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# Surface Distortion in Horizontally Produced Thermally Toughened Safety Glass and Heat Strengthened Glass

During the production of toughened safety glass and heat-strengthened glass in an oscillating roller hearth furnace, the glass is heated close to its softening point. The heating occurs in a furnace section where the glass is continually transported back and forth on fused silica rollers. As the glass temperature increases, the glass becomes pliable and tends to sag slightly between the rollers during reversals at each end of the furnace.
The result is a reduction in surface flatness known as 'roller wave', a periodic wave running at right angles to the direction of travel, and is measured from the lowest peak to the highest trough of the waves. Roller wave is most easily identified, when viewing the glass by reflection of rectilinear images, from the outside of a building in which it is installed. The ends of each piece of glass tend to sag to a greater degree due to the cantilever effect of the unsupported ends of glass at the leading and trailing edges, this sag is known as 'edge dip'.
When the lower glass surface becomes soft at high temperatures, heavier glasses of 8mm or greater thickness may be imprinted by minute surface distortions on the fused silica roller surface, which is known as 'roller pick-up', often similar in appearance to tiny raindrops.
These surface distortions are recognized by current European Standards as seen in the following extract from BS EN 12150-1.

**[Extract from BS EN 12150 part 1 Document]**

## Thermally toughened safety glass produced by horizontal toughening

While the hot glass is in contact with the rollers during the toughening process, a surface distortion is produced by a reduction in surface flatness, known as 'roller wave'. Roller wave is generally noticed in reflection. Glass which is thicker than 8mm can show signs of small imprints in the surface ('roller pick-up').
In order to ensure the break safe characteristics of the glass, once heated to the appropriate temperature, the glass is then transported directly into a quench section where the glass is rapidly cooled by high-pressure jets of cold air. During this period any slight variation in temperature within the glass, manifests itself by way of producing overall and local bow. The overall bow is measured as the deformation from flatness, expressed as the amount of deformation in millimeters divided by the appropriate glass length being considered. The local bow is expressed in the same manner as the overall bow but usually for a distance of 300mm length.