

**AGC** *Obekon*

# STOPRAY SMART

## PROCESSING GUIDE

Stopray Smart 30 on clear float & on tinted float  
Stopray Smart 51 on clear float & on tinted float

VERSION 2.0 – February 2021

Your Dreams, Our Challenge

# WARNING

Carefully read this manual before processing Stopray Smart products.



## Preliminary Important Instructions

- At each stage of the processing procedure, the personnel responsible for handling the glass must have the adequate equipment: safety shoes, safety gloves, safety glasses, ...
- Product shelf life without any protection: the glass has to be consumed within 9 months from the delivery in the processor's facility.
- Product shelf life with protection (closed packaging): the glass has to be consumed within 12 months from the delivery in the processor's facility. Once the pack is opened, the glass has to be consumed within nine months.
- The Stopray Smart range is self-matchable: these products can be used annealed or heat treated as required by the application. Both annealed and heat treated products have similar reflection and transmission characteristics. In case of heat treatment, the procedure and set up of the furnace in chapter 6 of this manual must be strictly respected.
- Stopray Smart coatings (heat treated or not) must be assembled in insulating glazing with the coating towards the cavity, so in position 2 of the insulating glazing. The glass should be assembled in insulating glazing within one week after being heat treated. The Stopray Smart coatings cannot be used as single glazing.
- The Stopray Smart coatings, tempered or not, cannot be laminated with coating against PVB. Both coatings are available upon request on laminated glass or laminated by the customer (coating outside lamination, with no coating in contact with PVB).
- We advise processing and handling this coated glass with care in order to avoid coating damage. The personnel responsible for handling must wear clean gloves to ensure that no fingerprints are left on the glass. Therefore we strongly recommend that everything coming into contact with the coating of the glass during preliminary processes be pre-validated.
- No edge deletion: Tests using different sealants have shown that, under strict conditions and with a selection of sealants, prior edge-deletion is no longer required.
- For the various glazing methods (traditional framing, structural glazing, ...) tests for compatibility and adherence of the coating with the sealant must be made in each case with the sealant manufacturer. The AGC specification described in the Appendix 1 "SEALANT COMPATIBILITY".

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# 0. PRODUCTS

This Processing Guide concerns the Stopray Smart products: Stopray Smart 30 & Smart 51.

The Stopray Smart products can be used either annealed (so without heat treatment) or with heat treatment (thermal toughening or heat strengthening).

The Stopray Smart products can be used in this configuration:

| Configuration | Insulated glazing units with coating facing cavity | Laminated glazing units with coating in contact with pvb-interlayer |
|---------------|----------------------------------------------------|---------------------------------------------------------------------|
| Smart 30      | YES                                                | NO                                                                  |
| Smart 51      | YES                                                | NO                                                                  |

## I. RECEPTION AND STORAGE

### 1. Unloading

The packs of glass must be inspected on arrival. AGC Obeikan shall accept no liability for coating defects arising after delivery or during handling, processing or installation of the finished product in the building if this procedure is not followed:

- The rack must be positioned on perfectly level ground.
- Use the appropriate handling equipment.
- The grab must be perfectly centered.
- Avoid damaging the protective packaging whilst handling.
- The glass must be stored on appropriate racks.
- All recommendations given in this Processing Guide shall be strictly followed.

#### **General comments:**

- Clamps, slings, lifting beams and other handling equipment must comply with prevailing regulations and be approved by the relevant authorities.
- Ensure the safety of personnel at all times. Keep all unnecessary personnel out of the handling area. Wear appropriate personal protective equipment.
- Personnel must have received the required training.

### 2. Storage of the packs

Storing packs correctly reduces the risk of chemical or mechanical damage to the glass.

As a general rule, care should be taken to avoid major fluctuations in temperature and humidity that may cause condensation on the glass. Such fluctuations generally occur near loading and unloading areas. No water must be allowed to come into contact with the sheets of glass.

Care should be taken to ensure that the ambient air is not polluted by any corrosive elements such as chlorine or sulphur. Sources of such elements include machinery fitted with heat engines, battery charging points, road salt on the ground and so forth.

Factory racks are used for packaging during transport and are not designed to be used for storage. Consequently, the PLFs must be stored on racks with spacers between packs ensuring that all packs of the same size are stored together.

### **Stock sheets (PLF and DLF)**

Special packaging requirements apply in function of the final destination of the coated glass packs.

Shelf life without any protection: the glass has to be consumed within 9 months from the delivery in the processor's facility.

Shelf life with protection: the glass has to be consumed within 12 months from the delivery in the processor's facility.

When protection is needed, desiccant bags are fit on the upper side and on the lateral sides of the stack (two thirds of the height, from the upper corners). A protection tape is glued on the four sides.

Once the pack is opened, the glass has to be consumed within nine months.

Once the protective packaging is opened, the remaining sheets cannot be re-packed.

Upon receipt, we advise you to check if the packaging has been damaged during transport/handling. If the weather-proof packaging has been damaged, condensation marks may appear on the glass. In this case, you should open the packaging to take out a desiccant pack and weigh it. Contact AGC Obeikan immediately.

However, it is important to bear in mind a number of additional points:

- The sheets must be moved using a suction-pad lifting beam or an automatic unstacking machine. The suction pads are placed on the glass side.
- If the glass is handled by placing suction pads on the coating, these suction pads must be perfectly clean and covered with a protective material<sup>1</sup>.
- Care must be taken to ensure that the suction pads/coating do not slip.
- The personnel responsible for unloading must wear clean gloves to ensure that no fingerprints are left on the glass.

