

ON EXPLICIT ANALYTIC SOLUTIONS FOR THE ACCURATE EVALUATION OF THE SHEAR STRESS IN SANDWICH BEAMS WITH A CLAMPED END

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We focus on analytic solutions for the accurate evaluation of the shear stress in sandwich beams under flexure. To this purpose, we follow Bardella and Tonelli [1] and apply the Jourawski method [2] to the structural beam model based on the zigzag warping [3]. We consider sandwiches whose cross-section is symmetric with respect to the neutral axis and whose skin shear deformation and core longitudinal stress are accounted for (that is, we do not limit our attention to thin skins or antiplane sandwiches [4]). We obtain explicit analytic expressions for the cases of cantilever and propped-cantilever beams subject to uniform transverse load. The comparison with numerical solutions obtained through plane stress continuum finite element simulations shows the excellent accuracy of the analytic solution, apart in a region very close to the fully clamped cross-section, where the finite element solution itself is unreliable, while the new analytic solutions provide useful estimates, whose reliability is thoroughly discussed.

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