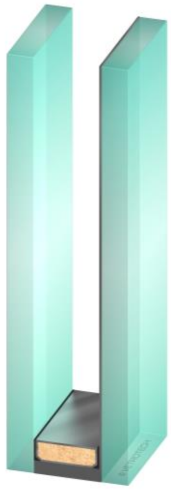
ENVIRONMENTAL PRODUCT DECLARATION

In accordance with EN 15804 and ISO 14025

VETROFLAM IGU

VETROFLAM 60 DGU: VF6-15-4
VETROFLAM 60 DGU: VF6-15-4t
VETROFLAM 60 DGU: VF6-15-6t
VETROFLAM 60 DGU: VF6-15-44.2 (laminated safety glass)
VETROFLAM 60 DGU: VF6-15-VF6
VETROFLAM 60 TGU: VF6-14-4t-14-VF6



EW60 (Radiation Control): Fire resistant glazing with tested Radiation Control and Integrity for 60 minutes

Programme : **The international EPD®System, www.environdec.com**
Programme operator: **EPD International AB**
Publication date: **2019-12-17**
Valid until: **2024-12-17**

EPD Registration number
S-P-01742

Table of content

Programme information

Programme	The International EPD® System EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden More information at www.environdec.com
EPD® registration number	S-P-01742
Programme category rules (PCR)	EN 15804 as the core PCR and PCR for construction products and construction services issued by the International EPD System (PCR 2012:01 Construction products and construction services, version 2.3 2018-11-15)
CPC Classification	37115 "safety glass"
PCR review was conducted by	The Technical Committee of the International EPD® System. Contact via info@environdec.com
Owner of the declaration	VETROTECH SAINT-GOBAIN INTERNATIONAL AG Bernstrasse 43, 3175 Flamatt, Switzerland Maureen Bernard. Email**:** maureen.bernard@saint-gobain.com
Manufacturer	Vetrotech Saint-Gobain France, Z.I. de Condren 27000 Tergnier, France
Independent third-party verification of the declaration and data, according to ISO 14025:2006	☐ EPD process certification ☒ EPD verification
EPD® prepared by	Elodie Ducourthial (Saint-Gobain Glass) Contact: Elodie.ducourthial@saint-gobain.com
Third party verifier	Elena Antuña-Bernardo, EA consultant Elena@eaconsultant.eu
Approved by	The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier	☐ Yes ☒ No
Declaration issued	**2019-12-17**
Valid until	**2024-12-17**

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.

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.

Product description

Product description and description of use

The Environmental Product Declaration (EPD) describes the environmental impacts of 1m² of VETROFLAM IGU, which is a fire resistant laminated glass.

SPECIFIC MAKE-UPS DESCRIBED IN THIS EPD

VETROFLAM IGU is a fire resistant and Insulating Glass Unit (IGU) for interior and exterior applications: either as a Double Glazed Unit (DGU) or Triple Glazed Unit (TGU) according to European standard EN 1279. It will then be called VETROFLAM - DGU or VETROFLAM - TGU. The contained VETROFLAM fire resistant glass in conformance with either EN12150 or EN14179 has EW integrity and radiation control properties according to European standard EN 13501-2 up to 60 minutes. It will protect life and property in living places for the specific time frame.

By adding a laminated safety glass including a PVB layer, fall-through protection in the event of breakage of the VETROFLAM unit can be included as an option.[1]
VETROFLAM can also be used as monolithic fire resistant glass without an insulation glass unit. This type of glass is described in a separate EPD.
In this Environmental Product Declaration, one square meter of 5 different glazing configurations will be analyzed:

1. VETROFLAM 60 DGU: VF6-15-4
2. VETROFLAM 60 DGU: VF6-15-4t
3. VETROFLAM 60 DGU: VF6-15-6t
4. VETROFLAM 60 DGU: VF6-15-44.2 (laminated safety glass)
5. VETROFLAM 60 DGU: VF6-15-VF6
6. VETROFLAM 60 TGU: VF6-14-4t-14-VF6

VETROFLAM Range

Products of the VETROFLAM range are monolithic fire-resistant glasses made of tempered safety glass that offer one-sided fire-resistance in its basic makeup. Two-sided fire-resistance is provided with the product VETROFLAM 2S, or if two VETROFLAM panes are combined in a laminated glass or in an Insulating glass unit IGU. In the event of fire, their special heat-reflective coating provides integrity (E) and offers partial heat radiation reduction (W) for 30 to 60 minutes, and the glass remains transparent. VETROFLAM products can be configured to the required fire resistance from one side only or from both sides. It is also ideal for renovation projects.

[1] With coating on the outer pane

PERFORMANCE DATA

The range of VETROFLAM is large. A few examples of configurations for each of the products are described in this EPD.