### **General comments:**

If, despite the precautions taken, marks do appear on the coating (fingerprints etc.) they should be removed at once using a clean, soft and wet (water) cloth and then a dry cloth. Soft circular movement should be applied.



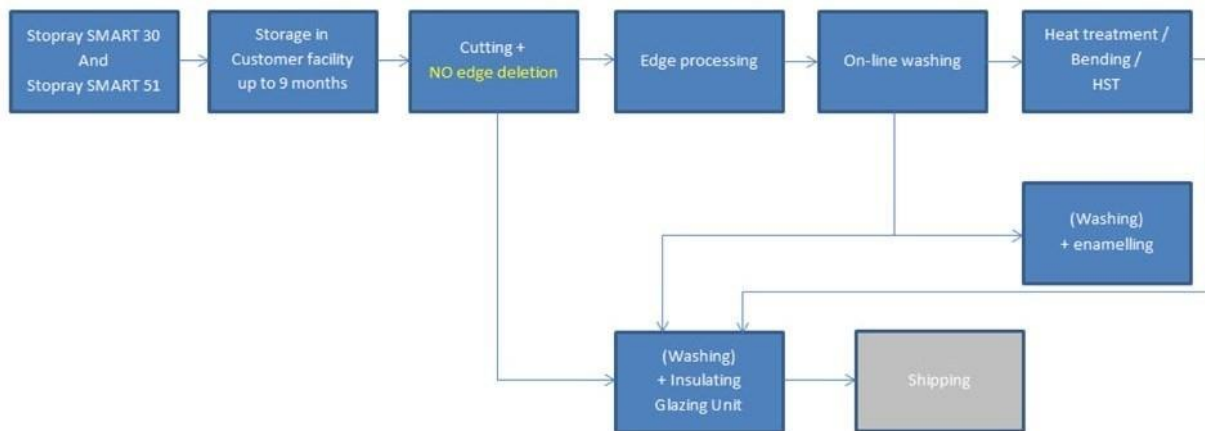
## II. PROCESSING

### 0. Safety & General Information

At each stage of the processing procedure, the personnel responsible for handling the glass must have the adequate equipment: safety shoes, safety gloves<sup>2</sup>, safety glasses, ...

The different industrial stages for Stopray Smart products are described hereafter.

### Stopray Smart 30 & Stopray Smart 51



### 1. Cutting

The following specific precautions must be taken when cutting:

- When cutting, the coated side must be facing upwards to avoid any contact between the coated side and the surface of the table.
- The cutting oil used should be compatible with the coating, sufficiently volatile and water soluble<sup>3</sup>.
- The table and any break-out equipment coming in contact with the coating on the glass must be pre-validated.
- Cutting personnel must wear clean gloves to avoid leaving finger marks on the coating<sup>2</sup>.
- If the glass is to be cut using a template, the template must be positioned very carefully and care must be taken not to scratch the coating. We recommend placing a protective sheet between the template and the glass.
- The cut sheets of glass must be stored on racks. Care must be taken when handling them to ensure that the coating on the first sheet does not rest against the back of the rack. All subsequent sheets should be turned the other way.
- No particular spacer is needed if the original interlayer powder is still present. However, if for any reason there is not enough interlayer powder left on the glass, we recommend that you place cork spacers between the sheets<sup>4</sup>.
- The coating around the edge of the glass may be removed during the cutting process provided that dust from grinding is properly removed.

## 2. Edge-deletion

Tests using different sealants have shown that, under strict conditions and with a selection of sealant, prior edge-deletion is no longer required. Check Appendix 1 “SEALANT COMPATIBILITY”. Contact AGC Obeikan’s sales team or IBP (International Building Projects) team for further information (info@agc-obeikanglass.com.sa). The described instructions must be strictly respected and executed.

If for any specific reasons, the customer wants to edge-delete the coating it has to be done as described in the Stopray range processing guide available on [www.agc-yourglass.com](http://www.agc-yourglass.com) and/or [www.w.agc-obeikanglass.com.sa](http://www.w.agc-obeikanglass.com.sa)

## 3. Edge processing

The Stopray Smart products are designed to possibly undergo thermal toughening or heat strengthening. Accordingly, edge processing is required.

### 3.1 Handling the glass

The personnel responsible for handling and shaping the edges of the glass must wear perfectly clean safety gloves<sup>2</sup>.

### 3.2 Shaping the edges

Several types of edging machinery are available on the market:

#### 3.2.1. Crossed belt system

We recommend for personnel to work with diamond belts and adhere strictly to the supplier’s instructions, specifically in terms of speed and cooling. For thicknesses in excess of 6 mm, we recommend ‘smooth edge’ shaping.

#### 3.2.2. Vertical single edging system

Since the glass is held with chain tracks and, depending on cleanliness and maintenance of the machine, there is a risk of scratching the coating.

#### 3.2.3. Horizontal double edging system

It is possible to use this type of machine provided that the glass is held by smooth, non-textured belts. The speeds of the various belts must be synchronised. Mains water jets are placed in such a way that the coating is soaked and cleared of various impurities (e.g. separating powder or glass dust) just before they come into contact with the upper roller belts.

#### 3.2.4. Numerical Control Systems (CNC)

Shaping using a numerically controlled machine is permitted provided that the glass is placed with the coated side facing upwards.

### **General recommendations for shaping edges:**

- The glass must remain moist throughout the shaping process in order to prevent ‘natural drying’.
- The glass must be washed as soon as it has been shaped.
- The glass may be drilled provided that the press is covered with a soft protective material.
- The glass may be processed using dry crossed belts provided that the extraction system is sufficiently effective to remove the dust resulting from grinding.

