FINITE ELEMENT ANALYSIS OF POINT FIXED LAMINATED GLASS PANELS UNDER DISTRIBUTED LOAD: A COMPARISON BETWEEN MECHANICAL AND BONDED FIXING SOLUTION

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Motivation, Objectives & Methodologies
Pointed Fixed Laminated Glass System are typically used on contemporary building’s façade as an architectural statement of transparency, allowing to reach lighter and spacious facilities [Fig. 1]. The fixing elements are characterized by stainless steel bolts, that are mechanically attached or bonded to the glass surface [Fig. 1]. However, despite the exponential growth of glass façade construction industry, design codes for glass elements are still under development.

The numerical analysis here presented, was developed with the aim of characterize the structural behavior of Bolted Pointed Fixed Laminated Glass Panels (PFLGP), subjected to orthogonal distributed load, e.g., Wind Load. The study focused on the methodologies to numerically modelled the articulated bolts and its interaction with the Laminated Glass Panels (LGP), benchmarked with an ongoing experimental campaign [Fig. 3]. The first stage was the characterization of the laminating material, considering three different interlayers: PVB, EVA and SentryGlas® [Fig. 2] [Fig. 4]. Next, the characterization of PFLGPs and the correspondent finite element numerical models [Fig. 5], were developed, aiming to compare the performance of three different fixing methods: i) Mechanical (Countersunk bolts), ii) Laminated (Embedded) and iii) Bonded bolts.

Outcomes
The methodologies to develop Numerical models for Countersunk, Embedded and Bonded stainless-steel articulated point fixings for Laminated Glass Panels (PFLGP) [Fig. 3], used for facade systems, were presented. The numerical models allow to compare the performance for bonded and classical mechanical fixing solutions, while characterizing the most important parameters for the PFGFS [Fig. 6], in terms of Interaction properties and interlayer material. The results from the numerical models were benchmark with experimental test results from GF-Seismic research project.