

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for

REFLECTASOL[®] on PLANILUX & PARSOL
SAINT-GOBAIN GLASS EGYPT

4 mm - 10 mm

Pyrolytic CVD coated glass

Version 1

Date of issue: 2022-06-28

Validity: 5 years

Valid until: 2027-06-27

Scope of the EPD[®]: EGYPT



The **environmental impacts** of this product have been assessed over its **whole life cycle**. Its Environmental Product Declaration has been verified by an **independent third party**.

Registration number
The International EPD[®] System:
SP-05697



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General information

Manufacturer : Saint-Gobain Glass EGYPT, Building 12B4,Cairo Festival City, 2nd Floor, New Cairo

Program used: The International EPD® System. More information at www.environdec.com

EPD registration/declaration number: SP-05697

PCR identification: PCR 2019:14 Construction products (EN 15804:2012: A2) version 1.1 and its c-PCR-009 Flat glass products used in buildings and other construction works (EN17074:2019)

UN CPC code: 371

Product name and manufacturer represented: REFLECTASOL® produced by SAINT-GOBAIN GLASS EGYPT

Owner of the declaration: Saint-Gobain Glass Egypt

EPD® prepared by: Marie-Charlotte Harquet (Saint-Gobain) and Helmy Maged (Saint-Gobain)

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Date of update: 2022-06-28 Valid: 2027-06-27

ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR): PCR 2019:14 Construction products, version 1.1	
EPD program operator	The International EPD® System. Operated by EPD® International AB. Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com .
PCR review conducted by	The Technical Committee of the International EPD® System Chair: Claudia A. Peña. Contact via info@environdec.com "
LCA and EPD performed by Saint-Gobain LCA central team	
Independent verification of the environmental declaration and data according to standard EN ISO 14025:2010	
Internal <input type="checkbox"/>	External <input checked="" type="checkbox"/>
Verifier ELYS CONSEIL Yannick LE GUERN Email : yannick.leguern@elys-conseil.com	
Accredited or approved by: The International EPD® System	
Procedure for follow-up of data during EPD validity involves third party verifier: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

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

EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Disclaimer: EPD of construction products may not be comparable if they do not comply with EN 15804

Product description

Product description and description of use

REFLECTASOL is soda-lime silicate glass produced using the float procedure, on which a CVD coating has been applied. The glass is meant to be used in building & industrial applications.

REFLECTASOL is a reflective, solar control glass. This reflective solar control glass product is manufactured by a process known as "on-line Pyrolytic coating" or "hard coating" wherein silicon-based coating is applied to the glass surface by means of pyrolysis. This coating gives it a number of properties:

- **Total integration with the surface of the glass,**
- **Strength and stability over time,**
- **Solar control properties and a reflective appearance.**

Depending on the flat glass used (PLANILUX / PARSOL), different products can be produced, distinguishable by the thermal performance, spectrophotometric values and processing characteristics:

- **REFLECTASOL Clear: reflective solar control glass on PLANILUX**
- **REFLECTASOL Bronze: reflective solar control glass on PARSOL bronze**
- **REFLECTASOL Green: reflective solar control glass on PARSOL green**
- **REFLECTASOL Grey: reflective solar control glass on PARSOL grey**
- **REFLECTASOL Dark Blue: reflective solar control glass on PARSOL dark blue**
- **REFLECTASOL Sapphire Blue: reflective solar control glass on PARSOL blue**

REFLECTASOL glass complies with the requirements of class A of European standard EN1096.

Performances

All performance data are given according to the EN 410-2011 standard.

REFLECTASOL Clear (on PLANILUX)

Thickness (mm)	4	5	6	8
Visible parameters				
Light transmittance (LT) %	32.2	32.1	31.9	31.6
External light reflection (RLE) (%)	46.8	46.5	46.1	45.4
Energetic parameters				
Energy transmittance (ET) %	48.7	47.8	46.9	45.2
Energy absorbance (EA) %	16	17.7	19.4	22.6
Solar factor g	0.53	0.52	0.51	0.50

REFLECTASOL Topaz Brown (on PARSOL bronze)

Thickness (mm)	4	5	6
Visible parameters			
Light transmittance (LT) %	21.6	19.5	17.6
External light reflection (RLE) (%)	23.3	19.8	16.9
Energetic parameters			
Energy transmittance (ET) %	35.5	32.2	29.2
Energy absorbance (EA) %	45.6	51.6	56.8
Solar factor g	0.46	0.44	0.43

REFLECTASOL Coral Green (on PARSOL green)

Thickness (mm)	4	5	6
Visible parameters			
Light transmittance (LT) %	28.1	27	26
External light reflection (RLE) (%)	37.3	35	32.9
Energetic parameters			
Energy transmittance (ET) %	30.5	27	24
Energy absorbance (EA) %	47.7	53.3	58
Solar factor g	0.42	0.40	0.38

REFLECTASOL Black Diamond (on PARSOL Dark grey)

Thickness (mm)	4	5	6
Visible parameters			
Light transmittance (LT) %	9.1	6.6	4.8
External light reflection (RLE) (%)	7.9	6.2	5.4
Energetic parameters			
Energy transmittance (ET) %	23.7	19.7	16.4
Energy absorbance (EA) %	65.7	71.6	76.1
Solar factor g	0.39	0.37	0.34