### 3.3 Unloading

Due to the fact that the interlayer powder is removed during the washing process, we recommend placing micro-suction pads 4 around the edge of each sheet of glass in order to prevent contact between the glass and the coatings. Paper with a neutral pH can also be used, for example, for large pieces.

The personnel responsible for handling the glass must wear clean gloves<sup>2</sup> suitable for handling coated glass.

## 4. Washing

This stage involves washing, rinsing and drying the glass.

**A mains-water spray station should be installed just before the point where the glass enters the washer. This will remove any abrasive elements on the coating (cutting and edge-processing residues) that could cause scratches when the brushes make contact with the coating.**

The glass must be washed in clean, deionized water with a pH of 7 ( $\pm 1$ ) and a conductivity of  $< 30 \mu\text{S/cm}$ . No hard particles (such as calcium) or acidic/detergent agents should be present in the water used for washing and rinsing as these may damage the coating.

We recommend the use of 'soft' brushes (diameter of the bristles  $< 0,15 \text{ mm}$ ), 1–2 mm of which come into contact with the glass. There must be enough water to guarantee that the water is distributed evenly and efficiently across the coating before it comes into contact with the brushes.

It is also important not to stop the cycle whilst the glass is in the washing machine.

After washing, micro-suction pads<sup>4</sup> should be used on the perimeter of the glass in the area that normally would be edge-stripped in order to avoid any contact between glass and coating. For large sheets of glass, a sheet of paper should be placed on the center of the glass.

The glass must be completely dry. We recommend checking whether the air filters of the ventilation units are clean.

**Two or three halogen lights should be present at the exit of the washer to light the glass correctly (vertically from top to bottom) and even detect and quickly correct any deviations from the requirements listed above.**

Summary of the quality of water used for shaping and washing the glass:

|              | WASHING |                               |                               |
|--------------|---------|-------------------------------|-------------------------------|
|              |         | Washing                       | Rinsing                       |
| Coolant      | NO      | —                             | —                             |
| Detergent    | —       | NO                            | NO                            |
| Temperature  | —       | $< 40 \text{ }^\circ\text{C}$ | $< 40 \text{ }^\circ\text{C}$ |
| pH           | 7 + 1   | 7 + 1-                        | 7 + 1                         |
| Conductivity | —       | $< 100 \mu\text{S/cm}$        | $< 30 \mu\text{S/cm}$         |



Unloading the glass from the washer:



- Due to the fact that the interleaving powder is removed during the washing process, we recommend placing micro-suction pads<sup>1</sup> around the edge of each sheet of glass in order to prevent contact between the glass side and the coated side.
- pH-neutral paper or corrugated cardboard can be used, assuming that it is clean and dry. The personnel responsible for handling the glass must wear clean gloves<sup>2</sup> suitable for handling coated glass.
- The water in the washer tanks should have a temperature of at least 40 °C. We also recommend the use of closed UV light systems to ensure the water is sufficiently disinfected.

## 5. Silk screen printing

### 5.1 Stopray Smart with silkscreen

In case of a silkscreen on the Stopray Smart, where the silkscreen is in contact with the sealant joint, the edge-deletion of the coating is required prior to the application of the silkscreen.

AGC Obeikan recommends to assess the aesthetics by means of a mock-up sample.

The calculation and dimensioning of the sealant joint is under responsibility of the manufacturer of the insulating glazing units.

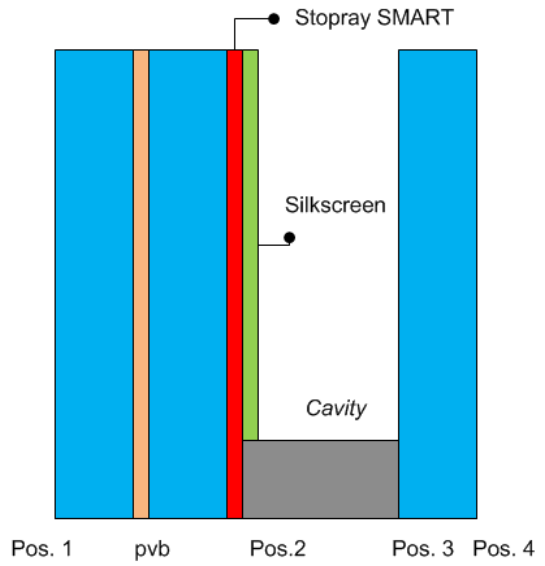
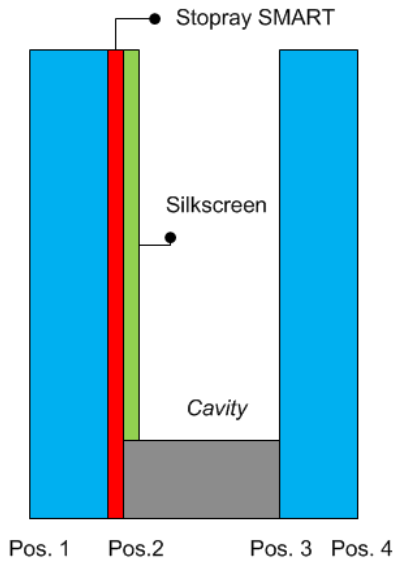
In case the silkscreen is in contact with the sealant joint, the compatibility of the sealant joint, structural joints and weatherseals with the silkscreen (enamel) paint is under responsibility of the manufacturer of the insulating glazing units, and should be assessed in cooperation with the sealant supplier.

