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Glass quality expectations

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Glass quality expectations

This information is intended for use by window fabricators, glaziers, and their customers, to give insight into what glass is subjected to during the manufacturing processes and what a consumer can reasonably expect from the finished product in reference to the building code standards.

Manufacturing phase

During the manufacturing process the base glass sheets are subjected to multiple processes, resulting in distinct effects and characteristics to the end glass product. It is the intent of this guide to outline many of these effects and to help identify what can be expected and what is considered acceptable in a finished glass product.

Building glass products are manufactured through the float glass process. Small inclusions and air pockets, referred to as seeds, can occur throughout this process. The manufacturers fault detection scanners identify the vast majority of these inclusions, often removing them from the glass ribbon prior to being incorporated into stock sheets for later processing.

Included in the current quality standards, there is an allowable number of seeds and inclusions deemed acceptable by manufacturers.

The float glass sheets are also subjected to additional processes that include application of coatings, cutting, laminating, processing, toughening and IGU assembly, along with handling during manufacture, transportation and installation stages.

Devices such as vacuum lifters and separation pads are used to handle the glass throughout processing and can leave a residue on the glass, which may result in preferential wetting patterns. These patterns are not visible under normal viewing conditions but may become apparent when moisture or condensation is present on the glass.

The functionality, performance or longevity of the units are not compromised by these patterns. They may dissipate over time and are not considered a defect that would constitute a cause for rejection of the glass.

Toughened or tempered glass

Glass is generally toughened in a horizontal roller hearth furnace, where glass is carried through and oscillated on ceramic rollers under high heat (approx. 600°C). At this temperature the panel surfaces begin to soften and varied levels of distortion are created as the glass expands and then contracts during the process. This distortion is apparent when viewed in reflection.

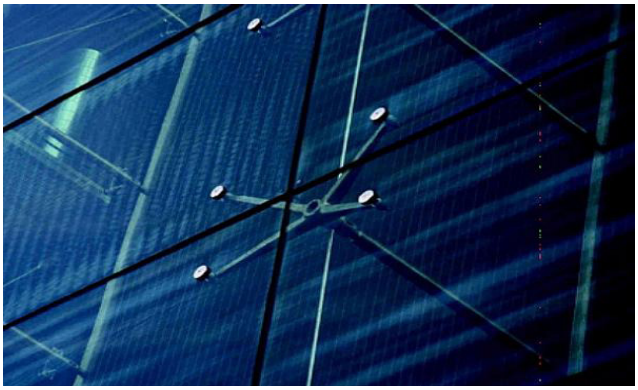
The ceramic rollers will invariably have very small particles of glass dust deposited from the passing of previous panels.

These fine particles adhere to the bottom surface of the glass as it moves across the rollers. They can be felt on all tempered panels when running a blade very gently across the bottom surface. These tiny particles can also become more apparent in direct sun as the light is dispersed across the glass surface and can often give off a sparkling effect.

Please note we strongly advise you not to use razor blades when cleaning glass. The blades can drag the adhered glass particles across the glass surface causing scratches.

Glass may also bow within the furnace due to uneven heating. This causes glass dust particles to adhere to a concentrated central area of the glass panel as it moves across the rollers. If the glass dust particles are not visible in ambient light conditions when using the recommended 3m inspection distance although can be seen in full sun conditions, this is then considered an inherent characteristic of the toughening process.

Lastly, colour or polarisation shadows from the toughening process also known as anisotropy, are also a physical property of increased surface tension and is not considered a fault or blemish.



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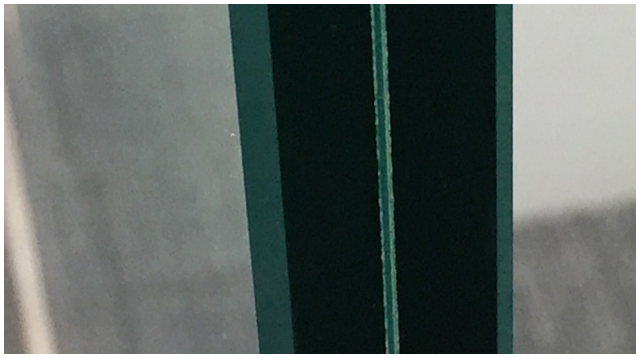
Laminated glass

Laminated glass may have more blemishes due to the multi layer makeup. When viewed under direct light conditions, some level of haze can be visible from some interlayers. Furthermore, particles of dust or foreign matter can find its way onto the interlayers during the processing phase, therefore becoming trapped within the glass layers.