Discover more information about the VETROFLAM range on www.vetrotech.com.

In this Environmental Product Declaration, one square meter of 6 different glazing configurations will be analyzed:

	N°1	N° 2	N° 3	N° 4	N° 5	N° 6
	Vetroflam 60 CLIMAPLUS VF6-15-4	Vetroflam 60 CLIMAPLUS VF6-15-4t	Vetroflam 60 CLIMAPLUS VF6-15-6t	Vetroflam 60 CLIMAPLUS VF6-15-44.2	Vetroflam 60 CLIMAPLUS 6 VF -15 - VF 6	Vetroflam 60 CLIMATOP 6VF -14 - 4t- 14 - VF 6
Details for this specific calculation	**1x Coating**	**1x Coating**	**1x Coating**	**1x Coating**	**2x Coating**	**2x Coating**
Mechanical properties						
Nominal thickness (mm)	**25**	**25**	**27**	**30**	**24**	**44**
Weight (kg/m^2)	**25**	**25**	**30**	**36**	**30**	**40**
Visible parameters						
Light transmittance (LT) %	**81**	**81**	**81**	**80**	**80**	**73**
Light reflection (RLe/RLi) (%)	**12 / 11**	**12 / 11**	**11 / 11**	**11 / 11**	**8 / 8**	**14 / 14**
Thermal transmission						
Ug value	**1,1**	**1,1**	**1,1**	**1,1**	**1,1**	**0,6**
Thermal properties						
Energy transmittance (ET) %	**58**	**58**	**57**	**53**	**52**	**46**
Energy reflection (Ree/Rei) %	**26 / 27**	**26 / 27**	**26 / 26**	**25 / 21**	**28 7 28**	**30 / 31**
Solar factor g	**0,61**	**0,61**	**0,61**	**0,60**	**0,61**	**0,53**
Safety properties						
Class EN 356 (protection against vandalism and burglary)	**NPD**	**NPD**	**NPD**	**P2A**	**NPD**	**NPD**
Acoustics properties						
Rw(C;Ctr) (real test)	**33 (-1; -4)**	**33 (-1; -4)**	**30 (-1; -5) calculated**	**37 (-3; -6) calculated**	**30 (-1; -5) calculated**	**34 (-3; -7) calculated**

The performance data are given according to the EN 410-2011 standard for thermal and visible parameters and following the EN 12758 for the acoustic data. Fire performance data is determined according to EN13823, EN1363-1, EN1363-2 and associated test standards. Fire classification is following EN15998, EN13501-1 and EN13501-2.

Declaration of the main product components and/or materials

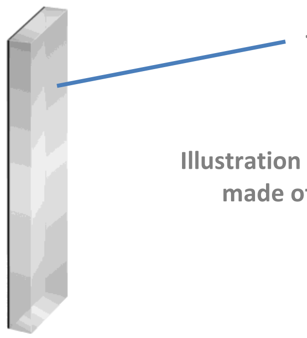


Illustration shows a VETROFLAM made of toughened glass

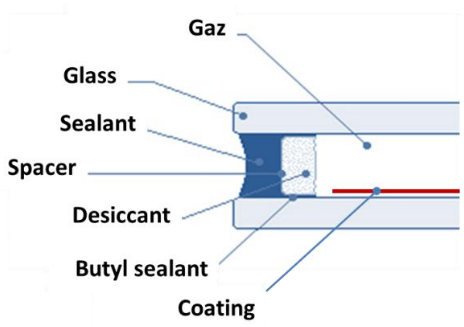


Illustration of DGU composition

	N° 1	N° 2	N° 3	N° 4	N° 5	N° 6	
	Vetroflam 60 CLIMAPLUS VF6-15-4	Vetroflam 60 CLIMAPLUS VF6-15-4t	Vetroflam 60 CLIMAPLUS VF6-15-6t	Vetroflam 60 CLIMAPLUS VF6-15-44.2	Vetroflam 60 CLIMAPLUS 6 VF -15 - VF 6	Vetroflam 60 CLIMATOP 6VF -14 - 4t- 14 - VF 6	
	1x Coating	1x Coating	1x Coating	1x Coating	2x Coating	2x Coating	CAS number
Glass	98	98	98	96	98	97	CAS number 65997-17-3, EINECS number 266-046-0
Coating	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	Metal Oxides, which bring thermal properties to the glazing
Butyl sealant	< 0,1	< 0,1	< 0,1	< 0,1	< 0,1	< 0,1	Polymer
Sealant Silicone	1,9	1,9	1,6	1,3	1,6	2,8	Polymer
Spacer bar (aluminium or steel)	< 1	< 1	< 1	< 1	< 1	< 1	Article
Desiccant	< 1	< 1	< 1	< 1	< 1	< 1	CAS number 63148-65-2
Gas	0,1	0,1	0,1	0,1	0,1	0,1	Dehydrated argon
PVB interlayer	no PVB	no PVB	no PVB	2,3	no PVB	no PVB	CAS number 631 48-65-2 EINECS number 272-808-3

The above list gives the main components of the product, including those contributing to more than 5% of any environmental impact, if any. The percentages are given for the glass make-ups mentioned in this EPD; the % may vary depending on the glazing configuration.

