# PROCESSING & INSTALLATION GUIDELINES



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## 1. GENERAL INFORMATION AND PRODUCT TYPES

1.1 MODIGUARD UltraMirror™ product is a high-quality mirror which uses the latest technologies available to manufacture beautifully reflective mirrors that have proven to be durable and long lasting.

1.2 Gujarat Guardian Limited produce MODIGUARD UltraMirror™ copper-free mirrors with outstanding technical properties, far exceeding today's toughest industry standards.

1.3 MODIGUARD UltraMirror™ is proven to be superior to conventional mirrors in all accelerated ageing tests including: CASS (Copper Accelerated Salt Spray), Humidity, Salt fog, Nitric Acid and Ammonia tests.

1.4 MODIGUARD UltraMirror™ are available on clear glass from 2.0 mm through 8.0 mm, with the capability of producing grey or bronze colored mirrors by applying the mirror coating onto a colored substrate.

1.5 MODIGUARD UltraMirror™ is widely used in various mirror applications include Wardrobe Doors, Bathroom Mirrors, Elevator Mirrors, Furniture, Display Cases, Vehicle Mirrors, Decorative Walls, Ceiling and Pillar Covers, Exercise Rooms, Mirrors for Dance Studios & many more.

## 2. RECEIVING & STORAGE GUIDELINES

2.1 Proper receiving and storage are critical to the long-term performance of Ultra Mirror Products.

- 2.1.1 Glass must be unloaded under dry, indoor conditions.
- 2.1.2 Glass must be protected from the elements (e.g., rain, snow, splashing water, sand, etc.) at all times.
- 2.1.3 Customers must not accept delivery of wet or damage glass.
- 2.1.4 Customers must notify the carrier immediately and then notify Gujarat Guardian Ltd. if a shipment arrived wet or damaged.

2.2 Rotate stock to use the oldest products first (i.e., First in, First Out).

2.3 Do not open the pack until the glass has reached the ambient temperature in the warehouse, to avoid condensation forming on the paint surface.

2.4 Environmental conditions that affect float glass products can also have adverse effects on mirror glass. Glass must be stored in a dry environment product from direct weather, or chemical exposure.

- 2.4.1 Do not store products near to glass washer, outside doors or corrosive chemical storage areas.
- 2.4.2 Avoid contact between glass and corrosive chemicals that could damage the glass or coating (e.g., concrete, plaster, Building runoff).
- 2.4.3 Do not store products in outdoors conditions.

2.5 Products packaging and the arrangement of the panes are indicated on a tag attached to each pack / box. The tag should be retained for reference until the whole pack has been satisfactorily processed.

2.6 An interleaving powder is placed between the mirror sheets to ensure the separation and prevent damage during transportation.

2.7 The warehouse should be well ventilated, not subject to major temperature variation.

2.8 Incoming material should be inspected for damage prior to acceptance and any problems reported immediately to Territory Sales Manager.

## 3. HANDLING & FABRICATION TECHNIQUES

3.1 Glass is sensitive to scratches, so handle it carefully.

3.2 Sharp objects, such as nails, screws, razor blades, steel wool, etc., can scratch and damage the mirror paint and surfaces.

3.3 Do not open the glass pack until all the people responsible for handling and processing the glass have been properly trained on the correct handling, storage processing and transportation of mirror glass.

3.4 Always wear suitable clean gloves when handling any glass product.

3.5 All mirror product tags must remain with the originals packaging. Lites must always remain traceable to original Gujarat Guardian Limited case tags.

3.6 Glass must be placed on racks for movement to the next process after cutting. The preferred method of separation is foam tabs/ foam-covered cork tabs with the static foam or with polyfoam strips/sheets.

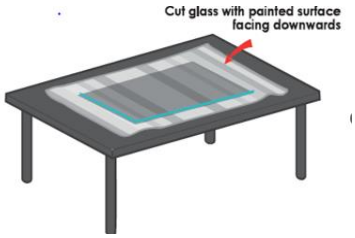
3.7 Opened material should be inspected for damage prior to acceptance and any problems reported immediately to Territory Sales Manager.

## 4. CUTTING

4.1 The cutting-table surface must be cleaned frequently and free from impurities.

4.2 Proper care must be taken for assuring the cutting table surface.

4.3 GGL recommends the use only glass cutting fluids only. Like Ace Cut, Cool Cut, Clean Cut etc. These fluids evaporate quickly and leave behind no residue that could damage glass surface or paints.




