climate Change (land use change) [kg CO_2 eq.]	9,91E-03	5,81E-03	0	0	9,62E-03	0	0	0	0	0	0	5,73E-04	0	9,08E-04	0
Ozone depletion [kg CFC-11 eq.]	1,02E-08	5,49E-14	0	0	1,09E-08	0	0	0	0	0	0	5,41E-15	0	1,17E-15	0
Acidification terrestrial and freshwater [Mole of H+ eq.]	6,65E-02	7,21E-04	0	0	9,33E-04	0	0	0	0	0	0	7,11E-05	0	2,26E-03	0
Eutrophication freshwater [kg P eq.]	2,98E-05	2,29E-06	0	0	1,34E-05	0	0	0	0	0	0	2,25E-07	0	5,42E-07	0
Eutrophication marine [kg N eq.]	1,43E-02	2,40E-04	0	0	3,01E-04	0	0	0	0	0	0	2,36E-05	0	5,83E-04	0
Eutrophication terrestrial [Mole of N eq.]	1,60E-01	2,91E-03	0	0	1,99E-03	0	0	0	0	0	0	2,87E-04	0	6,40E-03	0
Photochemical ozone formation - human health [kg NMVOC eq.]	4,34E-02	6,17E-04	0	0	5,60E-04	0	0	0	0	0	0	6,08E-05	0	1,76E-03	0
Resource use, mineral and metals [kg Sb eq.][1]	3,39E-06	4,07E-08	0	0	1,42E-06	0	0	0	0	0	0	4,02E-09	0	2,84E-08	0
Resource use, energy carriers [MJ][1]	2,71E+02	8,53E+00	0	0	2,40E+00	0	0	0	0	0	0	8,41E-01	0	4,14E+00	0
Water deprivation potential [m^3 world equiv.][1]	4,45E+02	7,23E-03	0	0	4,47E-01	0	0	0	0	0	0	7,13E-04	0	3,31E-02	0

[1] The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator

Resources Use

Resources Use indicators	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				D REUSE, RECOVERY, RECYCLING
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Use of renewable primary energy (PERE) [MJ] [2]	3,35E+01	6,03E-01	0	0	7,96E-01	0	0	0	0	0	0	5,95E-02	0	5,42E-01	0
Primary energy resources used as raw materials (PERM) [MJ] [2]	1,31E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ][2]	3,48E+01	6,03E-01	0	0	7,96E-01	0	0	0	0	0	0	5,95E-02	0	5,42E-01	0
Use of non-renewable primary energy (PENRE) [MJ] [2]	2,62E+02	8,55E+00	0	0	2,42E+00	0	0	0	0	0	0	8,43E-01	0	4,14E+00	0
Non-renewable primary energy resources used as raw materials (PENRM) [MJ] [2]	2,34E+01	0	0	0	6,53E-01	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ] [2]	2,86E+02	8,55E+00	0	0	3,07E+00	0	0	0	0	0	0	8,43E-01	0	4,14E+00	0
Input of secondary material (SM) [kg]	1,32E+01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of renewable secondary fuels (RSF) [MJ]	0,00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of non-renewable secondary fuels (NRSF) [MJ]	0,00E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Use of net fresh water (FW) [m^3]	5,54E-02	6,65E-04	0	0	1,04E-02	0	0	0	0	0	0	6,56E-05	0	1,04E-03	0

[2] From EPD International Construction Product PCR 1.3.2 (Annex 3). The option B was retained to calculate the primary energy use indicators.

Waste Category & Output Flows	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				D REUSE, RECOVERY, RECYCLING
	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
Hazardous waste disposed (HWD) [kg]	1,25E-06	3,16E-11	0	0	4,89E-06	0	0	0	0	0	0	3,12E-12	0	6,31E-08	0
Non-hazardous waste disposed (NHWD) [kg]	1,10E-01	1,23E-03	0	0	1,20E-01	0	0	0	0	0	0	1,22E-04	0	2,08E+01	0
Radioactive waste disposed (RWD) [kg]	4,31E-03	1,11E-05	0	0	5,19E-06	0	0	0	0	0	0	1,09E-06	0	4,70E-05	0
Components for re-use (CRU) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Materials for Recycling (MFR) [kg]	2,36E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material for Energy Recovery (MER) [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported electrical energy (EEE) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exported thermal energy (EET) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Additional voluntary indicators from EN 15804 (according to ISO 21930:2017)