REFLECTASOL Dark Blue (on PARSOL Dark Blue)

Thickness (mm)	4	5	6
Visible parameters			
Light transmittance (LT) %	14	11.5	9.4
External light reflection (RLE) (%)	13.7	10.9	9
Energetic parameters			
Energy transmittance (ET) %	24.3	20.3	17
Energy absorbance (EA) %	61.7	67.9	72.8
Solar factor g	0.39	0.36	0.34

REFLECTASOL Sapphire Blue (on PARSOL blue)

Thickness (mm)	4	5	6
Visible parameters			
Light transmittance (LT) %	23.5	21.6	19.9
External light reflection (RLE) (%)	27.9	24.5	21.7
Energetic parameters			
Energy transmittance (ET) %	28.8	25	21.8
Energy absorbance (EA) %	52.4	58.6	63.7
Solar factor g	0.41	0.39	0.37

Table 1: Performance Data of REFLECTASOL

The performance data are given according to the EN 410-2011 standard.

Declaration of the main product components and/or materials

The product is 100% glass CAS number 65997-17-3, EINECS number 266-046-0.

Description of the main components and/or materials for 1 m² of pyrolytic CVD coated glass REFLECTASOL® to 4 mm to 8 mm.

Thickness (mm)	4	5	6	8
Quantity of glass for 1 m ² of product (kg)	10	12,5	15	20
Coating	Less than 0,01% of the weight			

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

Packaging and product used : None

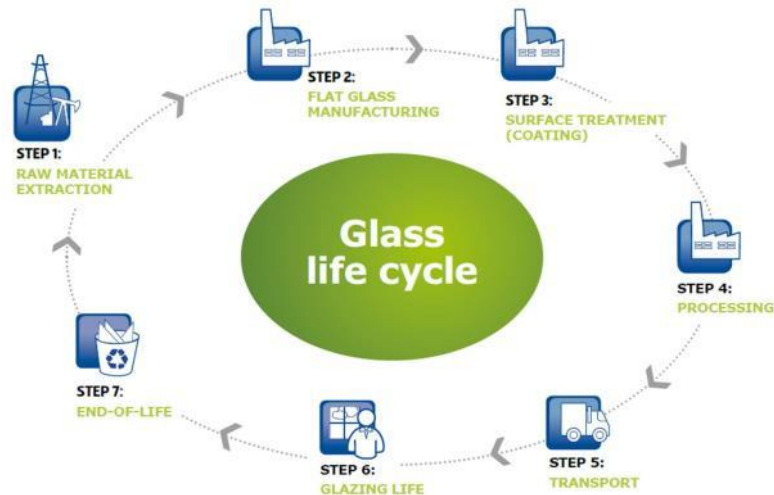
LCA calculation information

FUNCTIONAL UNIT / DECLARED UNIT	1 m ² of pyrolytic CVD coated glass REFLECTASOL® to 4 mm to 10 mm with a light transmittance of maximum 81%, for an expected average service life of 30 years.
SYSTEM BOUNDARIES	Cradle to grave and module D Mandatory Stages = A1-A3 ; B1-B7 ; C1-C4 and D
REFERENCE SERVICE LIFE (RSL)	According to PCR EN 17074:2019, the reference service life is 30 years
CUT-OFF RULES	All significant parameters shall be included. According to EN 15804, mass flows under 1% of the total mass input; and/or energy flows representing less than 1% of the total primary energy usage of the associated unit process may be omitted. However, the total amount of energy and mass omitted must not exceed 5% per module. The energy used for the installation of 1m ² of glass and the transport glass racks are included in the cut-off-rules
ALLOCATIONS	Allocations are done on mass basis (kg)
GEOGRAPHICAL COVERAGE AND TIME PERIOD	The information was established over the year 2021. The information collected comes from the EGYPT the plant producing REFLECTASOL® on PLANILUX and REFLECTASOL.
BACKGROUND DATA SOURCE	GaBi data were used to evaluate the environmental impacts. The data are representative of the years 2015-2019.
SOFTWARE	Gabi 9.2.0 - GaBi envision

According to EN 15804, EPD of construction products may not be comparable if they do not comply with this standard. According to ISO 21930, EPD might not be comparable if they are from different programmes.

Life cycle stages

Flow diagram of the Life Cycle



Product stage, A1-A3

For coated glass A1 to A3 represents the production of glass in the float from cradle to gate.

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

A1, raw material 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.