#### **Additional recommendations:**

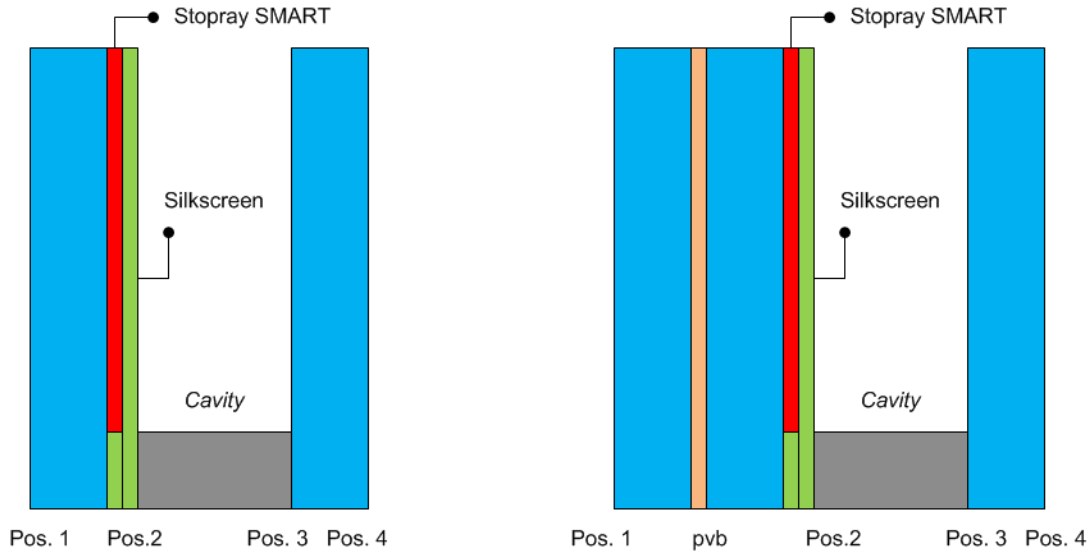
- Any impurities on the coated surface can be removed using a compressed dry-air jet.
- AGC Obeikan recommends using clear-coloured enamels that have a sufficiently high energy reflection level. A dark-coloured enamel will have a relatively high energy absorption level and the coating may be damaged under the enamel during the heating process.
- Similarly, when the coverage percentage is very high and confined to a very small area, the printed section of the glass may behave differently to the uncovered section in the quench.
- In any case, the final result will depend on the type of furnace used, its parameters, the colour and type of enamel used and the desired pattern. The processor will have to carry out preliminary tests, and manufacture some mock-up samples on a case by case basis, to avoid these problems. AGC Obeikan is not liable under any circumstances for the outcome of the operation.
- The presence of enamel on the coating changes the optical properties of the final glass product. These performance properties can be obtained from AGC Obeikan's sales team or IBP (International Building Projects) team ([info@agc-obeikanglass.com.sa](mailto:info@agc-obeikanglass.com.sa)).

*Drawing given for purpose of illustration.*

#### 5.1.1. [Silkscreen not in contact with the sealant joint](#)



### 5.1.2. Silkscreen in contact with the sealant joint



Two cases are possible:

- 1) the silkscreen is in contact with the sealant joint: the compatibility of the sealant joint, structural joints and weather seals with the silkscreen is the responsibility of the manufacturer of the insulating glazing units, and should be assessed in cooperation with the sealant supplier.
- 2) no silkscreen in contact with the sealant joint: no assessment required.

AGC Obeikan recommends to assess the aesthetics by means of a mock-up sample.

The calculation and dimensioning of the sealant joint is the responsibility of the manufacturer of the insulating glazing units.

## 6. Thermal Toughening / Heatstrengthening

### 6.1 Introduction

The Stopray Smart range is self-matchable: these products can be used annealed or toughened / heat strengthened as needed by the application. Both annealed and heat treated products have similar reflection and transmission. Hereafter the summary of the selfmatchability:

| COLOR MATCHABILITY              | Stopray Smart 30 Pos 2 annealed | Stopray Smart 30 Pos 2 heat treated or curved | Stopray Smart 51 Pos 2 annealed | Stopray Smart 51 Pos 2 heat treated or curved |
|---------------------------------|---------------------------------|-----------------------------------------------|---------------------------------|-----------------------------------------------|
| Stopray Smart 30 Pos 2 annealed | YES                             | YES                                           | NO                              | NO                                            |
| Stopray Smart 51 Pos 2 annealed | NO                              | NO                                            | YES                             | YES                                           |

Stopray Smart coatings (heat treated or not) must be assembled in insulating glazing. We recommend processing and handling this coated glass with care in order to avoid coating damages.

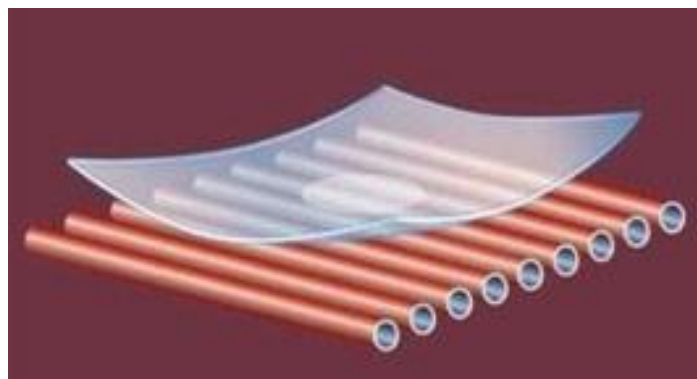
Pre-process defects will generally only be revealed by the toughening process itself and this can cause severe aesthetic defects. **Therefore we strongly recommend that all objects coming into contact with the coating of the glass during preliminary processes be pre-validated.**

## 6.2 Generalities

When a clear glass is placed in a toughening furnace it deforms considerably (concave shape) during the first heating cycle. The deformation is even more pronounced with low-emissivity glasses such as Stopray Smart.