## 5. SEAMING, BEVELING & DRILLING

5.1 The seaming-table surface must be cleaned frequently.

5.2 During edge work of MODIGUARD UltraMirror™, be sure to maintain a pH value between 7 and 10 for the water used in the process and ensure proper cooling of the grinding wheels.

5.3 Edge work of UltraMirror™ can be carried out manually or on automated machines. The products are suitable for edge grinding, polishing, as well as arising.

5.4 During manual processing, contact of grinding wheels or cross belts with the paint side should be minimized and limited to the edges. When using automated machines, surface clamping or conveyor devices should not be excessive.

5.5 With any type of grinding equipment, always ensure an adequate supply of clean water. In order to prevent paint damage by glass debris accumulation from either arising or grinding, the glass should be rinsed with copious amounts of water before washing directly after mechanical transformation operation.

## 6. MACHINE WASHING

6.1 General Guidelines

6.1.1 This section is applying to all mechanical washing applications of MODIGUARD UltraMirror™ glass.

6.1.2 In order to prevent the watermarks on the paint side, glass must exit the washing machine completely and must be dried.

6.1.3 Proper setup of the washer is critical for all mirror glass products. Like condition of brushes, cleanly ness of tap water and appropriate lightening.

6.1.4 Ensure the entire washing machine is regularly cleaned and free of accumulated dirt and debris (e.g. glass splinters, sand, lubricants, etc.)

6.1.5 The brushes, in particular, must be checked for cleanliness, alignment and ample supply of water.

6.1.6 If you use detergents, it is important that they are pH-neutral and free of abrasives. The washing machine must be checked, cleaned and maintained at regular intervals in order to ensure that it operates correctly.

6.1.7 We recommend the following checks before washing:

6.1.7.1 Water hardness and cleanliness (e.g. lime deposits) of the brushes

6.1.7.2 Correct adjustment of the brushes (as recommended by the washing machine manufacturer)

6.1.8 Washing machine manufacturer instructions should always be followed

6.1.9 There are specific details to be considered:

6.1.9.1 Always use clean and de-ionized water (< 30 µS). The water must not contain any cleaning agents or non-dissolved particles (such as lime)

6.1.9.2 Standard float glass washer settings may be utilized

6.2 Washer Operation

6.2.1 During the washing process, the glass must not remain stationary in the washing machine with the brushes revolving as excessive brushing may damage the paint surface.

6.2.2 Wash water tank temperature must be maintained between 49-60°C (120-140°F) during operation.

6.2.3 Brushes must be positioned to minimize contact with the glass surface.

6.2.4 Do not stop the glass beneath rotating washer brushes. Prolonged contact with the brushes will result in damage to the glass and paint.

6.3 Pre-rinse Section

6.3.1 A pre-rinse section that sprays clean water prior to entry into the primary wash section is effective in removing any separator powders, loose dirt and glass grinding residual.

6.3.2 A pre-rinse section is also effective in reducing washer maintenance and will reduce contamination of the primary wash section.

6.4 Washer Maintenance

6.4.1 Frequent cleaning of the washer assembly is required, as detailed in the washer manufacture's operating manual.

6.4.2 Worn or improperly adjusted brushes will cause coating damage or improper cleaning.

6.4.3 Steam cleaning of rolls and brushes can help assure removal of scale and residue buildup.

6.4.4 Avoid steam cleaning bearings and joints where released grease may contaminate the washer.

6.4.5 Separator curtains inside the washer must be checked and adjusted so they don't contact the glass surface.

6.4.6 Brushes and pinch rolls must be adjusted to accommodate the specific glass thickness being processed.

6.4.7 Cleaning agents used in the maintenance of glass washers (e.g., acids or alkaline solutions) must be thoroughly removed from the system before the system before washing.

6.5 The Wash and Rinse Section

6.5.1 The wash and rinse water spray bars must be directed into the brushes for uniform distribution.

6.5.2 Spray tubes must be periodically inspected to ensure even flow. Plugged holes must be opened.

6.5.3 Gujarat Guardian Limited does not normally recommend usage of detergents.

6.5.4 Wash and rinse water pH levels must be monitored to stay within the 6-8 pH range.

6.5.5 The wash and rinse tanks must have a slight overflow to ensure remove of foreign materials.

6.5.6 At minimum, Wash and rinse tanks must be drained and cleaned daily.

6.5.7 Normal tap water is suitable for use in washing and rising. Special deionization (DI) or reverse osmosis (RO) system are not required unless they are necessary for pH control.

