

Assessments on stress evaluations in compact, thin-walled, FGM and laminated beams

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For the design of compact and thin-walled structures, a detailed assessment of stress in critical regions is necessary. However, the complexity of the structures and use of anisotropic materials can complicate the analysis and increase computational costs. The Finite Element Method (FEM) is the most common approach to tackle such problems. In this paper, the numerical results stem from the use of refined beam theories and FEM. The focus is on the stress evaluation in thin-walled anisotropic structures. The Carrera Unified Formulation (CUF) provides the governing equations for the refined beam models via expansion functions over the cross-section to enrich the kinematics of the finite elements and obtain a 3D-like accuracy of the solution [1]. This study provides detailed numerical assessments on various thin-walled functionally graded and layered beams. The aim is to draw guidelines on the proper choice of the structural theory concerning the expansion type - Taylor or Lagrange - and the order. The assessments comprise various geometries and material compositions and evaluate the effect of transverse shear stress and thickness stretching.

References

- [1] Carrera E., Cinefra M., Petrolo M., and Zappino E, 2014, *Finite Element Analysis of Structures through Unified Formulation*, John Wiley & Sons