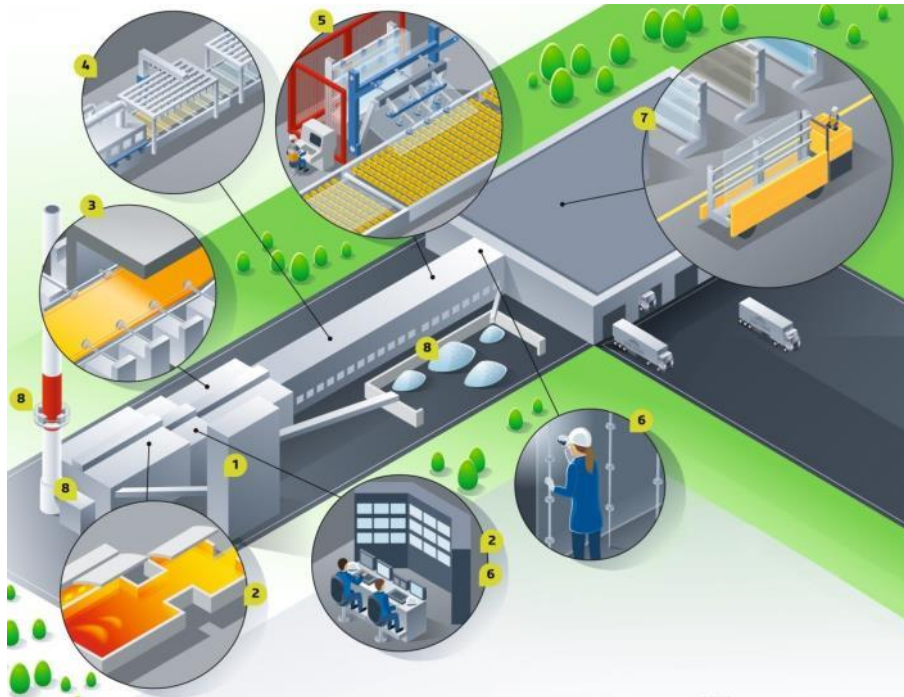
The raw materials are transported to the manufacturing site. The modelling includes road, boat and/or train transportations of each raw material.

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.

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

Manufacturing process flow diagram



1. **BATCH MIXER:** Mix of raw materials to which is added recycled glass (cullet) and other compounds depending on the desired color and properties.
2. **FUSION FURNACE:** Raw materials are melted at 1,550°C in a furnace.
3. **FLOAT:** The molten glass is fed into a bath of molten tin. The glass floats on this flat surface and is drawn off in a ribbon. Serrated wheels, or top rolls, pull and push the glass sideways depending on the desired thickness (from 2 to 8 millimeters).

ON-LINE COATING (PYROLYTIC CVD): a silicon based coating is deposited onto the surface of the glass during glass production and while the glass is still in a semi-molten state, typically at 600-700 °C. A chemical reaction occurs between the silicon vapor and the glass surface, changing the chemical composition of the glass surface, resulting in a hard coating that strongly adheres to the glass.

4. **ANNEALING LEHR:** The glass is lifted onto conveyor rollers and passes through a controlled cooling tunnel measuring more than 100 meters in length. Approximately 600°C at the start of this step, the glass exits the lehr at room temperature.
5. **CUTTING AND STACKING:** The glass is automatically cut lengthwise and crosswise. The sheets of glass are raised by vacuum frames that then place them on glass stillages.
6. **QUALITY:** Automatic inspections and regular samples are taken to check the quality of the glass at each step in the glassmaking process.
7. **STORAGE AND TRANSPORTATION:** The stillages are placed on storage racks in the warehouse.
8. **ENVIRONMENT:** Use of recycled cullet, installation of pollution abatement systems and closed circuit management of water: every measure is taken to limit the consumption of energy, extraction of natural resources, production of waste and emissions into the atmosphere.

The flat glass is transported on dedicated racks, used many times. This racks are not included in the life cycle of the product.

Construction process stage, A4-A5

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

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/DESCRIPTION
Fuel type and consumption of vehicle or vehicle type used for transport e.g. long distance truck, boat, etc.	Average truck trailer with a 27t payload, diesel consumption 38 liters for 100 km
Distance	750 km
Capacity utilisation (including empty returns)	100% of the capacity in volume 30 % of empty returns in mass
Bulk density of transported products*	2500 kg/m ³
Volume capacity utilisation factor	< 1

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
Ancillary materials for installation (specified by materials)	According to PCR NF EN 17074, none ancillary materials considered
Other resource use	None
Quantitative description of energy type (regional mix) and consumption during the installation process	According to EN 15804+A1, the energy needed during the installation is less than 0,1% of the total life cycle energy. It's include in the cut-off-rules.
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.
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

Use stage (excluding potential savings), B1-B7

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

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

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.

Maintenance parameters, B2 :

PARAMETER	VALUE (expressed per functional/declared unit)
Maintenance process	Water and cleaning agent
Maintenance cycle	Annual average
Ancillary materials for maintenance (e.g. cleaning agent, specify materials)	cleaning agent : 0,001 kg/m ² of glass/year
Wastage material during maintenance (specify materials)	0 kg
Net fresh water consumption during maintenance	0,2 kg/m ² of glass/year
Energy input during maintenance (e.g. vacuum cleaning), energy carrier type, (e.g. electricity) and amount, if applicable and relevant	None required during product lifetime

End of Life Stage, C1-C4

Description of the 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**

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.

Description of the scenarios and additional technical information:

End of life:

Thickness (mm)	4	5	6	8	10
Collection process specified by type	10	12,5	15	20	25
Recovery system specified by type	0	0	0	0	0
Disposal specified by type	10	12,5	15	20	25

Assumptions for scenario development (e.g. transportation): 50 km transport to landfill

Reuse/recovery/recycling potential, D

Description of the stage: An end of life recycling 0% (100% of glass wastes are landfilled) has been assumed using local demolition waste data and adjusted considering the recyclability of the product.