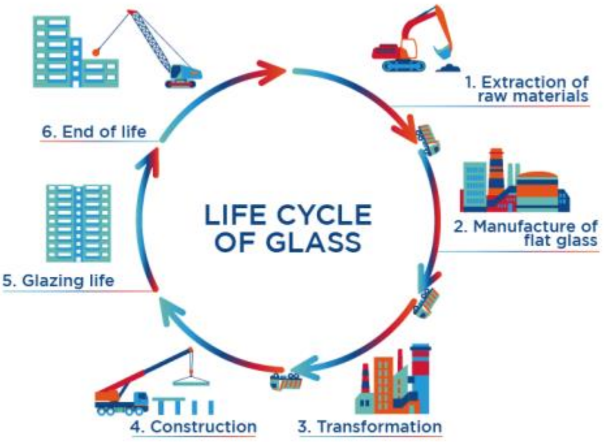
LCA calculation information

FUNCTIONAL UNIT / DECLARED UNIT	One square meter of VETROFLAM IGU to be incorporated into a building. The impacts of installation are not taken into account.
SYSTEM BOUNDARIES	Cradle to gate. Mandatory Stages = A1-A3
EXCLUDED LIFE CYCLE STAGES	Excluded stages = A4-A5; B1-B7; C1-C4 Optional stage = D
REFERENCE SERVICE LIFE (RSL)	n/a. Boundaries are cradle to gate
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. Substances of Very High Concern (SVHC), as defined in the REACH Regulation (article 57), in a concentration above 0.1% by weight, in glass final products, shall be included in the Life Cycle Inventory and the cut-off rules shall not apply. All inputs and outputs to the processes for which data is available were included in the calculation. No core processes were excluded. Particular care was taken to include materials and energy flows known to have the potential to cause significant emissions into air, water and soil related to the environmental indicators of the governing PCR.
ALLOCATIONS	No allocation. Attribution of total inputs and outputs are based on m² of production for Vetroflam. Allocation of background data (energy and materials) taken from the GaBi 2016 databases is documented online at http://www.gabi-software.com/support/gabi/
GEOGRAPHICAL COVERAGE AND TIME PERIOD	Primary production data is from the year 2014 VETROTECH SAINT-GOBAIN France. The shares of the different production sites are from 2019. LCI of SGG PLANICLEAR, and SGG STADIP are coming from background data base used for their EPD publication. The information was established over the year 2014. The information collected comes from the European sites producing float glass and laminated glass (SAINT-GOBAIN GLASS INDUSTRY), European transformation plants (GLASSOLUTIONS) and the processor sites from VETROTECH SAINT-GOBAIN..
BACKGROUND DATA SOURCE	GaBi data not older than 10 years were used to evaluate the environmental impacts.
SOFTWARE	Gabi 8 - GaBi envision The glass LCA model is based on an interactive GaBi tool which was verified separately in 2016. SGG_EPD tool for Building glass 1m2_2016-11-23.gmbx Initial tool was updated with most recent version data base (GaBi 8 service pack 36)

Reading note: In this document, the thousand separator and the decimal mark follow the International System; English version, *i.e* 1 234.56

Life cycle stages

Diagram of the Life Cycle



Relevant stages: as this is a cradle to gate the only relevant stages are A1-A3.

In conformity with EN 15804+A1, production step includes:

- Extraction and processing of raw materials;
- Generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport;
- Transportation up to the factory gate and internal transport;
- Manufacturing of ancillary materials or pre-products;
- Manufacturing of product;
- Processing up to the end-of-waste state or disposal of final residues including any packaging not leaving the factory gate with the product.

All glasses are transported in specific trucks (inloaders), with returnable racks. Other components, like are delivered in drums, which are return to the supplier.

A description of the relevant stages is given in the figures below.

