

PROCESSOR USER'S GUIDE, COMMERCIAL PRODUCTS

SECTION 1

GENERAL INFORMATION AND PRODUCT TYPES

- 1.1 Guardian offers SunGuard Solar coated glass products specifically designed for monolithic-vision applications. The products currently offered are Silver 20 / Green 20, Silver 20 / Green 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34 and Light Blue 52 / Green 52. The details of monolithic applications are not covered in this User's Guide. A separate User's Guide is available for the SunGuard Monolithic Solar products. Please contact your Sales Manager for additional information.
- 1.2 SunGuard Solar, High Performance, and SuperNeutral glass products utilize Guardian-patented multiple-layer stack designs that offer superior solar and thermal performance. SunGuard products offered in this market can support annealed, heat strengthened, heat-treated, and laminated options. Contact your Sales Manager for detailed performance information and to verify availability of products in different types of substrates.
- 1.3 The table below indicates the products that are available in this market and the allowable configurations and applications:

Table 1. SunGuard Coated Glass Products for Insulated Glass Unit (IGU) Applications

Product		Type	Coating Surface	Annealed	Heat Treatable
Silver 20	Green 20	Solar	#2	X	X
Royal Blue 20	Aquamarine 20	Solar	#2	X	X
Silver Grey 32	Green 32	Solar	#2	X	X
Neutral 34	Green 34	Solar	#2	X	X
Light Blue 52	Green 52	Solar	#2	X	X
Silver 35	Green 35	High Performance	#2	X	X
Neutral 40	Green 40	High Performance	#2	X	X
Royal Blue 40	Aquamarine 40	High Performance	#2	X	X
Neutral Plus 50	Green Plus 50	High Performance	#2	X	X
Neutral 60	Green 60	High Performance	#2	X	X
ClimaGuard Neutral 70	Green 70	High Performance	#2 or #3*	X	X

* ClimaGuard Neutral 70 / Green 70 can be used in a surface 3 configuration with a clear glass outboard lite or with a tinted lite or with other solar coating on #2 surface.

Table 2. SunGuard Coated Glass Products for Laminated Applications

Product		Type	Surface # 2 Application	Surface # 3 Application
Silver 20	Green 20	Solar	Yes	No
Royal Blue 20	Aquamarine 20	Solar	Yes	No
Silver Grey 32	Green 32	Solar	Yes	No
Neutral 34	Green 34	Solar	Yes	No
Light Blue 52	Green 52	Solar	Yes	No
Silver 35	Green 35	High Performance	Yes	No
Neutral 40	Green 40	High Performance	Yes	No
Royal Blue 40	Aquamarine 40	High Performance	Yes	No
Neutral Plus 50	Green Plus 50	High Performance	Yes	No
Neutral 60	Green 60	High Performance	Yes	No
ClimaGuard Neutral 70	Green 70	High Performance	Yes	Yes

- 1.4 The product references listed in Table 1 refer solely to the ability of the coated glass to withstand the heat-treatment process. They are not recommendations as to whether heat treatment is appropriate for any specific coating application. The product references listed in Tables 2 refer to the available products and allowable laminated configurations. Please contact your Sales Manager or Technical Services Executive for detailed product performance information or for technical support.
- 1.5 The processor must determine whether the glass must be heat treated to meet the project requirements. In most cases, tinted substrates and coatings with reflective properties will require heat treatment to avoid thermal stress breakage. If you require support with determining whether heat treatment is required for a particular project, please contact your Sales Manager or Technical Services Executive for assistance.
- 1.6 Processors must be aware that certain factors (such as large glass sizes, shapes and patterns; thickness of glass; damage to glass during shipping, handling or installation; orientation of the building; exterior shading; overhangs/fins that reduce wind speed; and areas with high daily temperature fluctuations) can increase the probability of thermal breakage.
- 1.7 SunGuard Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34, Light Blue 52 / Green 52, Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, Neutral 60 / Green 60 and ClimaGuard Neutral 70 / Green 70 coated glass products can be used in the annealed state or can be heat treated if required for the application.
- 1.8 It is the responsibility of the processor to identify and understand the application-specific details of the project and the implication of factors like thermal stress, wind load, and building code compliance.
- 1.9 The SunGuard Solar series of coated glass products which includes Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34 and Light Blue 52 / Green 52 require no special timelines for insulation after heat treatment.
- 1.10 SunGuard Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50 and Neutral 60 / Green 60 must be insulated within five days of heat treatment.

- 1.11 ClimaGuard Neutral 70 / Green 70 must be insulated within 30 days of heat treatment.
- 1.12 The processing of the SunGuard High Performance series of coated glass products must be performed in one facility. In the event that the processor chooses to ship High Performance products to another facility for further processing, the processor assumes all risks and liabilities associated with product damage during transportation and subsequent processing.
- 1.13 A dual-seal insulating glass unit must be used for all commercial applications. A “commercial application” is defined as any building designed primarily for commercial use, including public and private structures, schools, office buildings, malls, storefronts, hotels, etc., whether it uses site-glazed or factory-glazed glass. Multifamily structures of three stories or more are considered commercial buildings.
- 1.14 All SunGuard High Performance coated glass products are sold to Guardian Certified Processors only and must not be resold to non-certified processors.

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SECTION 2

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APPROVED COATED-SURFACE DETECTION METHODS

2.1 Detection of the coated surface is a critical step in correctly processing SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products.

The user must establish which surface has been coated:

- When opening incoming packaging (packing tags will indicate the orientation of the coated surface within the packaging; however, formal detection using one of the methods outlined below is necessary)
- When moving material
- Before any subsequent processing of the glass

2.2 Common Methods Available for Detection

2.2.1 Commercial Coating Detector (Figure 1)

- A coating detector that does not utilize metal contacts must be used. Metal contacts can scratch the coating if applied to the coating surface.
- Detectors, such as the one pictured, can be obtained from EDTM, Inc.®, in Toledo, OH, via their Web site (www.edtm.com). Detectors are also available from MLM Enterprises in Walbridge, OH, via their Web site (www.mlmenterprisesinc.com).



Figure 1. Commercial Coating Detector

2.2.2 Ohm Meter Detector

- Set an ohmmeter on a high-resistance setting (e.g., Rx 10,000).
- Contact the glass surface (near the extreme edge only) with the positive and negative terminals approximately 25 mm (1 in.) apart.
- A meter reading registers if the terminals are contacting the coated surface.
- No reading registers if they are contacting the uncoated surface.
- When using this method, take care to avoid scratching the coated surface.