	PRODUCT STAGE	CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				REUSE, RECOVERY RECYCLING
Environmental indicators	A1 / A2 / A3	A4 Transport	A5 Installation	B1 Use	B2 Maintenance	B3 Repair	B4 Replacement	B5 Refurbishment	B6 Operational energy use	B7 Operational water use	C1 Deconstruction / demolition	C2 Transport	C3 Waste processing	C4 Disposal	D Reuse, recovery, recycling
GWP-GHG [kg CO_2 eq.][3]	1,67E+01	6,24E-01	0	0	1,41E-01	0	0	0	0	0	0	6,16E-02	0	3,12E-01	0

[3] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Information on biogenic carbon content

Biogenic Carbon Content		PRODUCT STAGE A1 / A2 / A3
	Biogenic carbon content in product [kg]	0
	Biogenic carbon content in packaging [kg]	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

There is no biogenic carbon in glass products. Every thickness considered in this EPD has the same value for biogenic carbon 0 kg C. Moreover, there is no packaging considered for glass products.

Electricity information

The table below presents the information for the residual mix and the renewable electricity based on Guarantee of Origin certificates (GOs):

TYPE OF INFORMATION	DESCRIPTION
Location	Representative of Electricity purchased by Saint-Gobain Europe
Definition of the electricity	34% of the energy consumption is covered by the GOO 66% of the residual grid mix
Energy sources for electricity	**FRANCE** Share of energy sources of residual mix Biomass solid: 1.15% Geothermal: 0.02% Hard coal: 5.4% HFO: 1.2% Hydro: 0.32% Lignite: 0.01% Natural gas: 14.94% Nuclear: 72.86% Photovoltaics: 2.66% Wind: 1.44% **ITALY** Share of energy sources of residual mix Biomass solid: 1.68% Hard coal: 12.2% HFO: 7.2% Hydro: 0.54% Lignite: 0.02% Natural gas: 68.92% Nuclear: 2.62% Photovoltaics: 5.97% Wind: 0.84%

	POLAND Share of energy sources of residual mix Biomass solid: 1.69% Hard coal: 81.78% HFO: 0.42% Hydro: 0.47% Natural gas: 8.02% Nuclear: 0.49% Photovoltaics: 4.43% Solar thermal: 0.02% Wind: 2.67% **ROMANIA** Share of energy sources of residual mix Biomass solid: 0.74% Hard coal: 17.09% HFO: 0.98% Hydro: 26.23% Natural gas: 17.21% Nuclear: 21.09% Photovoltaics: 3.43% Solar thermal: 0.06% Wind: 13.16% **GERMANY** Share of energy sources of renewable electricity 100% Hydro **SPAIN** Share of energy sources of renewable electricity 96.21 % Wind, 2.97 % Photovoltaic, 0.82% Hydro **UNITED KINGDOM** Share of energy sources of renewable electricity 53,07% Wind, 14,06% Thermal, 18,42% Photovoltaics, 7,38 % Hydro, 3,74% Waste, 3,35% Biomass
Type of dataset	Cradle to gate from Gabi and ecoinvent databases
Source	AIB 2023 Guarantee of Origin certificates: . - Pfalzwerke Aktiengesellschaft GETEC Energie GmbH - Endesa Energía SAU – 2022 - SmartestEnergy Origin of Electricity Supply - 2022
CO_2 emission kg CO_2 eq. / kWh (residual mix)	**FRANCE:** 0.339 kg of CO_2 eq/kWh - Based on GWP-GHG indicator **ITALY:** 0.606 kg of CO_2 eq/kWh - Based on GWP-GHG indicator **POLAND:** 0.93 kg of CO_2 eq/kWh - Based on GWP-GHG indicator

	ROMANIA: 0.4824 kg of CO_2 eq/kWh - Based on GWP-GHG indicator
CO_2 emission kg CO_2 eq. / kWh (Guarantee of Origin)	**GERMANY:** 0.0063 kg of CO_2 eq/kWh - Based on GWP-GHG indicator **SPAIN:** 0.016 kg of CO_2 eq/kWh - Based on GWP-GHG indicator **UNITED KINGDOM:** 0.067 kg of CO_2 eq/kWh - Based on GWP-GHG indicator

The factories based in Germany, Spain, and the United Kingdom use electricity with Guarantee of Origin certificates (GO's).