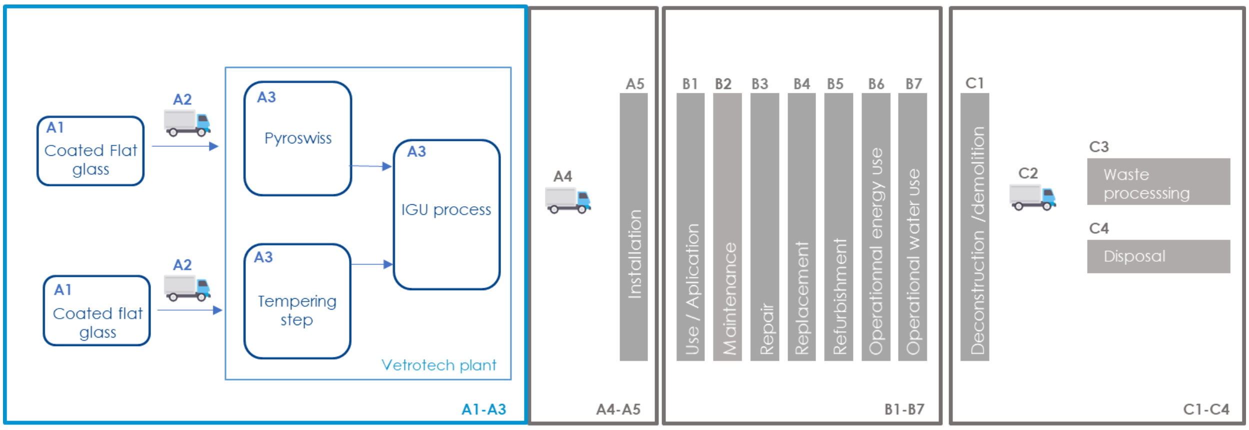


Figure 1 : Relevant LCA steps for VETROFLAM IGU Steps in blue are declared in this EPD, steps in grey are not declared.

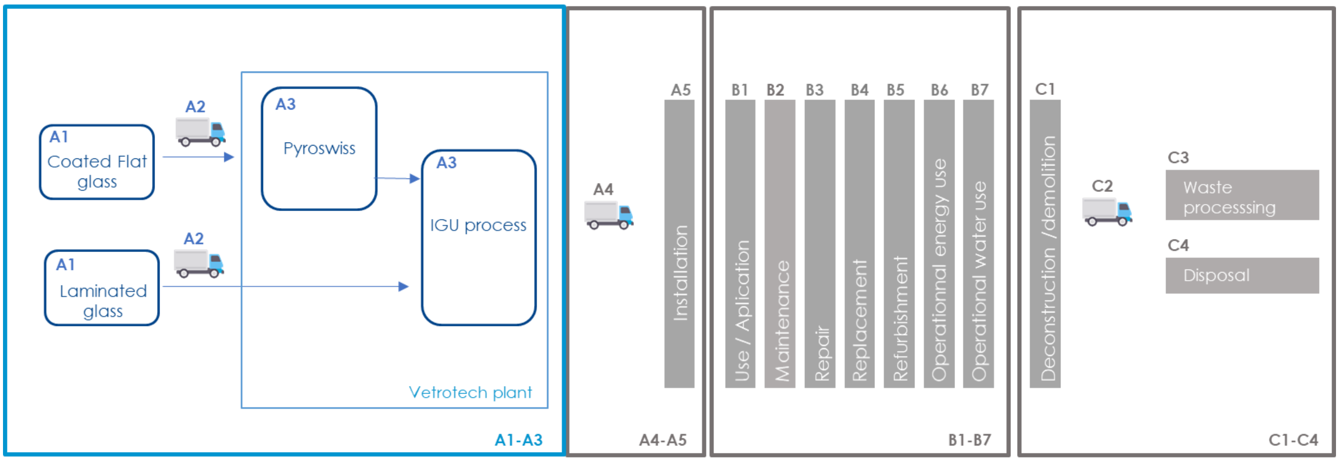


Figure 2 : Relevant LCA steps for VETROFLAM IGU with laminated glass. Steps in blue are declared in this EPD, steps in grey are not declared.

Production			Installation		Use phase							End-of-Life				Next product system
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C3	C3	C4	D
Raw materials (extraction, processing, recycled material)premières	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishement	Operational; energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse, recovery or recycling	Disposal	Reuse, recovery or recycling potential
X	X	X	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA

Table 1: Modules of the production life cycle included in the EPD (X = declared modules ; MNA = modules not assessed)

