LACOBEL – LACOBEL T

the range of decorative glasses
AGC GLASS EUROPE
AGC INTERPANE

Reference thickness:

4 mm

Other thicknesses:

3 – 12 mm

CONTACT

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DECLARATION HOLDER

THIS DECLARATION IS BASED ON THE PCR DOCUMENT

Product Category Rules (PCR) EN 15804:2012+A1:2013: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

Fiche de Déclaration Environnementale et Sanitaire no. 01-535:2016.

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

2016

CONSTRUCTION PRODUCT

Lacobel
Lacobel Safe
Lacobel Safe+
Lacobel T

DECLARED PRODUCT / DECLARED UNIT

The declared unit is 1 m² of painted 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.

This document applies for products supplied from both AGC Glass Europe and AGC Interpane.

VERIFICATION

The original Environmental Product Declaration* has been audited and externally verified according to EN 15804:2012+A1:2013, NF EN 15804/CN and ISO 14025:2010 by an independent third party.

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration, according to EN ISO 14025:201 ☐ Internal ☒ External
Third Party Verifier: bio by Deloitte. (Yannick Le Guern)
* PCR : Product category rules

* The original document is available under the French Programme INIES:

Environmental and health reference data for building

PRODUCT

1.1. Product description

The product considered for the assessment is part of AGC Glass Europe range of painted glass. The product is simply a clear float glass covered on one side by high-quality paint. Available in 20 trendsetting colours, the Lacobel glossy painted glass range features an attractive palette of contemporary colours. These paints are added on float glasses. The back of the glass with the paint coating is always positioned against the support structure. Positioning it in this way also preserves the colour and appearance of the glass.

The main advantages is that walls, sliding doors and furniture will retain their original appearance for years built upon AGC's manufacturing process guarantees which a uniform and glossy appearance, ensuring that the high-quality paint, industrially applied to the back of the glass, adheres flawlessly.

The Lacobel T is the first painted glass range that can be immediately cut and toughened by processors at their plant, simplifying the production process and accelerating the delivery times.

Reference: 4 mm Lacobel or Lacobel T.
Other thickness considered in this EPD: 3, 4, 5, 6, 8, 10 and 12 mm.

Colour options: please see in our product brochure.

AGC Lacobel products can also be delivered safety backed with a protection film: Lacobel SAFE / SAFE+. The added safety is a transparent, colourless polypropylene film applied to the back of the mirrors (painted side) using an industrial process. If accidentally broken, the glass splinters adhere to the plastic film. Two key benefits: guaranteed safety glass and protected from scratching when the back of the glass is exposed.

1.2. Application & delivery status

Interior use only: furniture, wall coverings, standard and sliding doors, etc. Lacobel combines beautifully with many other materials, including wood, steel and stone. The Lacobel T is suitable for furniture as e.g. tables, shelves, writing boards, display units, glass retail stands. Also available for wall covering: kitchen splashback, restaurant walls, hotels, shops, offices, showers, spandrels and facade cladding (shop fronts), spandrels.

1.3. Technical Data

The application of the organic paint does not affect the properties of the substrate which is in accordance with EN 572-2. For the Lacobel T, since it a toughenable product it must be heat treated before us.

For more information please check our product technical data sheet available at: www.yourglass.com.

1.4. Relevant Product Standard

The basis glass used for Lacobel and Lacobel T production is float glass conform to EN 572-1/2.

The product Lacobel T, after heat treatment, should be conform the following EN standards (in EU):

- EN 1863-1;
- EN 12150-1;
- EN 14179-1;

1.5. Base materials / Ancillary materials

The production of flat glass substrate is also in accordant with EN 572-1 for building products that defines the magnitude of the proportions by mass of the principal constituents of float glass.

Basic raw materials used in flat glass production:

- glass forming materials: silica sand and external glass cullet;
- intermediate and modifying materials such as sodium carbonate, dolomite, limestone, feldspar & blast furnace slag, sodium sulphate;
- colouring and coating agents such as iron oxide and other metallic compounds.

Composition of the declared unit (% of total mass):

- > 98% glass;
- < 2% painting layer;

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.

1.6. 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 tin bath. After the 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.

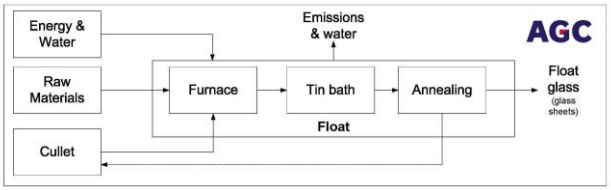


Figure 1 – Flat glass manufacturing.

