IGU Design & Glazing Notes

MAKE-UP DESCRIPTION

An IGU is typically assembled with 2 panels of glass, one the external (facing the outside) and the other being the internal panel (inside). With some exceptions, standard tinted/toned and low-E coated glass types are the external panel which is the optimal position to reduce direct solar heat gain.

To further aid correct specification and assembly of the IGU and in particular for units with low-E or other coatings such as printed/frit glass, an industry numbering sequence is used which identifies glass surface positions for the coatings e.g.,#1,2,3,4 as shown Fig 1 & Fig 2. As a general rule, the low-E coating is always surface position #2 (facing the IGU cavity). This provides optimal solar control whilst protecting the coating itself.

FIG.1

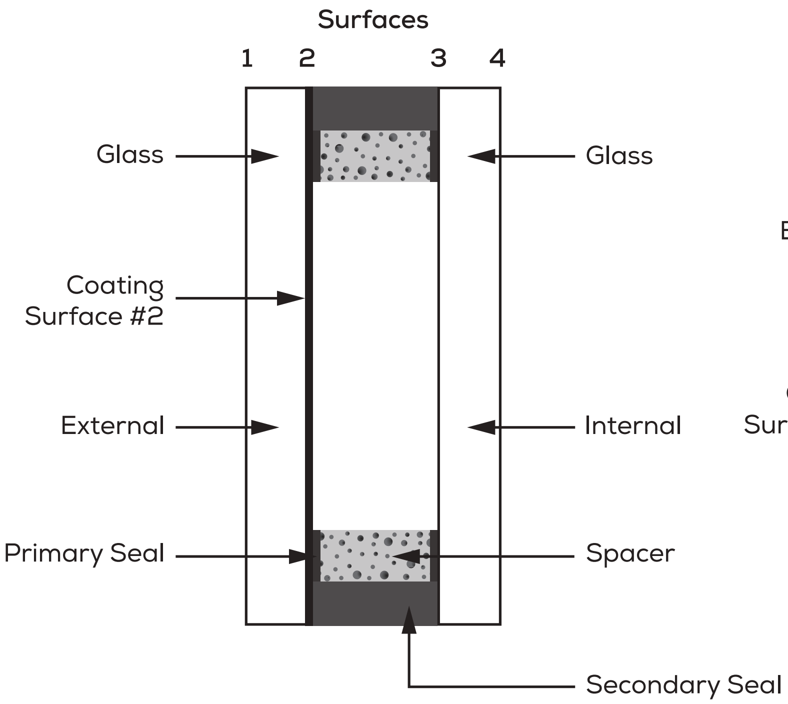

FIG.2

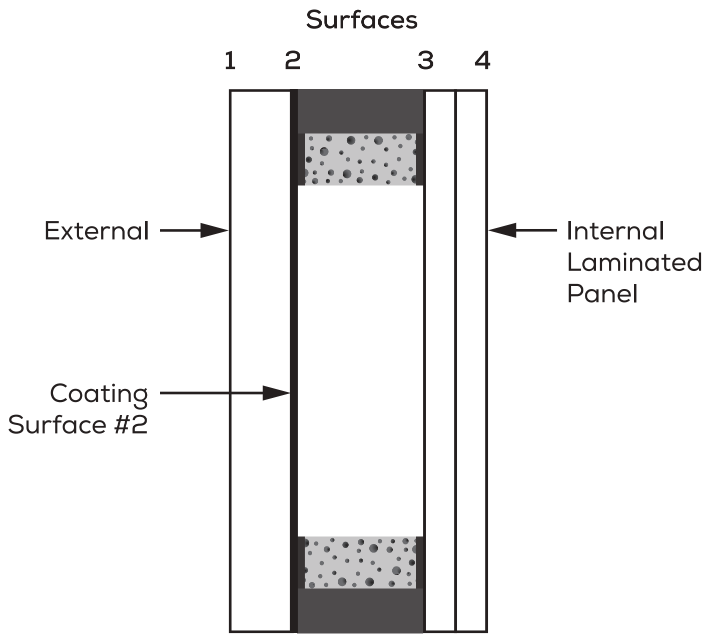

FIG.3

GLASS ID LABELS

The label **DOES NOT** indicate which way to glaze the panel. We simply state on the label as shown, which glass we have affixed the label to. In this example, the label is on the 6mm Clear glass component. Once the unit is delivered, it's the responsibility of the fabricator/installer to correctly glaze to ensure performance outcomes are met.

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MAKING GLASS VISIBLE (MANIFESTATION OR MOTIFS)

For panels capable of being mistaken for a doorway or opening, a detail such as a motif is required (See AS1288 for specific details). Upon request National Glass screens the motif on 1 panel only.

