Boundary of stability region of a thin-walled beam under complex loading condition

Phung Van Binh, Dang Hoang Minh, Gavriushin Sergei Sergeevich, Nguyen Viet Duc

www.elsevier.com/locate/ijmecsci

PII: S0020-7403(16)31023-2
DOI: http://dx.doi.org/10.1016/j.ijmecsci.2017.01.024
Reference: MS3562

To appear in: *International Journal of Mechanical Sciences*

Received date: 8 December 2016
Revised date: 5 January 2017
Accepted date: 10 January 2017

Cite this article as: Phung Van Binh, Dang Hoang Minh, Gavriushin Serge Sergeevich and Nguyen Viet Duc, Boundary of stability region of a thin-walle beam under complex loading condition, *International Journal of Mechanica Sciences,* http://dx.doi.org/10.1016/j.ijmecsci.2017.01.024

Boundary of stability region of a thin-walled beam under complex loading condition

Phung Van Binh[a], Dang Hoang Minh[b], Gavriushin Sergei Sergeevich[a], Nguyen Viet Duc[c,d*]

[a]*Bauman Moscow State Technical University, Moscow, Russian Federation*

[b]*Industrial University of Ho Chi Minh City, Ho Chi Minh City, Vietnam*

[c]*Division of Construction Computation, Institute for Computational Science, Ton Duc Thang University, Ho Chi Minh City, Vietnam*

[d]*Faculty of Civil Engineering, Ton Duc Thang University, Ho Chi Minh City, Vietnam*

[*]Corresponding author. Division of Construction Computation, Institute for Computational Science, Ton Duc Thang University, Ho Chi Minh City, Vietnam. nguyenvietduc@tdt.edu.vn

Abstract

Stability issue has a significant role in the design of structures; especially it becomes even much more substantial when the design deals with the thin-walled structures under complex loading condition, which is a combination of two or more loading types at the same time. The present research paper aims to analyse the stability region of the thin-walled beams with doubly symmetric cross-sections under combined loads simultaneously: axial force, uniformly distributed transverse loads and bending moments at the ends. A novel approach was proposed by the authors and the energy method was used to solve the problem. The final results are able to be represented by mean of not only generalized algebraic equations among the critical loads, but also by three-dimensional graphs. Based on a particular thin-walled beam as an example, the analytical results obtained by using a novel approach were in agreement with the numerical results of analysis by finite element method in the feasible computational software.

Keywords: *Boundary of stability region, lateral buckling, thin-walled beam, critical state, the combined loads, energy method*