Planibel Clear – Planibel Linea Azzurra – Planibel Clearvision – Planibel Coloured

the range of AGC float glasses

reference thickness: 4 mm

other thicknesses:

Planibel Clear and Planibel Clearvision 3 – 12 mm

Planibel Linea Azzurra 12 – 25 mm

Planibel Coloured 4 – 12 mm

Declaration Holder	**AGC Glass Europe**
Programme holder	Association HQE tio
Date of issue	2015

1. Summary

Declaration Holder

AGC Glass Europe
Avenue Jean Monnet 4
B- 1348 Louvain-la-Neuve

www.agc-glass.eu
www.yourglass.com
environment@eu.agc.com

Programme Operator

Association HQE tio

This Declaration is based on the PCR document:

EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

Validity date

This EPD applies to the above-mentioned construction product and is valid until replaced by a new version (evaluation typically 5 years from the date of issue).

Date of issue

2015

Construction product

Planibel Clear – Planibel Linea Azzurra – Planibel Clearvision – Planibel Coloured

Declared Product / Declared Unit

The declared unit is *1 m² of clear or tinted float glass*.

Scope of validity:

The Life Cycle Assessment was carried out according to ISO 14040 and ISO 14044. The Environmental Product Declaration was prepared according to EN 15804+A1 and ISO 14025.

Verification

CEN standard EN 15804 serves as core PCR.

Third party independent verification of the declaration, according to EN ISO 14025:2010.

☐ ***Internal*** ☒ ***External***

Third party verifier:

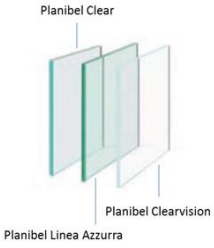
Anis Ghoumidh

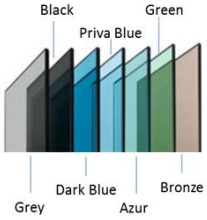
2. Product

2.1 Product description

The product considered for the assessment is flat glass. Planibel Clear, Planibel Linea Azzura, Planibel Clearvision and Planibel Coloured are the AGC brand names for clear, extra clear and tinted float glass.

The reference structure considered in this EPD is **4 mm float glass**. Other structures considered in the underlying calculations: 3, 5, 6, 8, 10, 12, 15, 19, 25 mm, including thermal toughening & heat soak treatment of the aforementioned glass thicknesses.





2.2 Application & delivery status

Float glass is delivered in a wide variety of dimensions, applicable in all kinds of configurations.

2.3 Technical Data

Technical data for Planibel Clear, Planibel Linea Azzurra, Planibel Clearvision and Planibel Coloured (reference structure 4 mm):

Parameter	Symbol Unit	Clear	Linea Azzurra	Clear vision	Coloured (e.g., Grey)
Thermal transmission (EN 673)	Ug - W/(m².K)	5,8	5,8	5,8	5,8
Light transmission (EN 410)	Tv - %	90	79	92	57
Light reflection (EN 410)	ρv - %	8	7	8	6
Solar factor (EN 410)	g - %	86	67	91	67

Further data on: www.yourglass.com

2.4 Relevant Product Standard

Float glass (soda lime silicate glass) complies with EN 572-9:2004. Thermally toughened soda lime silicate safety glass complies with EN 12150-2:2004 and heat soak thermally toughened soda lime silicate safety glass with standard EN 14179-2:2005.

2.5 Base materials / Ancillary materials

Basic raw materials used in flat glass production:

- glass forming materials: silica sand (57%) and external glass cullet (8%);
- intermediate and modifying materials such as sodium carbonate (17%), dolomite (14%), limestone (3%), feldspar & blast furnace slag (2%), sodium sulphate (1%);
- colouring and coating agents such as iron oxide and other metallic compounds (<1%).

Composition of the declared unit (% of total mass): 100% glass.

No substances of the "Candidate List of Substances of Very High Concern for Authorisation (or SVHC)", exceeding the concentration in article threshold, in the declared unit.

2.6 Manufacturing & Processing

The basic principle of the float glass process is to mix the raw materials, melt them in the furnace and pour the molten glass onto a bath of molten tin. The combustion in the furnace uses air and gas/fuel oil. The glass solidifies as it floats on the thin bath. After the tin bath, the glass ribbon passes on to an annealing zone where it cools down gradually while being carried on rollers. At the end of this zone the glass is cut into sheets.

