

AGC Sputter Coating Glass Processing Guidelines

Introduction

Comfort Select™ and Energy Select™ are Low-Emissivity glasses manufactured by AGC Glass Company North America. When incorporated into an insulating glass unit, Comfort Select and Energy Select greatly improve the thermal performance of the unit.

AGC has incorporated the latest sputtering technology into their Comfort Select and Energy Select. This has improved the quality and chemical durability of the coating, which is beneficial when handling the glass prior to manufacturing insulating glass units. However, this coating is very thin and care must be exercised in handling and processing the glass.

The purpose of these procedures is to guide you through the various steps that are necessary to produce a quality Comfort Select and Energy Select insulating glass unit.

It must be stressed that Comfort Select and Energy Select glass has a metallic coating, which is susceptible to damage and corrosion if not handled properly. Proper coated glass production procedures need to be adhered to in order to produce a quality insulating glass unit.

For additional information concerning processing Comfort Select and Energy Select coated glass with temporary protective film (TPF) please see AGC TSD 244.

Packaging of Comfort Select and Energy Select

- ◆ A label on the pack/rack/case will identify which way the coated surface is facing. This will facilitate opening the correct side to suit the method to be used in unloading and/or cutting the glass.

Storage of Comfort Select and Energy Select

- ◆ Normal good storage procedures are acceptable for unopened pack/rack/case of Comfort Select and Energy Select. The glass should be processed within six months from the date of shipment for annealed only coating, and within three months from date of shipment for post-temperable coating. This shelf life may be reduced in locations in which extremely high heat and humidity conditions are present. The date of manufacture is marked on the label.
- ◆ Glass should be stored away from fabrication processes that produce airborne contaminants (spacer and frame cutting, grinding, edging, etc.).

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- ◆ Glass should be removed from inventory on a first in, first out (FIFO) basis.
- ◆ Directions on the package indicate which side should be opened relative to the coated surface.
- ◆ Comfort Select and Energy Select glass should be stored at room temperature prior to opening to prevent condensation on the glass.
- ◆ The interleaving material must not be removed until the glass is required by the production operation.
- ◆ The packaging material should be retained when a pack/rack/case is opened. Any unused product should have the plastic covering replaced as tightly as possible to protect the product from contaminants. This will help protect shelf life. The case tag should be retained with the remaining product.

Handling Comfort Select and Energy Select

- ◆ Comfort Select and Energy Select coatings should not come in direct contact with hands, suction cups, cutting tables, cutting guides or any other part of production equipment, unless necessary to perform processing.
- ◆ All personnel handling Comfort Select and Energy Select must wear clean gloves. These gloves should be of sufficient bulk to absorb perspiration from the hands of the glass handlers. An acceptable solution is to wear cotton gloves over rubber gloves. Specially coated nitrile rubber gloves provide good results (AGC can supply a list of gloves upon request). Expectorate, perspiration, body oils, etc. can damage the coating.
- ◆ Comfort Select and Energy Select glass must be conveyed at all times coated side up and away from the conveying rollers.
- ◆ As much as possible, glass handlers should lift or carry the glass at the edge. If suction cups are used on the coated surface they must be in excellent condition, free from glass particles and no chemical break down of rubber material. Suction cup covers offer additional protection.
- ◆ The sputtered low-e coated surface can be detected by using a commercially available Low-E detector (such detectors can be found via internet search for low-e detector). As an alternative an ohm meter can be used on the coated surface near an edge. The sputtered low-e coated surface is conductive, but the probes must be pushed with force against the coating.

Cutting Comfort Select and Energy Select

- ◆ Comfort Select and Energy Select are available in lehr ends, stock sheets and cut sizes. This section refers to cutting down stock sheets.

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- ◆ Comfort Select and Energy Select must be cut with the coated surface up.
- ◆ Methods of transferring glass from the shipping container to the cutting table will vary depending on the size of the glass, the type of table and/or cutting operation.
- ◆ A free fall system with an air float table, cutting bridge and breaker bars is the preferred method of cutting.
- ◆ If a bridge-type cutting table is used, nothing but the cutting wheel should come in contact with the coated glass surface.
- ◆ Minimum cutting fluid should be used. A list of approved cutting fluids is available from AGC Technical Services.
- ◆ Comfort Select and Energy Select glass that will be insulated in the annealed state should be edge deleted, washed and fabricated into insulating units after cutting to size. If the glass has to be temporarily returned to a pallet before the next fabrication step, interleaving should be maintained between lites. A powder containing 100% Lucite® beads and no acid (such as Sydeline Corporation's part number 47GS) is preferred. This powder must be run through an 80 mesh screen. When this glass is needed for production, it must be processed with all previous steps taken.
- ◆ Once cut, glass must be fabricated into insulating units within 48 hours. Any glass that has been washed must be fabricated into an insulated unit immediately.

