# Product Information Sheet

2014

## *Basic Glass Products*

EN 572: Basic Soda Lime Silicate Glass Products
Part 2: Float Glass
Part 8: Tolerances

Dimensional Tolerances: Float Glass 572-8

Pane Dimensions less than 1500mm

| | | |
|---|---|---|
| 3 to 6 | ± | 1.0mm |
| 8 to 12 | ± | 1.5mm |
| 15 | ± | 2.0mm |
| 19 & 25 | ± | 2.5mm |

Pane Dimensions 1500mm ≤ 3000

| | | |
|---|---|---|
| 3 to 6 | ± | 1.5mm |
| 8 to12 | ± | 2.0mm |
| 15 | ± | 2.5mm |
| 19 & 25 | ± | 3.0mm |

Pane Dimensions > 3000

| | | |
|---|---|---|
| 3 to 6 | ± | 2.0mm |
| 8 to 12 | ± | 2.5mm |
| 15 | ± | 3.0mm |
| 19 & 25 | ± | 3.5mm |

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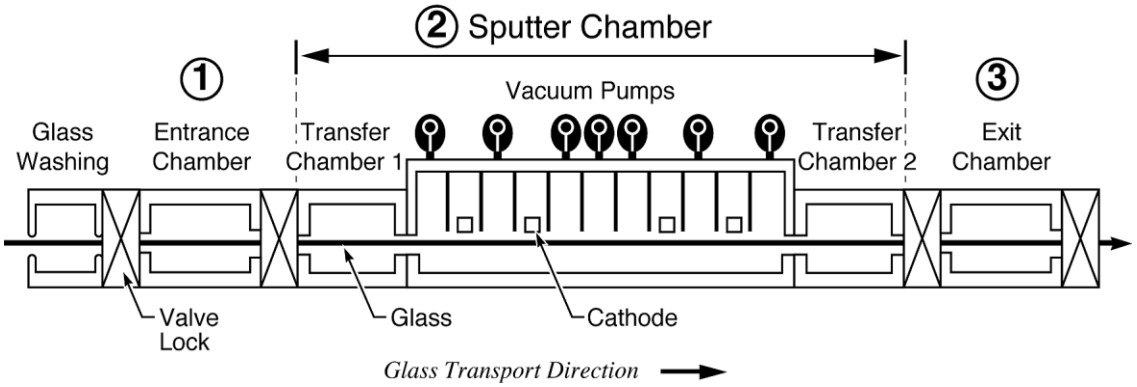
**EN 1096: Coated Glass**




Plasma Vapour Deposition, also called (PVD) is a process used to deposit thin films from a gaseous state to a solid state on a substrate material. Chemical reactions are involved in the process, which occur after creation of plasma of the reacting gases. The plasma is generally created by RF (AC) frequency or DC discharge between two electrodes, the space between which is filled with reacting gases.

Chemical vapour deposition, also called Pyrolytic coating, was developed as an online method of depositing films directly on the hot glass while it is still on the float line.

In CVD, precursor compounds (both gases and liquids) are vaporized in a reactor that spreads the resulting gas mixture uniformly over an advancing, newly formed glass ribbon. Chemical reactions occur in the gas above the glass and on the growing surface of the deposited film.

Glass that is coated online is flat and properly annealed, which minimizes post processing. CVD coatings also adhere more strongly to the glass than sputtered coatings because they are deposited at higher temperature (600–700 °C). Strongly adhered coatings maintain their integrity when the product is bent and tempered.

All coated glass will be Arrissed as standard. Processed glass will either be Arrissed or polished depending on requirements, holes drilled or cut outs before toughening. Special coated materials can be sourced which will have a lead time; these are cut from float glass, processed & toughened before the glass is coated. Time scales will be highlighted at the time of enquiry.

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**Processing Standards**

EN 952: Glass for Glazing

Part 1 – Classification
Part 2 – Terminology for work on Glass

Carey Glass is able to supply safety glass in the forms of Toughened, Heat Strengthened, Heat Soaked & PVB Laminate glasses.