LCA results

Product Environmental Footprint (PEF) method has been used as the impact model. Specific data has been supplied by the plant, and generic data come from GABI and Ecoinvent databases.














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

Raw materials and energy consumption, as well as transport distances have been taken directly from the manufacturing plant (Production data according 2019)








All result tables refer to a functional unit of 1 m² of pyrolytic CVD coated glass and an expected average service life of 30 years.

	PRODUCT STAGE			CONSTRUCTION STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	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	B ₁	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	EGYPT																
Specific data used	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation products	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation sites	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-




ENVIRONMENTAL IMPACTS 4 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	1,60E+01	3,66E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	2,44E-02	0	1,40E-01	0
 Climate Change (fossil) [kg CO2 eq.]	1,59E+01	3,80E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	2,42E-02	0	1,52E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	5,42E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	5,04E-03	2,98E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	1,99E-04	0	4,37E-04	0
 Ozone depletion [kg CFC-11 eq.]	8,60E-07	4,42E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	2,95E-18	0	5,62E-16	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	1,45E-01	1,56E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	1,04E-04	0	1,09E-03	0
 Eutrophication freshwater [kg P eq.]	3,30E-04	1,12E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	7,45E-08	0	2,60E-07	0
 Eutrophication marine [kg N eq.]	3,46E-02	7,33E-04	3,21E-07	0	5,33E-04	0	0	0	0	0	0	4,88E-05	0	2,80E-04	0
 Eutrophication terrestrial [Mole of N eq.]	4,06E-01	8,14E-03	2,60E-06	0	1,38E-03	0	0	0	0	0	0	5,43E-04	0	3,08E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	9,31E-02	1,97E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	1,31E-04	0	8,48E-04	0
 Resource use, mineral and metals [kg Sb eq.]	9,99E-06	2,64E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	1,76E-09	0	1,36E-08	0
 Resource use, energy carriers [MJ]	1,80E+02	4,90E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	3,26E-01	0	1,99E+00	0
 Water scarcity [m³ world equiv.]	1,47E+00	3,29E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	2,19E-04	0	1,59E-02	0





RESOURCE USE 4 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	4,58E+00	2,75E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	1,83E-02	0	2,61E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	4,58E+00	2,75E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	1,83E-02	0	2,61E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	1,80E+02	4,90E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	3,27E-01	0	1,99E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	1,80E+02	4,90E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	3,27E-01	0	1,99E+00	0
 Input of secondary material (SM) [kg]	6,64E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	1,37E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	1,61E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	3,57E-02	3,19E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	2,12E-05	0	5,02E-04	0














WASTE CATEGORIES 4 mm

Parameters	Product stage	Construction process 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	
 Hazardous waste disposed (HWD) [kg]	2,37E-07	2,28E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	1,52E-08	0	3,03E-08	0
 Non-hazardous waste disposed (NHWD) [kg]	2,98E-01	7,50E-04	9,63E-04	0	6,47E-03	0	0	0	0	0	0	5,00E-05	0	1,00E+01	0
 Radioactive waste disposed (RWD) [kg]	4,58E-04	6,07E-06	4,36E-08	0	2,84E-06	0	0	0	0	0	0	4,04E-07	0	2,26E-05	0








OUTPUT FLOWS 4 mm

Parameters	Product stage	Construction process 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	
 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]	3,40E-04	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

ENVIRONMENTAL IMPACTS 5 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	1,93E+01	4,57E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	3,05E-02	0	1,75E-01	0
 Climate Change (fossil) [kg CO2 eq.]	1,92E+01	4,75E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	3,03E-02	0	1,90E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	6,72E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	6,29E-03	3,72E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	2,48E-04	0	5,46E-04	0
 Ozone depletion [kg CFC-11 eq.]	1,03E-06	5,53E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	3,68E-18	0	7,03E-16	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	1,80E-01	1,95E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	1,30E-04	0	1,36E-03	0
 Eutrophication freshwater [kg P eq.]	4,07E-04	1,40E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	9,32E-08	0	3,26E-07	0
 Eutrophication marine [kg N eq.]	4,30E-02	9,16E-04	3,21E-07	0	5,33E-04	0	0	0	0	0	0	6,10E-05	0	3,50E-04	0
 Eutrophication terrestrial [Mole of N eq.]	5,05E-01	1,02E-02	2,60E-06	0	1,38E-03	0	0	0	0	0	0	6,78E-04	0	3,85E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	1,16E-01	2,46E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	1,64E-04	0	1,06E-03	0
 Resource use, mineral and metals [kg Sb eq.]	1,22E-05	3,30E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	2,20E-09	0	1,70E-08	0
 Resource use, energy carriers [MJ]	2,18E+02	6,12E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,08E-01	0	2,49E+00	0
 Water scarcity [m³ world equiv.]	1,80E+00	4,11E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	2,74E-04	0	1,99E-02	0