Product stage, A1-A3

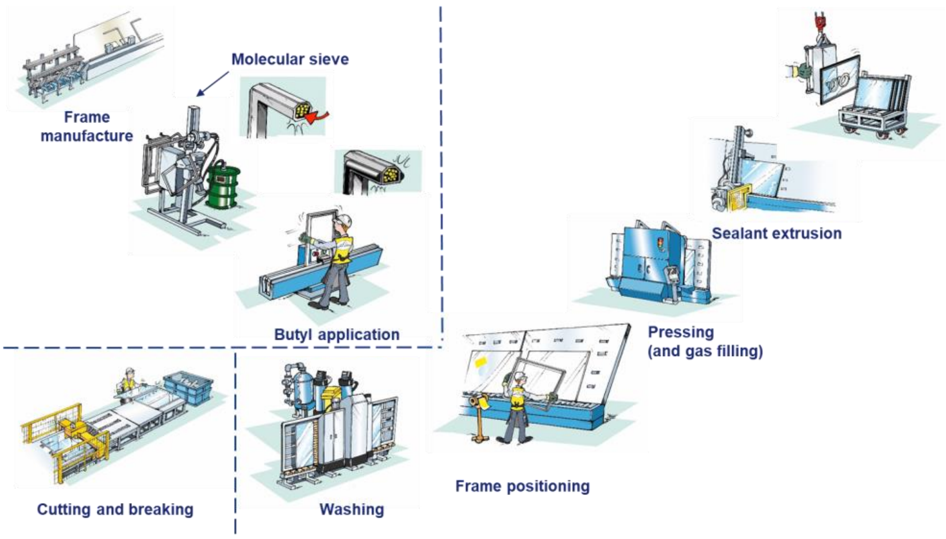
Description of the stage: For VETROFLAM IGU, A1 to A3 represents the production of a glass unit in the VETROTECH plant, based on the use of VETROFLAM with the transportation to the processing site.

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

Flat glass is a sheet of soda-lime glass made by floating molten glass on a bed of molten tin. This method gives the sheet uniform thickness and very flat surfaces.

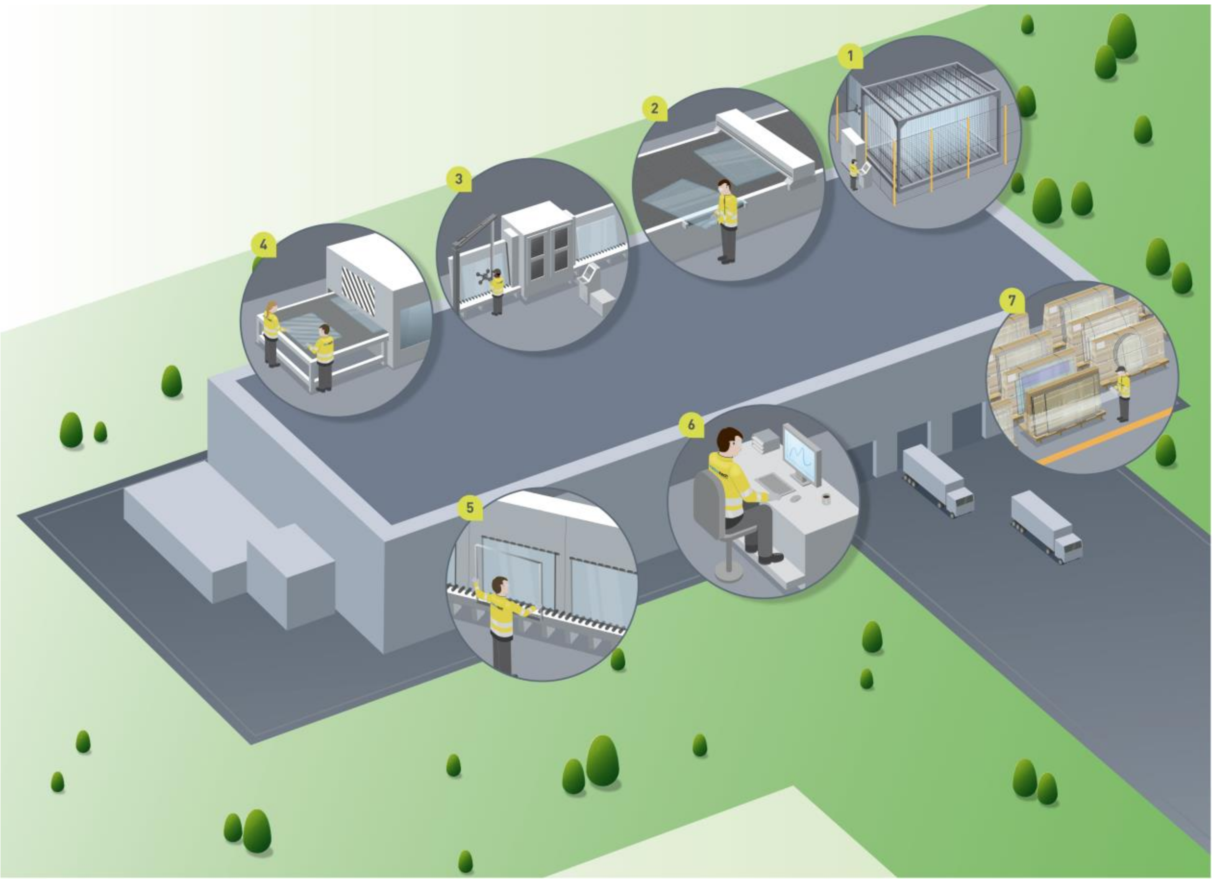
Laminated glass is an assembly of two flat glasses and a PVB foil. To ensure the good adhesion between the glass and the film, the assembly is manufactured in an autoclave (at high pressure and temperature).