Figure 2. Ohmmeter Detector

- 2.3 Sputter-coated films do not have the surface roughness of pyrolytic films and cannot easily be felt. Touching the coated surface with bare hands or with gloves is not a reliable method for detecting the coated surface. Skin oils are difficult to remove and can damage the coated surface after prolonged exposure.
- 2.4 SunGuard SuperNeutral HT coated products are supplied with Temporary Protective Film (TPF) on the coated surface. TPF is discussed in detail in Section 3.

SECTION 3

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TEMPORARY PROTECTIVE FILM (TPF) — SUNGUARD HT ONLY

3.1 For SunGuard SuperNeutral Heat Treatable products, Guardian has implemented a full-surface protective film, designated "Temporary Protective Film" (TPF). TPF increases fabrication yields while stabilizing the coated surface during storage.

- TPF is a full-coverage, recyclable, polyethylene (PE) tape applied to heat-treatable double-silver coatings.
- TPF is applied directly to the coated surface by Guardian during the manufacturing process.
- The adhesive used in conjunction with the TPF is low tack and leaves no residue on the coated surface, resulting in the cleanest, pre-furnace condition possible.

3.2 TPF is applied to the coated surface. The product must be cut, seamed, and washed with the coated (TPF) side up.

3.3 TPF must remain on the surface of the glass during all fabrication steps prior to the furnace.



Figure 3. TPF Instructions

3.4 Follow the TPF removal instructions below. Do not attempt to start the removal of the TPF with bare hands or gloves.

- Use double-sided tape and/or a tacky roller to start the removal process.
- Start at the corner of the lite and lift towards the center of the glass.
- Once the edge of the film is a safe distance of 50–76 mm (2–3 in.) from the surface, removal by hand may be performed, provided that there is no direct contact with the surface of the glass.

3.5 TPF must be removed prior to placing the glass the furnace.

3.6 For more information on TPF, please consult Guardian's Product Application Note, Temporary Protective Film (TPF).

RECEIVING AND STORAGE PROCEDURES

SECTION 4

Processor User's Guide, Commercial Products

- 4.1 Proper receiving and storage is critical to the long-term performance of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products.
- Glass must be unloaded under dry, indoor conditions.
 - Glass must be protected from the elements (e.g., rain, snow, splashing water, sand, etc.) at all times.
 - Customers must not accept delivery of wet or damaged glass.
 - Customers must notify the carrier immediately and then notify Guardian if a shipment arrived wet or damaged.
- 4.2 Rotate stock to use the oldest product first (i.e., First In, First Out).
- 4.3 Glass must be stored in a dry environment protected from direct weather or chemical exposure.
- Do not store products within 15.00 m (50 ft.) of glass washers, outside doors or corrosive chemical storage areas.
 - Avoid contact between glass and corrosive chemicals that could damage the glass or coatings (e.g., concrete, plaster, building runoff).
 - Do not store High Performance or SuperNeutral SunGuard products outdoors.
- 4.4 Due to the solar-absorbing characteristics of these coated glass products, glass stored in the shipping containers or stacked in a group may experience thermal breakage if exposed to direct sunlight.
- 4.5 SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products are shipped on racks or packed in cases and are labeled with Guardian production/identification tags.
- 4.6 All Guardian product and case tags must remain with the original packaging.
- 4.7 Pin racks must not be used for storage of SunGuard Solar, High Performance, SuperNeutral, or ClimaGuard Neutral 70 / Green 70 coated glass products.
- 4.8 The maximum product shelf life for all annealed SunGuard High Performance and SuperNeutral coated glass products is six months. ClimaGuard Neutral 70 / Green 70 shelf life is one year. This time frame is based on testing under normal plant conditions. It will vary if the glass is stored in an environment with high temperature and high humidity.
- 4.9 The SunGuard Solar series of coated glass products which includes Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34 and Light Blue 52 / Green 52 requires no special timelines for insulation after heat treatment.
- 4.10 SunGuard Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50 and Neutral 60 / Green 60 must be insulated within five days of heat treatment.
- 4.11 SunGuard SuperNeutral XX HT coated glass products must be insulated within 48 hours of heat treatment.
- 4.12 The ClimaGuard Neutral 70 / Green 70 coated glass product must be insulated within 30 days of heat treatment.

SECTION 5

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PROPER FABRICATION TECHNIQUES

- 5.1 The coated surface must always face up (away from conveyor rolls, felt covers or roller balls) during fabrication to avoid the possibility of glass splinters and chips scratching the glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 5.2 Contact with the coated surface must be avoided during fabrication. Contact must be made from the edges or with the uncoated surface of the lite as shown below. Never palm coated glass.

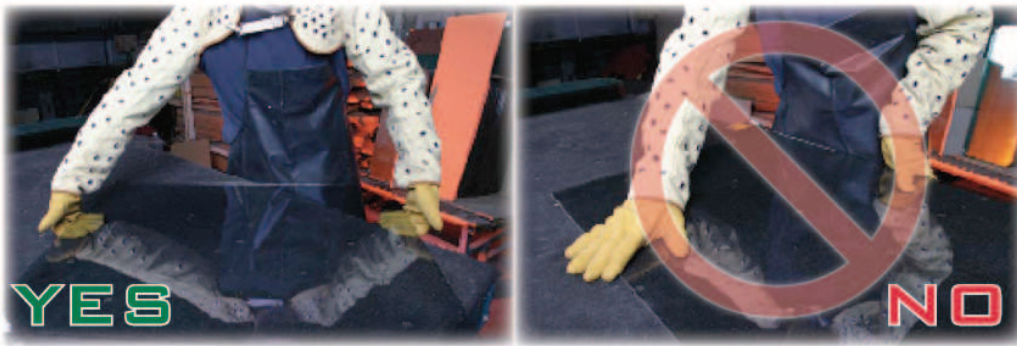


Figure 4. Handling Coated Glass

- 5.3 The coating must not be handled with bare hands. Clean, dry gloves must be worn when handling SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products.
- 5.4 Sharp objects, such as nails, screws, razor blades, steel wool, etc., can scratch and damage the coating and must not be used on coated products.
- 5.5 Blades or other scrapers must never be used to scrape material off the coated surface, as these may damage the coating and the glass.
- 5.6 The glass must be removed from the container such a way that cated surface facing up on the table. Care must be taken to avoid sliding or rubbing one pane of glass against another.
- 5.7 If suction cup equipment is utilized, it must be properly maintained for pressure and alignment to the drop table. The following procedures are mandatory when using suction cup equipment when handling SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products:
- If suction cups must contact the coated surface during movement of the individual lites, they must be clean and dry.
 - The minimum number of suction cups must be used to safely move the product.
 - If suction cup frames are used to move and position lites on a tilt table, the drop height must be minimized to eliminate any sliding of the cups against glass. All glass must be aligned so as to have no more than a +6 mm (1/4 in.) difference between the edge of the glass and the drop table.
- 5.8 All Guardian product tags must remain with the original packaging. Lites must always remain traceable to original Guardian case tags.
- 5.9 SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products must be washed immediately after any edge grinding, polishing, seaming or other fabrication steps.