RESOURCE USE 5 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	5,46E+00	3,44E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,29E-02	0	3,26E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	5,46E+00	3,44E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,29E-02	0	3,26E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	2,18E+02	6,13E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,08E-01	0	2,49E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	2,18E+02	6,13E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	4,08E-01	0	2,49E+00	0
 Input of secondary material (SM) [kg]	8,30E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	1,72E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	2,02E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	4,37E-02	3,98E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	2,66E-05	0	6,27E-04	0














WASTE CATEGORIES 5 mm

WASTE CATEGORIES 5 mm															
Parameters	Product stage	Construction process 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	
Hazardous waste disposed (HWD) [kg]	2,97E-07	2,85E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	1,90E-08	0	3,79E-08	0
Non-hazardous waste disposed (NHWD) [kg]	3,72E-01	9,38E-04	9,63E-04	0	6,47E-03	0	0	0	0	0	0	6,25E-05	0	1,25E+01	0
Radioactive waste disposed (RWD) [kg]	5,72E-04	7,58E-06	4,36E-08	0	2,84E-06	0	0	0	0	0	0	5,06E-07	0	2,83E-05	0








OUTPUT FLOWS 5 mm

OUTPUT FLOWS 5 mm															
Parameters	Product stage	Construction process 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	
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]	3,40E-04	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




ENVIRONMENTAL IMPACTS 6 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	2,26E+01	5,49E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	3,66E-02	0	2,10E-01	0
 Climate Change (fossil) [kg CO2 eq.]	2,25E+01	5,70E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	3,64E-02	0	2,28E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	8,02E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	7,53E-03	4,47E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	2,98E-04	0	6,55E-04	0
 Ozone depletion [kg CFC-11 eq.]	1,20E-06	6,63E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	4,42E-18	0	8,43E-16	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	2,15E-01	2,34E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	1,56E-04	0	1,63E-03	0
 Eutrophication freshwater [kg P eq.]	4,84E-04	1,68E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	1,12E-07	0	3,91E-07	0
 Eutrophication marine [kg N eq.]	5,14E-02	1,10E-03	3,21E-07	0	5,33E-04	0	0	0	0	0	0	7,33E-05	0	4,20E-04	0
 Eutrophication terrestrial [Mole of N eq.]	6,03E-01	1,22E-02	2,60E-06	0	1,38E-03	0	0	0	0	0	0	8,14E-04	0	4,62E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	1,38E-01	2,95E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	1,97E-04	0	1,27E-03	0
 Resource use, mineral and metals [kg Sb eq.]	1,44E-05	3,96E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	2,64E-09	0	2,04E-08	0
 Resource use, energy carriers [MJ]	2,56E+02	7,34E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,90E-01	0	2,98E+00	0
 Water scarcity [m³ world equiv.]	2,13E+00	4,93E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	3,29E-04	0	2,38E-02	0





RESOURCE USE 6 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	6,35E+00	4,13E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,75E-02	0	3,91E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	6,35E+00	4,13E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,75E-02	0	3,91E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	2,56E+02	7,35E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,90E-01	0	2,99E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	2,56E+02	7,35E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	4,90E-01	0	2,99E+00	0
 Input of secondary material (SM) [kg]	9,96E-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	2,06E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	2,42E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	5,18E-02	4,78E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	3,19E-05	0	7,53E-04	0














WASTE CATEGORIES 6 mm

Parameters	Product stage	Construction process 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	
 Hazardous waste disposed (HWD) [kg]	3,56E-07	3,42E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	2,28E-08	0	4,55E-08	0
 Non-hazardous waste disposed (NHWD) [kg]	4,45E-01	1,13E-03	9,63E-04	0	6,47E-03	0	0	0	0	0	0	7,50E-05	0	1,50E+01	0
 Radioactive waste disposed (RWD) [kg]	6,86E-04	9,10E-06	4,36E-08	0	2,84E-06	0	0	0	0	0	0	6,07E-07	0	3,39E-05	0








OUTPUT FLOWS 6 mm

Parameters	Product stage	Construction process 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	
 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]	3,40E-04	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

ENVIRONMENTAL IMPACTS 8 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	2,92E+01	7,32E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	4,88E-02	0	2,80E-01	0
 Climate Change (fossil) [kg CO2 eq.]	2,91E+01	7,60E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	4,85E-02	0	3,03E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	1,06E-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	1,00E-02	5,96E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	3,97E-04	0	8,73E-04	0
 Ozone depletion [kg CFC-11 eq.]	1,54E-06	8,84E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	5,89E-18	0	1,12E-15	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	2,84E-01	3,12E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	2,08E-04	0	2,18E-03	0
 Eutrophication freshwater [kg P eq.]	6,38E-04	2,24E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	1,49E-07	0	5,21E-07	0
 Eutrophication marine [kg N eq.]	6,81E-02	1,47E-03	3,21E-07	0	5,33E-04	0	0	0	0	0	0	9,77E-05	0	5,60E-04	0
 Eutrophication terrestrial [Mole of N eq.]	8,00E-01	1,63E-02	2,60E-06	0	1,38E-03	0	0	0	0	0	0	1,09E-03	0	6,16E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	1,83E-01	3,94E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	2,63E-04	0	1,70E-03	0
 Resource use, mineral and metals [kg Sb eq.]	1,88E-05	5,27E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	3,52E-09	0	2,72E-08	0
 Resource use, energy carriers [MJ]	3,32E+02	9,79E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	6,53E-01	0	3,98E+00	0
 Water scarcity [m³ world equiv.]	2,79E+00	6,57E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	4,38E-04	0	3,18E-02	0

