OPTICAL EFFECTS IN IGU’s

There are several optical effects associated with IGU’s that differ from monolithic (single) glazing. This applies to flat and curved/bent glass units.

Newton’s Rings

Newton’s rings are named after Sir Isaac Newton who first studied the phenomena. These are interference patterns caused by the reflection of light between two surfaces, a spherical surface and an adjacent nearly flat surface. They appear as concentric rings of rainbow colours and occur only near the centre of a unit. In a large IGU the two glasses may be displaced to touch or nearly touch in the middle by an increase in atmospheric air pressure due to; insufficient pressure equalisation during manufacture, heat treated glass bow, incorrect airspace for the unit size, or inadequate glass thickness. This effect is normally a manufacture or specification fault and replacement is required.

Brewster’s Fringes

Brewster’s Fringes are reflected light phenomena which occur if wavelengths of light meet up at 180 degrees out of phase. This can occur when high quality float glass is used with surfaces which are optically flat and both panes of glass are parallel in the IGU. Light reflected within one glass can combine with that similarly reflected within the other, with such small path differences as to cause interference. The effect is of faint coloured bands or irregular shapes, which can be located anywhere over the surface. It is rarely noticeable in normal lighting conditions. Brewster’s Fringes are not a manufacturing fault but can be generally avoided by using IGU’s of unequal glass thickness.

Roller Wave Distortion

IGU’s containing heat treated glass may exhibit a similar level of distortion as heat treated monolithic glazing. This is normally visible on an oblique angle perpendicular to the direction of the toughening furnace rollers, and more obvious in reflection than in transmission. Where IGU’s contain two or more panes of toughened glass this effect may be increased. For this reason, units containing multiple panes of toughened glass particularly where reflective or coated glass is involved should be evaluated for possible visual issues associated with roller wave distortion. Where thermal stress prevents the use of annealed glass in both panes, the use of heat strengthened glass instead of toughened glass may be considered as often the roller wave is reduced. Roller wave is not a manufacturing fault but an industry recognised and accepted inherent feature of heat treated glass.
Reflection
As a standard IGU has four reflective surfaces, a higher level of reflectivity occurs and multiple images in reflection may be created. This will be more apparent when viewed on an angle to the glass and is an inherent property of the unit.
Due to the sealed airspace of an IGU differences in temperature and atmospheric pressure from the time of manufacture will cause the IGU to act as a lens. This can cause significant changes in the images reflected from the windows due to glass deflection. The appearance is of a convex distortion when the glass is bowing outwards and a concave distortion when bowing inwards. The effect will be more noticeable when reflective coatings are incorporated within the IGU, and in larger units. These distortions are a result of the laws of physics and cannot be eliminated.

Haze
Haze is the scattering of light rays when visible light passes through a transparent material. The amount of haze in ordinary glass is very low and is not detected by the human eye.
High performing IGU’s often incorporate Low E coated glass. With any coated glass it is possible to see the presence of the coating under certain lighting conditions. When bright sunlight shines directly onto partly shaded, coated glass and there is deep shade on both sides of the glass, haze may be visible and usually has the appearance of a blue-grey film or dust on the glass. The shaded area will be free of the effect, giving a clean appearance in the shadow.
The effect will be more noticeable on some types of coated glass than on others. Vacuum or sputter coated Low E glass products generally have a very low amount of haze, Pyrolytic coatings tend to have higher levels of haze that can be more readily seen by the human eye. Haze is not a manufacturing flaw, rather an industry known and recognised inherent feature of IGU’s.