HUIZHOU HOPSON GLASS CO.,LTD

insulated glass

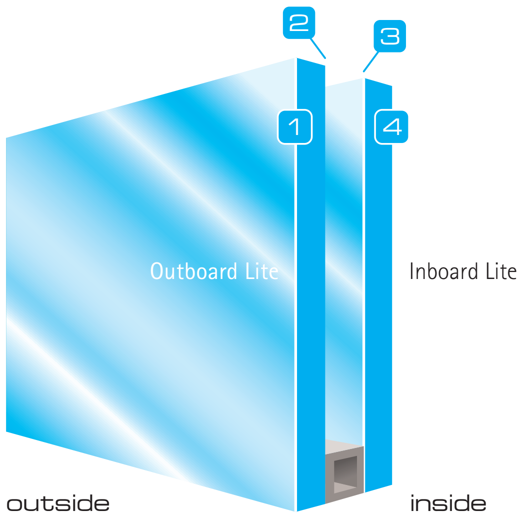
Insulated glass units (IGU's) or **double glazed units** are a significantly more energy efficient glazing system than single glazing. IGU's consist of two or more layers of glass separated by a void normally filled by air. The combination of airspace and glass panes act as an additional barrier, making the transfer of heat by convection, conduction and radiation more difficult. The glass panels are separated using aluminium or other types of spacers around the edges, hermetically sealed to the perimeter in controlled conditions. Common spacers range in width from 6mm up to 14mm. The spacer contains a desiccant (drying agent) which eliminates moisture vapour in the cavity. IGU's are not to be confused with double glass windows or secondary sashes/windows, where the two panes have not been hermitically sealed. An IGU depending on the type of glazing used is generally glazed into an aluminium, timber or PVC window frame.

insulated glass units

features and applications

- Solar and thermal control;
- Reduction of heat build up in summer;
- Reduction of winter heat loss and condensation;
- Lower air conditioning and heating energy costs;
- Improves occupant comfort, particularly next to windows by reducing hot and cold spots;
- Lower noise penetration;
- Lower UV transmission;
- Increased windload strength;
- Increased security.

glass surface positions for IGU's



primary functions

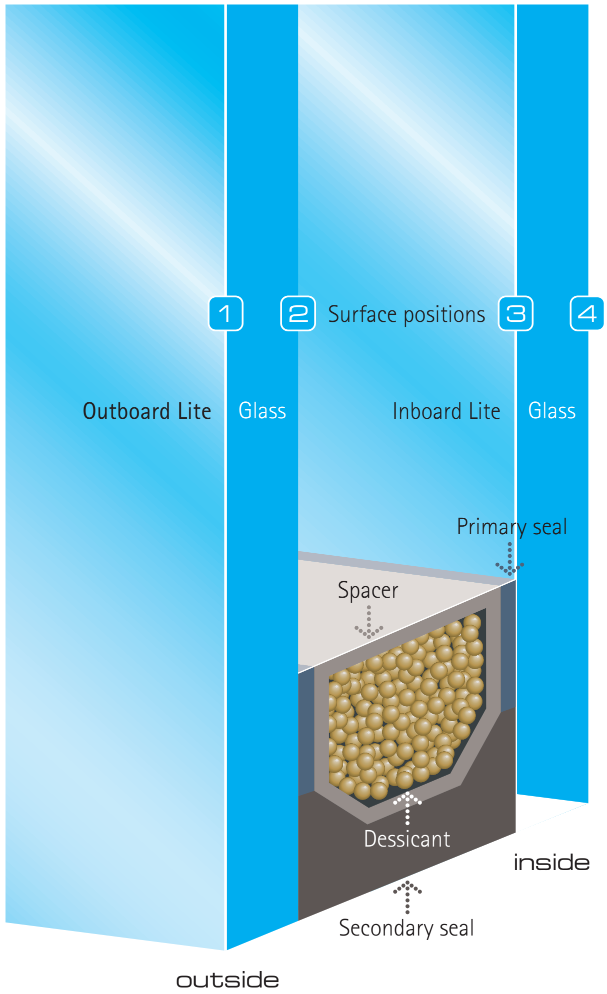
- **Solar control** – The energy emitted from our Sun is referred to as solar energy or radiation. When glazed with select tinted, reflective and low-E glass, IGU's reduce the sun's direct heat energy through the glass more efficiently than ordinary single glazing. Solar control also refers to the ability of a glass to reduce visible light and UV transmittance. These select IGU's perform a solar control function by limiting to various degrees the transmittance of direct heat energy, visible light and UV transmission;

  See also "Solar Heat Gain Co-efficient (SHGC)".

