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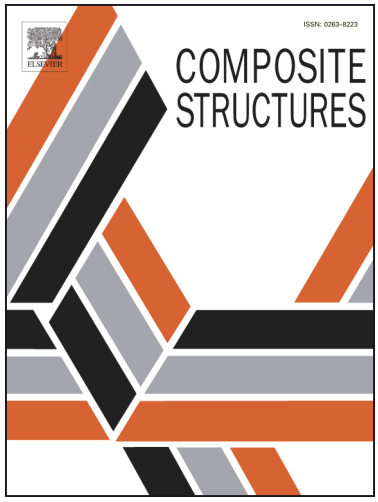

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Manuel Santarsiero, Chiara Bedon, Christian Louter

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Experimental and numerical analysis of thick embedded laminated glass connections

Manuel Santarsiero[1]*, Chiara Bedon[2], Christian Louter[3]

Abstract

Laminated glass components are usually realized by bonding glass plates using interlayer polymers that develop adhesion forces during lamination. Recently, these adhesion forces have been used also to realize special adhesive connections for structural glass components and assemblies. The typical example of such a joining technique is conventionally known as "embedded laminated connection", where a metal insert is encapsulated in multi-ply laminated glass components.

In this study, careful consideration is paid for the investigation of the mechanical behaviour of embedded laminated connections with thick metal insert. To this aim, small-scale laboratory tests, Finite Element (FE) numerical models and analytical considerations are presented. Firstly, the results of experimental investigations at different temperatures are discussed, giving evidence of the geometrical and mechanical parameter effects on the so observed performances. It is observed, in particular, that the temperature markedly affects not only the maximum load carrying capacity but also the failure mode of the studied connection typology. Non-linear numerical simulations are then developed in ABAQUS on refined FE models, able to account for the geometrical and mechanical properties of the reference connection specimens. Further analytical considerations are also presented, in support of the observed experimental findings. It is shown, in particular, that as far as high temperatures are not attained, the mechanical performance and failure mode of the examined connections is strictly related to glass breakage. In addition it is also observed that at high temperature, failure mode (i.e. bubble formation) and failure location are in line with the expectations. Rather close correlation can be also found for the same embedded connections between test results, FE numerical simulations and analytical assumptions.

Keywords: laminated glass connections, adhesives, thick metal insert, experimental testing, numerical modelling, temperature

[1] Structural and R&D Engineer, Eckersley O'Callaghan, London, United Kingdom. (*) Corresponding Author
[2] Assistant Professor, University of Trieste, Department of Engineering and Architecture, Trieste, Italy
[3] Assistant Professor, Delft University of Technology, Faculty of Architecture and the Built Environment, Department of Architectural Engineering and Technology, Delft, The Netherlands

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