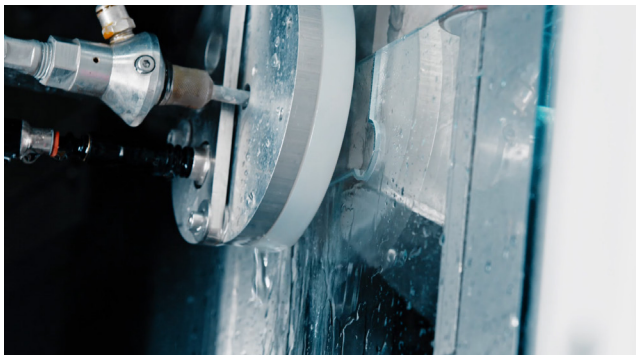


Low E or reflective coatings

Low E or reflective coatings may produce transient visual effects which may look like a transparent film or produce a haze. These effects can be exaggerated through the toughening process. Some coatings can also cause a variance in off angle colour, resulting in differing hues reflected in adjacent panels. Tolerances for these should be checked with the coated glass manufacturer and where possible, the same batches of product should be used to complete larger projects.

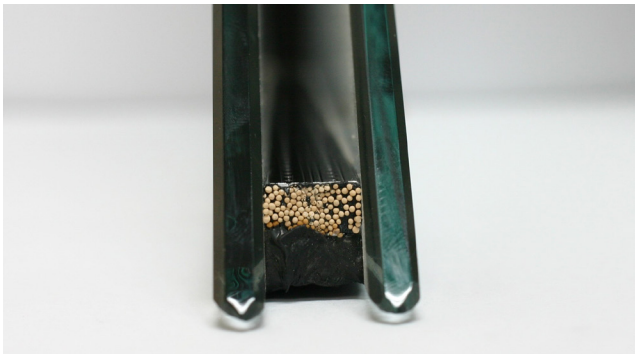
Processed glass

Glass processes can include polished edges, mitres, holes, shapes, cut outs and CNC polishing. These processes involve extra handling and movement of panels which increases the risk of minor damage or scratches.



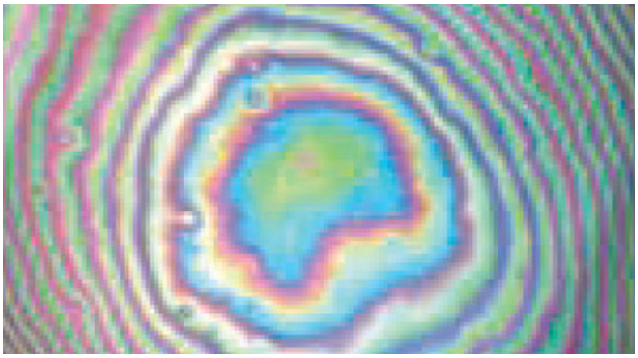
Insulated Glass Units

Insulated Glass Units (IGU) have a level of double reflection due to its multi surface makeup that also incorporates a sealed internal spacer component. Changes in relative air pressure from within the unit, may cause glass panels to either balloon out or concave, which is a natural characteristic of the product.



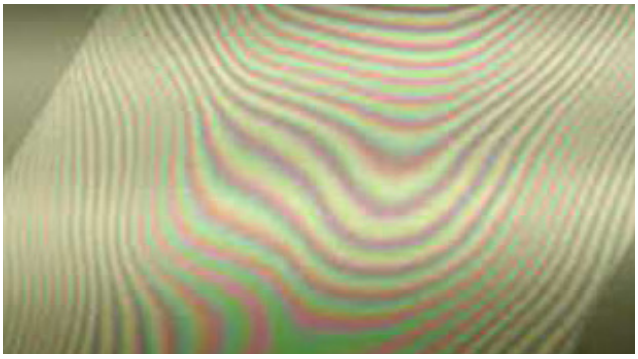
Within large IGU's the two glass panels may be so displaced by air pressure that they concave and touch in the centre. On this occurance Newton's Rings may be visible. Newton's Rings are roughly circular, coloured bands similar to oil films on water. They will occur only near the centre of a unit and cannot appear if the cavity, internal pressure and the glass thickness is sufficient. It is important to follow manufacturer guidance to prevent undersized spacer bars being used in larger units.

