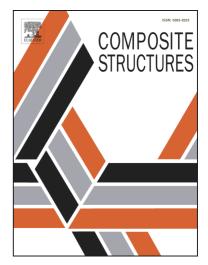
### Accepted Manuscript

A shear-deformable beam model for stability analysis of orthotropic composite semi-rigid frames

Goran Turkalj, Domagoj Lanc, Damjan Banić, Josip Brnić, Thuc P. Vo

PII:	S0263-8223(17)33945-4
DOI:	https://doi.org/10.1016/j.compstruct.2018.01.105
Reference:	COST 9345
To appear in:	Composite Structures
Received Date:	25 November 2017
Revised Date:	22 January 2018
Accepted Date:	31 January 2018



Please cite this article as: Turkalj, G., Lanc, D., Banić, D., Brnić, J., Vo, T.P., A shear-deformable beam model for stability analysis of orthotropic composite semi-rigid frames, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.01.105

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## ACCEPTED MANUSCRIPT

# A shear-deformable beam model for stability analysis of orthotropic composite semi-rigid frames

Goran Turkalj<sup>a</sup>, Domagoj Lanc<sup>a,\*</sup>, Damjan Banić<sup>a</sup>, Josip Brnić<sup>a</sup>, Thuc P. Vo<sup>b</sup>

<sup>a</sup>Department of Engineering Mechanics, Faculty of Engineering, University of Rijeka, Vukovarska 58, HR-51000 Rijeka, Croatia. <sup>b</sup> Department of Mechanical and Construction Engineering, Northumbria University,

Ellison Place, Newcastle upon Tyne, NE1 8ST, United Kingdom

#### Abstract

In this paper, a shear deformable beam model for nonlinear stability analysis of frames made of composite materials is presented. Each wall of the cross-section is assumed to be orthotropic in such a way that normal stress does not cause shear strains to occur. The incremental equilibrium equations for a straight thin-walled beam element are derived within the framework of updated Lagrangian formulation and the nonlinear displacement field of cross-sections, which accounts for the restrained warping and the large rotations effects. Timoshenko's theory for non-uniform bending and modified Vlasov's theory for non-uniform torsion are applied to include the shear deformation effects. The coupled bending-torsion shear deformation effects occurring at the asymmetric cross-section are also included in the model. To account for the semi-rigid connection behaviour, the hybrid finite element is introduced through the special transformation procedure. Several benchmark examples are demonstrated for verification purposes. The obtained results indicate that the proposed model can be classified as shear locking-free one.

Keywords: buckling, orthotropic composite beam, large displacement, semi-rigid frames

\* Corresponding author. Tel.: +385 51 651 495; fax: +385 51 651 490; e-mail: dlanc@riteh.hr

Download English Version:

# https://daneshyari.com/en/article/6704123

Download Persian Version:

https://daneshyari.com/article/6704123

Daneshyari.com