6.5.8 Avoid abrasive cleaners (e.g., Ajax, comet, soft scrub, rouge, Lime-Away, Cerium Oxide) or non-detergents cleaners (e.g., vinegar, citric acid).

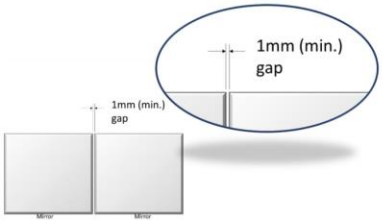
6.6 Rinse Water Blow-off section

6.6.1 Make necessary adjustment to pinch rolls and air knives to assure total removal of rinse water, per OEM instruction.

## 7. INSTALLATION GUIDELINES

7.1 Correct installation is the major element for the mirror products with respect to visual appearance & product durability.

7.2 When more than one mirror is installed on the same surface, keep a gap of at least 1mm between the edges of these mirrors.




7.3 The base where the mirror is installed must be clean, dry, completely free of moisture, acidic or alkaline substances, or any other aggressive material. Avoid installing mirror on freshly painted walls and in solvent borne fumes in the environment. Do not use a base- materials that absorb moisture, such as wood, cork, newspaper, etc.

7.4 The installation of the mirror should be scheduled as the final task in the project building timeline & the rooms should be well ventilated.

7.5 Two types of fixation are possible:

7.5.1 Mechanical: frame or studs to support edges

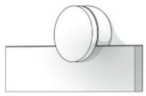
7.5.2 Bonding: Silicones or double tape bonding

7.6 The back of the mirror should remain unscratched during installation, to avoid oxidation of glass that could create black or brown traces on the reflective side of the mirror.

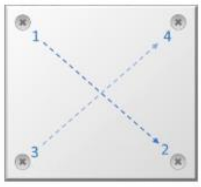
## 7.7 MECHANICAL: frame or studs to support edges

7.7.1 Use washers or plastic spacers on both sides of the mirror to avoid excessive localized effort and ensure a minimum spacing of 3 mm between the mirror and the base, favoring air circulation

7.7.2 Use plastic or rubber support to avoid direct contact of the metal with the mirror.



7.7.3 The final tightening should only be done at the end of the installation and always through the diagonals of the parts, reducing the risk of breakage and deformations in the image leading to distortion.




7.6.4 Avoid direct contact between the fixing screws and the mirror surface, minimizing the risk breakage and oxidation in the contact area. One solution to this is to use spacers.

## 7.8 BONDING - SILICONES

7.8.1 First, it is recommended to verify the surface on which you want to apply your UltraMirror™. The surface must be clean, flat, uniform and dry.

7.8.2 Special care must be taken so that the non-metal spacers are used at the bottom and the back side of the mirror to make sure air circulates vertically between the back of the mirror and the substrates.

7.8.3 This proves to be extremely valuable in situations where mirror is mounted in very moisture areas, such as bathrooms.

7.8.4 The back of the mirror should also remain unscratched, to avoid oxidation of glass that could create black or brown traces on the reflective side of the mirror.

7.8.5 Finally, the supporting surface of the mirror should be perfectly flat in order to avoid deformation of the mirror and the image reflected.

7.8.6 **Type of Silicones -**

7.8.6.1 GUJARAT GUARDIAN LIMITED does not manufacture silicones and can only recommend silicones that have been tested and can guarantee the effects of their application on UltraMirror™.

7.8.6.2 We still recommend performing your own test before actual installation and strictly adhering to the manufacturer's recommendations for use.

7.8.6.3 The silicones that are recommended for use on UltraMirror™ are: Neutral Cure Alkoxy silicones, Oxime silicones and MS polymers. We would not recommend using Rubber silicone, Acetic acid silicone and Polyurethane based silicones.

7.8.7 **Application -**

7.8.7.1 Clean the back surface of the mirror using clean dry cloth or tissue paper.

7.8.7.2 Apply silicon vertically on the back of the mirror according to how you will install the mirror on the surface/wall.