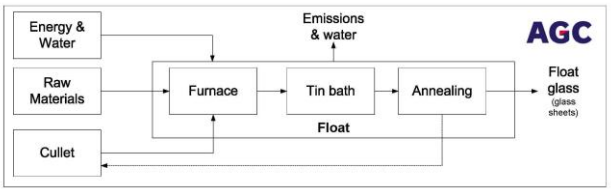


Figure 1 – Flat glass manufacturing

Input data were gathered from fifteen European based AGC float lines and the European AGC R&D centre.

All manufacturing sites operate under a certified quality, environmental and safety management system.

2.7 Environmental and health during manufacturing

AGC plant managements are committed to the group environmental and safety policy. At group or division level specific programmes are defined to act as guidelines for the country organisations and plants. Key performance indicators (KPI's) have been selected, are reported and are reviewed on a regular basis.

All glass manufacturing plants obtained ISO, 9001, ISO 14001 and OHSAS 18001 certification.

2.8 Product processing / Installation

Not relevant. The construction process stage is not in the system boundary.

2.9 Packaging

Flat glass is warehoused and transported in vertical position: flat glass by in loader trucks (dedicated trailer stillage combinations). Some wood and metal ropes are used for fixation, plastic film can be used for additional protection.

2.10 Condition of use

Not relevant. The use stage is not in the system boundary.

2.11 Environment and health during use

Intended usage of flat glass does not entail adverse environmental or health effects. On the contrary, the use of flat glass in different setups in residential and in commercial buildings (e.g., double glazing) contributes to energy savings and thus makes it possible to avoid CO_2-emissions (see chapter 8).

2.12 Reference service life

The reference service life (RSL) for flat glass is set at 30 years.

The RSL does not reflect the actual life time which typically is set by the lifetime and refurbishment of a building. The RSL is not referring to the warranty either.

2.13 Extraordinary effects (Fire, water, Mechanical destruction)

Not relevant.

2.14 Re-use phase

Glass is recyclable. Glass cullet from manufacturing and processing is commonly reintroduced in the glass manufacturing process. It decreases the required energy input for the furnaces. Cullet represents on average 30% of flat glass mass manufactured by AGC, at average 4% coming from outside the glass manufacturing plant (pre-consumer cullet - reference year 2009).

Nowadays about 5% of end-of-life glazing from buildings is dismantled, collected separately and recycled for glass manufacturing (post-consumer cullet); about 95% ends up in demolition waste. Nevertheless, and because the lack of accurate data, we assume a conservative approach and consider that 100% is treated as demolition waste.

2.15 End-of-Life

The following waste codes (EU-codes according to Commission Decision 2000/532/EC and Annex III to Directive 2008/98/EC) can apply:

- 10 11 12 – waste glass from manufacture of glass and glass products (pre-consumer glass cullet);
- 17 02 02 – glass from construction and demolition waste (end-of-life glass);

3. Life Cycle Assessment (LCA): Calculation rules

3.1 Calculation rules

This EPD reports the results of the LCA in which the environmental impacts generated by material and energy flows involved in the manufacturing of float glass are modelled and calculated. The LCA was performed in accordance with the product category rules set out in the European standard EN 15804+A1 and the LCA principles and requirements set out of ISO 14040 and ISO 14044.

3.2 Declared unit

The declared unit is 1 m² of clear or tinted float glass.

3.3 System boundary

This is a cradle-to-gate EPD, which covers a system boundary including raw materials & energy supply, manufacturing of flat glass with associated transport (A1-A3). The installation and use stage is due to the diversity of application and construction not included in the calculation.

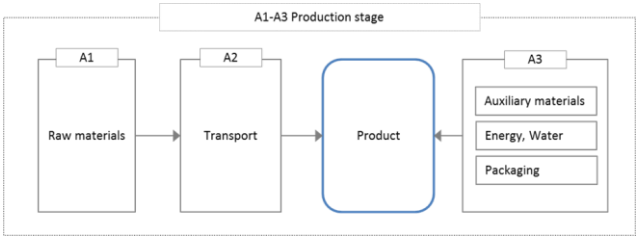


Figure 3 – System boundary "cradle-to-gate"

3.4 Data quality & Background data

Primary data on input/output and transport were collected from European based AGC production plants: 10 float sites (15 float lines and the AGC R&D centre. Other relevant data were obtained from manufacturer's information (e.g., product composition).
The production volumes of these sites were used to determine average values (weighed averages).