5.10 If lubricants or coolants are used in processing, the resulting glass grit slurry may become highly alkaline (with a pH of 8.0 or higher) and will damage the glass and coating if not removed promptly.

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

- If A-Frames are used, like sizes must be stacked together.
- Different sizes must be separated by foam tabs or polyfoam strips (see Section 10, "INTERLEAVING MATERIALS," in this User's Guide for more information on glass separation when transporting).
- Harp racks present a scratch hazard to the SunGuard coatings and are not recommended. If the processor chooses to use harp racks, the following actions are recommended:
 - Keep harp racks clean and well maintained.
 - Avoid sliding the coated surface against the harp cords.
 - Never put more than one lite in a slot.



Figure 5. Harp Racks Are Not Recommended for Coated Products

SECTION 6

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CUTTING

- 6.1 The coated surface must always face up (away from conveyor rolls, felt covers or roller balls) during glass cutting to avoid the possibility of glass splinters and chips scratching the glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 6.2 Proper fabrication techniques must be followed in all processing of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. Refer to Section 5, "PROPER FABRICATION TECHNIQUES," in this User's Guide for more information.
- 6.3 The cutting-table surface must be cleaned frequently.
- 6.4 There must be no contact (except by the cutting wheel) with the coated surface during cutting.
- 6.5 Guardian recommends the use of the following approved fluids: Mineral Spirits, Shellsol D60, Glasol GB, Picoform 4704, AceCut 5503, Perfect Score, MMT-VO, AceCut 5929, Cool Cut and Clean Cut. These fluids evaporate quickly and leave behind no residue that could contaminate the washers.
- Cutting fluid must be used in moderation.
 - Other oils are currently being tested for coating compatibility and effectiveness. Please contact your local Sales Manager or Technical Services Executive for up-to-date information.
- 6.6 Glass must be moved from the cutting table to the rack one lite at a time, as shown below.

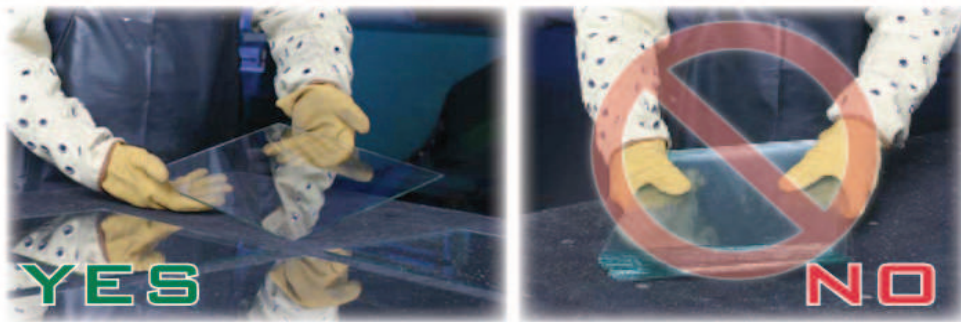


Figure 6. Post Cutting Glass Handling

SEAMING

- 7.1 The coated surface must always face up (away from conveyor rolls, felt covers or roller balls) during seaming to avoid the possibility of glass splinters and chips scratching the glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 7.2 Proper fabrication techniques must be followed in all processing of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. Refer to Section 5, "PROPER FABRICATION TECHNIQUES," in this User's Guide for more information.
- 7.3 The seaming-table surface must be cleaned frequently.
- 7.4 Contact with the coated surface must be avoided during seaming. Contact must be made from the edges or with the uncoated surface of the lite.

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SECTION 8

MACHINE WASHING

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- 8.1 This section applies to all mechanical washing applications, such as tempering, insulating, laminating, etc., for SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products.
- 8.2 The coated surface must always face up (away from conveyor rolls, felt covers or roller balls) during washing to avoid the possibility of glass splinters and chips scratching the glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 8.3 Proper fabrication techniques must be followed in all processing of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. Refer to Section 5, "PROPER FABRICATION TECHNIQUES," in this User's Guide for more information.
- 8.4 The coated surface must not be touched when loading or unloading the washer. Contact must be made only with the uncoated surface or at the edges of the lite, as shown below.



Figure 7. Post Washing Glass Handling

- 8.5 Proper setup of the washer is critical for all glass products, especially low-E coated glass. Due to a contrast in light transmission, damage caused by the brushes that may not be visible in non-coated glass can be seen in coated glass.
- 8.6 Low-E brushes are required for washers processing SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. These brushes must not be damaged or worn and must be adjustable and positioned to minimize contact with the coated surface. Low-E brushes have the following specifications:
- Bristle diameter between 0.15 mm–0.20 mm (0.006 in. – 0.008 in.)
 - Bristles made from 6-12 crimped Nylon or similar "soft" material that has high water absorption
 - Bristle length between 50 mm–60 mm (2 in. – 2 in.)
 - Bristles of uniform density
- 8.7 When spot cleaning is required, use mild, fast-drying household glass cleaners. Dab or blot the surface (avoiding wiping) with a clean, soft cloth to remove any excess cleaning solution. Do not wipe the surface, as this may damage the coating. Approved cleaners are:
- General-purpose cleaners, such as original Windex® or equivalent.
 - A mixture of approximately 10% ammonia and 90% tap water
 - A mixture of approximately 50% isopropyl alcohol and 50% tap water

8.8 Pre-rinse Section

8.8.1 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.