This is due to the different heating speeds of the surfaces.

In a purely radiation furnace, the lower surface is heated by conduction (contact with the rollers) and radiation (lower heating resistance). Since the upper surface is covered with a low-emissivity coating, which, by definition reflects the radiation emitted by the upper heating elements in the furnace, it does not heat up as quickly. The two surfaces do not, therefore, heat up symmetrically which leads to concave deformation of the glass due to differential expansion (see photo below). This phenomenon causes a marking, or even optical deformation of the glass at the center of the pane.





The only way to neutralise these defects is to balance the heating process by using additional heat transfer onto the upper surface. Significantly increasing the temperature of the roof does not resolve the problem because the low-emissivity coating will still reflect this increase in radiated energy. Moreover, this will cause the rollers to overheat which could aggravate the problem.

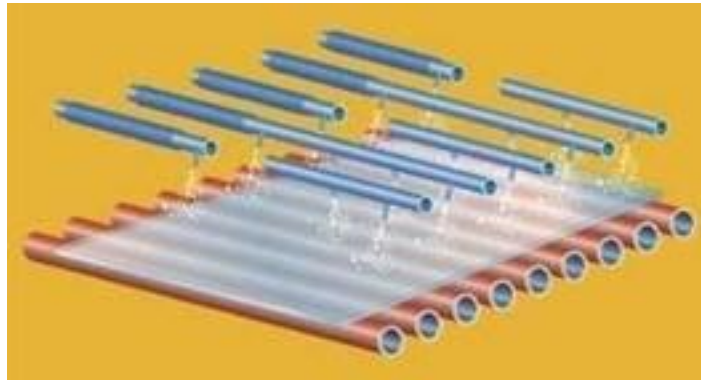
The only solution is to create additional energy via **convection over the upper surface**.

This can be done by creating an air flow over the upper surface that is hotter than the glass itself. The air is provided by an external compressor and is pre-heated in the furnace before it is pumped over the upper surface of the glass via rollers fitted with jets (see figure below). Another technique involves drawing hot air out of the furnace and pumping it back in again (re-circulation).

The latest generation of convection furnaces no longer have internal radiation elements. They only heat the glass using pre-heated air.

This additional air supply to the upper surface of the glass helps:

- Keeping the glass flat during the heating process and avoiding the aforementioned defects.
- Significantly reducing the heating time and therefore boosting the productivity of the plant.



### 6.3 Recommendations

- We recommend toughening or heat strengthening within 48 hours of cutting.
- The glass must be placed with the coated side facing upwards.
- The personnel handling the glass must wear clean gloves<sup>2</sup>. Larger and heavier sheets should be handled with suction pads covered with a protective material<sup>1</sup>.
- Markings may be made before toughening on the upper side of the glass coated.
- We recommend stopping the SO<sub>2</sub> supply in the toughening furnace at least 24 hours before toughening this kind of glass: the combination of SO<sub>2</sub> and a preliminary process that is not completely correct may change the appearance of the product.

## 6.4 Settings

Each furnace has its own settings for heating and quenching. As a result, the following recommendations should be taken as general guidelines.

### The furnace settings depend on:

1. The product to be thermally toughened or heat strengthened
  - a. dissymmetry of the absorption (emissivity of the coating/absorption of the substrate)
  - b. glass thickness
  - c. glass/furnace dimensions
2. Type of furnace
  - a. power density
  - b. convection rates
    - radiation with compressed air (type A)
    - radiation with re-circulation (type B)
    - convection (type C)
  - c. heating geometry (relative position of the heating/thermocouple/glass elements)

### In practice, it is advisable to start with pieces of 1,500 × 1,500 mm

1. Temperature 700 °C at the top and bottom
2. Cycle time
  - a. Furnace type A: 60–75 sec/mm
  - b. Furnace type B: 50–55 sec/mm
  - c. Furnace type C: 40–45 sec/mm
3. Convection: The convection profile will be adapted to obtain a flat sheet of glass as quickly as possible and to maintain this flatness until the end of the heating process. If, despite a maximum convection rate, the glass retains a concave profile for too long, the temperature on the lower side will need to be reduced by 20–30 °C.

The cycle time will be adjusted to prevent breakage in the quench and to obtain an acceptable optical quality.

The quench parameters will be set to ensure that the glass comes out flat (air balance top/bottom) and that the desired break pattern is achieved.

**NB** For very low-emissivity products, such as Stopray Smart products, a much higher air pressure needs to be applied to the upper surface of the glass during the actual heat treatment process. This is due to the fact that the coated surface does not cool down through radiation whilst the lower surface does. This phenomenon is all the more noticeable when the air pressure is low (very thick toughened glasses > 8 mm and heat-strengthened glass > 6 mm). A quench capable of producing highly dissymmetrical air pressure flows is therefore required.

For further information, please contact AGC Obeikan's sales team or IBP (International Building Projects) team (info@agc-obeikanglass.com.sa).