Background data were used from the GaBi 6 database (2013). European data sets were used for raw materials, auxiliary materials, energy, water and transport. Data choices focussed on including the best fitting alternatives for all processes in the LCA-model.

The life cycle inventory (LCI) results were modelled and calculated using the GaBi software tool and a life cycle impact assessment (LCIA) was performed.

3.5 Period under review

The period under review is one year. Data from 2013 were utilized for this study.

3.6 Estimates and assumptions

Road transports were considered to return empty, transport per ship with a load. Operational data on transport distances were completed with estimates for local supplies (e.g., packaging). An average distance of 100 km was considered for these local supplies, all by road transport.

3.7 Cut-off criteria

The production of the required machinery and equipment have not been considered.

Operational data (raw materials, energy, auxiliary and operating materials, waste, emissions to air and water) were utilised in the calculation. Also known material and energy flows of less than 1% were accounted.

It can be assumed that the total of negligible processes does not exceed 5%.

3.8 Allocation

There is no allocation of co-products for the manufacturing and processing under consideration in this EPD.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all data sets to be compared were created according to EN15804:2012+A1:2013 and the building context, respectively the product-specific characteristics of performance, are taken into account.

4. Life Cycle Assessment (LCA): Inventory & Interpretation

4.1 Description of the system boundary

The product stage is covered by this EPD (see point 3.2):

- Raw materials supply (A1);
- Transport (A2);
- Manufacturing (A3).

Below a selection of indicators is presented for the declared unit, being 1 m² of clear or tinted float glass.

These indicators describe different types of environmental impact (e.g., global warming), input needs of resources (e.g., fresh water, energy) and output flows (e.g., waste) for the declared unit for a selected number of compositions with similar technical properties (U_g ,Tv, ρ_v, solar factor).

4.2 Environmental impact indicators

The life cycle impact assessment methods recommend by EN 15804 were used. The impact indicators are presented below for the production stage.

Parameter		Unit	A1-3				
			4 mm	3 mm	6 mm	10 mm	25 mm
Global warming potential (100 years)	GWP	[kg CO_2-eq.]	**1,13E+01**	8,48E+00	1,70E+01	2,83E+01	7,06E+01
Ozone depletion	ODP	[kg CFC11-eq.]	**1,24E-08**	9,30E-09	1,86E-08	3,10E-08	7,75E-08
Acidification for soil and water	AP	[kg SO_2-eq.]	**8,33E-02**	6,24E-02	1,25E-01	2,08E-01	5,20E-01
Eutrophication potential	EP	[kg PO_4^{3-}- eq.]	**1,10E-02**	8,26E-03	1,65E-02	2,75E-02	6,88E-02
Formation potential of tropospheric ozone	POCP	[kg Ethene eq.]	**5,00E-03**	3,75E-03	7,50E-03	1,25E-02	3,13E-02
Abiotic depletion potential for non-fossil resources	ADPE	[kg Sb eq.]	**4,64E-05**	3,48E-05	6,96E-05	1,16E-04	2,90E-04
Abiotic depletion potential for fossil resources	ADPFE	[MJ]	**1,44E+02**	1,08E+02	2,17E+02	3,61E+02	9,03E+02

The environmental impacts of Planibel are primarily determined by the manufacturing process of the flat glass, and, the upstream energy & raw materials provision:

- The global warming potential (GWP) is mainly due to carbon dioxide emissions (> 97%). The manufacturing process, the raw materials provision and the energy provision are the main contributors (respectively 64 %, 20 % and 14 %). Thermal toughening of the glass adds about 1,3 kg CO2 eq. to the GWP (for all glass thicknesses mentioned);
- The ozone depletion potential (ODP) is predominantly (about 93%) due to upstream processes for some raw and packaging materials (e.g., dolomite, wood treatment, steel) and to a lesser extent to energy provision (e.g., electricity production);
- The acidification potential (AP) mainly arises from sulphur dioxide and nitrogen oxides emissions (together > 95%) and is for about two third related to the onsite manufacturing process;
- The nitrogen oxides emitted by the manufacturing process (about 86 %) and by upstream processes for energy provision, raw materials provision (e.g., soda) are the main contributors to the eutrophication potential (EP);
- The photochemical ozone creation potential (POCP) is predominantly a result of sulphur dioxide and nitrogen oxides emitted (about 73 %). Manufacturing, as well as upstream energy and raw materials provision are important contributors. Organic emissions to air, related to upstream processes for energy and raw materials provision, are the second important contributor (about 18%);
- About 78% of the abiotic depletion potential of non-renewable material resources (ADPE) arises from upstream sodium chloride (rock salt) which is required to produce sodium carbonate (a raw material for flat glass). Sodium sulphate provision, used for flue gas treatment, contributes for about 10% to this indicator;
- The abiotic depletion potential for fossil resources (ADPFE) is due to fossil fuels used in the glass manufacturing process, and fossil fuels and uranium for electricity provision.