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

8.9 Washer Operation

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

8.9.2. Brushes must be positioned to minimize contact with the coated surface.

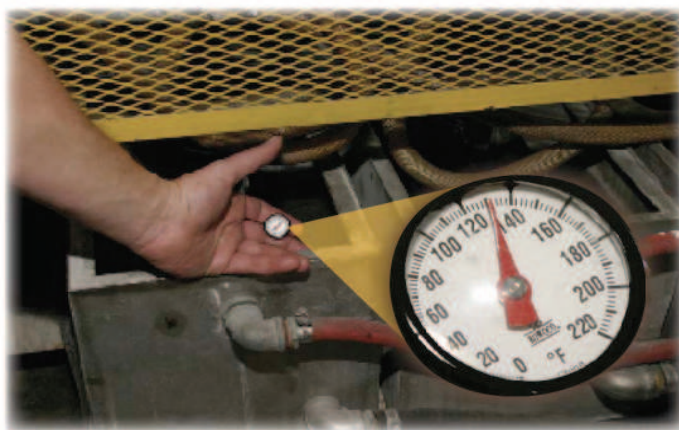


Figure 8. Measuring Water Temperature

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

8.10 Washer Maintenance

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

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

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

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

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

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

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

8.11 Wash and Rinse Section

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

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

8.11.3 Guardian does not normally recommend detergents as hot water is usually sufficient to clean coated glass. However, if detergents are used, they must be formulated for machine washing, formulated to handle low emissivity coatings, and must be used in moderation. Too much detergent can cause difficulty in rinsing, resulting in scale buildup on the brushes or pinch rolls. Low phosphate, liquid detergents dissolve best.

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

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

8.11.6 At minimum, wash and rinse tanks must be drained and cleaned daily.

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

8.11.8 Avoid abrasive cleaners (e.g., Ajax, Comet, Soft Scrub, rouge, Lime-A-Way, cerium oxide) or non-detergent cleaners (e.g., vinegar, citric acid).

8.12 Rinse Water Blow-off Section

8.12.1 Make necessary adjustments to pinch rolls and air knives to assure total removal of rinse water, per OEM instructions.

8.12.2 Any washer blow-off streaks that remain on the coated surface of the glass can be baked in during heat-strengthening, tempering or bending and become permanent.

HEAT-STRENGTHENING AND TEMPERING

SECTION 9

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- 9.1 The product references listed in Table 1 refer solely to the ability of the coated glass to withstand the heat-treatment process. It is not a recommendation as to whether heat treatment is appropriate for any specific coating or application.
- 9.2 The processor should determine whether the glass must be heat treated to meet the project requirements.
- 9.3 In most cases, tinted substrates and reflective coatings will require heat treatment in order to avoid thermal stress breakage.
- 9.4 Processors must be aware that certain factors (such as large glass sizes, shapes and patterns; thickness of glass; damage to glass during shipping, handling or installation; orientation of the building; exterior shading; overhangs/fins that reduce wind speed; and areas with high daily temperature fluctuations) can increase the probability of thermal breakage.
- 9.5 It is the responsibility of the processor to identify and understand the application-specific details of the project and the implication of factors like thermal stress, wind load and building code compliance.
- 9.6 The coated surface must always face up (away from conveyor and furnace rolls) during heat treatment to avoid the possibility of damaging the coated glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 9.7 Proper fabrication techniques must be followed in all processing of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. Refer to Section 5, "PROPER FABRICATION TECHNIQUES," in this User's Guide for more information.
- 9.8 Surface contaminants (e.g., fingerprints, water streaks, cutting oil residues, cooling lubricants used in grinding and hole-drilling, etc.) will adhere to the coated surface and affect the visual appearance. All surface contaminants must be fully removed before heat treatment.
- 9.9 SunGuard SunGuard Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34, Light Blue 52 / Green 52, Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, Neutral 60 / Green 60 and ClimaGuard Neutral 70 / Green 70 coated glass products can be used in the annealed state or can be heat treated if required for the application.
- 9.10 The SunGuard Solar series of coated glass products which includes Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34 and Light Blue 52 / Green 52 requires no special timelines for insulation after heat treatment.
- 9.11 SunGuard Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50 and Neutral 60 / Green 60 must be insulated within five days of heat treatment.
- 9.12 SunGuard SuperNeutral XX HT coated glass products must be insulated within 48 hours of heat treatment.
- 9.13 The ClimaGuard Neutral 70 / Green 70 coated glass product must be insulated within 30 days of heat treatment.
- 9.14 Furnaces used to heat treat SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products must have aspiration. A true

convection furnace will provide the best results.

9.15 SO₂ (sulfur dioxide) must not be used when heat treating SunGuard Solar heat-treatable coatings. The use of SO₂ must be discontinued a minimum of 30 minutes prior to heat treating SunGuard coated glass products.

9.16 The set-point temperature of the furnace must be at or below 700°C (1290°F).

9.17 Because of the thermal-reflective properties of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products, adjustments to the furnace profile and conveyor speed will be necessary in heat-treating processes. As a general rule:

- Furnace temperatures must be decreased.
- Furnace residence time must be increased.
- Each of the above must be adjusted in direct proportion to the improvement in reflective properties of the glass being heat treated.

9.18 The thermal-reflective properties of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products will render top-mounted measuring devices inaccurate.

- Adjustments to the emissivity settings of top-mounted radiant pyrometers will be required. Even with correct adjustments, top-mounted pyrometers can be inaccurate.
- Surface temperatures are best measured from the bottom (uncoated side) of the product.

9.19 After heat treating, the coated lites must be separated using interleaving. The preferred method is to use foam covered cork tabs with the static foam side contacting the coated surface (see Section 10, "INTERLEAVING MATERIALS," in this User's Guide for more information on glass separation when transporting).

9.20 Heat-treated SunGuard Solar, High Performance, and SuperNeutral coated glass products must not be re-heat treated after the initial heat treatment.

9.21 Glass temperature must be less than 50°C (120°F) prior to packing.

9.22 A visual inspection of both transmission and reflection of heat-treated glass must be performed regularly and in accordance with Guardian quality standards. Refer to Section 15, "QUALITY GUIDELINES – VISUAL INSPECTION," and Section 16, "QUALITY GUIDELINES – OPTICAL INSPECTION," in this User's Guide for specific information.

- Bow, warp, roll wave and surface pressure are important data that must be checked and recorded on a regular basis to assure compliance with the SunGuard Solar Control and Low-E certification program.
- Glass that does not meet these quality guidelines must not be processed further and must not be shipped to the jobsite.

9.23 For information on heat-soaking SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products, please contact your Sales Manager or Technical Services Executive.

9.24 Optical quality and heat-treatment conditions (heat-strengthening/tempering) must be adhered to as described in Guardian Product Application Note, Heat-Treatment Guidelines for SunGuard Coated Glass Products (PAN-SG-HT).

9.25 A polariscope or GASP (Grazing Angle Surface Polarimeter) is a necessary piece of

equipment for determining the degree of residual stress in glass. A GASP allows for an accurate, nondestructive analysis of both heat-strengthened and tempered products.

