Stress relaxation in tempered glass caused by heat soak testing

Heat soak testing of tempered glass is a thermal process required after the tempering process itself to bring glasses of commercial soda-lime-silica-glass to failure that are contaminated with nickel sulphide inclusions, diameter 50 mm to 500 mm typically. Thus, the tests avoid a so-called "spontaneous" breakage of the glass in building elements at ambient temperatures months or years later. According to industry standards, the duration of the tests typically differs between 1 h and 4 h at temperatures of 290 ± 10 °C. Although this temperature is well below the transformation temperature of commercial soda-lime-silica glass, it causes stress relaxation in tempered glass and the fracture pattern of the glass changes accordingly, especially thin glasses are affected. Based on the Tool-Narayanaswamy-Model, this paper comprises the theoretical background of the stress-relaxation-process and the results of a parameter study for its most influential technical parameters. Results are compared to photoelastic measurements of temper stresses and fracture patterns of tempered glass before and after a heat treatment similar to heat soak testing.

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