These glasses can be used in many different applications:

Doors and Side Windows
Shower Cubicles
Splash Backs
Balustrading
Stair Treads and Landings

Structural Glazing
Wall Cladding
Fins
Lift Shafts
Partitions
Stairs Cases
Floor Panels

Our Heat Worked Glass is available in thicknesses ranging from 4mm to 19mm.
Laminated glass is available in different thicknesses as to suit the performance criteria, and in float, Heat Strengthened and toughened glass types.

All products can be made available in a range of glass types which include:

| | | |
|---|---|---|
| Clear Float Glass | Body Tinted Glass | LowE Glass |
| Patterned Glass | Light diffusing Glass | Low Iron Glass |
| Screen Printed | Ceramic | Solar Control |

Toughened Glass Conforms to BS EN 12150 class 1(was formerly BS 6206 class A) and the laminate glass conforms to BS EN 12543 & Kite Marked to BS EN 14449. Heat strengthened glass is stamped EN 1863 however no kite mark can be given on this product.

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## Advantages

- Our glass conforms to British and International Standards
- Toughened Glass breaks in to relatively small particles
- Toughened Glass is four to five times stronger than Float Glass
- Heat Strengthened Glass breaks in to several pieces, whilst maintaining good Mechanical Strength
- Toughened Glass or Heat Strengthened Glass can be Heat Soaked Tested to BS EN 14179
- Laminated Glass can be used for extra Security and Safety
- Laminated glass can be made from Annealed or Toughened Glass
- Glass types are available from a wide range of manufactures, we only use the main European supply chain, Pilkington, AGC, Guardian or Saint Gobain

## Product Overview

**EN 12150: Thermally Toughened Soda Lime Silicate Glass**
**EN 12600: Pendulum & Impact Test**

Toughened glass is manufactured by heating the glass to approximately +620°C and quenching rapidly, this creates high compressive stresses on the surfaces with balanced tensile stresses in the centre. This makes the toughened glass four to five times stronger than annealed glass of the same thickness, plus with toughened glass when it is broken the glass breaks safely conforming to the requirements BS EN12150 class 1 (formerly BS 6206).

The toughening mark will be situated in most instances to the right hand bottom corner (however due to the logistics from toughening to IGU manufacture the stamps may appear in opposite corners).

**EN 1863: Heat Strengthened Glass**

Heat Strengthened Glass is heated and cooled in a controlled manner in order to give it increased resistance to mechanical and thermal stress. Heat Strengthened Glass is also designed to break in a manner similar to Annealed Glass.

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**Toughened & Heat Strengthened Glass**

| | |
|---|---|
| Roller Wave | ± 0.15 mm |
| Edge Dip | ± 0.25 mm |
| Bow | ± 0.02 mm/mm |
| Diagonal Difference | ≤ 4mm |

**Tolerances and Squareness -Toughened Glass**

Table 2 : from the GGF manual Section 4.4

| Nominal dimension of side B or H | Tolerance, t | |
|---|---|---|
| | Nominal glass thickness D ≤ 12 | Nominal glass thickness D > 12 |
| ≤ 2000 | ± 2.5 (horizontal tightening) ± 3.0 (Vertical toughening) | ± 3.0<br>± 0.2<br>± 0.2<br>± 0.2<br>± 0.3<br>± .03 |
| 2000 < B Or H ≤ 3000 | ± 3.0 | ± 4.0 |
| > 3000 | ± 4.0 | ± 5.0 |

**Appearance**

During the toughening process the heating of the glass can cause an overall warp called bow.

Whilst the glass is in contact with the rollers during the toughening process, a distortion known as roller wave is produced, which may be more exaggerated at the edge of the glass known as (edge dip).

Glass thicknesses of 8mm and over will show signs of small indentations on the glass surface this is called roller pick up.

