



# ENVIRONMENTAL PRODUCT DECLARATION

*In accordance with EN 15804 and ISO 14025*

## VETROFLAM

VETROFLAM 30 VF10  
VETROFLAM 60 VF12  
VETROFLAM 2S 30

**EW30 / EW60 (Radiation Control): Fire  
resistant glazing with tested Radiation  
Control and Integrity for 30 or 60 minutes**

Programme :  
Programme operator:  
Publication date:  
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The international EPD®System, [www.environdec.com](http://www.environdec.com)  
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**EPD®**

EPD Registration number  
S-P-01736

**vetrotech**  
SAINT-GOBAIN

## Table of content

Table of content.....	2
Programme information .....	3
Product description.....	4
Product description and description of use .....	4
Declaration of the main product components and/or materials .....	6
LCA calculation information .....	7
Life cycle stages .....	8
Product stage, A1-A3 .....	10
LCA results .....	12
VETROFLAM 30 VF10 .....	13
VETROFLAM 60 VF12 .....	17
VETROFLAM 2S 30.....	21
LCA results interpretation .....	25
Health characteristics.....	25
Additional Environmental Information .....	26
Disposal considerations .....	26
Saint-Gobain’s environmental policy .....	26
Our products’ contribution to Sustainable Buildings .....	26
References .....	28

## Programme information

<b>Programme</b>	The International EPD® System EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden More information at <a href="http://www.environdec.com">www.environdec.com</a>
<b>EPD® registration number</b>	S-P-01736
<b>Programme category rules (PCR)</b>	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)
<b>CPC Classification</b>	37115 “safety glass”
<b>PCR review was conducted by</b>	The Technical Committee of the International EPD® System. Contact via <a href="mailto:info@environdec.com">info@environdec.com</a>
<b>Owner of the declaration</b>	VETROTECH SAINT-GOBAIN INTERNATIONAL AG Bernstrasse 43, 3175 Flamatt, Switzerland Maureen Bernard. Email: <a href="mailto:maureen.bernard@saint-gobain.com">maureen.bernard@saint-gobain.com</a>
<b>Manufacturer</b>	VETROTECH Saint-Gobain France, Condren
<b>Independent third-party verification of the declaration and data, according to ISO 14025:2006</b>	<input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification
<b>EPD® prepared by</b>	Elodie Ducourthial (Saint-Gobain Glass) Contact: <a href="mailto:Elodie.ducourthial@saint-gobain.com">Elodie.ducourthial@saint-gobain.com</a>
<b>Third party verifier</b>	Elena Antuña-Bernardo, EA consultant <a href="mailto:Elena@eaconsultant.eu">Elena@eaconsultant.eu</a>
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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](http://www.environdec.com).

# Product description

## Product description and description of use

The Environmental Product Declaration (EPD) describes the environmental impacts of 1m<sup>2</sup> of VETROFLAM, which is a fire resistant laminated glass.

### SPECIFIC MAKE-UPS DESCRIBED IN THIS EPD

VETROFLAM is a clear, highly tempered safety glass in conformance with either EN12150 or EN14179 that offers EW-class fire-resistance and has EW30 or EW60 integrity and radiation control properties according to European standard EN 13501-2. 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.

VETROFLAM IGU can also be used as a fire resistant and Insulating Glass Unit for internal or external applications. This type of glass is described in a separate EPD.