Hence, the electricity mix considered for the manufacturing of the studied product is modeled according to the electricity mix described in the Guarantee of Origin certificate.

The Guarantee of Origin is valid for at least the upcoming year and Saint-Gobain Glass makes a commitment to buy Guarantees of Origin for the full validity period of the EPD. If the electricity mix changes during the EPD validity in a way that has an impact on the results or other contents of the EPD, the rules of the GPI will be followed.

Health transparency

Concerning indoor air quality, flat glass is an inert material that doesn't release any inorganic & organic compounds, in particular no VOC (volatile organic compounds).

Additional information:

Data quality

Inventory data quality is judged by geographical, temporal, and technological representativeness. To cover these requirements and to ensure reliable results, first-hand industry data crossed with LCA background datasets were used. The data was collected from internal records and reporting documents. After evaluating the inventory, according to the defined ranking in the LCA report, the assessment reflects good inventory data quality.

Geographic representativity	Technical representativity	Temporal representativity
1.5 Very Good	**2.1** Good	**1.2** Very Good

Saint-Gobain's sustainability roadmap

At Saint-Gobain, we strive to build a more sustainable and inclusive world. Therefore, to establish our sustainability approach, we have set objectives to reach by 2030 in our key focus areas:

- Reducing CO_2 emissions by 33 % for scope 1 and scope 2, and 16 % for scope 3 compared to 2017 levels
- Advancing a circular economy model by decreasing non-valorized production residue by 80 %, increasing the avoidance of virgin raw materials by 30%, and using 100 % recyclable packaging with at least 30 % recycled or bio-sourced content
- Conducting life-cycle assessments for all our product ranges
- Decreasing industrial water withdrawal by 50 % and eliminating water discharge in areas with a high risk of water scarcity

Saint-Gobain approach for Sustainable Construction

For us, over their whole life cycle, buildings should enhance people's health & wellbeing while having reduced footprint on the planet. They should offer better economic value and quality for the developers, owners and occupants.

The following information might be of help for green building certification programs:

RECYCLED CONTENT

(Required for LEED v4.1 Materials and Resources - Sourcing of raw materials)

Recycled content: proportion, by mass, of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content.

- Post-consumer material: material generated by households or commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. In practice, in the case of flat glass, all material coming from glass recycling collection schemes falls under this category, i.e. glass waste from end-of-life vehicles, construction and demolition waste, etc.

- Pre-consumer material: material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

  In the case of flat glass, this waste originates from the processing or re-processing of glass that takes place before the final product reaches the consumer market. Pre-consumer waste flat glass is made of cut-offs, losses during laminating, bending and other processing, including the manufacture of insulating glass units or automotive windscreens.

Cullet generated in the furnace plant, and which is reintroduced into the furnace cannot be considered as pre-consumer recycled content, since there was never an intent to discard it and therefore it would never have entered the solid waste stream.

Saint-Gobain Glass intends to continue the increase of recycled material in its products.

RESPONSIBLE SOURCING

(Required for BREEAM International new construction 2016 – MAT 03 Responsible sourcing)

All Saint-Gobain Glass sites with a glassmaking furnace, are ISO 14001 certified.

All internal Saint-Gobain Glass quarries are certified ISO 14001, as its SAINT-GOBAIN SAMIN (sand) in France. Many Saint-Gobain Glass raw material suppliers are certified ISO 14001. Our policy consists in encouraging the sourcing of raw materials extracted or made in sites certified ISO 14001 (or the equivalent).

For any other question / document / certification, please contact our local sales teams.

Differences with previous versions of the EPD

The LCA calculation and the EPD have been updated to better reflect the carbon footprint of the PVB interlayer and the lamination process. Editorial modifications have been made as well.

References

1. EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
2. EN 15804:2019+A2 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
3. EPD International, General Program Instructions (GPI) for the international EPD® (version 5.0) www.environdec.com
4. The International EPD System PCR 2019:14 Construction products and Construction services. Version 1.3.2
5. c-PCR-009 Flat glass products (EN 17074)
6. European Chemical Agency, Candidate List of substances of very high concern for Authorization. https://echa.europa.eu/candidate-list-table
7. LCA report, Information for the Environmental Product Declaration of laminated glass products