7.8.7.3 Apply the 1st layer of silicon 50mm from the edge.

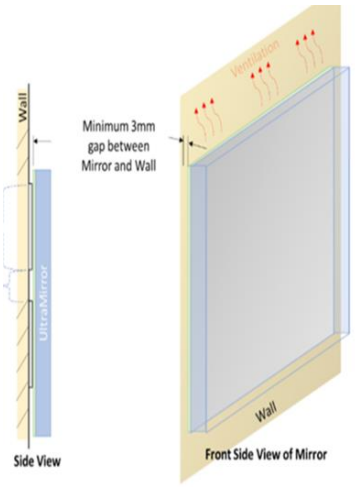
7.8.7.4 The bead of the silicon should be about 10mm wide.

7.8.7.5 Apply the succeeding silicon layer with a gap of 100mm to 150mm.

7.8.7.6 Clean the wall or surface area where you will install the mirror. Ensure that it is dry.

7.8.7.7 Position & press the mirror against the wall or surface of installation.

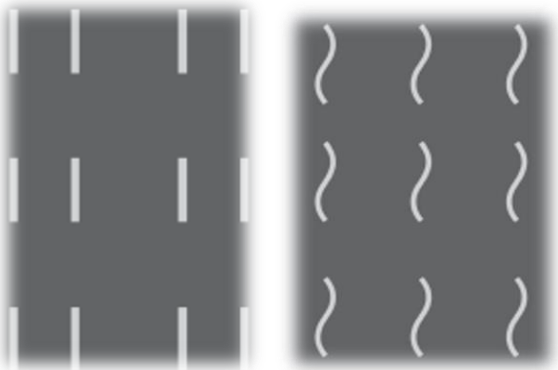
7.8.7.8 Press the mirror leaving a gap of about 3mm to allow air circulation to dry the silicon.




7.8.7.9 Allow silicon to cure from 24 to 72 hrs. Attach tape on the edges to support the weight of the mirror while the silicon dries.

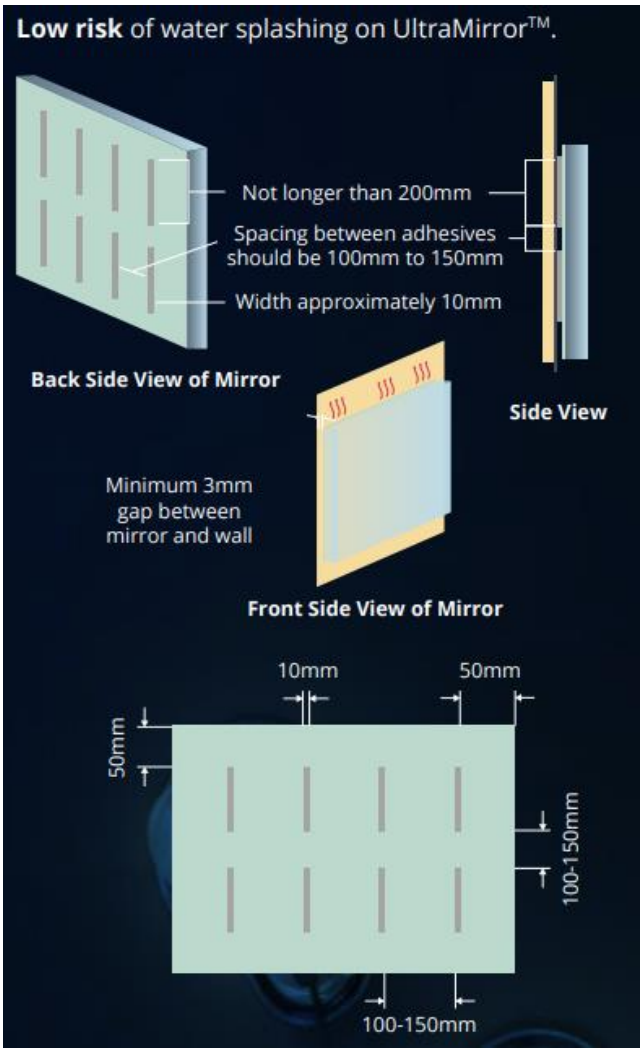
7.8.7.10 When cleaning the mirror after installation, use again clean & dry cloth to wipe the dirt from the installation process. You can also use the damp cloth but do not forget to dry the mirror especially on the edges.

7.8.7.11 **Correct Application**: The correct application is one which allows good air circulation and the least possibility for stagnancy of moisture or water.