The flat glass is the substrate for the fabrication of painted glass which undergoes different process-stages. The float glass that arrives by truck needs first to be rinsed with water. This first step of cleaning/rinsing makes sure that the glass is prepared for the following first layer of paint. The glass sheet undergoes different paint curtains followed by a baking step through an online oven. Finally, the painted glass gets a final cleaning before being cut and packaged for clients.

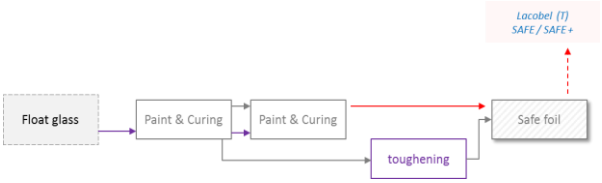


Figure 2 – Painted glass overall process.

For some products a safety film can be applied. This operation does not occur on the line and the glass needs to be moved to another machine on site.

Concerning the inventory management, input data were gathered from fifteen European based AGC float lines and three European based AGC mirror lines with the technical support of the European AGC R&D centre.

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

1.7. Environmental and health during manufacturing

AGC plant managers 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 flat glass manufacturing plants obtained ISO, 9001, ISO 14001 and OHSAS 18001 certification, as did the main transformation sites.

1.8. Product processing / Installation

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

1.9. Packaging

Glass warehoused and transported in vertical position: by in-loader trucks (dedicated trailer stillage combinations). Wood, cardboard and metal ropes are used for fixation. Plastic film can be used for additional protection.

1.10. Condition of use

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

1.11. Environment and health during use

Intended usage of painted glass does not entail adverse environmental or health effects. No dangerous substances are released during the use of the product (see also section 6).

1.12. Reference service life

The reference service life (RSL) for painted glass is set at 10 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.

1.13. Extraordinary effects (Fire, water, Mechanical destruction).

Not relevant.

1.14. Re-use phase

Glass is recyclable. AGC Flat Glass Europe leads an environmental policy that encourages recycling practice. Glass cullet from manufacturing and processing is commonly reintroduced in the glass manufacturing process. It decreases the required energy input for the furnaces. Cullet (internal + external) represents on average 30% of flat glass mass manufactured by AGC and use only glass cullet from other well-controlled glass process.

1.15. End-of-Life

According to European data, end-of-life building glass is almost never recycled into new glass products. 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, considering the lack of accurate statistical data, we assume a conservative approach and thus consider that 100% is treated as demolition waste.

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);

LIFE CYCLE ASSESSMENT: CALCULATION RULES

2.1. 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 mirrored 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.

2.2. Declared unit

The declared unit is 1 m² of painted glass.

2.3. System boundary

This document is a cradle-to-gate EPD, which covers a system 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.

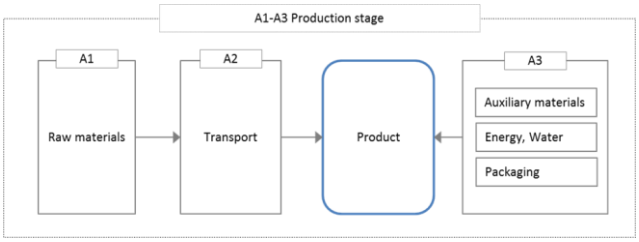


Figure 3 – System boundary "cradle-to-gate".

2.4. Data quality & Background data

Primary data on input/output and transport were collected from European based AGC production plants: 9 sites (15 float + 3 processing 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.

Background data were used from the GaBi 6.110 database (2015). 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.

2.5. Period under review

The period under review is one year. Data from 2015 was used for this study.

2.6. 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. Specific data was used for modelling raw materials transport, depending on supplier's distance.

2.7. 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%.

Allocation

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

2.8. 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 and for the same functional unit.

LIFE CYCLE ASSESSMENT (LCA): INVENTORY & INTERPRETATION

3.1. Description of the system boundary

The product stage is covered by this EPD (see point 3.3):

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

Below a selection of indicators is presented for the declared unit, i.e. 1 m² of flat glass, covered with painted layer.

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 a selected number of compositions with similar technical properties (U_g ,Tv, ρ_v , solar factor).

3.2. Environmental impact indicators

The life cycle impact assessment methods recommend by EN 15804+A1 were used. The impact indicators are presented below for the production stage (A1 - A3) for different thicknesses.