RESOURCE USE 8 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	8,12E+00	5,50E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	3,67E-02	0	5,21E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	8,12E+00	5,50E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	3,67E-02	0	5,21E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	3,32E+02	9,80E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	6,54E-01	0	3,98E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	3,32E+02	9,80E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	6,54E-01	0	3,98E+00	0
 Input of secondary material (SM) [kg]	1,33E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	2,75E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	3,23E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	6,78E-02	6,37E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	4,25E-05	0	1,00E-03	0

WASTE CATEGORIES 8 mm














WASTE CATEGORIES 8 mm															
Parameters	Product stage	Construction process 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	
Hazardous waste disposed (HWD) [kg]	4,74E-07	4,56E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	3,04E-08	0	6,07E-08	0
Non-hazardous waste disposed (NHWD) [kg]	5,92E-01	1,50E-03	9,63E-04	0	6,47E-03	0	0	0	0	0	0	1,00E-04	0	2,00E+01	0
Radioactive waste disposed (RWD) [kg]	9,15E-04	1,21E-05	4,36E-08	0	2,84E-06	0	0	0	0	0	0	8,09E-07	0	4,52E-05	0

OUTPUT FLOWS 8 mm








OUTPUT FLOWS 8 mm															
Parameters	Product stage	Construction process 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	
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]	3,40E-04	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

REFLECTASOL on PARSOL 4 mm (Bronze, Green, Grey, Sapphire Blue, Dark Blue)

ENVIRONMENTAL IMPACTS 4 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	2,92E+01	3,66E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	2,44E-02	0	1,40E-01	0
 Climate Change (fossil) [kg CO2 eq.]	2,92E+01	3,80E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	2,42E-02	0	1,52E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	1,22E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	7,62E-03	2,98E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	1,99E-04	0	4,37E-04	0
 Ozone depletion [kg CFC-11 eq.]	1,86E-06	4,42E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	2,95E-18	0	5,62E-16	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	1,59E-01	1,56E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	1,04E-04	0	1,09E-03	0
 Eutrophication freshwater [kg P eq.]	7,65E-04	1,12E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	7,45E-08	0	2,60E-07	0
 Eutrophication marine [kg N eq.]	3,67E-02	7,33E-04	3,21E-07	0	5,33E-04	0	0	0	0	0	0	4,88E-05	0	2,80E-04	0
 Eutrophication terrestrial [Mole of N eq.]	4,30E-01	8,14E-03	2,60E-06	0	1,38E-03	0	0	0	0	0	0	5,43E-04	0	3,08E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	1,02E-01	1,97E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	1,31E-04	0	8,48E-04	0
 Resource use, mineral and metals [kg Sb eq.]	1,56E-05	2,64E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	1,76E-09	0	1,36E-08	0
 Resource use, energy carriers [MJ]	3,36E+02	4,90E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	3,26E-01	0	1,99E+00	0
 Water scarcity [m³ world equiv.]	1,81E+00	3,29E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	2,19E-04	0	1,59E-02	0

RESOURCE USE 4 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	6,28E+00	2,75E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	1,83E-02	0	2,61E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	6,28E+00	2,75E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	1,83E-02	0	2,61E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	3,36E+02	4,90E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	3,27E-01	0	1,99E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	3,36E+02	4,90E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	3,27E-01	0	1,99E+00	0
 Input of secondary material (SM) [kg]	1,25E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	2,44E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	2,86E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	4,39E-02	3,19E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	2,12E-05	0	5,02E-04	0

WASTE CATEGORIES 4 mm














WASTE CATEGORIES 4 mm															
Parameters	Product stage	Construction process 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	
Hazardous waste disposed (HWD) [kg]	2,96E-07	2,28E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	1,52E-08	0	3,03E-08	0
Non-hazardous waste disposed (NHWD) [kg]	2,95E-01	7,50E-04	9,63E-04	0	6,47E-03	0	0	0	0	0	0	5,00E-05	0	1,00E+01	0
Radioactive waste disposed (RWD) [kg]	5,56E-04	6,07E-06	4,36E-08	0	2,84E-06	0	0	0	0	0	0	4,04E-07	0	2,26E-05	0

OUTPUT FLOWS 4 mm








OUTPUT FLOWS 4 mm															
Parameters	Product stage	Construction process 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	
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]	3,40E-04	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

REFLECTASOL on PARSOL 5 mm (Bronze, Green, Grey, Sapphire Blue, Dark Blue)




