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07/02/19

To Allan Brown

System 3 Limited  
Denton Hall Farm Road

Denton

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M34 2SY

Dear Allan,

Ref: Laminated heat-treated glass and distortion

With reference to the above, please find below information that may be of assistance.

Laminated glass comprises of two or more sheets of glass bonded together with an interlayer (e.g. PVB, EVA, etc.) in between. For some applications, the incorporation of heat-treated glass (thermally toughened glass or heat strengthened glass) in laminated glass can bring additional benefits, such as increased load resistance, reduced risk of thermal breakage, etc.

When heat treated glass is produced, the process of heating the glass up and quenching it rapidly can introduce optical distortion. In laminated heat-treated glass, the optical distortion associated with each sheet of heat-treated glass can be exaggerated when combined together. The two sheets of heat-treated glass in laminated glass may have slightly different optical distortion profiles resulting in glass surfaces that are non-parallel or out-of-phase when bonded together. This can result in magnification of objects in transmission, sometimes referred to as a 'small lens' effect. This effect can be more pronounced at the edges of laminated glass.

Optical distortion may be due to internal variations in interlayer thickness, heat treatment of the glass, differences in glass types and installation / in-situ conditions. In general, more distortion may be observed with thinner rather than thicker glass.

Most standards and industry guidelines recommend that site inspections on glass should be undertaken from a distance of 3 metres and viewed at right angles to the glass. Optical effects not visible under these conditions are usually deemed acceptable in such standards.

While it may be possible to minimise this small lens effect, for example by using thicker glass, it may not be possible to completely eliminate it.

We hope the above information is of assistance.

Yours sincerely  
For, and on behalf of  
**Pilkington UK Limited**



Phil Brown  
Technical Advisory Service Manager UK/Ireland and European Regulatory Marketing Manager  
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