CertBond
COST Action CA18120

Numerical Analysis of Adhesive Point Fixings for Glass Facades

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Hosting Institution: University of Coimbra, Portugal
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Relevant Working Groups: WG2

Objectives / Description / Main outcomes

The aim of the STSM was to develop FE numerical models for bonded stainless-steel articulated point fixings for Laminated Glass Panels (LGP), used for facade systems, and compare its performance with classical mechanical fixing solutions. Three types of point fixings were studied and compared: i) Adhesive bolt fixings (AB), bonded with a 2-component structural silicone Sikasil SG-500®, ii) Embedded (laminated) bolt fixings (EB). iii) Countersunk bolt fixings (CB). The results from the numerical models were benchmark with experimental test results from an on-going experimental campaign performed for the visitor's PhD project under GF-Seismic research project for LGP under distributed loads.

A literature research carried out at the beginning of the STSM, allowed the selection of material models for the silicone Sikasil SG-500®, the calibrated hyper-elastic models selected, were correlated with further numerical models. The Numerical models were developed with ABAQUS software, first a correlation of the hyper-elastic material models for Sikasil SG-500® (Figure 1) was carried on. Further, the numerical models of the adhesive joint, with a laminated glass panel with 1500x1500 mm square section, laminated with 1.52mm of EVASAFE with two layers of glass 6 + 10 mm was studied (Figure 2). Careful consideration was given to the appropriate solid FE for the silicone, C3D8H (hybrid formulation), and for the interaction between steel-silicone-glass-lamination with appropriate TIE surface to surface interactions. For the three types bolt fixings (Figure 3), a correlation for the linear-elastic material properties for the interlayer was carried on for all the cases, and parametric variation accounting for other type of interlayers (PVB & Sentry glass). The panels were studied under uniform distributed load and lateral loads (Figure 4), "slotted holes" typically used for façade systems in seismic prone areas were investigated, further extended studies are envisaged to continue with a full scale façade system with bonded connections under lateral loads.

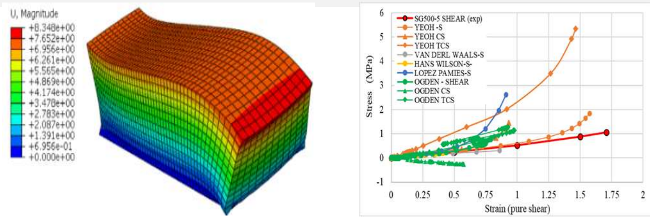

***Figure 1:** Calibration of material model for silicone Sikasil SG-500*

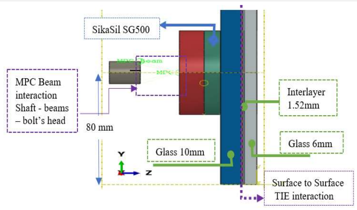

***Figure 2:** Numerical model for adhesive bolt fixing on laminated glass panel*

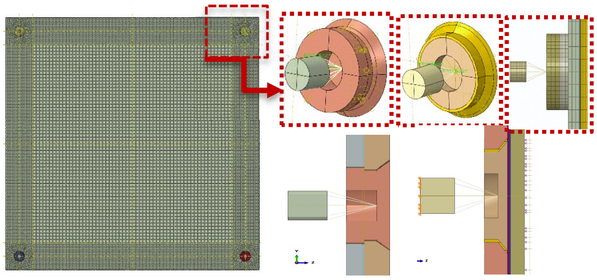

***Figure 3:** Numerical model of Laminated glass panel with different bolt fixings*

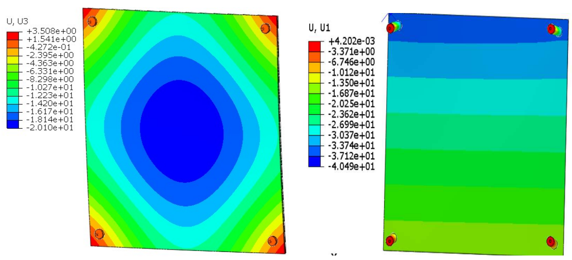

***Figure 4:** Out of plane displacements for LGP under uniform distributed loads and lateral loads*

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