NSG GROUP

Technical Bulletin

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Handling, Inspecting and Fabricating NSG **TEC™** Glass

Summary

NSG **TEC™** glass is a hard, neutral color, electrically conductive, pyrolytic coating, on clear glass. The coating is available in various thicknesses which give electrical resistance from 6 to 8 Ohms/square for NSG **TEC™** 7, up to around 5000 Ohms/square for NSG **TEC™** 1000 on 3 mm glass. Note: the resistance is measured between 2 opposite bus bars on a square sample. The result is independent of the size of the square and so 'Ohms/square' has no dimension units.

The coating is tough and durable, and for most situations the product can be treated in the same way as uncoated glass.

Unpacking

The coated surface is hard and is not easily damaged, so cases can be opened normally.

Do not mark the coated surface with adhesive labels or wax crayons, and do not drag suction cups or metal objects across the surface. The coating will not be damaged by such materials, but it may be difficult to remove deposited fine rubber or metal residues due to the submicroscopic roughness of the coating.

Surface Identification

The coating is electrically conductive so a hand-held ohm-meter or continuity checker (such as Radio Shack #22-212) can be used to identify the coated side by touching the two probes to the coating. Take care not to drag the probes across the surface.

With practice the coating can be felt by the increased drag on finger tips or a finger nail when rubbed on the coated side. Additionally, an ordinary lead pencil will lightly write on the coating but not on the glass surface.

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These techniques should be used near the edge of the glass where it will be within a frame when glazed.

A hand held meter (E-TEKT) to identify the presence of a low emittance coating on the inaccessible surfaces within an insulated glazing unit, or a laminated light, is available from EDTM, Toledo, Ohio, phone: 419 861 1030.

Inspection

NSG **TEC™** Glass can be inspected, in reflection, for uniformity of coating by placing it in front of a mat black, non-reflective, background with a uniformly lit white surface, behind the viewer, reflected in the glass. (This simulates the viewing condition where a person outside looks at the daytime reflection of an overcast sky in a glazed window.)

Inspections should also be performed in transmitted light by viewing through the glass to a uniformly bright surface with a dark background behind the viewer (to eliminate distracting reflections) to simulate daytime viewing of the glass from within a building.

Coating Quality Specification for Cut Sizes

When viewed in reflection or transmission, as described above, from a distance of 10 feet (3 m), the coating will not have objectionable, bands, streaks or color differences as detailed in ASTM C 1376-03. "Specification for Coatings on Glass".

There shall be no single visible spots on the coating greater than 3/32" (2.4 mm) diameter in the outer area, or greater than 1/16" (1.6 mm) dia. in the central area.

There shall be no more than 2 readily apparent blemishes in a 3" (75 mm) dia. circle, or no more than 5 in a 12" (300 mm) dia. circle.

FABRICATION

Cutting

The glass can be cut with the coating side up or down depending on preference, but coating side up is recommended to minimize the risk of marking the coating. Cutting wheel pressures will be very similar to those for uncoated glass.

When hand cutting on the coated surface the score may feel slightly different but no change in wheel type or pressure is needed from those used with uncoated glass of the same thickness.

If the glass is to be dragged across rollers or over a poorly inflated air-float table it is preferable to have the coating side up to avoid rub marks. However, care must be taken if straight edges, metal tape measures, or cutting bars are dragged on the coated top surface, as marking may occur which would require special cleaning techniques (see ATS #143).

Edge preparation such as seaming or polishing should be done coated side up, as the rotation of the seaming table casters could cause a swirling pattern where they would touch the coating if it were facing down.

Washing

Automatic washing machines using hot water and detergent, such as Alconox, can be used as on uncoated glass. See Pilkington North America, Inc. ATS Bulletin #133. See ATS #143 for details on hand washing techniques.

Razor blades and steel wool must not be used on the coated surface.

Abrasive cleaners should be only be used with great caution as they can easily cause bright or dark spots which are only visible under certain lighting conditions.

Heat Treating

As with all low emissivity coated glasses, the NSG **TEC™** Glass coating will reflect radiant heat and so it will require a longer furnace cycle to achieve the same uniform temperature as uncoated glass of the same thickness. The heating cycle time will be greatest for highest IR Reflection values.

IR Reflectivity = 1 – Emittance.

For NSG **TEC**™ 8 the IR Reflectance is 87%.

For NSG **TEC™** 1000 the IR Reflectance is only 22% (close to the value for plain, non-coated, glass of 16%).

For NSG **TEC**™ 15, (IR Reflectance = 85%) with the coating up, the furnace cycle time can be 20% or more, greater than that for non-coated glass of the same thickness.