Edge Stripping Comfort Select and Energy Select

- ◆ Grinding has proven to be the most productive and economical method of removing a narrow strip of the coating from the perimeter of the lite. The width of the strip must be equal to the width of sealant that will be in contact with the glass after fabrication of the insulating glass unit. Typically this will be in the range of 3/8" to 1/2" in width. Complete removal of the silver layer is necessary, and this can be verified by use of an ohm meter.
- ◆ Post-Tempered Comfort Select and Energy Select **must be edge deleted** before insulating. Edge deletion is recommended on annealed Comfort Select and Energy Select products; however some window manufacturers have chosen not to edge delete, (See AGC Glass Company North America Supplemental Non-Edge Deletion Comfort Select Warranty for reduction in warranty period and other conditions).
- ◆ Commercial glazing must be edge deleted.
- ◆ The grinding operation must take place with the coated surface face-up.

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- ◆ Once the grinding is completed, the glass must be fabricated within 24 hours.
- ◆ Temperable Comfort Select and Energy Select must be edge deleted.

Washing Comfort Select and Energy Select

- ◆ Cleaning Low-E coated glass does not require a special glass washing machine; however it does require a different approach or commitment to maintaining a glass washer.
- ◆ Washer must be maintained in “like new condition”.
- ◆ Always run coated side up.
- ◆ Wash water should be at a minimum of 120⁰F to 130⁰F, but never over 160⁰F. If a detergent is necessary, a mild, easily dissolving type (such as Shaklee Basic-H® or Billco low-e detergent) is preferred. Soap/water concentration should be held as close to neutral as possible. Vinegar cannot be used in the washer. Wash water should never be allowed to go acidic when processing Comfort Select and Energy Select.
- ◆ A pre-rinse is helpful (required for post-temperable coating) in removing the debris prior to the brushes for reduced scratching potential, and a de-ionized final rinse is advantageous in assuring a clean, residue free condition prior to heat treatment.
- ◆ The washing machine must incorporate brushes designed to be compatible with soft coatings. Roller or drum brushes should be used. Cup type brushes must not be used on Comfort Select and Energy Select coated glass.
- ◆ The pinch rolls in the rinse and drying sections must be perfectly smooth and clean, with no cuts, gouges, or other imperfections.
- ◆ Pinch rolls should make only slight contact with the glass.
- ◆ The glass must never be allowed to stop in the washer, especially under the brushes, this may cause mechanical abrasion. Any abrasion of the coating would be considered reason for rejection.
- ◆ Continuously overflowing the wash and especially the rinse tanks into the overflow pipe is a good practice to help assure clean wash water. All tanks should be drained and cleaned daily.
- ◆ Brush bristles should be a maximum diameter of 0.008” (0.006” diameter or less is desirable) and crimped. Proper brush adjustment is important; otherwise damage to the low-e coating may result. Brushes should initially be adjusted so bristles just touch the coated glass surface

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when the brushes are spinning at normal speed. Check low-e coating for signs of damage after any adjustment. For the post-temperable coating, minimal or no brush contact is desired.

- ◆ When running small lites in a large washer it is good to alternate where the glass is running in the washer to even out brush wear.
- ◆ Brushes should be replaced/trimmed when wear makes adjustment difficult.
- ◆ The spray lines and holes must be clean and clear, and water flow must be to the manufacturer's original flow rates and pressures (1gallon per minute minimum with line speed 10 FPM or less).
- ◆ Frequent flushing of the washing machine is necessary, especially when washing companion lites of glass that have been interleaved with acid-bearing separator materials such as lucor. Residual acids left in the washing machine, unless neutralized, will attack the coated surface.
- ◆ The washing machine should be steam cleaned regularly to minimize contaminant build up. Care should be taken to never direct pressurized water directly at the brushes. This can lead to deformation of the bristles. The brushes should be thoroughly flushed with low pressure water (never use a pressure washer directly on the bristles) to remove all glass chips, grinding fines, dirt, dust, etc.
- ◆ Routine checking and regular maintenance of the washing machine is essential to insure cleanliness, correct condition of recycled wash and rinse water, and condition and adjustment of brushes. AGC can provide a suggested maintenance schedule.

Drying Comfort Select and Energy Select

- ◆ Clean filtered air should be used. It is important that absolutely no moisture remains on the coated surface. Moisture that is left on the coating could cause corrosion. Moisture left on the coating and allowed to evaporate could result in residues and stains.
- ◆ Internal cleanliness of the drying system is critical. The air filters should always be clean to insure the ambient air supply to the blower is clean. There should not be any processing equipment near the washer with any type of exhaust that may emit an oil mist, or grinding fines into the air. Aerosol or paint sprays should not be used near the washer.