Production of Insulated Glass Unit (IGU)



1. **GLASS PREPARATION:** Glass plates are cut to be at the good dimension for the final product. Glasses are cleaned and dried.
2. **PRODUCTION OF COMPONENTS:** In parallel the spacer is prepared. It arrives to the line as a several meters long bar. This bar is folded until the frame size of the glazing. The frame is filled with molecular sieve (desiccant) and then manually closed by a connector. The frame then passes between two injectors of butyl sealant which cover the entire edge.
3. **IGU PREPARATION:** The last step is to assemble the glasses and frame. The frame is positioned between the two glasses (positioning of the frame). The two glasses and the frame enter a chamber where they are assembled under pressure, and where the gas is injected into the cavity (pressure and injection of gas). After this operation, the secondary seal is applied around the double glazing (extrusion of the sealant). The glazing is then stored to allow crosslinking of the seal (conditioning).

VETROFLAM manufacturing process flow diagram



1. **RECEPTION AND STORAGE**: Sheets of glass arrive from float glass plants by special trucks (inloaders) and are stored in our plants.
2. **CUTTING**: The right sheet of glass is automatically taken from the glass storage and cut-to-size according the customer's requirements (cut to order).
3. **EDGE TREATMENT**: Glass edges are treated to the specific profile and polished in order to satisfy the prescribed quality and prepare the next processing step.
4. **TEMPERING**: All glasses are tempered to a high level to ensure the overall performance in terms of fire resistance. Break resistance and accidental impact safety aspects are also granted.
   HEAT SOAK TEST (optional): fast ageing test that is used to eliminate the risk of spontaneous breakages of heat-treated glass caused by nickel sulphide inclusions.
5. **POST PROCESSING (optional)**: PYROSWISS glass can then be combined into many different make-ups in order to bring multifunctionality to our ready to install glazing unit.
6. **QUALITY CONTROL**: All glass units are inspected and checked to regulatory requirements and quality standards before being packed on stillages. That gives us the possibility to meet the customer needs.
7. **STORAGE AND TRANSPORT**: All glass units are packed on stillages and dispatched to the final place of application.

Use of sustainable light bulbs, recycling of broken glass culets, recycling of cardboard, metal, timber and 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.

LCA results

The table below present the environmental impacts associated with the production of one square meter of VETROFLAM IGU. This is a Cradle-to-Gate EPD. The environmental impacts of all the other stages in the life cycle of VETROFLAM IGU are not declared (INA).

ENVIRONMENTAL IMPACTS VETROFLAM 60 DGU VF 6-15-4

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	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	4.38E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas (carbon dioxide) which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	5.96E-10	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	2.05E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	5.39E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients and the associated adverse biological effects.														
Photochemical ozone Creation potential (POCP) *kg Ethene equiv/FU*	1.23E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	3.90E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	5.30E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE VETROFLAM 60 DGU VF 6-15-4

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 excluding renewable primary energy resources used as raw materials - *MJ/FU*	1.28E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	1.28E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	1.05E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.05E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	2.72	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	3.90E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES VETROFLAM 60 DGU VF 6-15-4

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 *kg/FU*	1.71E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	1.97	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	2.03E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 60 DGU VF 6-15-4

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 *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	7.84E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS VETROFLAM 60 DGU VF 6-15-4T

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				
	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
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	4.75E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas (carbon dioxide) which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	6.43E-10	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	2.16E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	5.83E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients and the associated adverse biological effects.														
Photochemical ozone Creation potential (POCP) *kg Ethene equiv/FU*	1.32E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	4.04E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	5.57E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE VETROFLAM 60 DGU VF 6-15-4T

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 excluding renewable primary energy resources used as raw materials - *MJ/FU*	1.39E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	1.39E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	1.14E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.14E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	2.87	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	4.57E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES VETROFLAM 60 DGU VF 6-15-4T

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 *kg/FU*	1.77E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	3.29	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	2.31E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 60 DGU VF 6-15-4T

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 *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	8.26E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS VETROFLAM 60 DGU VF 6-15-6T