## 6.5 Unloading

- If the glass is unloaded manually, the personnel must wear clean gloves<sup>2</sup>.
- Larger and heavier sheets should be handled with a suction-pad lifting beam. The suction pads must be covered with a protective material<sup>1</sup>. The toughened sheets are then stored on racks.
- Care must be taken when handling them to ensure that the coating on the first sheet does not rest against the back of the rack. All subsequent sheets should be turned the other way.
- Given that toughened glass sheets are never perfectly flat, micro suction pads<sup>4</sup> should be placed around the edge of each sheet of glass in order to prevent contact between the glass and the coatings. For large volumes, paper with a neutral pH can be placed in the center to avoid all contact with the glass/coating during handling and transport.

## 6.6 Heat Soak test

The risk of spontaneous breakage due to nickel-sulphide inclusions is inherent to thermally toughened glass. The presence of such inclusions can in no way be considered as a fault in the glass. In order to eliminate the risk of spontaneous breakage, an additional heat soak test can be carried out in accordance with standard EN 14179-1 (or equivalent standards for countries outside the EU).

AGC Obeikan highly recommends using electrical equipment. Gas-fired furnaces must not be used for heat soak tests due to the risk that the coating could react with the smoke.

Interlayer's should only be placed on the perimeter of the glass.

## 6.7 Quality control

The declared properties of toughenable coatings correspond to the performances after the heat treatment. The coating will have achieved the performances indicated once its temperature reaches 500 °C.

The electrical resistance of the coating is an indicator of this change in properties during the heat treatment process. Resistance (measured with a four-point probe) must be around 3.5 Ohm/square.

Annealed products present the same optical and energy performance as the heat treated glass.

Heat-strengthened products offer the same optical and energy performance as the toughened glass.

For further information, please contact the AGC Obeikan's sales team or IBP (International Building Projects) team ([info@agc-obeikanglass.com.sa](mailto:info@agc-obeikanglass.com.sa)).

After the toughening process, the Stopray Smart products should be inspected as follows:

- The coating is inspected in accordance with EN 1096-1\*
- Toughened glass must comply with EN 12150-1\*
- Heat-strengthened glass must comply with EN 1863-1\*.
- The eventual Heat Soak Test (HST) must be carried out in accordance with EN 14179-1\*

\* Or equivalent local standards for countries out of the EU.



## 6.8 Packaging

If the heat treated coating is not assembled in an insulating glazing in the same processing factory, the following recommendations for packaging must be adhered to:

- A 1 mm-polyethylene foam spacer<sup>5</sup> should be placed between each sheet.
- The pack of glass should be packaged in watertight plastic. Sachets filled with desiccating agents should be placed inside the packaging<sup>6</sup>.
- Care must be taken to ensure that the pack is properly attached to the rack so that the sheets do not rub together.
- The glass will be assembled into insulating glass within one week after it has been toughened.

## 7. Bending

Bending tests have been carried out in different types of bending furnaces.

The following general recommendations refer to 6 mm Stopray Smart 51. Other thicknesses have not been evaluated as such and require preliminary validation tests by the glass processor. This is particularly important for glass thicker than 6 mm that will be subject to higher temperatures for a longer period of time.

The technical values stated (cycle times, temperatures and so forth) were noted during tests on certain types of bending equipment and obviously depend on the individual characteristics (shape, strength, convection rate and so on) of this equipment. The recommendations set out here are therefore intended as general guidelines and preliminary tests must be carried out for each bending furnace.

### 7.1 Curved annealed glass (on a concave mould)

Only bending ovens with top and bottom heating elements and with an upper convection system are suitable for bending coatings. The coating of the glass must always be in position 2 (coating in compression).

All instructions regarding the pre-process (unloading, storage, cutting, shaping, washing and handling) must be strictly adhered to.

The glasses should be shaped to a smooth ground edge.

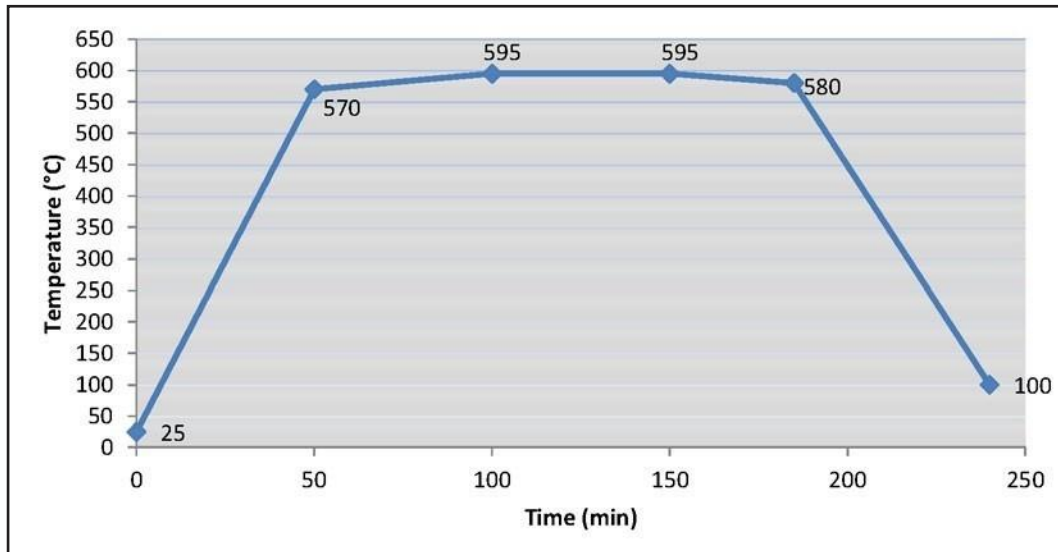
- Place the coating on the concave mould (coated surface facing upwards).
- Apply the appropriate packing powder (generally crystalline silica).
- Place a sheet of float glass on top.