In this Environmental Product Declaration (EPD®), the environmental impact of one square meter of 3 different glazing configurations will be analyzed:

1. VETROFLAM 30 VF10 (laminated safety glass)
2. VETROFLAM 60 VF12 (laminated safety glass)
3. VETROFLAM 2S 30

### **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.

## 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](http://www.vetrotech.com).

In this Environmental Product Declaration, one square meter of 3 different glazing configurations will be analyzed:

	N° 1	N° 2	N° 3
	Vetroflam 30 VF10	Vetroflam 60 VF12	Vetroflam 2S
Details for this specific calculation	1x Coating	1x Coating	2x SGG V2S
Mechanical properties			
Nominal thickness (mm)	11	13	6
Weight (kg/m <sup>2</sup> )	26	31	15
Visible parameters			
Light transmittance (LT) %	79	49	82
Light reflection (RLe/RLi) (%)	11 / 11	22 / 25	11 / 11
Thermal transmission			
Ug value	5,4	5,4	3,7
Thermal properties			
Energy transmittance (ET) %	53	24	72
Energy reflection (Ree/Rei) %	24 / 21	38 / 41	11 / 11
Solar factor g	0,59	0,33	0,74
Safety properties			
Class EN 356 (protection against vandalism and burglary)	P2A	P2A	NPD
Acoustics properties			
Rw(C;Ctr) (real test)	37 (0; -2)	37 (-1; -3) calculated	32 (-2; -2)

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



Toughened glass

Illustration shows a VETROFLAM  
made of toughened glass

	N° 1	N° 2	N° 3	
	Vetroflam 30 VF10	Vetroflam 60 VF12	Vetroflam 2S	
	Weight (in %)	Weight (in %)	Weight (in %)	CAS number
Glass	97	97	100	CAS number 65997-17-3, EINECS number 266-046-0
Coating	<0.1%	<0.1%	<0.1%	Metal Oxides, which bring thermal properties to the glazing
PVB Interlayer	3,2	2,7	no PVB	CAS number 63148-65-2 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

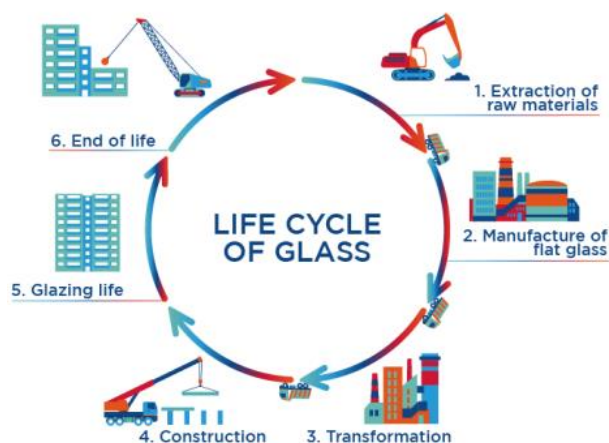
<b>FUNCTIONAL UNIT / DECLARED UNIT</b>	One square meter of VETROFLAM to be incorporated into a building. The impacts of installation are not taken into account.
<b>SYSTEM BOUNDARIES</b>	Cradle to gate. Mandatory Stages = A1-A3
<b>EXCLUDED LIFE CYCLE STAGES</b>	Excluded stages = A4-A5; B1-B7; C1-C4 Optional stage = D
<b>REFERENCE SERVICE LIFE (RSL)</b>	n/a. Boundaries are cradle to gate
<b>CUT-OFF RULES</b>	<p>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.</p> <p>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.</p> <p>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.</p>
<b>ALLOCATIONS</b>	<p>No allocation. Attribution of total inputs and outputs are based on m<sup>2</sup> of production for Vetroflam.</p> <p>Allocation of background data (energy and materials) taken from the GaBi 2016 databases is documented online at <a href="http://www.gabi-software.com/support/gabi/">http://www.gabi-software.com/support/gabi/</a></p>
<b>GEOGRAPHICAL COVERAGE AND TIME PERIOD</b>	<p>Primary production data is from the year 2014 VETROTECH SAINT-GOBAIN Germany.</p> <p>The shares of the different production sites are from 2019.</p>
<b>BACKGROUND DATA SOURCE</b>	GaBi data not older than 10 years were used to evaluate the environmental impacts.
<b>SOFTWARE</b>	<p>Gabi 8 - GaBi envision</p> <p>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</p> <p>Initial tool was updated with most recent version data base (GaBi 8 service pack 36)</p>

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 intumescent layer are delivered in drums, which are return to the supplier.