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	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	5.42E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas (carbon dioxide) which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	6.61E-10	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	2.50E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	6.87E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients and the associated adverse biological effects.														
Photochemical ozone Creation potential (POCP) *kg Ethene equiv/FU*	1.52E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	4.53E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	6.38E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE VETROFLAM 60 DGU VF 6-15-6T

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				
	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 excluding renewable primary energy resources used as raw materials - *MJ/FU*	1.43E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	1.43E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	1.23E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.23E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	3.44	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	4.75E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES VETROFLAM 60 DGU VF 6-15-6T

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 *kg/FU*	1.97E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	3.46	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	2.32E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 60 DGU VF 6-15-6T

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 *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	9.85E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS VETROFLAM 60 DGU VF 6-15-44.2

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	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	6.47E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas (carbon dioxide) which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	2.65E-9	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	2.81E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	7.46E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients and the associated adverse biological effects.														
Photochemical ozone Creation potential (POCP) *kg Ethene equiv/FU*	1.75E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	4.79E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	8.09E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE VETROFLAM 60 DGU VF 6-15-44.2

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 excluding renewable primary energy resources used as raw materials - *MJ/FU*	1.56E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	1.56E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	1.34E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.34E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	3.71	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	4.75E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES VETROFLAM 60 DGU VF 6-15-44.2

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 *kg/FU*	2.41E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	2.36	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	2.10E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 60 DGU VF 6-15-44.2

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 *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.87	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS VETROFLAM 60 DGU VF 6-15-VF 6

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	
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	5.51E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas (carbon dioxide) which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	8.93E-10	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	2.57E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	6.83E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients and the associated adverse biological effects.														
Photochemical ozone Creation potential (POCP) *kg Ethene equiv/FU*	1.54E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	4.58E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	6.64E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE VETROFLAM 60 DGU VF 6-15-VF 6

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 excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.02E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.02E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	1.62E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.62E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	3.44	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	6.13E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES VETROFLAM 60 DGU VF 6-15-VF 6															
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 *kg/FU*	1.98E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	2.38	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	3.78E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 60 DGU VF 6-15-VF 6

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 *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	9.85E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

ENVIRONMENTAL IMPACTS VETROFLAM 60 DGU VF 6-14-4T-14-VF 6

Parameters	Product stage	Construction process stage		Use stage							End-of-life stage				
	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
Global Warming Potential (GWP) - *kg CO_2 equiv/FU*	7.58E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	The global warming potential of a gas refers to the total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas (carbon dioxide) which is assigned a value of 1.														
Ozone Depletion (ODP) *kg CFC 11 equiv/FU*	1.17E-9	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine and/or bromine containing compounds (chlorofluorocarbonsor halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
Acidification potential (AP) *kg SO_2 equiv/FU*	3.44E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Acid depositions have negative impacts on natural ecosystems and the man-made environment incl. buildings. The main sources for emissions of acidifying substances are agriculture and fossil fuel combustion used for electricity production, heating and transport.														
Eutrophication potential (EP) *kg $(PO_4)^{3-}$ equiv/FU*	9.27E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Excessive enrichment of waters and continental surfaces with nutrients and the associated adverse biological effects.														
Photochemical ozone Creation potential (POCP) *kg Ethene equiv/FU*	2.10E-2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Chemical reactions brought about by the light energy of the sun. The reaction of nitrogen oxides with hydrocarbons in the presence of sunlight to form ozone is an example of a photochemical reaction.														
Abiotic depletion potential for non-fossil resources (ADP-elements) - *kg Sb equiv/FU*	5.78E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Abiotic depletion potential for fossil resources (ADP-fossil fuels) - *MJ/FU*	9.03E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
	Consumption of non-renewable resources, thereby lowering their availability for future generations.														

RESOURCE USE VETROFLAM 60 DGU VF 6-14-4T-14-VF 6

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 excluding renewable primary energy resources used as raw materials - *MJ/FU*	2.45E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) *MJ/FU*	2.45E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	1.99E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy used as raw materials *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) - *MJ/FU*	1.99E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of secondary material *kg/FU*	4.59	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable secondary fuels- *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable secondary fuels - *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Use of net fresh water - *m^3/FU*	7.78E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

WASTE CATEGORIES VETROFLAM 60 DGU VF 6-14-4T-14-VF 6

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 *kg/FU*	2.79E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Non-hazardous (excluding inert) waste disposed *kg/FU*	4.83	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Radioactive waste disposed *kg/FU*	4.29E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 60 DGU VF 6-14-4T-14-VF 6

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 *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for recycling *kg/FU*	1.33	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery *kg/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Exported energy. detailed by energy carrier *MJ/FU*	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

LCA results interpretation

In the production of VETROFLAM 60 DGU VF6-15-4, most of the impacts are linked to the tempering process.