A very rough rule of thumb for heating non-coated, clear glass for tempering is: 1 second in the furnace for each 0.001 inch of thickness. i.e. 6 mm (0.222") glass will require about 3 ½ minutes heating time. Individual furnace times will differ.

The use of 'aspirators' in a furnace increases the forced convection heat transfer and reduces the heating cycle time with Low-E coated glass.

Note that with the coated side facing up, the bottom surface will run hotter and will need to be watched for roller marking or center-rub ("Skunk Stripe") from temporary warping or overheating.

With the coating down, a more rapid heating (and shorter furnace cycle time) may be achieved by thermal convection and conduction to the lower coated, surface, and radiant heating to the top, non-coated, surface. Furnace cycle times will then be close to those for non-coated glass of the same thickness. However, care must be taken to prevent any sliding actions which could cause marking from the furnace rolls, or from the loading and unloading conveyors.

The forced convection heat loss during the quenching part of the tempering process is little affected by the presence of the coating, but normal air flow adjustments may still be required to prevent bowing and obtain an acceptable break pattern if the glass is not at the exact same temperature as uncoated glass of the same thickness.

Insulating Glass (IG)

Typically the coated surface will face the air space in an IG unit. Note: the night-time U-Factor is unchanged with the coating on either the number 2 or number 3 surface. The coating should

be on the number 3 surface to maximize passive solar gain in winter. When the coating is on the number 2 surface there is a lower solar heat gain coefficient and less passive solar gain.

It is important to confirm that the glass is effectively cleaned and that full sealant adhesion is developed to the coated surface. It is the IG manufacturer's responsibility to ensure that sealant adhesion is satisfactory. To date, NSG **TEC™** Glass has been tested, and found compatible, for IG construction, without edge deletion, with Hot Melt Butyls, Polyisobutylenes, Polysulphides, Urethanes and One and Two Part Silicones.

Do not allow aluminum spacers to be dragged across the coated surface when assembling the units or a metal deposit will be left on the coating.

Laminating

Laminated glass must be fabricated with the coating out, away from the PVB interlayer, to preserve the low emissivity effect. The electrical conductivity will not be affected by being laminated with the coating against the PVB interlayer.

Glass is opaque to the long wave radiation (around 10 micro-meters wavelength) associated with near room temperature bodies. A low emissivity coating on glass reduces winter heat transfer, depending which surface the coating is on, either by:

1. Reducing the emission, or radiation, of far-IR energy from warm glass towards a cold exterior, if the coating is on surface #1 or #3 of an IG unit. (#1 is the exterior surface on which rain can fall)
2. Reflecting the far IR energy radiating from a warm room back towards the room, if the coating is on surface #2 or #4 of an IG unit.

A laminate can physically be made with a NSG **TEC™** Glass low emittance coating placed against the PVB interlayer, but the low emissivity property will be lost. If the laminate is made with the coating against the PVB there will be a slight reduction of SHGC, compared to clear, non-coated glass, caused by absorption of some solar near-IR radiation. (Optics and Window 5 programs can compute this for Pilkington NA Inc. Low-E coatings). Impact testing should be repeated to ensure the safety fracture properties of laminated glass have been preserved. Note: the pvb of a laminate does not prevent the slow diffusion of water vapor and the consequent deterioration of a 'soft' sputtered, silver based, low-e coating.

If a low emittance coating is against the PVB in a laminate, far-IR heat absorbed on the room-side surface (#4) of the laminated light, will heat that surface in Winter (Glass is opaque to far IR radiation). The absorbed heat will then flow by conduction (from hot to cold) towards the cooler exterior surface (#1) where it will transfer to the exterior environment, by convection and radiation. When this heat is flowing, by conduction, through the glass, it will meet no resistance from the extremely thin metal oxide of a low emittance coating in the middle of a laminate.

The NSG **TEC™** Glass coating is not damaged by normal laminating processes. Care should be taken to minimize excess PVB remaining around the edge of the glass prior to autoclaving, as this can be difficult to remove from the coated surface. Do not use razor blades or steel wool to remove deposits from the coated surface.

Packing

When packing NSG **TEC™** Glass for shipping with the coating exposed, it is preferable to use paper or hardwood flour as an interleaving medium. Over long shipping distances, the acrylic beads in Lucor powder can be abraded and leave a deposit on the coating which is difficult to remove.

Care should also be taken to minimize the contact of Styrofoam packing materials with the coated surface. Styrofoam packing materials can easily leave a rub mark on the coating which would be difficult to remove.

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