Bending moment capacity of sandwich panels with a discontiuous core in the context of the arrangement of core lamellas

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KEYWORDS: *Sandwich Panels, Material Discontinuity, Wrinkling, Numerical Modelling.*

ABSTRACT

The paper concerns sandwich panels composed of two metal facings and a core made of mineral wool [1]. The core is not continuous because it is created by arranging small lamellas next to each other. The lamellas are glued to the facings, but they are not glued together, which affects the load-bearing capacity of the panels. The aim of the work is to analyze the influence of the lamella arrangement on the mechanical response of the panel, considering both the influence of the variability of the lamella arrangement on the results of normative mechanical tests used to determine the load-bearing capacity of the panel, as well as the optimal arrangement of lamellas in the panel. Although the panel considers a typical layer element used in civil engineering, similar issues also occur in other areas of industry [2].

In order to solve the presented problem, numerical parametric analyzes were performed, in which the variables were the displacement of the lamellas in relation to the edge of the panel and the shift of the lamellas relative to each other. The bending of single-span panels was modeled, which in simple terms means the action of the bending moment and shear force. A three-dimensional model was used for the analyses, in which the facigs were defined as shells and the core lamellas were composed of solid elements. A cohesive interface layer was used between the lamellas and the facings, and contact was defined between the lamellas. The material parameters were obtained in laboratory material tests.

The obtained results indicate that regardless of the obvious variability of material properties (in particular the non-homogeneous and anisotropic core), the lamella system that occurs during the test has a significant impact on the result of the normative tests. This influence, of course, depends on the considered lamella system, span and thickness of the panel, but it is always important from the point of view of the safety of the structure. On the other hand, it turns out that there are lamella systems that result in higher load-bearing capacity of the panels and/or lower variability of this load-bearing capacity. The presented conclusions were also confirmed experimentally.

REFERENCES

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