### Heating/cooling parameters

- The temperatures must be adjusted so that the **upper surface of the glass** matches the following curve as closely as possible.

An example of heating/cooling parameters are described in the following figure for a 6 mm Stopray Smart 51 (coating upwards) with a 6 mm clear glass in a static furnace.



**NB:** The final heating phase must be adjusted according to the position of the glass in the bending mould.

## **7.2 Curved toughened glass (on a concave mould)**

### 7.2.1. Static furnace

- The glass is placed on a **concave mould with the coated surface facing upwards**.
- The furnace has heating elements on each of the six surfaces within the furnace and has an upper convection system composed of compressed air pipes ( $P = 2$  bar).
- The temperature of the **furnace** must gradually reach its final value (640 °C) (line ar progression).
- The glass must be transferred to the toughening section one to two minutes after it has completely bonded to the support.
- The cycle time lasts 15 to 20 minutes and depends largely on the size of the glass and the radius of curvature.
- The lower blow pressure is identical to that used for clear float glass of equal thickness.
- The upper blow pressure must be increased by 10 to 15 %.

### 7.2.2. Conveyor furnace

- The glass is placed in the furnace with the coated surface facing upwards.
- The furnace is equipped with one of the latest models of upper convection system.
- The temperatures should be 700 °C and 680 °C in the upper and lower sections respectively.
- The cycle time lasts 400 seconds (this should be adjusted according to the size of the glass and the radius of curvature).
- Convection pressure: 70 % of the maximum value for 220 seconds.
- Then, linear decrease to 0 % at the end of the heating cycle.
- The glass is then transferred to the bending/toughening section.
- The lower blow pressure is identical to that used for clear float glass of equal thickness.
- The upper blow pressure must be increased by 10 to 15 %.

For further information, please contact the AGC Obeikan's sales team or IBP (International Building Projects) team (info@agc-obeikanglass.com.sa).

## 8. Use in single glazing

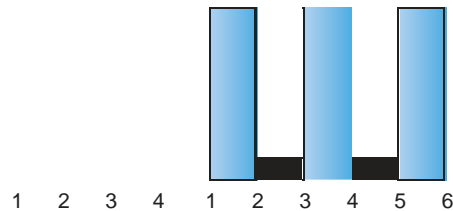
The Stopray Smart coatings cannot be used as single glazing.

## 9. Lamination

Stopray Smart 30 & Smart 51, tempered or not, cannot be laminated with coating against PVB.

## 10. Assembly in Insulating Glass Unit

The Stopray Smart products are designed to be assembled in insulating glass units with the following restrictions for the coating position.



| Coating position in the IGU |    |    |    |    |
|-----------------------------|----|----|----|----|
|                             | 1  | 2  | 3  | 4  |
| Stopray Smart 30            | KO | OK | KO | KO |
| Stopray Smart 51            | KO | OK | KO | KO |

As such, it is essential to check that the coating is in the correct position before assembly.

**The glass should be assembled in insulating glazing within one week after being heat treated.**

The individual responsible for assembly must check that the coating is compatible with the sealing products. See special brochure for sealants recommended by AGC Obeikan.

AGC Obeikan recommends indicating the external surface after assembly to ensure that the units are installed correctly.

### Quality control

It is essential to check that the coating is in the correct position before assembly. Any mistake could lead to changes in performance and/or aesthetics.

Quality control for the final product (insulating glass) involves not only strict compliance with the instructions provided in this processing guide, but also meticulous checks at each stage of the manufacturing process.

Two or three halogen projectors must be placed at the exit of each processing machine to light the glass correctly (vertically from the top to the bottom) to immediately detect any deviation from the regulatory parameters that could affect the appearance of the coating (e.g. scratches or other contamination).

## 11. Use in Structural glazing

When installation or assembling is by mechanical methods, structural glazing or other techniques, tests for compatibility and adherence of the coating or the adhesive must be made in each case with the adhesives manufacturer. Check Appendix 1 “SEALANT COMPATIBILITY”. Contact AGC Obeikan’s sales team or IBP (International Building Projects) team (info@agc-obeikanglass.com.sa) for further information.

## 12. Identifying the coated surface

Before the shaping process, the coated side can easily be identified by the cut, which is visible on the edge of the glass.

After shaping, and until the glass is assembled in double glazing, the coating may be identified using an electric tester, available on request from any AGC Obeikan representative.



## 13. Storage of cut sizes / IGU

### 13.1 During processing in the same factory

After each processing step, when the glass is stored on racks, no particular spacer is needed if the original interlayer powder is still present. If for any reason there is not enough interlayer powder left on the glass, and particularly after the washing, we recommend that you place cork spacers between the sheets<sup>4</sup>. The same recommendations apply for packs with several glass dimensions.

The storage must be conform to the recommendations of § 1.2.

### 13.2 To send cut size to another factory

If the Stopray Smart coatings have to be delivered from the processing factory to another factory, the following recommendations for packaging must be adhered to:

- A 1 mm-polyethylene foam spacer should be placed between each sheet<sup>5</sup>.
- Care must be taken to ensure that the pack is properly attached to the rack so that the sheets do not rub together.
- The pack of glass should be packaged in watertight plastic. Sachets filled with desiccating agent should be placed inside the packaging.

### 13.3 On site

When the glazing is delivered on site to be installed on the facade, it must be stored in a dry, sheltered and ventilated space. It must never be laid flat, nor be stored in the sun or near a heat source.

