

# *Visual quality standard for installed insulating glass units constructed from flat transparent glass*



1. Transparent glass used in the manufacture of insulating glass units is identical to that used traditionally for single glass and will, therefore, have a similar level of quality

2. Both panes of the sealed unit shall be viewed at right angles to the glass from the room side standing at a distance of not less than 2 metres; but for toughened, laminated or coated glasses, not less than a distance of 3 metres in natural daylight and not in direct sunlight. The area to be viewed is the normal vision area with the exception of a 50mm wide band around the perimeter of the unit.

3. Flat transparent glass, including laminated or toughened (tempered) glass shall be deemed acceptable if the following phenomena are neither obtrusive nor bunched: totally enclosed seeds, bubbles or blisters; hairlines or blobs; fine scratches not more than 25mm long; minute embedded particles

4. When thermally toughened (tempered) glass is viewed by reflection, the effect of the toughening process can be seen under certain lighting conditions. The visibility of surface colouration or patterns does not indicate deterioration in the physical performance of the toughened glass. Because of the nature of the toughening process, distortion can be introduced. Such distortion will be accentuated when the glass is viewed in reflection or incorporated in insulating glass units

5. Visible double reflection can occur under certain lighting aspect conditions, especially when viewed from an angle. This is an optical phenomenon arising

from multiple surface reflections in sealed units.

6. The manufacture of flat laminated glass does not usually affect the visual quality of the glass incorporated in insulating glass units. However, the faults generally accepted in paragraph 3 may be increased in number by the fact that several glasses and interlayers are used in the production of laminated glass. When viewed under certain light condition, insulating glass units incorporating clear or tinted flat laminated glass may show a distortion effect caused by reflection on the multiple surfaces of the components of the laminated glass.

## **7. BREWSTER'S FRINGES**

The appearance of the optical phenomenon known as Brewster's Fringes is not a defect of the glass and can occur with any glass of high optical and surface quality. This phenomenon is a result of the high quality now being achieved world wide by modern methods of glass manufacture. Brewster's Fringes occur if wavelengths of light meet up with each other when they are exactly 180o out of phase – an example of the phenomenon known to physicists as the interference of light. The effect is similar to, although usually much smaller than, the interference fringes which can sometimes be seen on toughened windscreens.

In the case of insulating glass installations, Brewster's Fringes only occur when the surfaces of the glass are parallel to each other, i.e. when the light transmission properties of the installation are of a very high order. What happens is that some of the incident light from the sun meets

light reflected from one of the surfaces of the insulating glass in such a way that they are 180o out of phase and cancel each other out, thereby giving rise to a fringe effect, small in area on the glass when viewed from a particular angle. Alternatively, different parts of the solar radiation may be refracted through the glass by different amounts and end up being 180o out of phase. This phenomenon is not a defect of the product, being dependent upon the laws of physics and not on the quality of the insulating glass. In fact, it arises because modern glass made by the float process is flat and, therefore, free of the distortion inherent in sheet glass.

The occurrence of Brewster's Fringes is in its nature rather like (though very much more rare than) the fact that under certain conditions, the observer will see a reflection of himself in any window or door – and no-one could claim that this was a defect of glass.

## **NOTE: PATTERNED GLASS**

The above criteria do not apply to patterned glass as, due to the method of manufacture imperfections such as seeds and bubbles are deemed to be acceptable.

