

TECHNICAL BRIEF

Heat Soaking

Heat soaking is a statistically based process designed to limit the occurrence of spontaneous fracture of thermally tempered glass, in service, caused by nickel sulfide inclusions in the glass.

Nickel sulfide (NiS) is a minor contaminant occasionally present in float glass. NiS is present as small inclusions typically in the range of 0.076 to 0.38mm in size. Statistically not all glass contains NiS and it tends to be a batch wise impurity rather than an on going contaminant and furthermore the inclusions are randomly positioned throughout volume of the glass. The impurity is introduced during the manufacture of float glass and is not a flaw introduced into the glass during post processing.

During the tempering process NiS can transform from its room temperature structure (β -phase) to an unstable high temperature structure (α -phase). This structure change is accompanied by a roughly 4% decrease in the size of NiS particle. Over time the unstable α -phase returns to the larger β -structure, this process can take a number of years to occur. The time required for the transformation to occur is dependent on the size, exact chemical composition and the temperature / time history of the inclusion. If the NiS inclusion is present in the tension band of the toughened glass, and is of sufficiently large size, the accompanying volume change will result in spontaneous fracture of the panel.

G.James uses the procedure specified in BS EN 14179-1 2005 to heat soak its products, on request. This standard has been designed to improve the breakage rate from 1 panel per 8 tonnes of toughened glass to 1 panel per 400 tonnes of toughened glass.

It must be noted that heat soaking is a statistical based treatment designed to minimize, not prevent the possibility of spontaneous fracture due to NiS inclusion. NiS particles while present in both annealed and heat strengthened glass are generally accepted as not being susceptible to NiS induced failure.