- 9.26 A change in outdoor reflected color and visible light reflectance and/or transmission may occur after heat treatment of SunGuard Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34, Light Blue 52 / Green 52, Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, Neutral 60 / Green 60 and ClimaGuard Neutral 70 / Green 70. This minor variation is due to the heat-treating process and is within the normal production tolerance of coated, annealed glass.

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SECTION 10

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INTERLEAVING MATERIALS

10.1 SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products must never be stored or transported without proper separation between lites. Glass-to-glass contact will lead to abrasion, which can cause damage to the coating.

Table 4. Glass Separators

Recommended	No Recommended
Foam Pads	Newsprint
Cork Pads (static foam against coating)	Silver Saver and Kraft Papers
Polyfoam Sheets*	Cardboard
Lucite Beads	Powder Separators Containing Acid
	Nut Powders

** Care must be taken when using polyfoam sheets. They must never be dragged across the coated surface.*

10.2 After heat treatment of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products, the glass temperature must be below 50°C (120°F) prior to packing or storing the glass on racks.

EDGE-DELETION REQUIREMENTS

SECTION 11

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- 11.1 The coated surface must always face up (away from conveyor rolls, felt covers or roller balls) during edge deletion to avoid the possibility of glass splinters and chips scratching the glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 11.2 Proper fabrication techniques must be followed in all processing of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. Refer to Section 5, "PROPER FABRICATION TECHNIQUES," in this User's Guide for more information.
- 11.3 SunGuard Solar and High Performance ranges of coated glass products which includes SunGuard Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34, Light Blue 52 / Green 52, Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, Neutral 60 / Green 60 and ClimaGuard Neutral 70 / Green 70 can be fabricated into insulated glass units without edge deletion in both annealed and heat-treated applications using Guardian-approved sealants.
- 11.4 Edge deletion is required for all SunGuard SuperNeutral coated glass products used in commercial annealed and heat-treated applications. This requirement includes SuperNeutral XX, SuperNeutral XX HT.
- 11.5 Edge deletion is also required when laminating SunGuard High Performance and High Selective Super Neutral ranges which includes Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, Neutral 60 / Green 60, ClimaGuard Neutral 70 / Green 70 and SuperNeutral XX, SuperNeutral XX HT directly to the PVB surface.
- 11.6 Edge deletion must be performed via an automated process or with an edge-deletion table. If edge deletion is done with a manual hand-style grinding tool, care must be taken to ensure the edge deletion is complete and consistent.
- 11.7 For heat-treated applications using products that require edge deletion, post-furnace edge deletion is preferred in order to avoid exposing the uncoated edge of the glass to additional heat during the heat-treatment process.
- 11.8 SunGuard SuperNeutral Heat Treatable products with Temporary Protective Film (TPF) must be edge deleted after heat treatment, either automatically on the IG line or manually, post-furnace. Post-furnace edge deletion is preferred in order to avoid exposing the uncoated edge of the glass to additional heat during the heat-treatment process.
- 11.9 For specific information regarding automated edge deletion systems that integrate edge deletion into the glass-cutting operation for SunGuard SuperNeutral heat treatable coatings with TPF, contact your Sales Manager or Technical Services Executive for assistance.
- 11.10 Review the SunGuard Edge-Deletion Product Application Note, Edge-Deletion Guidelines, for complete information regarding all edge-deletion considerations.

SECTION 12

Processor User's Guide, Commercial Products

INSULATING

- 12.1 Many processors have vertical insulating lines that tend to reduce deflection on standard insulated glass. However, processors with horizontal insulating lines should be extremely cautious regarding potential glass deflection. During horizontal glass insulation, the unsupported upper lite can sag under its own weight, creating a concave effect in the unit. The resulting deflection creates an observable concave or collapsed appearance on the unit's exterior. The amount of deflection is solely a function of the horizontal insulating process and the weight of the glass. In fact, this appearance has been cause for rejection on project sites.
- 12.2 The deflection is caused by a combination of the shape, size, weight and thickness of glass. As an example, a horizontal insulating process involving a 2 meters x 2 meters (4 m²) square unit could produce a 8-10 mm deflection in the center. However, a rectangular unit of the same area (e.g., 1 meter X 4 meters) may exhibit no deflection. Aspect ratio is critical; squares will always be at greater risk than rectangles. As an interim guideline, Guardian recommends that the insulation crew measure deflection on square units and on any unit greater than 4 meters².
- 12.3 The concave appearance may be reduced by placing the unit's #1 surface against a solid base for support during sealant application. Deflection is easily measured by attaching string diagonally from opposing corners. The deflection should be measured where the two strings intersect. Units exhibiting any measurable gap between the string intersection and glass surface should not be shipped if any optical distortion is visibly apparent.
- 12.4 Special care must be taken when using the Truseal, Duraseal or Duralite spacer system for commercial insulated glass unit fabrication. Truseal has placed restrictions on the physical size of the unit. The processor is responsible with complying with Truseal's requirements for insulated glass unit fabrication. Insulated glass units fabricated with the Truseal family of flexible spacer systems require the application of a secondary seal. Please contact your local Truseal representative or distributor for up-to-date information on product usage.
- 12.5 Quality control is a processor responsibility. The processor must ensure that the performance and optical requirements of the project can be met with the available capabilities at the factory.
- 12.6 Guardian recommends that inspection for deflection be added to the insulator's daily quality routine. As a final check, representative units should be spot checked outdoors to confirm acceptable optics.
- 12.7 For assistance with center-of-glass deflection, please contact your Sales Manager or Technical Services Executive.
- 12.8 The coated surface must always face up (away from conveyor rolls, felt covers or roller balls) during insulating to avoid the possibility of glass splinters and chips scratching the glass surface. Refer to Section 2, "APPROVED COATED-SURFACE DETECTION METHODS," in this User's Guide for more information.
- 12.9 Proper fabrication techniques must be followed in all processing of SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. Refer to Section 5, "PROPER FABRICATION TECHNIQUES," in this User's Guide for more information.
- 12.10 SunGuard Solar products offered in this market can be used in monolithic applications. Please consult with your Sales Manager for specific information and product availability.

The SunGuard High Selective Super Neutral and High Performance coated glass products must not be used in monolithic vision applications.

