

Structural Performance of Linearly Laminated Metal Fittings for Glass Shell Structures

Isabell Ayvaz ^a, Timon Peters ^a, Anna Buksak ^b, Thiemo Fildhuth ^c, Gergana Rusenova ^c,
Matthias Haller ^d, Miriam Schuster ^a, Michael Kraus ^a

- a. Glass Competence Center, Institute of Structural Mechanics and Design, Technical University of Darmstadt, Germany, ayvaz@ismd.tu-darmstadt.de, peters@ismd.tu-darmstadt.de, schuster@ismd.tu-darmstadt.de, kraus@ismd.tu-darmstadt.de
- b. Yachtglass GmbH & Co. KG, Dersum, Germany, anna.buksak@yachtglass.de
- c. knippershelbig GmbH, Stuttgart, Germany, t.fildhuth@knippershelbig.com, g.rusenova@knippershelbig.com
- d. Solutia Deutschland GmbH, Frankfurt, Germany, mmhall@eastman.com

Abstract

In architectural glass construction, transparent shell structures are often realized using non-load-bearing glass infill elements supported by a secondary substructure. This common practice limits the efficient use of glass as a structural material. Against this background, the present research explores a linearly laminated metal edge fitting as a means to structurally activate glass elements in frameless shell structures. Building on existing concepts for embedded connectors in laminated safety glass, the aim was to investigate the potential of a linear fitting detail that balances structural performance with manufacturability, installation-related aspects and scalability. The study involved the development of a connection detail compatible with insulating glass units (IGUs), requiring a comprehensive approach from early digital planning and structural analysis to fabrication, assembly, and testing. Analytical models were used to approximate the rotational stiffness of the fitting, followed by parameter studies to understand the influence of key geometric and material variables. Mechanical testing supported the findings. A full-scale mockup, (approximately 7mx3m) was assembled to assess buildability under real-world conditions, revealing both the practical viability and current limitations of the system. Among the identified challenges are the precision of the lamination process, control of welded seam quality, and long-term performance under environmental influences. Additionally, aspects related to thermal performance/building physics requirements and durability require further investigation before the system can be considered for broader application. This research contributes to the ongoing discourse on the structural use of glass by focusing on the development of a practical, adaptable connector solution.

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Keywords

Load-bearing glass structure, frameless glass shell, structural PVB interlayer, laminated glass-metal connectors,

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