The influence of the edge design of glass on the edge strength

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Summary

Be it the burden of its own weight or those introduced by the external support structure, the common cause of glass failure are its broken edges, especially for load bearing glass structures. Here the support conditions and the strength of glass edges play a significant role, wherefore the edge strength largely depends on the design of the edges. In this paper the first qualitative results of a numerical investigation into stress distribution of the edge cross-section are presented by using divergent edge design and connector materials.

Keywords: edge design, edge strength, in plane load, stress distribution

1. Introduction

In the construction industry glass is becoming increasingly involved as an integral part of the support structure, because on the one hand contemporary architecture desires it as a filigree and transparent element, and on the other hand development in glass production permits it. In recent decades glass production has undergone constant optimization, and has, as a result established new boundaries and higher expectations for the use of glass as a constructive element. The edging of a glass panel, which in any case is the materials central weakness, is subject to a constant state of stress and, in correlation with support conditions, plays a definitive role in the potential strength. These factors decide which forces can be implemented to the glass structure. A prime example being the automotive industry, using the windshield to stiffen the car body.

So far, there are few studies exploring the edge strength of glass (e.g. [1]) as, until now, the topic has previously played a minor role. In the standardization of glass, edge strength is also only referred to in passing [2][3][4][5].

This research presents the first qualitative results of a numerical investigation into the connection of stress distribution within edge cross-sections as a result of different designs and materials. Based on these results, support conditions can be optimized.

2. Edge Strength

The theoretical strength of glass is much higher than that measured in practice. This fact is due to structural defects in the glass surface and the optimal-elastic behavior of the material. Tension in-

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