- 12.11 A dual-seal insulating glass unit must be used for all commercial applications.
- 12.12 A “commercial application” is defined as any building designed primarily for commercial use, including public and private structures, schools, office buildings, malls, storefronts, hotels, etc., whether it uses site-glazed or factory-glazed glass. Multifamily structures of three stories or more are considered commercial buildings.
- 12.13 The SunGuard Solar series of coated glass products which includes Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34 and Light Blue 52 / Green 52 requires no special timelines for insulation after heat treatment.
- 12.14 SunGuard Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, New product Neutral Plus 60 must be insulated within five days of heat treatment.
- 12.15 SunGuard SuperNeutral XX HT coated glass products must be insulated within 48 hours of heat treatment.
- 12.16 The ClimaGuard Neutral 70 / Green 70 coated glass product must be insulated within 30 days of heat treatment.
- 12.17 SunGuard SuperNeutral heat treatable products in the annealed state must never be fabricated into an insulated glass unit.

SECTION 13

Processor User's Guide, Commercial Products

OTHER FABRICATION (BENDING, LAMINATING, SPANDREL APPLICATIONS AND SILK-SCREENING)

- 13.1 The processor should determine whether the glass must be heat treated to meet the project requirements.
- 13.2 In most cases, tinted substrates and reflective coatings will require heat treatment to avoid thermal stress breakage.
- 13.3 Processors must be aware that certain factors (such as large glass sizes, shapes and patterns; thickness of glass; damage to glass during shipping, handling or installation; orientation of the building; exterior shading; overhangs/fins that reduce wind speed; and areas with high daily temperature fluctuations) can increase the probability of thermal breakage.
- 13.4 It is the responsibility of the processor to identify and understand the application-specific details of the project and the implication of factors like thermal stress, wind load and building code compliance. If heat treatment is necessary, heat-treatable products must be used.
- 13.5 Bending (Heat-Treatable Products Only)
- 13.5.1 Guardian must be contacted before any bending processes involving SunGuard coated glass products.
- 13.5.2 Most SunGuard Solar, High Performance, and SuperNeutral heat-treatable coated glass products have been bent successfully. Because every application is different, each circumstance must be independently evaluated. For specific information regarding bending, refer to Guardian Product Application Note, Bending Guidelines.
- 13.5.3 Guardian recommends full-scale mock-ups be prepared and approved for every project.
- 13.6 Laminating
- 13.6.1 Table 2 shows the SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products that can be laminated with PVB sheet or liquid resin facing the coated surface. However, the PVB or liquid resin can cause a color shift that may be objectionable. Full-scale mock-ups must be prepared and approved.
- 13.6.2 Guardian has limited experience with the use of liquid resins in laminating SunGuard coated glass products and requires that these resins be used with caution. It is recommended that mock-up samples are build for every project and inspected for any aesthetics or manufacturing defects before committing to large scale production.
- 13.6.3 SunGuard Solar, High Performance, and ClimaGuard Neutral 70 / Green 70 coatings do not need to be edge deleted when they are laminated to or away from the PVB surface.
- 13.6.4 SunGuard SuperNeutral series of coated glass products must be edge deleted when they are laminated away from the PVB surface. This type of configuration is commonly known as exposed laminated coating. The exposed coated surface in the laminate must be installed in an insulated glass unit configuration and any heat treated glass must be insulated within the time requirements listed in this User's Guide. The exposed coated surface must face the airspace in the insulated glass unit.
- 13.6.5 For specific information regarding laminating, refer to Guardian Product Application Note, Laminating Guidelines.

13.7 Spandrel Applications and Silk Screening

13.7.1 Heat-treated SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products must be used in spandrel applications to avoid the possibility of thermal breakage. Annealed SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products must never be utilized in spandrel applications.

13.7.2 Ceramic frits and silicone paints may be applied directly to the following SunGuard products: SunGuard Silver 20 / Green 20, Royal Blue 20 / Aquamarine 20, Silver Grey 32 / Green 32, Neutral 34 / Green 34, Light Blue 52 / Green 52, Silver 35 / Green 35, Neutral 40 / Green 40, Royal Blue 40 / Aquamarine 40, Neutral Plus 50 / Green Plus 50, Neutral 60 / Green 60 and ClimaGuard Neutral70 / Green 70. Approval is recommended via a full-scale mock-up.

SECTION 14

Processor User's Guide, Commercial Products

GLAZING GUIDELINES AND THERMAL BREAKAGE

- 14.1 The processor should determine whether the glass must be heat treated to meet the project requirements.
- 14.2 In most cases, tinted substrates and coatings with reflective properties will require heat treatment to avoid thermal stress breakage.
- 14.3 Processors must be aware that certain factors (such as large glass sizes, shapes and patterns; thickness of glass; damage to glass during shipping, handling or installation; orientation of the building; exterior shading; overhangs/fins that reduce wind speed; and areas with high daily temperature fluctuations) can increase the probability of thermal breakage.
- 14.4 It is the responsibility of the processor to identify and understand the application-specific details of the project and the implication of factors like thermal stress, wind load and building code compliance. If heat treatment is necessary, heat-treatable products must be used.
- 14.5 SunGuard coated glass products must not be glazed on the #1 surface.
- 14.6 SunGuard coated glass products must be glazed inside a hermetically sealed, insulated glass unit. If the insulated glass unit contains a laminated component, the SunGuard coating must be embedded against the PVB. In the event that the laminated component was made with the coating exposed, the insulated glass unit must be constructed in such a way that the coated surface of the laminated component faces the airspace in the insulated glass unit.
- 14.7 The SunGuard High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 series of coated glass products must never be installed in monolithic vision applications.
- 14.8 For help or assistance with complex configurations involving the SunGuard products, contact your Sales Manager.
- 14.9 Please contact Guardian Industries for technical information and support regarding glazing issues and thermal breakage concerns for SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products. You can obtain general information at Guardian's Web site (www.guardian.com). For more detailed information, contact your Sales Manager or Technical Services Executive.

QUALITY GUIDELINES — VISUAL INSPECTION

SECTION 15

Processor User's Guide, Commercial Products

- 15.1 When viewed against a bright, uniform background, SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products must meet or surpass the guidelines outlined in this section. SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products that undergo further fabrication must be inspected prior to each step in the fabrication process, as well as after final fabrication.
- 15.2 The inspection criteria outlined in this document apply to stock sheets, finished cut size or Guardian-supplied finished-cut-size lites. The area of most importance during visual inspection is the Main Area. The "Main Area" is defined as 90% of the length and 90% of the width dimensions centered on a lite of glass. The remaining area is considered the "Edge Area (Outer area)". An example of the Main Area of a lite that is 2440 mm by 1830 mm (96 in. x 72 in.) is shown in Figure 9.

