Numerical simulation of residual stresses at holes near edges and corners in tempered glass: A parametric study

This work presents 3D results of the thermal tempering simulation by the Finite Element Method in order to calculate the residual stresses in the area of the holes near edges and corners of a tempered glass plate. A viscoelastic material behavior of the glass is considered for the tempering process. The structural relaxation is taken into account using Narayanaswamy’s model. The motivation for this work is to study the effect of the reduction of the hole and edge minimum distances, which are defined according to EN 12150-1. It is the objective of the paper to demonstrate and elucidate the influence of the hole and edge distances on the minimal residual compressive stresses at holes after the tempering process. The residual stresses in the area of the holes are calculated varying the following parameters: the hole diameter, the plate thickness and the interaction between holes and edges and corners. Furthermore, a comparison between the minimal residual stresses at holes and the residual stresses at other areas of the glass plate (edge, chamfer and far-field stresses) is made.

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