ENVIRONMENTAL IMPACTS 5 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	3,58E+01	4,57E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	3,05E-02	0	1,75E-01	0
 Climate Change (fossil) [kg CO2 eq.]	3,58E+01	4,75E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	3,03E-02	0	1,90E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	1,48E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	9,52E-03	3,72E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	2,48E-04	0	5,46E-04	0
 Ozone depletion [kg CFC-11 eq.]	2,28E-06	5,53E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	3,68E-18	0	7,03E-16	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	1,97E-01	1,95E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	1,30E-04	0	1,36E-03	0
 Eutrophication freshwater [kg P eq.]	9,50E-04	1,40E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	9,32E-08	0	3,26E-07	0
 Eutrophication marine [kg N eq.]	4,55E-02	9,16E-04	3,21E-07	0	5,33E-04	0	0	0	0	0	0	6,10E-05	0	3,50E-04	0
 Eutrophication terrestrial [Mole of N eq.]	5,34E-01	1,02E-02	2,60E-06	0	1,38E-03	0	0	0	0	0	0	6,78E-04	0	3,85E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	1,26E-01	2,46E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	1,64E-04	0	1,06E-03	0
 Resource use, mineral and metals [kg Sb eq.]	1,92E-05	3,30E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	2,20E-09	0	1,70E-08	0
 Resource use, energy carriers [MJ]	4,12E+02	6,12E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,08E-01	0	2,49E+00	0
 Water scarcity [m³ world equiv.]	2,22E+00	4,11E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	2,74E-04	0	1,99E-02	0





RESOURCE USE 5 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	7,59E+00	3,44E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,29E-02	0	3,26E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	7,59E+00	3,44E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,29E-02	0	3,26E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	4,12E+02	6,13E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,08E-01	0	2,49E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	4,12E+02	6,13E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	4,08E-01	0	2,49E+00	0
 Input of secondary material (SM) [kg]	1,56E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	3,04E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	3,58E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	5,40E-02	3,98E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	2,66E-05	0	6,27E-04	0

WASTE CATEGORIES 5 mm














WASTE CATEGORIES 5 mm															
Parameters	Product stage	Construction process 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	
 Hazardous waste disposed (HWD) [kg]	3,70E-07	2,85E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	1,90E-08	0	3,79E-08	0
 Non-hazardous waste disposed (NHWD) [kg]	3,67E-01	9,38E-04	9,63E-04	0	6,47E-03	0	0	0	0	0	0	6,25E-05	0	1,25E+01	0
 Radioactive waste disposed (RWD) [kg]	6,94E-04	7,58E-06	4,36E-08	0	2,84E-06	0	0	0	0	0	0	5,06E-07	0	2,83E-05	0

OUTPUT FLOWS 5 mm








OUTPUT FLOWS 5 mm															
Parameters	Product stage	Construction process 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	
 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]	3,40E-04	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

REFLECTASOL on PARSOL 6 mm (Bronze, Green, Grey, Sapphire Blue, Dark Blue)




ENVIRONMENTAL IMPACTS 6 mm

Parameters	Product stage	Construction process 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	
 Climate Change [kg CO2 eq.]	4,24E+01	5,49E-01	2,70E-03	0	9,50E-02	0	0	0	0	0	0	3,66E-02	0	2,10E-01	0
 Climate Change (fossil) [kg CO2 eq.]	4,24E+01	5,70E-01	1,85E-03	0	8,08E-02	0	0	0	0	0	0	3,64E-02	0	2,28E-01	0
 Climate Change (biogenic) [kg CO2 eq.]	1,73E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Climate Change (land use change) [kg CO2 eq.]	1,14E-02	4,47E-03	2,13E-07	0	7,28E-02	0	0	0	0	0	0	2,98E-04	0	6,55E-04	0
 Ozone depletion [kg CFC-11 eq.]	2,70E-06	6,63E-17	6,82E-19	0	4,39E-09	0	0	0	0	0	0	4,42E-18	0	8,43E-16	0
 Acidification terrestrial and freshwater [Mole of H+ eq.]	2,35E-01	2,34E-03	6,55E-07	0	4,99E-04	0	0	0	0	0	0	1,56E-04	0	1,63E-03	0
 Eutrophication freshwater [kg P eq.]	1,14E-03	1,68E-06	1,90E-08	0	3,23E-05	0	0	0	0	0	0	1,12E-07	0	3,91E-07	0
 Eutrophication marine [kg N eq.]	5,44E-02	1,10E-03	3,21E-07	0	5,33E-04	0	0	0	0	0	0	7,33E-05	0	4,20E-04	0
 Eutrophication terrestrial [Mole of N eq.]	6,38E-01	1,22E-02	2,60E-06	0	1,38E-03	0	0	0	0	0	0	8,14E-04	0	4,62E-03	0
 Photochemical ozone formation - human health [kg NMVOC eq.]	1,51E-01	2,95E-03	8,52E-07	0	3,22E-04	0	0	0	0	0	0	1,97E-04	0	1,27E-03	0
 Resource use, mineral and metals [kg Sb eq.]	2,28E-05	3,96E-08	1,25E-11	0	2,55E-06	0	0	0	0	0	0	2,64E-09	0	2,04E-08	0
 Resource use, energy carriers [MJ]	4,89E+02	7,34E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,90E-01	0	2,98E+00	0
 Water scarcity [m³ world equiv.]	2,64E+00	4,93E-03	1,83E-04	0	3,27E-01	0	0	0	0	0	0	3,29E-04	0	2,38E-02	0