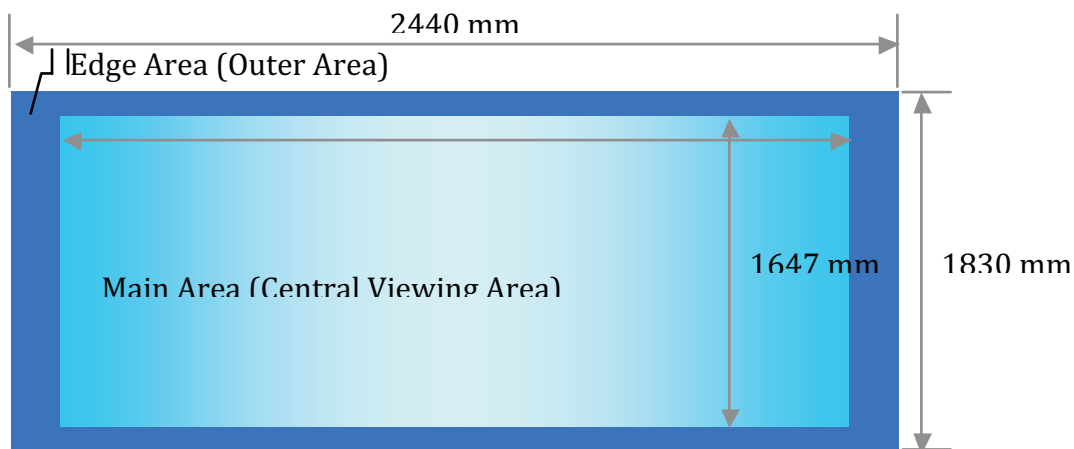


Figure 9. Main Area (Central Viewing Area) Diagram

- 15.3 A diffused light source gives the processor the ability to simulate normal daylight conditions. The light source is essential when inspecting SunGuard products for transmission and reflection. An example of a common light source is displayed in Figure 10.



Figure 10. A Common Artificial Light Source and Reflection Setup

15.4 Pinholes and Clusters (in Transmission)

15.4.1 Pinholes between 2 mm and 3 mm are acceptable if not more than 1/m²

15.4.2 A cluster is defined as 2 or more pin holes up to 2 mm each that are readily apparent

15.4.3 Clusters of pin holes within the main area are not acceptable, but are acceptable in the outer area

15.5 Scratches (in Transmission)

15.5.1 Scratches longer than 75 mm within the main area are not acceptable.



Figure 11. Visual Inspection of Transmission (Light Source Behind Glass)

15.6 Uniformity (in Reflection)

15.6.1 Color variation is acceptable as long as they are not regarded as visually disturbing.

This applies to color variation within one pane or variation between different panes



Figure 12. Visual Inspection of Reflection (Light Source Behind or Above Inspector)

QUALITY GUIDELINES — OPTICAL INSPECTION

SECTION 16

Processor User's Guide, Commercial Products

16.1 This section covers optical quality inspection for SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 / Green 70 coated glass products after heat treatment.

16.2 Many conditions may contribute to optical distortion, including:

- Batch considerations
- Glazing errors
- Manufacturing conditions
- Unequal pressure within an insulating unit

16.3 Minimizing optical distortion caused by the heat-treatment process will greatly enhance the appearance of the final product.

16.4 Lites must be processed so that roll wave will be horizontal to the base dimension of the finished unit, whenever possible.

16.5 A roll distortion gauge is used to measure roll distortion and is explained below.

- The gauge is passed over the uncoated surface or bottom side of the glass in both the x and y dimensions.
- The gauge takes peak-to-valley measurements. Extremes in roll wave and in center and edge kink will be determined during this measurement.

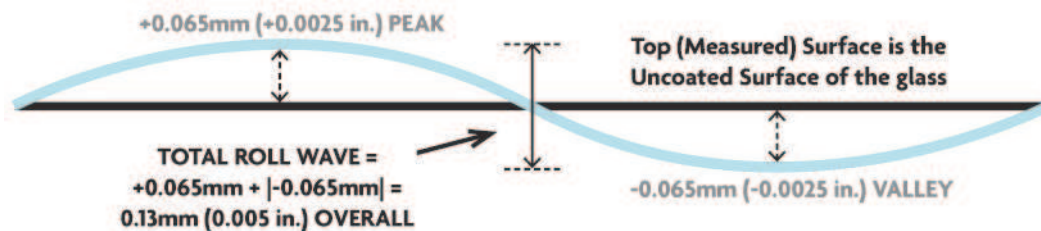


Figure 13. Sketch Depicting Roll Wave and Roll Wave Calculation

16.6 For any commercial application, a roll-wave of 0.07mm (0.003 in.) should be targeted. Processors are urged to develop improved in-house specifications for maximum roll wave. These specifications must be based on both furnace capabilities and aesthetic expectations for the product.

16.7 As described in EN 12150 - 1, localized bow and warp may be determined with the use of a straight edge spanning the concave surface.

- The glass must be measured with a feeler gauge or dial indicator.
- See EN 12150 - 1 for warp tolerance guidelines. Half of the EN guideline must be used as an in-house tolerance.

SECTION 17

Processor User's Guide, Commercial Products

GLAZED WINDOW CLEANING RECOMMENDATIONS

GUARDIAN POSITION

- 17.1 Guardian Industries Corp supports the procedures and recommendations developed by the Glass Association of North America.
- 17.2 The Glass Association of North America (GANA) has published an Informational Bulletin titled "Proper Procedures for Cleaning Architectural Glass Products" to provide procedures and instructions on how to clean installed architectural glass. The information is contained in Glass Information Bulletin 01-0300 which is publicly available at the Glass Association of North America website. Please use the enclosed link to access the document:
- [www.glasswebsite.com/publications/reference/GIB-Proper Procedures, Cleaning 01-0300.pdf](http://www.glasswebsite.com/publications/reference/GIB-Proper-Procedures-Cleaning-01-0300.pdf)
- 17.3 Consult the GANA website at www.glasswebsite.com for any additional information or clarification.

REFERENCES, AVAILABLE DOCUMENTATION AND PATENTS

REFERENCES

Guardian Product Application Notes for SunGuard Coated Glass Products

- **PAN-SG-TPF:** Temporary Protective Film (TPF) Guidelines
- **PAN-SG-ED:** Edge-Deletion Guidelines
- **PAN-SG-HT:** Heat-Treatment Guidelines
- **PAN-SG-HS:** Heat Soaking Guidelines
- **PAN-SG-LAMI:** Laminating Guidelines
- **PAN-SG-IG:** Insulating Glass Guidelines
- **PAN-SG-BEND:** Bending Guidelines
- **PAN-SG-TB:** Thermal Breakage Guidelines

European Standards Referenced in this User's Guide

- **BS EN 1096** Glass in Building Coated Glass
- **BS EN 12150** Glass in Building - Thermally Toughened Soda Lime Silicate Safety Glass
- **BS EN 1863** Glass in Building - Heat Strengthened Soda Lime Silicate Glass

PATENTS

Guardian SunGuard Solar, High Performance, SuperNeutral, and ClimaGuard Neutral 70 products contain protected intellectual property, as described below.

