POLITECNICO DI TORINO
Repository ISTITUZIONALE

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

Original
Assessments on stress evaluations in compact, thin-walled, FGM and laminated beams / Demirbas, M. D.; Carrera, E.; Petrolo, M.. - (2019). ((Intervento presentato al convegno Second International Conference on Mechanics of Advanced Materials and Structures - ICMAMS 2019 tenutosi a Nanjing, China nel 19-22 October 2019.

Availability:
This version is available at: 11583/2763052 since: 2019-10-23T11:45:06Z

Publisher:
Erasmo Carrera, Weiqiu Chen, Cun-Fa Gao, J.N. Reddy

Published
DOI:10.5281/zenodo.3516599

Terms of use:
openAccess

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

04 August 2020

ICMAMS 2019
Second International Conference on Mechanics of Advanced Materials and Structures
Nanjing, 19-22 October 2019
www.icmams.com

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

M.D. Demirbas[1*], E. Carrera[2], and M. Petrolo[2]

[1] Department of Mechanical Engineering, Erciyes University, Turkey
[2] Mul[2] Group, Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Italy
[*] Corresponding author: mddemirbas@erciyes.edu.tr

Keywords: *Refined beam theories, Finite Element method, CUF*

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