MANUFACTURING AND INSTALLATION

Australian Standard AS 4666:2012 Insulating glass units documents the requirements for compliance in relation to glazing, periodic manufacturing testing and long term testing and other associated aspects. This means both IGU manufacturers and window fabricators are responsible for supplying compliant product.

GENERAL PRODUCT SPECIFICATIONS

Size Limits*

- Maximum Size - 4500mm x 2700mm
- Minimum Size - 350mm x 180mm
- Maximum thickness - 15mm + Spacer width + 19mm
- Minimum thickness - 4mm + 8mm Spacer + 4mm

*subject to glass types and design specifications.

Glass Types

- Clear, tinted and low-E
- Acid etched - with etched side to surface #4
- Patterned glass - 4,5,6mm Satinlite / 4,5mm Spotswood with rough side to surface #4
- Lacobel® T – with painted side to surface #4

Gas filled

- Argon gas as standard fill

Spacer Details

- Type – SuperSpacer® silicone foam
- Widths - 8,10,12,14,16,20mm
- Finish - Matte dark grey

- Unit seals (dual seal),
- Primary - PIB (polyisobutyl)
- Secondary – silicone with minimum default inset depth of 6mm.

- Stepped and exposed edge units - 12mm and 14mm width spacers only with silicone secondary seal as a minimum requirement
- Spandrel units – printed, painted or fritted side to surface #4 with silicone secondary seal as a minimum requirement
- Edge Deletion - sputter coat low-E only as used in Duo Ultra™ units

PRIMARY AND SECONDARY SEALS

Duo Plus™ and Duo Ultra™ IGU's are manufactured with dual seals consisting of a primary seal using polyisobutylene (PIB) and a secondary seal using silicone. Silicone secondary sealed units are used where one or more edges are exposed, or where no frame is covering the edge of the glass. An example of this type of glazing is 90° butt joints and silicone structural glazing. Silicone secondary seals should also be used in spandrel IGU's. The default silicone secondary sealant depth supplied by National Glass is 6mm. The glazing contractor should check whether 6mm depth is sufficient for site conditions. Our technical staff can assist with further information and advice.

ARGON GAS FILL

To further improve the thermal insulation of the unit, the cavity can be filled with a heavy gas such as argon that lowers convection heat loss between the two glass panels. All National Glass IGU's are argon gas filled.

SPACER WITDTHS

A wide range of spacer widths are available to suit different frame widths and applications;

- 8/10/12/14/16/20mm

It is always advisable to have a wider spacer or gap for larger sized units as the deflection due to pressure changes or deflection or bowing as a result of tempering can cause the panels to touch in the middle.

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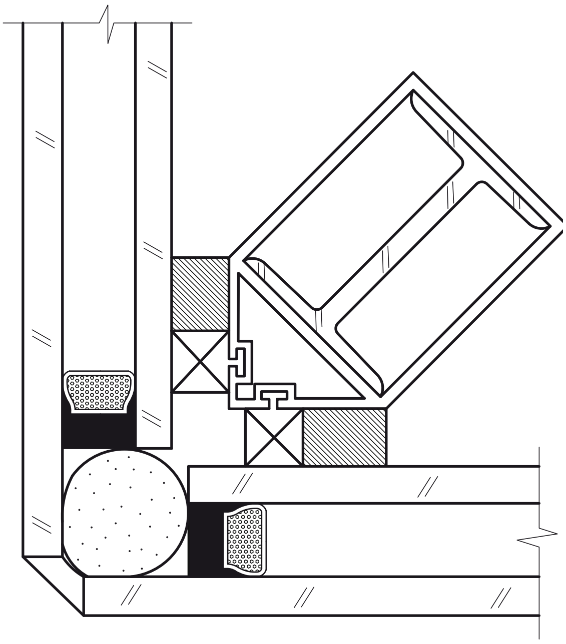
OPTIMAL THERMAL PERFORMANCE

Using low-E coated glass along with argon gas provides for improvement in the thermal insulation of the unit. Sputter or soft coat low-E's provide better performance than standard hard coat low-E glass. U-Value performance is further improved with a minimum 12mm spacer width with performance generally peaking at 16mm width. Using a spacer with lower conductivity such as Super Spacer will also marginally improve performance. Extreme climatic conditions especially in cold climates will sometimes require the use of two low-E panels or triple glazing using combinations of low-E coatings.

STEPPED EDGE UNITS

As shown in Fig4, stepped edge units are mostly used in exposed edge applications, such as silicone structural glazing or 90o butt joint glazing (see also note and comments in Primary and Secondary Seals). The stepped section of the glass and sometimes the other edges are printed with a black ceramic fired coloured ink to hide seal and spacer elements. The minimum spacer widths used for stepped edge units is only 12mm and 14mm. The secondary seal of the unit shall be silicone.