7.8.7.12 **Wrong Application**: The incorrect application is one which does not allows good air circulation and maximum possibility for stagnancy of moisture or water.

## 7.9 FRAMELESS MIRROR:



7.9.1 Clean the back surface of the UltraMirror™ using a clean dry cloth or tissue paper.

7.9.2 Apply the silicone vertically on the back of the mirror according to how you will install the UltraMirror™ on the surface/wall.

7.9.3 Apply the first layer of silicon 50mm from the edges.

7.9.4 The bead of the silicone should be about 10mm wide.

7.9.5 Apply the succeeding silicone layers with a gap of 100 to 150mm.

7.9.6 Clean the wall or surface area where you will install the UltraMirror™. Ensure that it is dry.

7.9.7 Position and press the UltraMirror™ against the wall or surface of installation.

7.9.8 Press the mirror leaving gap of about 3mm to allow air circulation to dry the silicone.

7.9.9 Allow Silicone to cure from 24 to 72 hrs. Attach tape on the edges to support the weight of the UltraMirror™ while silicone dries.

7.9.10 When cleaning the UltraMirror™ after installation, use again clean dry cloth to wipe any dirt from the installation process. You can also use a damp cloth but do not for get to dry the mirror especially on the edges.

## 7.10 FRAMED MIRROR:

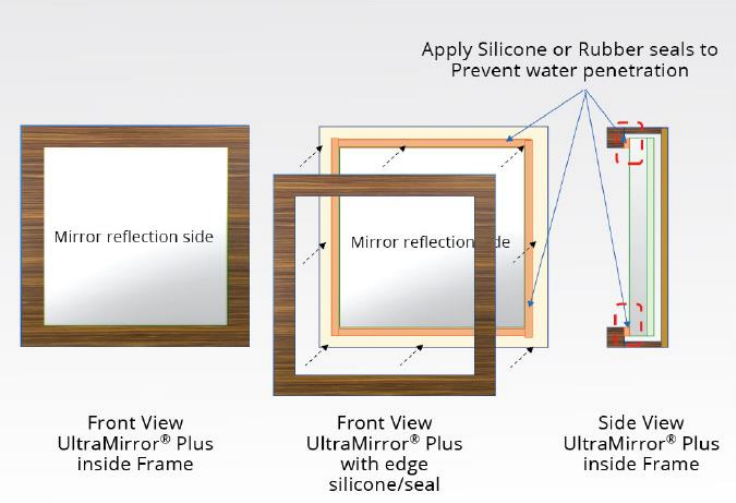
7.10.1 Follow the procedure 7.7.7.1 to 7.7.1.12, If mirror needs to be bonded in a frame.

7.10.2 Apply silicon on edge of the glass and press the frame on to it. See the figure below.

7.10.3 Remove or wipe excess silicon.

7.10.4 As an alternative to silicon application, a rubber seal can ne used and inserted on the perimeter of the frame.

Note: Framed Mirror has high risk of water getting deposited on the edges of Mirror/ frame.




## 7.11 DOUBLE TAPE BONDING

7.11.1 GUJARAT GUARDIAN LIMITED does not manufacture bonding tapes and we are not able to guarantee the effects of their application on UltraMirror™.

7.11.2 We recommend Acrylic, Modified acrylic and Rubber tapes as compatible tapes but we recommend performing your own test before actual installation and strictly adhering to the manufacturer's recommendations for use.

## 8. CLEANING

8.1 Cleaning of the Mirror, as well as removal of residue from stickers and spacing-pads is to be carried out using clean water or mild cleaning agents.

8.2 Sharp-edged tools such as razor blades and scrapers may cause fine scratches in the surface and the use thereof should be avoided.

8.3 Should residues of sealants come onto the mirror during sealing works, they should also be removed immediately.

8.4 Strong alkali solutions as well as acids, particularly liquid acids, and cleaning agents containing fluoride should never be used. These solutions may irreparably damage the glass surface.

## 9. FACTORS AFFECTING IMAGE DISTORTION

In order to ensure a mirror image free of distortions, the mirror should be fixed flat, stress free and in accordance with the following principles:

9.1 Mirrors should be fixed so that the weight is not supported by the edges in order to avoid bending and thus distortion.