A description of the relevant stages is given in the figures below, two types of VETROFLAM configurations are given in the Figure 1 and Figure 2.

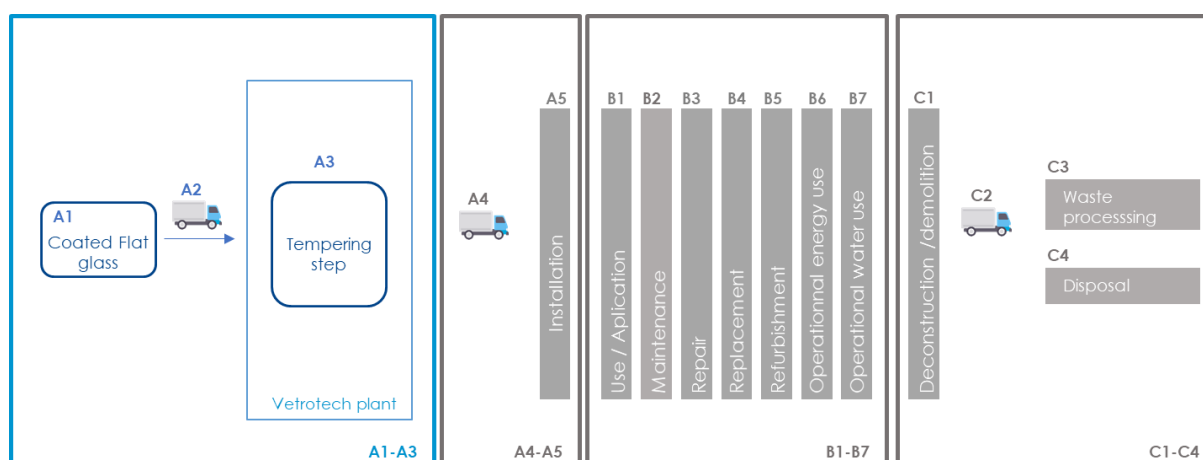


Figure 1 : Relevant LCA steps for VETROFLAM Steps in blue are declared in this EPD, steps in grey are not declared.



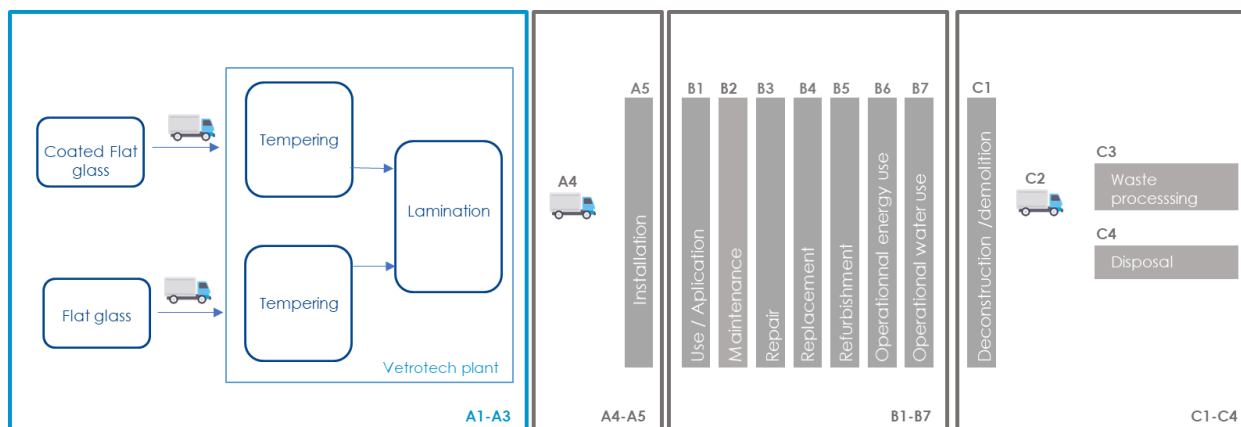


Figure 2 : Relevant LCA steps for VETROFLAM with laminated step. Steps in blue are declared in this EPD, steps in grey are not declared.

