

## **A Mindlin multilayered hybrid-mixed approach for laminated and sandwich structures without shear correction factors**

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### **Abstract**

A new hybrid-mixed variational approach for the linear analysis of laminated and sandwich plates, without transverse shear correction factors, is presented. It's based on the first order theory of Reissner/Mindlin. A quadratic approximation through the thickness is proposed for transverse shear stresses (continuity C-1), and two equilibrium equations are used for their approximation. This reduces in consequence the number of interpolation parameters of bending stresses, which are eliminated using the static condensation technique. The proposed approach has been adapted to a quadrilateral 4-node finite element, free of locking, to which performances have been analyzed using some known problems of sandwich and laminated structures.

**Keywords:** sandwich plates, laminated plates, finite element, hybrid\mixed model, Reissner/Mindlin, transverse shear.

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