Newton's Rings Effect



Brewster's Fringes, commonly known as the rainbow effect, occurs when high quality float glass within an IGU is optically flat and parallel with each panel causing refraction of light. The effect is faint coloured bands or irregular shapes, which can be located anywhere over the surface.

Brewsters Fringes Effect



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Application of Standards to finished product

This section outlines the relevant building code standards that refer to the quality requirements for cut to size and processed glass in Australia.

AS/NZS 4667:2000

AS/NZS 4667:2000 is the Australian and New Zealand standard for quality requirements for cut to size and processed glass.

It was published in 2000 to promote a consistent approach to finished product quality and adopted for use in the glazing and greater building industry.

Sections of the standard relevant to glass quality:

- Dimensional Tolerances for Glass (section 6)
- Thickness Tolerances for Glass (section 6)
- Flatness Requirements (section 7)
- Glass Quality (section 8)
- Test Methods for all of the above (section 9)

AS 4666:2012

AS 4666 is the Australian standard for insulated glass units (IGU).

More stringent requirements were introduced in 2012 due to increased quality demand for panels incorporated into IGU's.

Clauses within Section 5 of the standard relevant to glass quality:

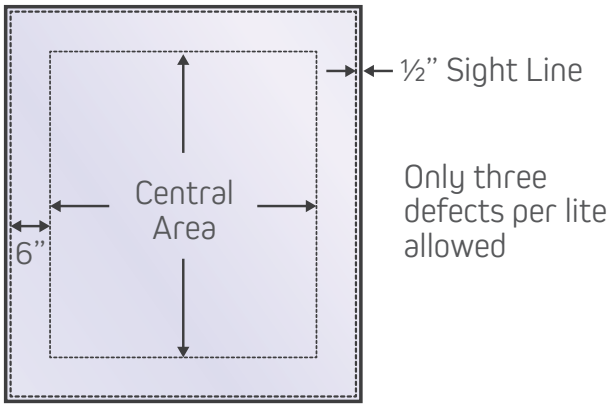
- Glass Flatness and Distortion (table 5.3)
- Thickness Tolerances (table 5.8 & 5.9)
- Edge Quality (table 5.2)
- Dimensional Properties (clause 5.8.4)
- Glass Scratches, Blemishes, Marks and Inclusions (table 5.5 & 5.6)

Quality and dimensional aspects of spacers, seals and their appearance are also included comprehensively within this section of the standard.

How to check for blemishes

- Clean the glass in accordance with manufacturers recommendations
- Stand no less than 3 metres away from the glass and look directly through it. Glass must be viewed at 90° to the window
- Inspect the glass in natural daylight, not in direct sun or with visible moisture on the surface of the glass
- Where it is not possible to stand at the correct distance then stand as far away as you can from the glass
- When viewing IGU's, exclude a defined edge area around the perimeter of the panels as stated in AS 4666 Table 5.5 and 5.6.

Diagram 1. IGU parameter of panel



Why can't we observe faults in direct sun?

When very bright light shines onto and through glass surfaces it highlights any residue material or imperfections. This is accentuated the more angular the light source is to the surface of the glass.

Glass washing processes are conducted to meet the required standards but do have the potential to leave faint traces of cleaning product residue on glass surfaces. These residues are not noticeable in normal lighting such as a factory or industrial environment, although they may become more apparent in full sun conditions.

Well lit inspection areas in the factory do pick up the vast majority of larger imperfections, however the intensity of sunlight cannot be practically replicated in a manufacturing environment.

When looking through glass panels, the colour background material may have an effect to either highlight or reduce the ability to see imperfections. Darker backgrounds will accentuate imperfections and must not be used when subjecting glass to the limits placed within the standard.

When specific product quality issues are raised, inspection of the glass should be carried out as soon as reasonably practicable following the installation or supply.

SOLOS Glass issues TechKnow™ documents to provide clarification on a range of topics and is offered as a general guide only. It is recommended the user should undertake careful evaluation and make suitable enquiries with a technical consultant.