FIG.4 STEPPED IGU (For more detailed information refer AS 4666:2012 Insulating glass units)



SPANDREL UNITS

For applications using spandrel coloured glass the secondary seal shall be silicone. For more detailed information on spandrel glazing refer to ImageTek ™ Design and Glazing Notes.

SILICONE STRUCTURAL GLAZING

This method of glazing is more often used in commercial buildings, where no vertical or horizontal aluminium members are seen and essentially the glass edges are exposed. For these applications the silicone secondary seal depth on the unit may need to be wider to accommodate wind loads. The same will apply to structural overhead glazing. The default silicone secondary sealant depth supplied by National Glass is 6mm. The glazing contractor should check whether 6mm depth is sufficient for site conditions. Our technical staff can assist with further information and advice.

HIGHER ALTITUDE GLAZING

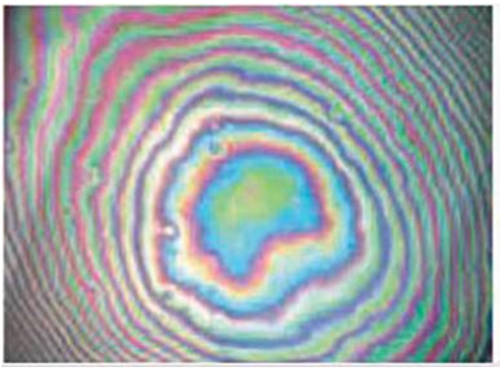
Pressure equaliser valves or capillary tubes are required for IGU's at altitudes greater than 800 metres above sea level. The reason being that when the unit is manufactured at lower altitudes and installed at higher altitudes, the increase in altitude causes the glass panels of the unit to bow out. This creates added stress to the IGU perimeter seals that can reduce the life span of the unit and can also be visually unacceptable.

THERMAL STRESS BREAKAGE

The use of annealed float, solar control type laminated and low-E coated glass increases the risk of thermal glass breakage. For more information refer to Thermal Breakage document.

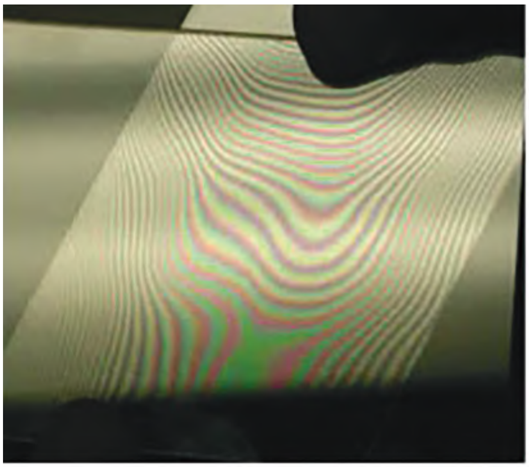
VISUAL PROPERTIES

Newton Rings – a visual effect created when the centre of the glass panels making up the IGU come so close as to touch each other. It will appear as a circular or semi-circular rainbow effect in central areas of the unit. This may indicate that the spacer width is too small, the result of temperature related pressure changes or improper pressure equalisation.



Newton Rings

Brewsters fringes – a visual effect manifesting itself as a rainbow visible within the unit. Brewsters fringes is not considered a defect. It is created when light passes through two panels of glass of the same thickness. The resulting refraction becoming visible as a rainbow effect. Brewsters fringes can be confirmed by depressing one glass surface of the unit. The rainbow effect will move and colours change as the one glass surface is depressed and released. The effect can be avoided by using two different thicknesses of glass.



Brewsters fringes

Distortion/ Deflection – the tempering of glass (eg Toughening and Heat Strengthening) can create slight visual distortions across the glass surface. Distortions can also occur due to atmospheric pressure and temperature changes. This is not considered a defect.

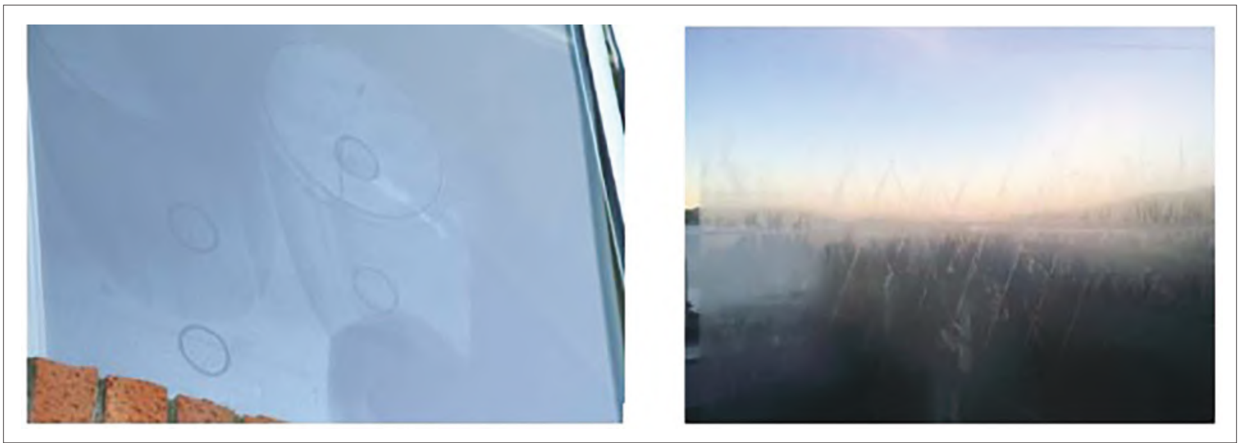
Multiple Reflections – can be present when viewing an object's reflected image in an IGU. The use of tinted or reflective glass as external panels and low-E coated glass as the internal panel gives a greater reflection. Whilst it is not a common problem, a certain amount of double imaging is inherent in IGU's.