The toughening process produces areas of different stress in the cross section of the glass. These areas of stress produce a bi-refringent effect in

the glass, which is visible in polarised light. When toughened glass is viewed in polarised light, the areas of stress show up as coloured zones, sometimes known as 'iridescence' or 'leopard spots'. Polarised light occurs in normal daylight. The amount of polarised light depends on the weather and the angle of the sun. The bi-refringent effect is more noticeable either at a glancing angle or through polarised spectacles

**EN 14179: Heat Soaked Glass**

Heat soaked toughened glass is used to minimise the risk of spontaneous breakage due to nickel sulphide (NiS) inclusions, which occur naturally in glass. Heat soaking is to BS EN 14179 where the oven air temperature is controlled by thermocouples that are placed in-between the glass, once all of the Thermocouples have reached 280 $^{0}$c,the oven is held at this temperature for 2 hours, within a tolerance of ± 10 $^{0}$c.

Therefore the level of spontaneous breakage is reduced, based on statistical studies (EN 14179-1: 2005) 3-3.2
"Risk of spontaneous breakage of heat soaked thermally toughened soda lime silicate safety glass, on a statistical basis, due to the presence of critical nickel sulphide inclusions, is no more than one breakage in 400 tons of heat soaked thermally toughened soda lime Silicate safety glass"
Even after the heat soak testing process NIS breakages may occur Carey Glass cannot accept responsibility.

**PVB Laminate**

**EN 12543: Laminate Safety Glass**

Laminated Glass made with a PVB Interlayer can be manufactured using different types of interlayer and from many types of glass products and thicknesses.
It is through heat and pressure that the PVB sheet bonds the glass panes together.

The PVB material purchased is tested to BS EN 12543 & Kite marked as BS EN 14449.

The glass when processed is delivered to the PVB laminating line, the glass is washed and inspected and sent into the clean room where the PVB interlayer is placed on the glass.

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Whilst the interlayer is being placed on the first pane the second pane of glass is being washed and inspected so that it is ready to sandwich the PVB interlayer.

When the second pane of glass is placed on top of the PVB interlayer the glass can then leave the clean room for entry into the oven, the first section of the oven heats the glass and the interlayer to create an initial bond between the surfaces, this bond happens when the glass passes through a roller that compress the panes of glass to the PVB interlayer.

The pane is further heated in the second part of the oven and passes through a second roller.

The completed PVB pane can then be stored on a rack ready to go into the autoclave.

Toughened Laminate: The glass will be cut from float glass, edge worked and if required further processed. The glass is then washed before it is toughened.

Roller wave should not exceed for example 0.152mm when used with a 1.5mm PVB lamination layer
Once the glass has been toughened is delivered to the PVB laminating line

**Laminated Glass Tolerances & Appearance**

**BS EN ISO 12543 – 5:**

**Appearance**

The appearance of toughened laminated will depend on the type of glass, the colour and the thickness.

Laminated glass may have small air bubbles around holes, cut outs and the perimeter; these should be no larger in size than 1.5mm diameter.

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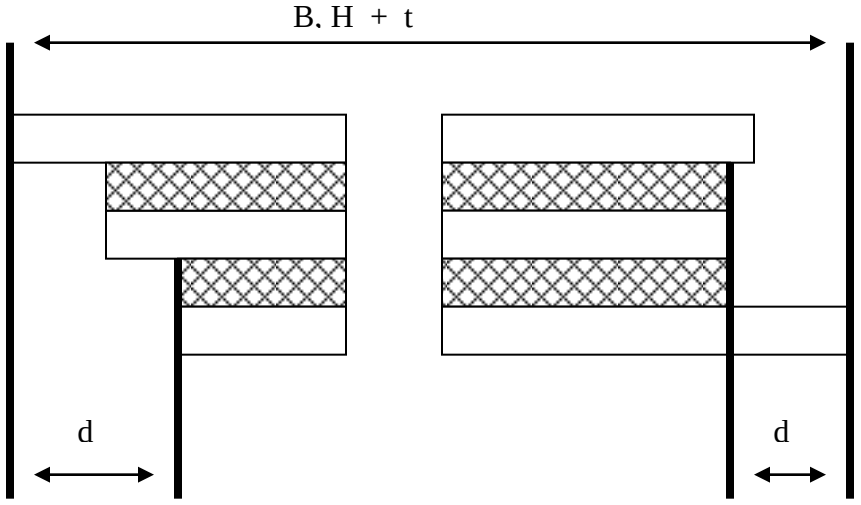
**Tolerances Laminated Glass**