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	Refurbishment	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, 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.

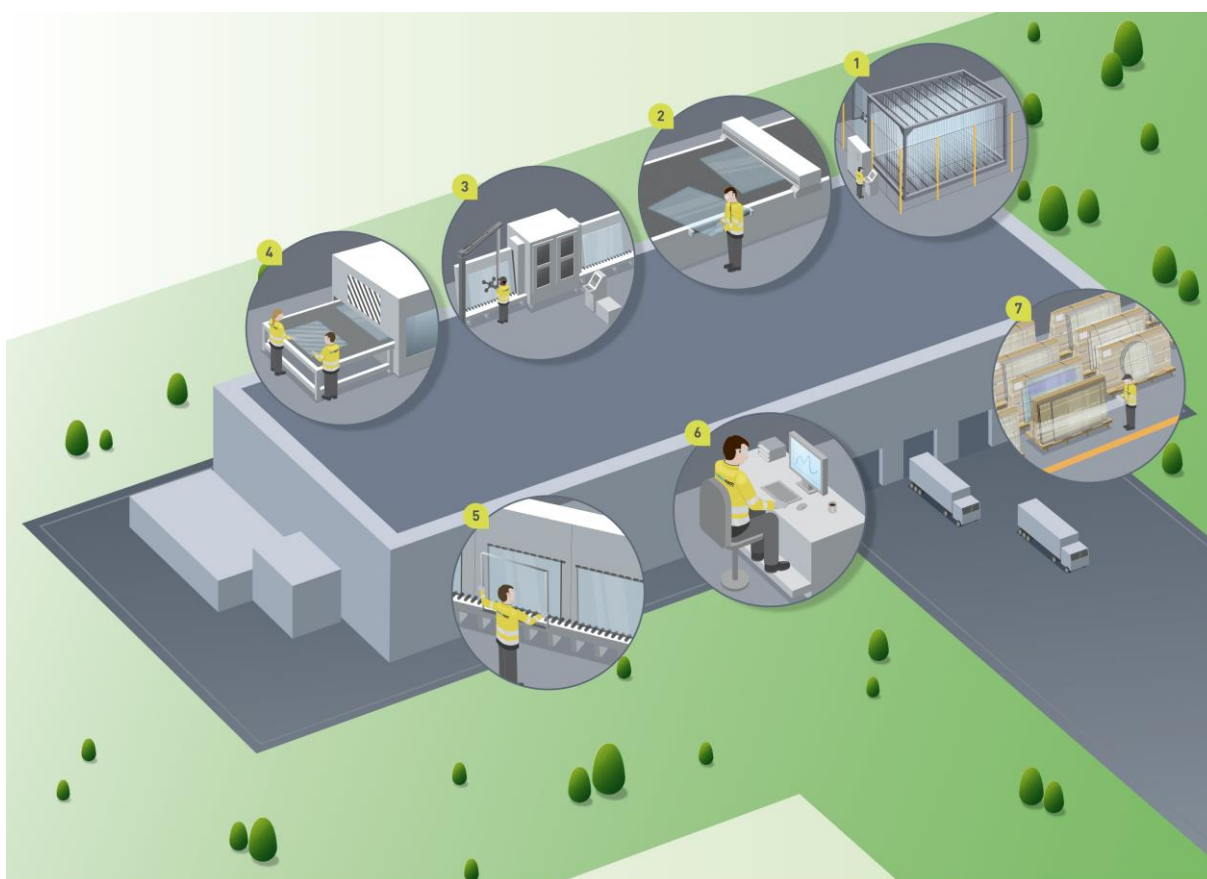
The product stage includes the extraction and processing of raw materials and energies, transport to the manufacturer, manufacturing and processing of VETROFLAM glazing.