- **Thermal control** – The Sun's direct transmission on the glass is not the only way in which heat is transferred. Heat is also transferred by method of re-radiation, conduction and convection. Thermal control refers to the ability of a glazing to resist heat transfer through these three methods. (Similar to the functional performance of batt or insulation foil for walls and ceilings). IGU's greatly improve the thermal control properties of a glazing over ordinary non coated single glazing. Adding a low-E coating further improves performance. These thermal or insulation improvements work day and night in both summer and winter conditions, reducing heat entry and heat loss.

  See also "U-value".

typical IGU construction



- 2 or more **glass panels**;
- **Primary seal** – consisting of a hot melt butyl or a PIB (Polyisobutylene). This seal provides a barrier for moisture penetration;
- **Aluminium, thermoplastic spacer** – (or other type) filled with moisture absorbing desiccant;
- **Secondary seal** – performing a structural function of holding the two panes of glass together. There are a number of types of secondary seals, including polysulphide, polyurethane, silicone and holt 'melt'.

energy efficient glazing

warm climates

The primary consideration for warm climates where glazed openings have little or no protection from the sun's direct energy is the reduction of heat gain. The air gap in IGU's slow down the rate of heat gain thus improving the thermal properties and energy efficiency when compared to a standard single glazed window. In these situations a tinted, reflective or a tinted Low-E coated glass such as Sunergy® is used on the outer layer or outboard lite of the IGU to control heat gain.

Adding a low-E coating to surface position #2 acts like an additional barrier by further slowing the rate of the heating of the air gap. Having the coating on surface position #3 allows the air gap to be heated more quickly, because the low-E surface position #2 barrier is removed. This reduces the performance of the glazing in terms of heat gain to the interior of the building.

The "E" in low-E refers to emissivity. Emissivity is a measure of a material's ability to radiate energy. A material with low emissivity absorbs and radiates infrared energy poorly, which is the key factor in reducing heat transfer/gain/loss. The lower the emissivity of a coating, the better the glass insulates.

As mentioned above, warm climate glazing requires a tinted or reflective glass to control solar heat gain. These traditional products (unless laminated with a hard coat low-E or applying a soft coat low-E) only allow low-E coat placement on surface #3. However, new generation products such as Sunergy® combine a tinted glass and low-E coating in one, thus allowing surface #2 placement and improved thermal properties. Consideration should always be given to toughening or heat strengthening of low-E panels in surface position #2 placement.

cold climates

The ideal cold climate glazing should allow maximum solar heat gain or what is referred to as "passive solar heat gain", to naturally heat the building's interior during daylight hours. This requires that the glass be as transparent as possible (without overheating the building during summer conditions). Equally important is that once the sun has set and does not contribute to the heating of the interior, the glass now creates a "heat trap" by retaining the warmth generated through passive heating. This "heat trap" is best achieved through IGU's. The air gap in IGU's slow down the rate of heat loss to the colder outside environment thus improving the thermal properties or energy efficiency when compared to a standard single glazed window.

Adding a low-E coating greatly improves the insulation performance by reflecting re-radiated heat back into the room. Re-radiated heat occurs when short wave infrared heat energy (part of the infrared energy spectrum that we normally feel as heat) is absorbed in the interior of the building by carpets, curtains, furniture, walls etc., and is converted into long wave infrared heat. The low-E coated glass reflects this long wave heat radiation back into the room.

For more information see "Low-E Coated Glass" pages 15-17.