| Limit Deviations t on width B or length H (figure 2 BS EN ISO 12543 -5 3.2.1) | | | |
|---|---|---|---|
| | | Nominal Thickness >8 mm | |
| Nominal Dimension B or H mm | Nominal Thickness ≤ 8 mm | Each glass pane < 10mm Nominal Thickness | At least one glass pane ≥ 10 mm Nominal Thickness |
| < 1100 | + 2.0<br>- 2.0 | + 2.5<br>- 2.0 | + 3.5<br>- 2.5 |
| < 1500 | + 3.0<br>- 2.0 | + 3.5<br>- 2.0 | + 4.5<br>- 3.0 |
| < 2000 | + 3.0<br>- 2.0 | + 3.5<br>- 2.0 | + 5.0<br>- 3.5 |
| < 2500 | + 4.5<br>- 2.5 | + 5.0<br>- 3.0 | + 6.0<br>- 4.0 |
| > 2500 | + 5.0<br>- 3.0 | + 5.5<br>- 3.5 | + 6.5<br>- 4.5 |

**3.2.3 Displacement**

Displacement d (figure 3 BS EN ISO 12543 -5 3.2.3) is the misalignment at any one edge of the constituent glass panes or plastic glazing sheet material making up the laminated glass

**Figure 3**



The Maximum Displacement d shall be given as table 5. Width B and length H shall be considered separately

**Table 5**

| Nominal dimension B or H mm | Maximum permissible displacement d mm |
|---|---|
| B, H ≤ 1000 | 2.0 |
| 1000 < B, H ≤ 2000 | 3.0 |
| 2000 < B, H ≤ 4000 | 4.0 |
| B, H ≥ 4000 | 6.0 |

**BS EN 1279: Insulating Glass Units**

**Production Processing:**

Before any glass is put onto the washing machine of the production line, it will be inspected for defects such as shells (the tolerance for shells is that they are no deeper than half of the thickness of the glass and no larger than 5mm high x 15mm across), scratches (as per GGF and product standards), coating defects etc. and that the edge deletion is correct (the tolerance for edge deletion is +3 -2).

If any defects are found, the glass is removed from the production line and the charge hand is called to check the defect and to ascertain its origin.

If the glass was found to be defective from supply, the glass where possible will be photographed and the information passed on to the supplier.

If the problem was caused internally the cause shall be found and rectified immediately. The label will be passed on to production planning for re-ordering.

Once inspected and the glass has either been found to be fit for purpose or rejected then production will recommence.

The next station is the set up station where the spacer bar is positioned on the first pane of glass; the inspection of the spacer bar is critical to ensure it is clean and then the butyl can be applied which should also be clean

and that the application of the butyl is within tolerance a) gap in-between the butyl is to have the absolute limit of 10mm gap x 3, however we aim to ensure there are no gaps.

The last inspection is the gunning station; the filling of the sealant is monitored to ensure the units are sealed properly, and the overall visual quality of the unit is checked again.

When the unit is filled there should be no greater air void in-between the butyl and the secondary seal such as 2.0mm high x 50mm long approx., again we aim to ensure there are no voids or gaps.

In some instance it is possible that the butyl will seep into the cavity however this shall be no greater than 2mm, the minimum Butyl string will be 3mm continuous.

