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

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**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.

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