Haze – defined as the scattering of light rays when visible light passes through a transparent material like glass. Haze can appear on coated glass such as low-E or laminated glass or tinted glass. The amount of haze in ordinary glass is very low and is not detected by the human eye. Haze is a characteristic that is a common consequence of the crystalline structure of coated glass. Some of the light that enters glass is absorbed and some scattered by components within the glass. If sufficient light is scattered, then it will appear as a haze in the glass. The visibility of haze depends on two criteria: the surrounding conditions and the brightness of the background.

It is possible for a glass product to exhibit haze at certain times of the day and not at another. It is also possible for the same type of glass to display haze in one location and not in another. With any coated glass, it is possible to see the presence of the coating under a certain angle and intensity of the lighting. Haze sometimes has the appearance of a blue-grey film or dust on the coated glass. Haze can occur in both clear and coloured laminate, with it more evident in grey laminate. Haze is very dependent on the angle and intensity of the light. Some colour variations such as a blue haze may exhibit in low-E glass, especially noticeable if part of the glass is shaded. Haze is not considered a manufacturing defect. (AGWA). An example of haze is shown.

Haze

Preferential Wetting Patterns - patterns that are visible when the glass surface gets wet from rain, condensation or washing and are caused by manufacturing tools, equipment and devices such as vacuum lifters and separation pads that come into contact with glass during manufacture, handling and installation. Although these tools, equipment and devices leave no visible residue on the glass, they do change the surface condition, creating patterns on the glass surface that show when it gets wet. These patterns do not affect the functionality, performance or longevity of the units and fade over time. Preferential Wetting Patterns are not considered a defect. They can be removed using a special buffing compound.



Preferential wetting patterns

IGU Design & Glazing Notes

Condensation – water from condensation build-up and resultant run-off can damage window frames/sills and seep into adjoining areas. Condensation will form when the moisture in the air condenses out on surfaces that are cooler than the 'dew point'. Insulated walls, ceilings and floors provide better thermal barriers than windows. Window surfaces being colder than outer surfaces in the home are more prone. IGU's reduce the likelihood of condensation forming by providing an additional thermal barrier between the inside and outside. Low-E coated glass will further reduce the likelihood of condensation.

Condensation can also form on the outside surface of the external panel. Where the unit is made with a high performing Low-E coated glass, the coating is reflecting heat inside back inside the room, eg., performing its insulation function. This means that the external outside glass surface temperature may drop such that on damp mornings of evenings moisture in the air can condense onto the colder glass surface. This is not considered a defect of the unit. Usually when the air starts to heat up, the condensation will disappear. Another example is on hot humid days, when the room is air conditioned for a prolonged period of time such that the same external outside glass surface temperature drops and the humid conditions allow condensation to form. This is not considered a defect of the unit.

If condensation starts to appear on the inside glass surfaces or cavity side of the unit, this could be an indication that the unit is starting to fail. Whilst some condensation might be acceptable as the unit is approaching its end of life, newly installed units should not display signs of cavity condensation.

Anisotropy - is the variation of stress across the surface of toughened glass from the toughening process which can result in light and dark areas being visible (sometimes known as leopard spots) when polarised light is incident on the glass. This phenomenon is known as photoelasticity. This photoelastic effect is an inherent characteristic of all heat treated glass, and is more noticeable on thicker glass, coated glass and laminated glass through polarised glasses. This effect may be accentuated when there are two or more layers of toughened glass in an IGU. Photoelasticity or Anisotropy is not considered a defect.

Anisotropy

Surface Imperfections – the manufacture of IGU's requires in some circumstances multiple glass processes and stages of handling. In addition, the raw glass material is not perfect, with some allowance for defects in the glass itself. With this in mind, the industry has developed an Australian Standard that covers allowable defects in finished IGU products including means of inspection. Refer to AS 4666:2012 Insulating glass units.