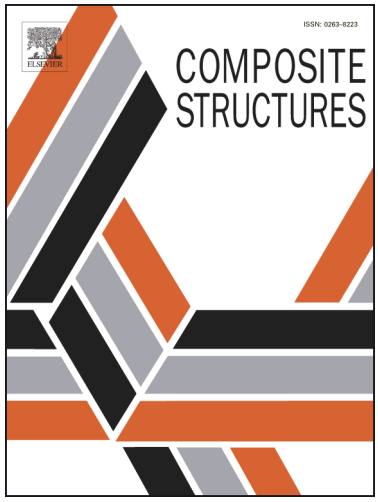

Effect of beam orientation on the static behaviour of phenolic core sandwich composites with different shear span-to-depth ratios

Wahid Ferdous, Allan Manalo, Thiru Aravinthan

PII: S0263-8223(16)32388-1
DOI: http://dx.doi.org/10.1016/j.compstruct.2017.02.061
Reference: COST 8282

To appear in: *Composite Structures*

Received Date: 2 November 2016
Revised Date: 4 January 2017
Accepted Date: 10 February 2017

Please cite this article as: Ferdous, W., Manalo, A., Aravinthan, T., Effect of beam orientation on the static behaviour of phenolic core sandwich composites with different shear span-to-depth ratios, *Composite Structures* (2017), doi: http://dx.doi.org/10.1016/j.compstruct.2017.02.061

Effect of beam orientation on the static behaviour of phenolic core sandwich composites with different shear span-to-depth ratios

Wahid Ferdous, Allan Manalo* and Thiru Aravinthan

Centre for Future Materials (CFM), School of Civil Engineering and Surveying, Faculty of Health, Engineering and Sciences, University of Southern Queensland, Toowoomba, QLD 4350, Australia

Email: md.ferdous@usq.edu.au; allan.manalo@usq.edu.au; thiru.aravinthan@usq.edu.au;

Abstract

This study thoroughly investigated the flexural behaviour of phenolic cored sandwich beams with glass fibre composite skins in the horizontal and vertical positions. The beams have a shear span-to-depth ratio (a/d) varying between 0.5 and 12, and tested under 4-point static bending. Their failure load are then predicted theoretically. The results showed that changing the beam orientation from horizontal to vertical changes the failure mode from brittle to progressive. The sandwich beam's high bending stiffness can be efficiently utilised by placing them vertically. The a/d ratio played a major role on the load capacity and failure mode. In both orientations, the load capacity decreased with the increased of a/d. The beam failed in shear, a combined shear and bending, and bending for $a/d \leq 2$, $2 < a/d < 6$, and $a/d \geq 6$, respectively. These failure mechanisms can be correlated to the shear-to-bending stress ratio while the failure load can be reasonably predicted using the available theoretical models. The two-way analysis of variance showed that the beam orientation is a more influential parameter than the a/d ratio. From this study, the horizontal beams are preferable for flexural dominated structures while the vertical beams are desirable for shear dominated structures.

Keywords

Sandwich beam; Static behaviour; Beam orientation; Shear span-to-depth ratio; Theoretical model.

*Corresponding author, tel. +61 7 4631 2547; fax. +61 7 4631 2110; E-mail addresses: allan.manalo@usq.edu.au (Allan Manalo)