RESOURCE USE 6 mm

Parameters	Product stage	Construction process 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	
 Use of renewable primary energy (PERE) [MJ]	8,90E+00	4,13E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,75E-02	0	3,91E-01	0
 Primary energy resources used as raw materials (PERM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of renewable primary energy resources (PERT) [MJ]	8,90E+00	4,13E-01	2,20E-04	0	7,69E-01	0	0	0	0	0	0	2,75E-02	0	3,91E-01	0
Use of non-renewable primary energy (PENRE) [MJ]	4,89E+02	7,35E+00	1,59E-03	0	1,38E+00	0	0	0	0	0	0	4,90E-01	0	2,99E+00	0
 Non-renewable primary energy resources used as raw materials (PENRM) [MJ]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total use of non-renewable primary energy resources (PENRT) [MJ]	4,89E+02	7,35E+00	1,59E-03	0	1,48E+00	0	0	0	0	0	0	4,90E-01	0	2,99E+00	0
 Input of secondary material (SM) [kg]	1,88E+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of renewable secondary fuels (RSF) [MJ]	3,65E-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of non-renewable secondary fuels (NRSF) [MJ]	4,29E-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
 Use of net fresh water (FW) [m3]	6,41E-02	4,78E-04	4,39E-06	0	7,61E-03	0	0	0	0	0	0	3,19E-05	0	7,53E-04	0

WASTE CATEGORIES 6 mm

Parameters	Product stage	Construction process 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	
 Hazardous waste disposed (HWD) [kg]	4,44E-07	3,42E-07	1,31E-11	0	7,69E-11	0	0	0	0	0	0	2,28E-08	0	4,55E-08	0
 Non-hazardous waste disposed (NHWD) [kg]	4,40E-01	1,13E-03	9,63E-04	0	6,47E-03	0	0	0	0	0	0	7,50E-05	0	1,50E+01	0
 Radioactive waste disposed (RWD) [kg]	8,33E-04	9,10E-06	4,36E-08	0	2,84E-06	0	0	0	0	0	0	6,07E-07	0	3,39E-05	0

OUTPUT FLOWS 6 mm

Parameters	Product stage	Construction process 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	
 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]	3,40E-04	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

Information on biogenic carbon content

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

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

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

LCA results interpretation for REFLECTASOL® Clear 6 mm

The following figure refers to a functional unit 1 m² of pyrolytic CVD coated glass product.



Global Warming Potential (Climate Change) (GWP)

When analyzing the above figure for GWP, it can clearly be seen that the majority of contribution to this environmental impact is from the production modules (A1 – A3). This is primarily because the sources of greenhouse gas emissions are predominant in this part of the life cycle. CO₂ is generated upstream from the production of electricity and is also released on site by the combustion of natural gas. Production of one of raw material will generate the second highest percentage of greenhouse gas emissions. We can see that other sections of the life cycle also contribute to the GWP; however, the production modules contribute to over 90% of the contribution.

Non-renewable resources consumptions

We can see that the consumption of non – renewable resources is once more found to have the highest value in the production modules. This is because a large quantity of natural gas is consumed within the factory. The contribution to this impact from the other modules is very small and primarily due to the non – renewable resources consumed during transportation.

Energy Consumptions

As we can see, modules A1 – A3 have the highest contribution to total energy consumption. Energy in the form of electricity and natural gas is consumed in a vast quantity during the manufacture of glass so we would expect the production modules to contribute the most to this impact category.

Water Consumption

As we don't use water in any of the other modules (A4 – A5, C1 – C4), we can see that there is no contribution to water consumption. For the production phase, water is used within the manufacturing facility and therefore we see the highest contribution here. However, we recycle a lot of the water on site so the contribution is still relatively low. We also use water during the use phase to cleaning the product.

Waste Production

Waste production does not follow the same trend as the above environmental impacts. The largest contributor is the end of life module. This is because 100% of the product is sent to landfill. However, there is still an impact associated with the production module since we do generate waste on site.

Health characteristics

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

Additional Environmental Information

Saint-Gobain's environmental policy

Saint-Gobain has been setting environmental objectives for more than 10 years now. Existing objectives are set for key milestones in 2025, 2030 and 2050, in line with our EHS charter, our EHS policies, as well as the Group's CSR roadmap and long term ambition. On 2030 targets Saint-Gobain has defined an objective for LCA:

All our product ranges and systems are covered with Life Cycle Assessments (LCAs) and all published results (e.g. in the form of Environmental Product Declarations, EPDs) are third party verified. This objective is valid for all products manufactured by Saint-Gobain or traded goods that enter into the systems sold by Saint-Gobain.

The ambition of Saint-Gobain is to develop more and more sustainable solutions and to provide robust proofs about the sustainability performance of its products and systems. To this end, Life Cycle Assessments (LCAs) and associated Environmental Product Declarations (EPDs) have been for many years at the heart of Saint-Gobain strategy.

Our products' contribution to Sustainable Buildings

Saint-Gobain encourages sustainable construction and develops innovative solutions for new and renovated buildings that are energy efficient, comfortable, healthy and esthetically superior, while at the same time protecting natural resources.

RECYCLED CONTENT

(Required for LEED v4 Building product disclosure and optimization - sourcing of raw materials)

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.

In the future, Saint-Gobain Glass intends to continue the increase of recycled material in its products, especially when recycling building post-consumer cullet glass dismantling and recycling networks will be available in every country.

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