9.2 When adhering a mirror to a substrate material, flatness should be ensured to avoid distortion.

9.3 When fixing a mirror using adhesive tape, care should be taken that pressing does not cause distortion. If possible, the support base material should be adhered to the mirror (not the other way around) and subsequently the assembled mirror fixed mechanically.

9.4 When placing several mirrors next to each other to create a mirror wall, optical breaks in the image at the joints can be positively influenced by using the adjustment tolerances of the fixing system.

9.5 The mirror should be fixed securely but free from stress to avoid distortion and risk of breakage. Wall unevenness should be levelled by using suitable soft spacers.

9.6 The reflected image in mirror shall not be optically disturbed e.g., by another reflective surface, window etc.

9.7 Tunneling effect in Mirror – Tunneling effect usually occurs in case if two mirrors are installed facing each other, in such installation multiples images are formed and image formed looks like distorted in nature, therefore such installations should generally be avoided unless required for such effects.

## 10. QUALITY GUIDELINES

10.1 When viewed against a bright & uniform background, mirror products must meet or surpass the guidelines outlined in this section. MODIGUARD UltraMirror™ products must undergo further processing must be inspected prior to each step in the fabrication process. As well as well after final fabrications.

10.2 The inspection criteria outlined in this document apply to stock size sheets, i.e. GGL supplied size based on JIR R3220 silvered flat mirror manufacturing standard.

## Annexure A: Glass Storage Guidelines

### Purpose

The purpose of creating this document is to provide information about suitable practices for storing glass in warehouses.

### Humidity

Exposure to water over a period can cause damage to glass surfaces. This is often found in the form of moisture, which reacts with the surface of the glass and leads to corrosion. However, it is practically impossible to completely eliminate moisture from warehouse spaces. Therefore, adopting appropriate practices is crucial for efficiently reducing or controlling the resulting impact.

### Ventilation

Ventilation is considered one of the most crucial components of warehouse management. Good air circulation helps reduce the risk of moisture build-up on concrete floors or on stored glass surfaces. Air with moisture moves and condenses less on cooler surfaces.

### Roof Openings and Leaks

In addition to leaks, roof openings pose a risk of water seepage, which can lead to glass stored in warehouses coming into contact with water or moisture. This is because the typical storage method for glass (stacked vertically) results in minimal spacing between glass sheets,increasing the likelihood of water or moisture lingering on the glass surface for extended periods due to limited moisture drainage between the sheets. This significantly elevates the risk of corrosion or rusting of the glass. Regular inspection of roof openings or leaks and prompt repair as necessary are crucial for mitigating these risks.

### Opening Warehouse Doors

Reducing the frequency of opening warehouse doors or windows during periods of high humidity or rainfall can help decrease moisture accumulation in the warehouse.

Glass storage should always include interleaving materials or have minimal spacing between glass sheets at all times.

Condensation occurs when the air's humidity is compressed due to a drop in temperature until it reaches the dew point. This can happen naturally or due to inadequate air circulation and unsuitable storage conditions. Preventing glass from condensing moisture in the air can be achieved by storing it in areas with temperatures above the dew point. Dew point is the temperature at which air becomes saturated with moisture, causing water droplets to form and adhere to surfaces at a constant pressure, relative to the humidity level.

Storing glass in a sheltered area with a roof to protect from rain and heat, free from leaks or contact with water, and ensuring good ventilation.

Avoid storing glass near openings such as doors or windows. Glass should be stored at least 15 meters or 50 feet away from openings.

Avoid storing glass near areas designated for chemical storage, especially those containing corrosive substances.

Rotating goods in the warehouse is crucial, so glass should be stored in a manner conducive to the First In, First Out (FIFO) system, ensuring that older stock is used before newer ones. This helps maintain an appropriate level of inventory turnover.

Avoid storing glass in areas with heat sources, as this may lead to heat accumulation within the glass and potential damage.

Regularly inspect for any leaks in the roofs of factories and warehouses. If any are found, promptly repair them as necessary.

If glass is packaged with moisture-resistant materials, caution should be exercised to prevent damage to the packaging during handling. If there are any tears or damages to the packaging, immediate repair is necessary.

If glass received in packaging arrives while its temperature is lower than the temperature inside the warehouse, it should be allowed to acclimate to the surrounding temperature before unpacking to avoid condensation build-up on the glass surface.

Always keep the tag number with the stored glass so that in case of any issues with the glass, it can be easily identified and checked.