Table 1. Environmental impact categories

		4 mm	3 mm	8 mm
GWP	Global warming potential (100 years) [kg CO_2-eq.]	1,32E+01	9,89E+00	2,64E+01
ODP	Ozone depletion [kg CFC11-eq.]	1,63E-08	1,22E-08	3,25E-08
AP	Acidification for soil and water [kg SO_2-eq.]	9,43E-02	7,07E-02	1,89E-01
EP	Eutrophication potential [kg PO_4^{3-}- eq.]	1,28E-02	9,60E-03	2,56E-02
POCP	Formation potential of tropospheric ozone [kg Ethene eq.]	5,74E-03	4,30E-03	1,15E-02
ADPE	Abiotic depletion potential for non-fossil resources [kg Sb eq.]	5,25E-05	3,94E-05	1,05E-04
ADPFE	Abiotic depletion potential for fossil resources [MJ]	1,82E+02	1,37E+02	3,64E+02

The environmental impacts of the declared products are primarily determined by the manufacturing process of the flat glass, and, the upstream energy & raw materials provision. It contributes for about:

- The global warming potential (GWP) is mainly due to carbon dioxide emissions and more than 80% are due to the float glass process. The back layer of paint contributes a bit less than 15% on the total GWP emissions. From the latter, the upstream production of the raw materials is the main source of impact (±75%), with transport of involved accounting for ±25% of it. The energy provision on the painted glass process itself is less relevant contributing around 2%; Safe film if added contributes to around 2% of total GWP.
- Almost 50% of the ozone depletion potential (ODP), is predominantly due to CFC (chlorofluorocarbons) involved in upstream processes of the glass substrate manufacturing. Some raw materials of the paint process are also relevant contributors (±17%). Around 30% of the emissions are due to material used in the cleaning steps. Process energy is around 2% relevant;
- ±96% of the acidification potential (AP), mainly arising from sulphur dioxide and nitrogen oxides emissions from the manufacturing of the flat glass with the associated energy provision. The painting step contributes to a minor extent (±1%), being 3% of this due to transport. Process energy around 2% of the total;
- 85 to 95% to the eutrophication potential (EP) are emitted during glass manufacturing - where nitrogen oxides are the main contributor. The painting steps are responsible for less than 3% of the emissions;
- Around 94% of the photochemical ozone creation potential (POCP), predominantly as a result of sulphur dioxide and nitrogen oxides emitted during flat glass production. Painting accounts for less than 2% while process energy contributes to 2,5%;
- Paint steps are responsible for up to ±30% of the abiotic depletion potential of non-renewable material resources (ADPE);
- The abiotic depletion potential of fossil resources (ADPFE) is predominantly due to fossil fuels used in the glass manufacturing process and fossil fuels and uranium for electricity provision. Process energy is around 6% and painting for up to 5%;

The influence of the transport and water provision is for most of these indicators marginal.

Estimate for other structures:

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). Considering this, each 1 mm of 1 m^2 of Lacobel has a GWP = 3,3 [kg CO_2-eq.].

Please take into account that the above mentioned allows for a rough estimate. Emissions from glass substrate are linear dependent of the thickness of the product while the following steps (e.g. paint) only vary with the m^2 of the unit or some specificity of the product (e.g. Lacobel T). The results presented here are assumed as a worst-case scenario were most of our products sold are thus represented.

3.3. Resource use

The results for resource use are presented in **Table 2** for the different thickness of mirrored glass.

Table 2. Resource use

		4 mm	3 mm	8 mm
PERT	Primary energy resources, total renewable [MJ]	1,81E+01	1,36E+01	3,62E+01
PENRT	Primary energy resources, total [MJ]	2,19E+02	1,64E+02	4,38E+02
FW	Fresh water use [m^3]	2,88E-02	2,16E-02	5,76E-02

The primary energy use related to the production of painted glass sheets (219 MJ) is dominated by the production of the flat glass sheets, i.e. ±75% (*4 mm thickness*). Heavy fuel and natural gas are significant energy sources (non-renewables) in the manufacturing process. Painting accounts for about 5% of the total emissions while transport (all) is responsible for a minor fraction. Process energy contributes for ±7%. The product uses 8% of total renewable primary energy (PERT).

The fresh water demand is about 15% due to production of cleaning and paint materials (6%) including the water involved during the process.

3.4. Waste categories

The results for waste flows are presented in **Table 3**.