The unit when sealed will be placed on a rack / stillage for delivery to the customer.

When Toggles are required in a unit the unit will be sealed as normal and the unit is then removed from the production line where it will be laid flat on a table, the toggle distances are measured out and then inserted into the sealant. The excess sealant that is pushed out in the insertion of the toggles is used to fill any gaps then removed before the unit is placed on a rack.

Spider units are manufactured by ensuring that both panes of glass are an exact match to each other. The doughnut is cleaned, primed and a water tight sealant is applied before the doughnut is set in place on the first pane of glass. When all of the Doughnuts are in situ the unit can then be sealed. Once the unit has dried the remaining parts of the bolts can be attached to the unit.

Cut Size Coated Glass: This production flow will continue until the batch of glass that contains the coated cut size glass has been completed.

Each rack/stillage will have a board that details the batch number and the order number of the glass. Any shortages will be recorded on this board to inform the loaders of missing units.

Any breakages in the loading area are to be reported to the production planning department immediately to ensure that the glass is reordered without haste.

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The glass when ready for delivery will be packed in a manner as to avoid damage in transit.

When the glass is packed it will be loaded on to a suitable vehicle for delivery to the customer's requirements.

**IGU Tolerances**

**Thickness Tolerance on the Insulating Glass Units (IGU) when float glasses are used EN 1279/1-5.3.3**

**Table 3**

| | First Pane (note 1) | Second Pane (note 1) | IGU Thickness Tolerance |
|---|---|---|---|
| A | Annealed Glass | Annealed Glass | ± 1.0mm |
| B | Annealed Glass | Toughened or Strengthened glass (note 2) | ± 1.5mm |
| C | Annealed Glass Thickness ≤ 6 mm and total<br>In Other Cases | Folio Laminated Glass (note 3) Thickness ≤ 12 mm | ± 1.0 mm<br>± 1.5 mm |
| D | Annealed Glass | Patterned Glass | ± 1.5 mm |
| E | Toughened or Strengthened glass | Toughened or Strengthened glass | ± 1.5 mm |
| F | Toughened or Strengthened glass | Glass / Plastic composites (note 4) | ± 1.5 mm |
| G | Toughened or Strengthened glass | Patterned Glass | ± 1.5 mm |
| H | Glass / Plastic composites | Glass / Plastic composites | ± 1.5 mm |
| I | Glass / Plastic composites | Patterned Glass | ± 15 mm |

| | |
|---|---|
| Note 1 | Pane Thicknesses are expressed as nominal values. |
| Note 2 | Thermally Toughened safety glass, heat strengthen glass or Chemically strengthened Glass |
| Note 3 | Laminated glass or Laminated Safety glass, consisting of two annealed float glass sheets (maximum thickness 12 mm each) and plastic sheet interlayer. For different assemblies of laminate glass or laminated safety glass , see EN 12543-5, and apply subsequently the calculation rule given in 5.3.3 |
| Note 4 | Glass / Plastics composites are a form of laminated glass incorporating at least one pane of plastic glazing sheet material; EN 12543 |

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## Carey Glass Kite Mark & Certifications

**IMS Policy Certifications with BM Trada**

- ISO 9001-2008
- OHSAS-18001/2007
- EMS 14001-2004

**Kite Mark registration with BSI**

- **KM-32799 which covers:**

- BS EN 12150-1:2000 - Thermally toughened soda lime silicate safety glass
- BS EN 14179-1:2000 - Heat soaked thermally toughened soda lime silicate safety glass
- BS EN 14449:2005 - Laminated glass and laminated safety glass
- Coated toughened / heat soaked glass meeting Impact Class 1 (BS EN 12600)

- **KM-23809 which covers:**

- BS EN 1279-2: 2002 – Insulating Glass Units. Long term test method and requirements for moisture penetration.
- BS EN 1279-3: 2002 – Insulating Glass Units. Long term test method and requirements for gas leakage rate and for gas concentration tolerances.