## III. CONFORMITY and GUARANTEE

### 1. Conformity

The Stopray Smart products comply with the standard EN 1096-1, category C.

The Stopray Smart coatings (heat treated or not) must be assembled in double glazing with the coating in inside the cavity. The Stopray Smart coatings cannot be used as single glazing.

Information regarding inspection conditions and quality criteria are available in that standard.

### 2. Warranty

The warranty is available on request from your local AGC Obeikan' s sales representative.

### 3. Disclaimer

It is the responsibility of the processor to inspect the processed coated glass adequately before and after each step of fabrication and prior to installation. Failure to apply all professional standards, customary instructions and processing instructions written in this processing guide and related links will automatically void any warranty regarding coated glass of AGC Obeikan. We advise the processor to undertake some preliminary trials with the typical glass compositions for the project prior to any further commitment with his customer. The processor is solely responsible for the quality of the final product.

Regarding preliminary trials advices can be obtained at AGC Obeikan's sales team or IBP (International Building Projects) team ([info@agc-obeikanglass.com.sa](mailto:info@agc-obeikanglass.com.sa)).

## IV. GLAZING INSTRUCTIONS

The AGC Obeikan glazing instructions are available on request from your local AGC Obeikan' s sales representative.

## V. CLEANING ON FACADE

The cleaning instructions for glazing installed on facades are available on request from your local AGC Obeikan' s sales representative.



## VI. NOTES

<sup>1</sup> Recommended protective material for suction pads:

Product description: suction cup housing

NB: max. diameter: 300 mm.

Supplier: IMPEXACOM

Rue des tourterelles 14-16

B - 5651 Thy le Château -Belgium

Tel.: + 32 71 612145

Fax: + 32 71 612164

<sup>2</sup> Recommended gloves:

Product description: HYD TUF 52-547 (glove size 8-10 for handling coated glass)

Supplier: IMPEXACOM

Rue des tourterelles 14-16

B -5651 Thy le Château -Belgium

Tel.: + 32 71 612145

Fax: + 32 71 612164

<sup>3</sup> Recommended cutting oil:

Product description: ACPE 5503 cutting oil

Supplier: ROLAND

Rue de la petite Ile 4

B - Brussels -Belgium

Tel.: + 32 2 5250618

Fax: + 32 2 5200856

<sup>4</sup> Recommended spacer for toughened/heat-strengthened:

Product description: Cork disks with micro suction pads (3 × 20 × 20 mm)

Supplier: VITO IRMEN

Mittelstrasse 74-80

D - 53407 Remagen -Germany

Tel.:+ 49 26 42 40 07 10

Fax:+ 49 26 42 42 913

<sup>5</sup> Recommended packing foam:

Product description: 1 mm packing foam

Supplier: SCRIPHORIA

Wellen Belgium

Tel.: + 32 11 370 111

<sup>6</sup> Recommended sachets of desiccating agents:

Product description: desiccating agent in sachets of 125 g

Supplier: STOKVIS

Vilvoorde -Belgium

Tel.:+ 32 2 255 06 11

## APPENDIX 1

# SEALANT COMPATIBILITY TABLE

Only sealants tested with Stopray Smart 30 and Smart 51 product and mentioned below may be used without edge-deletion. The use of any other sealant requires edge-deletion in any case.

Table 1 below shows compatible insulating glass sealants, structural glazing silicones, and weather sealants for Stopray Smart 30 and Smart 51.

**Table 1: compatible insulating glass sealants, structural glazing silicones, and weather sealants for Stopray Smart 30 and Smart 51.**

| Sealant supplier | Sealant ID               | Type         | Application        |
|------------------|--------------------------|--------------|--------------------|
| Dow Corning      | OWSIL993                 | Silicone     | Structural glazing |
| Dow Corning      | DOWSIL3362               | Silicone     | Insulated glass    |
| Dow Corning      | DOWSIL3362 HD            | Silicone     | Insulated Glass    |
| Dow Corning      | DOWSIL3793               | Silicone     | Insulated glass    |
| Dow Corning      | DOWSIL791                | Silicone     | Weather sealant    |
| Dow Corning      | DOWSIL791T (with primer) | Silicone     | Weather sealant    |
| Fenzi            | Thiover                  | Polysulphide | Insulated glass    |
| Fenzi            | Thiover F1               | Polysulphide | Insulated glass    |
| Kommerling       | GD 677                   | Polyurethane | Insulated glass    |
| Kommerling       | GD 116                   | Polysulphide | Insulated glass    |
| Kommerling       | PS 200                   | Polysulphide | Insulated glass    |
| Sika             | Sikasil SG 500-CN        | Silicone     | Structural Glazing |
| SHINWOO          | Plus 040                 | Silicone     | Structural glazing |
| SHINWOO          | Plus 020                 | Silicone     | Insulated glass    |

## DISCLAIMER

The proper protection of the Stopray Smart 30 and Smart 51 coatings is always under the responsibility from the processor and curtain waller.

It is the responsibility of the processor to inspect the processed coated glass adequately before and after each step of fabrication and prior to installation. Failure to apply all professional standards, customary instructions and processing instructions written in this processing guide and related links will automatically void any warranty regarding coated glass of AGC Obeikan. We advise the processor to undertake some preliminary trials with the typical glass compositions for the project prior to any further commitment with his customer. The processor is solely responsible for the quality of the final product.

In case of needs, AGC Obeikan's sales team or IBP (International Building Projects) team ([info@agc-obeikanglass.com.sa](mailto:info@agc-obeikanglass.com.sa)) is available to supply additional product or process information.