VETROFLAM is made of special, processed tempered glass.
Most of the CO_2 emissions are linked to the glass production phase.
Water consumption is linked to the electrical energy used for the transformation process of the glass and the tempering process.

	Environnemental impacts (A1-A3) VETROFLAM 60 DGU : VF6-15-4	Unit
Global warming	4.38E+1	kg CO_2 equiv/FU
Non-Renewable resources consumption[1]	5.30E+2	MJ/FU
Energy consumption[2]	1.18E+3	MJ/FU
Water consumption[3]	3.90E-1	m^3/FU
Waste production[4]	2.17	kg/FU

[1]: This indicator corresponds to the abiotic depletion potential of fossil resources.
[2]: This indicator corresponds to the total use of primary energy (renewable and non-renewable)
[3]: This indicator corresponds to the use of fresh net water.
[4]: This indicator corresponds to the sum of hazardous. non-hazardous and radioactive waste disposed.

Health characteristics

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).

The sealant of VETROFLAM IGU is made of organic materials which have been tested regarding their VOC emissions (following ISO 16000 standard):

- Polysulfide: total VOC after 28 days < 38 µg/m3 (Eurofins report G07104)
- Polyurethane: total VOC after 28 days < 4 µg /m3 (Eurofins report G08363).

If the glass is laminated, a PVB layer is included in the glazing. The VOC emissions test (following ISO 16000 standard) rank the PVB A+ (highest rank) following the French regulation (Eurofins report G10504).

- Total VOC after 28 days < 200 µg/m^3
- Formaldehyde after 28 days < 10 µg/m^3

Additional Environmental Information

Disposal considerations

Disposal may be in accordance with local and national legal requirements for the disposal of glass waste. The local regulations for discharging waste water in sewage treatment plants must be taken into consideration for water-soluble material. In the EU, waste code 200102[2] is applied (Test report 66988008 Eurofins).

Saint-Gobain's environmental policy

Saint-Gobain's environmental vision is to ensure the sustainable development of its activities, while preserving the environment from the impacts of its processes and services throughout their life cycle. The Group thus seeks to ensure the preservation of resources, meet the expectations of its relevant stakeholders, and offer its customers the highest added value with the lowest environmental impact.

The Group has set two long-term objectives: zero environmental accidents and a minimum impact of its activities on the environment. Short and medium-term goals are set to address these two ambitions. They concern five environmental areas identified by the Group: raw materials and waste; energy, atmospheric emissions and climate; water; biodiversity; and environmental accidents and nuisance.

Saint-Gobain's long term objectives:

	Non recovered waste (2010-2025): -50% Long-term: zero non-recovered waste
	Energy consumption: -15% (2010-2025) CO_2 emissions: -20% (2010-2025) Emissions of NOx. SO_2 and dust: -20% for each emissions category (2010-2025)
	Water discharge: -80% (2010-2025) Long-term: zero industrial water discharge in liquid form
	2025: promote the preservation of natural areas at Company sites as much as possible
	2025: all environmental events are recorded. registered and investigated

More information on our website: www.saint-gobain.com and our Registration Document.

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.

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

RECYCLED CONTENT

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

[2] EWC code 200102 – glass – Absolute Non-hazardous

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-off, 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 intent to discard it and therefore it would never have entered the solid waste stream.

Pre-consumer cullet	~7%
Post-consumer cullet	< 1%

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.

RESPONSIBLE SOURCING

(Required for BREEAM International new construction 2013 – MAT 03 Responsible sourcing)

Romont (Switzerland) and Namyslow (Poland) Vetrotech Saint-Gobain factories are certified ISO 14001. Kinon Aachen (Germany) is certified ISO 50001 (Energy management).

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

All internal Saint-Gobain Glass quarries are certified ISO 14001 like for example 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).

References

EN 15804 + A1(2013) – Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction product.
PCR 2012:01 Construction products and construction services, version 2.3 2018-11-15
GPI 3.0 - GENERAL PROGRAMME INSTRUCTIONS FOR THE INTERNATIONAL EPD® SYSTEM
EN 410 - Glass in building - Determination of luminous and solar characteristics of glazing
EN 1363-1 - Fire resistance tests - Part 1: General Requirements
EN 1363-2 - Fire resistance tests - Part 2: Alternative and additional procedures
EN 12758 - Glazing and airborne sound insulation - Product descriptions and determination of properties
EN 13501-1 - Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13501-2 - Fire classification of construction products and building elements - Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13823 - Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 14449 - Glass in building - Laminated glass and laminated safety glass - Evaluation of conformity/Product standard
EN 15998 - Glass in building - Safety in case of fire, fire resistance - Glass testing methodology for the purpose of classification