**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).

**Coating magnetron** transformation consists in a process where different materials are deposited on a flat glass surface under determined conditions so it gets different kind of properties that improve the energy efficiency of the glazings.

### *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. This is a Cradle-to-Gate EPD. The environmental impacts of all the other stages in the life cycle of VETROFLAM are not declared (INA).

**ENVIRONMENTAL IMPACTS VETROFLAM 30 VF10**

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	
 <b>Global Warming Potential (GWP) - kg CO<sub>2</sub> equiv/FU</b>	4.71E+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.															
 <b>Ozone Depletion (ODP) kg CFC 11 equiv/FU</b>	2.46E-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 (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.															
 <b>Acidification potential (AP) kg SO<sub>2</sub> equiv/FU</b>	1.98E-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.															
 <b>Eutrophication potential (EP) kg (PO<sub>4</sub>)<sup>3-</sup> equiv/FU</b>	5.79E-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.															
 <b>Photochemical ozone Creation potential (POCP) kg Ethene equiv/FU</b>	1.29E-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.															
 <b>Abiotic depletion potential for non-fossil resources (ADP-elements) - kg Sb equiv/FU</b>	3.21E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Abiotic depletion potential for fossil resources (ADP-fossil fuels) - MJ/FU</b>	5.77E+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 30 VF10

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 - <i>MJ/FU</i>	1.22E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable primary energy used as raw materials <i>MJ/FU</i>	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) <i>MJ/FU</i>	1.22E+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 <i>MJ/FU</i>	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) - <i>MJ/FU</i>	1.14E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of secondary material <i>kg/FU</i>	2.87	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable secondary fuels- <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of non-renewable secondary fuels - <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of net fresh water - <i>m³/FU</i>	4.21E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA








WASTE CATEGORIES VETROFLAM 30 VF10															
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	
 <b>Hazardous waste disposed</b> <i>kg/FU</i>	1.69E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Non-hazardous (excluding inert) waste disposed</b> <i>kg/FU</i>	2.44	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Radioactive waste disposed</b> <i>kg/FU</i>	2.22E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA











# OUTPUT FLOWS VETROFLAM 30 VF10

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	
 <b>Components for re-use</b> <i>kg/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Materials for recycling</b> <i>kg/FU</i>	1.60	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Materials for energy recovery</b> <i>kg/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Exported energy. detailed by energy carrier</b> <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA




## ENVIRONMENTAL IMPACTS VETROFLAM 60 VF12

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) - <i>kg CO<sub>2</sub> equiv/FU</i>	5.38E+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) <i>kg CFC 11 equiv/FU</i>	2.48E-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 (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.															
 Acidification potential (AP) <i>kg SO<sub>2</sub> equiv/FU</i>	2.32E-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) <i>kg (PO<sub>4</sub>)<sup>3-</sup> equiv/FU</i>	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) <i>kg Ethene equiv/FU</i>	1.48E-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) - <i>kg Sb equiv/FU</i>	3.70E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Abiotic depletion potential for fossil resources (ADP-fossil fuels) - <i>MJ/FU</i>	6.57E+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 VF12

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 - <i>MJ/FU</i>	1.26E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable primary energy used as raw materials <i>MJ/FU</i>	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) <i>MJ/FU</i>	1.26E+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	1.22E+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 <i>MJ/FU</i>	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) - <i>MJ/FU</i>	1.22E+3	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of secondary material <i>kg/FU</i>	3.44	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable secondary fuels- <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of non-renewable secondary fuels - <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of net fresh water - <i>m³/FU</i>	4.39E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA








# WASTE CATEGORIES VETROFLAM 60 VF12

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 <i>kg/FU</i>	1.86E-6	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Non-hazardous (excluding inert) waste disposed <i>kg/FU</i>	2.61	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Radioactive waste disposed <i>kg/FU</i>	2.23E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA









# OUTPUT FLOWS VETROFLAM 60 VF12

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	
 <b>Components for re-use</b> <i>kg/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Materials for recycling</b> <i>kg/FU</i>	1.76	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Materials for energy recovery</b> <i>kg/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Exported energy. detailed by energy carrier</b> <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA




**ENVIRONMENTAL IMPACTS VETROFLAM 2S 30**





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	
 <b>Global Warming Potential (GWP) - kg CO<sub>2</sub> equiv/FU</b>	2.48E+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.														
 <b>Ozone Depletion (ODP) kg CFC 11 equiv/FU</b>	3.35E-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 (chlorofluorocarbons or halons), which break down when they reach the stratosphere and then catalytically destroy ozone molecules.														
 <b>Acidification potential (AP) kg SO<sub>2</sub> equiv/FU</b>	1.20E-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.														
 <b>Eutrophication potential (EP) kg (PO<sub>4</sub>)<sup>3-</sup> equiv/FU</b>	3.33E-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.														
 <b>Photochemical ozone Creation potential (POCP) kg Ethene equiv/FU</b>	7.05E-3	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.														
 <b>Abiotic depletion potential for non-fossil resources (ADP-elements) - kg Sb equiv/FU</b>	2.18E-4	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Abiotic depletion potential for fossil resources (ADP-fossil fuels) - MJ/FU</b>	2.94E+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 2S 30

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 - <i>MJ/FU</i>	8.82E+1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable primary energy used as raw materials <i>MJ/FU</i>	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) <i>MJ/FU</i>	8.82E+1	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	7.45E+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 <i>MJ/FU</i>	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) - <i>MJ/FU</i>	7.45E+2	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of secondary material <i>kg/FU</i>	1.72	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of renewable secondary fuels- <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of non-renewable secondary fuels - <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Use of net fresh water - <i>m³/FU</i>	2.71E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA



WASTE CATEGORIES VETROFLAM 2S 30															
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 <i>kg/FU</i>	9.32E-7	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Non-hazardous (excluding inert) waste disposed <i>kg/FU</i>	7.29E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 Radioactive waste disposed <i>kg/FU</i>	1.78E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

OUTPUT FLOWS VETROFLAM 2S 30															
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	
 <b>Components for re-use</b> <i>kg/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Materials for recycling</b> <i>kg/FU</i>	4.79E-1	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Materials for energy recovery</b> <i>kg/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
 <b>Exported energy. detailed by energy carrier</b> <i>MJ/FU</i>	0	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA






## LCA results interpretation

In the production of VETROFLAM 30 VF10, most of the impacts are linked to the tempering process.

VETROFLAM is made of special, processed tempered glass.

Most of the CO<sub>2</sub> 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 30 VF10	Unit
	Global warming	4.71E+1	kg CO <sub>2</sub> equiv/FU
	Non-Renewable resources consumption <sup>[1]</sup>	5.77E+2	MJ/FU
	Energy consumption <sup>[2]</sup>	1. 26E+3	MJ/FU
	Water consumption <sup>[3]</sup>	4.21E-1	m <sup>3</sup> /FU
	Waste production <sup>[4]</sup>	2.66	kg/FU

<sup>[1]</sup>: This indicator corresponds to the abiotic depletion potential of fossil resources.

<sup>[2]</sup>: This indicator corresponds to the total use of primary energy (renewable and non-renewable)

<sup>[3]</sup>: This indicator corresponds to the use of fresh net water.

<sup>[4]</sup>: 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).

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<sup>3</sup>
- Formaldehyde after 28 days < 10 µg/m<sup>3</sup>

## 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<sup>1</sup> 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 <sub>2</sub> emissions: -20% (2010-2025) Emissions of NO <sub>x</sub> , SO <sub>2</sub> 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](http://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)*

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<sup>1</sup> 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.

<b>Pre-consumer cullet</b>	~7%
<b>Post-consumer cullet</b>	< 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.

## 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