SunGuard SuperNeutral™ Series

- **SN 68 HT (Clear and Green):** Manufactured in accordance with one or more of U.S. Patents 6,475,626; 6,495,263; 6,558,800; 6,667,121; 6,686,050; 6,887,575; 6,692,831; 6,863,928; 6,936,347 and 7,217,460.
- **SN 68 HT (CrystalGray™):** Manufactured in accordance with one or more of U.S. Patents 6,475,626; 6,495,263; 6,558,800; 6,667,121; 6,686,050; 6,692,831; 6,863,928; 6,936,347 and 7,217,460.
- **SN 68 HT (UltraWhite™):** Manufactured in accordance with one or more of U.S. Patents 5,344,718; 6,475,626; 6,495,263; 6,558,800; 6,667,121; 6,686,050; 6,887,575; 6,692,831; 6,863,928; 6,936,347; 7,037,869 and 7,217,460.
- **SN-68 (Clear):** Manufactured in accordance with one or both of U.S. Patents 6,916,408 and 6,936,347.
- **SN-68 (Green and CrystalGray™):** Manufactured in accordance with U.S. Patent 6,936,347.
- **SN 68 (UltraWhite™):** Manufactured in accordance with one or both of U.S. Patents 5,344,718, 6,916,408; 6,936,347 and 7,037,869.
- **SN 54 (Clear, Green, and CrystalGray™):** Manufactured in accordance with U.S. Patent 6,936,347.
- **SN 54 (UltraWhite™):** Manufactured in accordance with one or both of U.S. Patents 6,936,347 and 7,037,869.

SECTION 18

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■ **SN 54 HT (Clear and Green):** Manufactured in accordance with one or more of the following U.S. Patents: 6,475,626; 6,495,263; 6,558,800; 6,627,317; 6,623,846; 6,667,121; 6,686,050; 6,887,575; 6,936,347; 6,692,831; and 6,863,928.

■ **SN 54 HT (CrystalGray™):** Manufactured in accordance with one or more of U.S. Patents 6,475,626; 6,495,263; 6,558,800; 6,627,317; 6,623,846; 6,667,121; 6,686,050; 6,936,347; 6,692,831 and 6,863,928

■ **SN 54 HT (UltraWhite™):** Manufactured in accordance with one or more of the following U.S. Patents: 6,475,626; 6,495,263; 6,558,800; 6,627,317; 6,623,846; 6,667,121; 6,686,050; 6,887,575; 6,936,347; 6,692,831; 6,863,928; and 7,037,869.

SunGuard® High Performance

■ **Neutral 40:** Manufactured in accordance with one or more of the following U.S. Patents: 5,688,585; 5,837,108; 6,475,626; 6,495,263; 6,558,800; 6,692,831; 6,782,718; and 6,863,928.

■ **Neutral 50:** Manufactured in accordance with one or more of the following U.S. Patents: 5,688,585; 5,837,108; 6,475,626; 6,495,263; 6,558,800; 6,692,831; 6,782,718; and 6,863,928.

■ **Light Blue 63:** Manufactured in accordance with one or more of the following U.S. Patents: 6,475,626; 6,495,263; 6,558,800; 6,692,831; and 6,863,928.

■ **AG 43 and AG 50 (Clear and CrystalGray™):** Manufactured in accordance with one or more of the following U.S. Patents: 5,688,585; 5,837,108; 6,475,626; 6,495,263; 6,524,714; 6,605,358; 6,692,831; 6,730,352; 6,782,718; and 6,863,928.

■ **Neutral 61 HT (NP 61 HT):** Manufactured in accordance with U.S. Patent 6,686,050.

■ **Royal Blue 40 (Clear and CrystalGray™):** Manufactured in accordance with U.S. Patent 7,166,359.

SunGuard® Solar

■ **Silver 32 and Silver 20:** Manufactured in accordance with one or more of the following U.S. Patents: 5,688,585; 5,837,108; 6,159,607; 6,524,714; 6,716,532; and 6,926,967.

WARRANTY

The SunGuard series of coated glass products are sold under Guardian's general terms and conditions of sale and are subject to the SunGuard Coated Glass Limited Warranty, copies of which are available upon request. Failure to follow the requirements of this User's Guide is one of the conditions that will void the warranty.

Guardian assumes no responsibility for breakage, improper usage, failure of the product resulting from faulty installation or building construction or design, improper handling or failure to follow Guardian's written instructions regarding the product. Further, Guardian assumes no responsibility for scratches or abrasions of any kind, including, without limitation, those that may occur as a result of abnormal weather conditions, of abrasive cleaners being used on the surface of the glass, or of acids, alkalis or other chemicals being used to wash the glass or surfaces around the glass.

It is the sole responsibility of the processor to adequately inspect SunGuard coated glass products before each step of fabrication and prior to shipment and installation. Inspection must be done in accordance with the criteria described in this User's Guide. Guardian will not assume responsibility for any claims if the coating is fabricated contrary to these written instructions or if the glass is damaged in fabrication or handling or improperly stored or installed. Guardian reserves the right to inspect any product claimed to be defective.

No variation or change from this Warranty will be binding upon Guardian unless made in writing and signed by an officer of Guardian.

Verification: The signature below verifies that the customer has read and understands the full contents of this User's Guide and all SunGuard fabrication documents including:

- ☐ *Coated Glass Limited Warranty*
- ☐ *Heat-Treatment Guidelines*
- ☐ *Edge-Deletion Guidelines*
- ☐ *Insulating Glass Guidelines*
- ☐ *Laminating Guidelines*
- ☐ *Thermal Breakage Guidelines*
- ☐ *Bending Guidelines*
- ☐ *Temporary Protective Film (TPF) Guidelines*

SECTION 19

Processor User's Guide, Commercial Products

REQUIRED SIGNATURES

➤ PROCESSOR REPRESENTATIVE NAME

➤ PROCESSOR REPRESENTATIVE SIGNATURE

➤ TITLE

➤ COMPANY

➤ DATE

➤ GUARDIAN REPRESENTATIVE NAME AND PHONE NUMBER

➤ GUARDIAN REPRESENTATIVE SIGNATURE