Table 3. Waste categories

		4 mm	3 mm	8 mm
HWD	Hazardous waste disposed [kg]	2,30E-05	1,73E-05	4,60E-05
NHWD	Non-hazardous waste disposed [kg]	2,16E-01	1,62E-01	4,33E-01
RWD	Radioactive waste disposed [kg]	4,12E-03	3,09E-03	8,23E-03

The non-hazardous waste (including inert waste) is mainly generated by the processes upstream for raw materials. Waste from the line/process is less than 3%. The hazardous waste is predominantly due to the upstream processes for float (±75) and process energy production (±20%). Radioactive waste is generated exclusively linked to electricity supply (nuclear power stations) for the manufacturing and all upstream processes.

REQUISITE EVIDENCE

4.1. Volatile organic compounds (VOC)

Lacobel and Lacobel T are labelled in the top categories "A" and "A+" following accredited testing, in accordance with the French Décret No. 2011-321 du 23 mars 2011, completed by l'Arrêté du 19 avril 2011 which regard to the labelling of construction products on emissions of volatile compounds.

ADDITIONAL INFORMATION

5.1. Decorative products

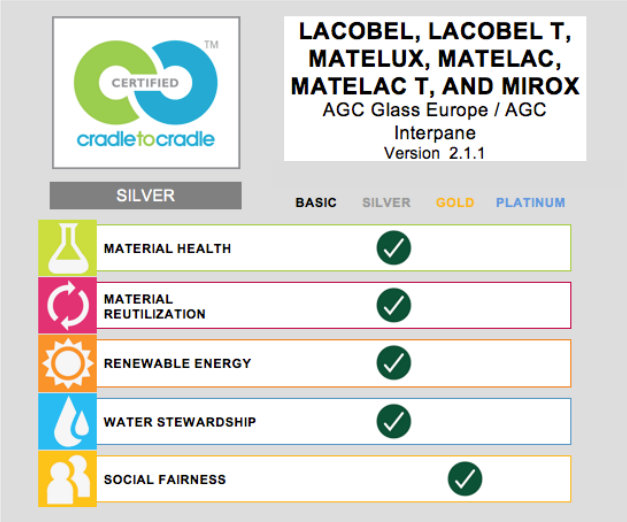
Lacobel is clear float glass covered on one side by high-quality paint Adding to the available 20 colours, MyColour by Lacobe (AGC's colour-on-demand service) is also available for orders.

Advantages of Lacobel and Lacobel T:

- Durable material;
- Available in a SAFE/SAFE+ version: this is a safety film applied to the back of the glass (uniform) which ensures safety (comply with EN12600);
- Lacobel paints are environmentally friendly: they preserve indoor air quality by emitting very low levels of volatile organic compounds (VOCs) and formaldehyde.;
- Lacobel range is Cradle to Cradle Certified Silver;

5.2. Cradle-to-Cradle (C2C) certification

AGC Glass Europe's decorative glasses have achieved Cradle to Cradle Certified^{CM} Silver.



AGC is the first and so far the only European glass manufacturer to offer a wide range of products bearing the Cradle to Cradle Certified^{CM} label.

C2C is the brainchild of German chemist Michael Braungart and American architect William McDonough.

The concept is broader than recycling and rather than focusing on reducing consumption, it focuses on aligning products into a more sustainable business (eco-effectiveness) in complementary ways to our product's life cycle assessment (eco-efficiency). LCA is used in complement to assess the different solutions that C2C envisions and help us keeping track in where we stand regarding to our existing environmental footprint.

C2C help us to design each product in such a way that it does not go from the cradle to the grave, but into a new cradle. Furthermore and while many certifications address one particular aspect of a product, the C2C Product Standard addresses five categories relating to human and environmental health. In order to achieve certification, a product must meet strict standards in all five categories. AGC exceeds the basic requirements in each of these categories.

The added value of Cradle to Cradle Certified^{TM} products for buildings:

he new LEED Version 4 for new constructions, there is an increased awareness of the importance of developing a transparency policy at product level. Thus, it assures points to products with a C2C and products that have third-party verified

EPDs. In this new version, Cradle to Cradle Certified™ products and our EPDs can contribute to additional points in the Materials & Resources section. This credit encourages project teams to choose "healthier products and materials" in order to minimise the use and generation of harmful substances while endorsing the use of materials for which life cycle information is available. Hence, by using AGC's EPDs and Cradle to Cradle Certified™ products, architects and builders are eligible to earn direct points.

As well as being a standardised report, EPDs can also be incorporated into Building Information Models (BIM).

For more information please visit: www.yourglass.com/

www.yourglass.com/

REFERENCES

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Additional information available at www.yourglass.com

and in the « Environment » section at www.agc-glass.eu