Where retention of heat is a priority, the low-E coating on surface position #3 is recommended. In these situations we are relying on the effects of passive solar heat gain to naturally heat the building's interior and the low-E coating to reflect any of the re-radiated heat back into the room.

design and glazing notes

greater thermal performance

To further improve the thermal insulation of IGU's, the unit cavity can be filled with a heavy gas such as **Argon** or **Krypton** which lowers convection heat loss between the glass panes. The spacer width can be increased to a maximum of 15mm where performance peaks and using a spacer with low conductivity will also improve performance. Extreme climatic situations especially in cold climates will sometimes require triple glazing with combinations of low-E coatings, gas and low conductive spacers.

condensation

Water from condensation build-up and resultant water run-off can damage window frames/sills and seep into walls and 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 other surfaces in the home or building are more prone to condensation build up. An IGU reduces the likelihood of condensation forming by providing a thermal barrier between the inside and the outside.

thermal stress

The use of solar control glass (tinted, reflective and Sunergy® glass) may affect the thermal safety of the glazing unit. Careful consideration needs to be given to building design, frame type, glazing methods, proximity of blinds, screens or curtains and external shading.

See "Thermal Breakage" page 125-126.

distortion

Tinted and reflective IGU's may experience slight visual distortion or bowing due to atmospheric/air changes. This is not considered a defect. This distortion can be more obvious with tempered glass.

high altitude

Pressure equalizer valves are required for IGU's at altitudes greater than 1200 metres above sea level.

brewsters fringes

Brewsters fringes is a visual effect manifesting itself as a rainbow visible within the unit. Brewsters fringes is not a deterioration of the unit or glass but an effect created when light passes through two panes of glass of the same thickness. The resulting light refraction becoming visible as a rainbow effect. Brewsters fringes can be confirmed by depressing one 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 for each lite.

newton rings

Newton rings is a visual effect created when the centre of the glass panes making up an 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.

spacer size - height width ratio

To avoid the effect of Newton Rings where the spacer width is too small, a matrix should be provided by the IGU manufacturer showing maximum size combinations for a given air space width. e.g. 4mm/6mm air/4mm IGU no bigger than 1200mm x 1200mm for a square shape and 2100mm x 1000mm for a rectangle shape.

multiple reflections

Multiple reflections can be present when viewing an object's reflected image in an IGU. The use of tinted or reflective glass as outside lites and low-E glass as the inside lite gives a greater reflection. Whilst it is not a common problem, a certain amount of double imaging is inherent in IGU's.

installation and glazing

90% of double glazed units fail because of improper glazing techniques. Failure is most commonly characterised by the appearance of moisture in the cavity suggesting seal and/or desiccant failure. The glazing system must be designed to drain out all water in the rebate and a void must exist under the unit so that moisture is not trapped against the edge of the glass. Setting blocks should be centred at the bottom quarter points of the unit (two per unit) and should always be an equal distance from the centre of the glass. Blocks must be neoprene or rubber of 80–90 shore hardness and allow no water to gather on the unit.

Dry glazing of units is always recommended but if units are to be glazed or bedded into compounds or sealants it is imperative that compatible sealants are used or edge failure may result. Linseed oil, acid cure silicones and small joint sealants must be avoided.

The sun's energy with its damaging UV radiation will have a detrimental effect on IGU seals. To prevent failure of the unit, it is critical to have all the edges protected from the sun. Exposed edges should be fully flashed over with an aluminium strip or similar using an adhesive such as neutral cure silicone. Do not use setting blocks which expose the spacer to sunlight. For structurally glazed IGU's where the edges are exposed, the minimum requirement for the secondary seal is structural silicone, due to its high resistance to UV radiation.

setting blocks

Setting blocks and their correct positioning are critical in order to ensure that the unit is uniformly supported and unit sealant is above entrapped water. Positioning of the blocks must allow for water drainage holes to be clear.

setting blocks table

Area of unit Minimum length at each (m^2)	quarter point (mm)
Less than $2.0m^2$	50
$2.0–3.0m^2$	75
$3.0–4.0m^2$	100
$4.0–5.0m^2$	125
$5.0–6.0m^2$	150
Up to $7.0m^2$	175

Guide = 25mm per m^2 of glass.

setting block locations

- Two blocks per sill;
- Drainage holes or slots must exist (6mm holes or 10mm x 5mm slots);
- Heel and toe blocks to doors and sashes.