Fabrication of Comfort Select and Energy Select into Insulating Units

- ◆ All normal insulating glass fabrication procedures can be used with properly stored and washed Comfort Select and Energy Select.
- ◆ AGC recommends following IGMA guideline TM 4000-02(04), "[Insulating Glass Manufacturing Quality Procedures](#)".

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- ◆ AGC manufactures Comfort Select and Energy Select insulating units as both single seal and double seal applications. AGC will be pleased to discuss specific materials with you and your sealant suppliers.
- ◆ All handling and conveying should be done with the coated surface facing up and away from the conveying rollers.

AGC Comfort Select and Energy Select Post-temperable Coating Considerations

The post-temperable Comfort Select and Energy Select has proven to be an important advance in temperable sputter coated Low-E. We have successfully tempered the product at numerous locations, on most every style of tempering furnace. The main considerations for tempering the Comfort Select and Energy Select product relate to bottom surface quality and handling. Due to the reflective Low-E film, heating of the coated surface of the glass is much slower than the clear surface, particularly in radiantly heated ovens. This leads to bowing of the glass during initial heating, caused by the top versus the bottom temperature differential. This bowing can scar or scuff the glass if allowed to occur for an extended time, and therefore, the furnace set-ups are designed to address this issue. Handling, prior to tempering, is also discussed below.

- ◆ Normal good storage procedures are acceptable for unopened pack/rack/case of post-temperable Comfort Select and Energy Select. The glass should be processed within three (3) months from the date of shipment. This shelf life may be reduced in locations in which extremely high heat and humidity conditions are present.
- ◆ Prior to tempering, the product should be kept in its original package until processed. The time between removal from the package and tempering should be minimized to reduce problems encountered from dirt and debris, moisture, and excessive handling. The post-temperable glass should be tempered within 8 hours of cutting. However, once washed the product should be tempered immediately. Washed, coated glass is in a fully hydrated condition that can lead to staining of the film if extended exposure times are allowed. Once tempered it is a good practice to process the product into an insulating unit within 48 hours to avoid problems with coating deterioration.
- ◆ Pre-tempering handling and washing are very important process areas where care in handling is required. Small scratches and debris can lead to larger problems following the tempering process. Refer to the previous **Handling, Cutting, Edge Stripping, Washing, and Drying** sections of this guideline.
- ◆ Post-temperable Comfort Select and Energy Select must be edge deleted. Edge deletion may be performed before or after tempering. Edge deleting before tempering can create difficulties

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during tempering with the edges of the glass on some types of furnaces. Edge deleting before tempering is best suited for furnaces with the latest convection and sophisticated zone heat control.

- ◆ The furnace is cooled and slowed, as compared to standard clear glass parameters. In regards to oscillating furnaces, oven top temperatures range from 670⁰C to 690⁰C while bottom temperatures are set approximately 15 to 20⁰C lower than the top. Furnace cycle times range from 150 to 350 seconds for 3 and 4 mm and increase for thicker substrates. Cycle times are subject to furnace conditions and modifications such as convection, spiral cut rolls, etc. When tempering on a continuous line, temperatures range from 640⁰C, at the entrance, to approximately 680⁰C at the exit and similar to the oscillating ovens, speed is reduced compared to clear glass. Glass and/or coating temperature should never exceed 690⁰C regardless of furnace type.
- ◆ When possible, the furnace temperature is set cooler at the entrance and exit of an oscillating oven to reduce initial bowing caused by uneven heating top to bottom of a Low-E lite. Usually, this offset is 20 to 30⁰C. On a continuous oven, the temperature at the entrance is lowered approximately 40⁰C to 70⁰C and increased in a gradient fashion to the target tempering temperature.
- ◆ Convection is necessary for heat treating sputter coated glass. With the increase in efficiency of convection systems care should be taken not to overheat either glass surfaces (top and bottom) or coating damage will result. Care should be taken in assuring that the air used is free of contaminants such as oils or moisture.
- ◆ The use of SO₂ is not acceptable during heat treating Comfort Select and Energy Select. Sulfur, when present during the heating of the Low-E film will damage the coating. No SO₂ should be used for 2 hours prior to running post-temperable Comfort Select and Energy Select.
- ◆ In overheating conditions, besides concerns regarding film degradation, the reflected color can shift to the point that the color in reflection will not match the standard annealed product line.
- ◆ Overheating will cause the coating to develop a haze that may be unacceptable when viewed in transmission. Care should be taken to temper the Low-E in a fashion that is sensitive to the fact that the product is a sputtered Low-E film.
- ◆ Due to the nature of the sputter coating, Comfort Select and Energy Select products cannot be bent. Attempts to bend Comfort Select and Energy Select will result in significant damage to the coating.

For additional information contact AGC Technical Services at 1-800-251-0441.

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