The influence of the transport and water provision related to float glass production is for most of these indicators marginal.

Estimate for other applications:

On the basis of the results presented in this EPD conservative estimates of environmental indicators, resources uses and waste quantities can be made for other applications:

- For glass sheets with a thicknesses other than those mentioned in the tables (e.g., 5 mm, 8 mm, 12 mm, 15 mm, 19 mm): by dividing the impact indicator of the reference structure by its thickness (namely 4) and multiplying it by its proper thickness (e.g., 8).
- Combining glass sheets of various thicknesses: summing the result for a particular impact indicator of the glass sheets used.

4.3 Resource use

Parameter		Unit	A1-3				
			4 mm	3 mm	6 mm	10 mm	25 mm
Primary energy resources, total renewable	PERT	[MJ]	**7,41E+00**	5,55E+00	1,11E+01	1,85E+01	4,63E+01
Primary energy resources, total non-renewable	PENRT	[MJ]	**1,59E+02**	1,19E+02	2,38E+02	3,97E+02	9,93E+02
Fresh water use	FW	[m³]	**2,28E-02**	1,71E-02	3,43E-02	5,71E-02	1,43E-01

The primary energy use related to the production of flat glass sheets (about 159 MJ) is related to the energy consumption for the production of the flat glass sheets and the energy provision (about 74%). Upstream raw materials provision and associated transport contribute for about 26%. Fossil fuels are significant energy sources (non-renewables) in all processes involved.
Toughened glass implicates additional energy consumption, representing an additional primary energy use of about 31 MJ (for all glass thicknesses mentioned).

Used non-renewable material resources are mainly sodium chloride (rock salt) required for the production of sodium carbonate, a raw material. To a lesser extent sodium sulphate, used for flue gas treatment, contributes to this indicator. Upstream processes of auxiliary materials involving mining ores, such as steel for metal straps for packaging, contribute as well but to a lesser extent. Mining ores and energy resources (e.g., coal for electricity production) also result in waste rock.

The fresh water demand is for about 70% due to upstream processes of electricity and raw materials required for flat glass production (e.g., sodium carbonate, oxygen)

4.4 Waste categories

Parameter		Unit	A1-3				
			4 mm	3 mm	6 mm	10 mm	25 mm
Hazardous waste disposed	HWD	[kg]	2,08E-05	1,56E-05	3,12E-05	5,19E-05	1,30E-04
Non-hazardous waste disposed	NHWD	[kg]	1,68E-01	1,26E-01	2,51E-01	4,19E-01	1,05E+00
Radioactive waste disposed	RWD	[kg]	3,50E-03	2,63E-03	5,26E-03	8,76E-03	2,19E-02

The non-hazardous waste (including inert waste) is mainly generated by the processes upstream for raw materials, recyclable packaging materials and energy provision. The

hazardous waste is predominantly due to the upstream processes for packaging material (metal straps). Radioactive waste is generated exclusively linked to electricity supply (nuclear power stations) for the manufacturing and all upstream processes.

.

5. Requisite evidence

Volatile organic compounds (VOC)
Not relevant.

6. References

EN 15804+A1
Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products.

XP P01-064/CN
Contribution des ouvrages de construction au développement durable — Déclarations environnementales sur les produits — Règles régissant les catégories de produits de construction — Complément national à la NF EN 15804+A1.

ISO 14025
Environmental labels and declarations — Type III environmental declarations

NF P01-10
Qualité environnementale des produits de construction – Déclaration environnementale et sanitaire des produits de construction.

PCR 2011, Part A
Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. July 2011
www.bau-umwelt.de

PCR Guidance Text for Building-Related Products and Services, Part B
Requirements on the EPD for Plate glass for construction

EeB Guide
EeB Guide – Part A (October 2012): Operational guidance for the preparation of LCA studies for energy-efficient buildings and building products.

GaBi 6
GaBi version 6 database 2012 (release 2013) – PE International