Accepted Manuscript

Generalization of the C^0-type zigzag theory for accurate thermomechanical analysis of laminated composites

Jang-Woo Han, Jun-Sik Kim, Maenghyo Cho

PII: S1359-8368(16)32915-8

DOI: 10.1016/j.compositesb.2017.03.037

Reference: JCOMB 4971

To appear in: *Composites Part B*

Received Date: 1 December 2016

Revised Date: 18 March 2017

Accepted Date: 19 March 2017

Please cite this article as: Han J-W, Kim J-S, Cho M, Generalization of the C^0-type zigzag theory for accurate thermomechanical analysis of laminated composites, *Composites Part B* (2017), doi: 10.1016/j.compositesb.2017.03.037.

Generalization of the C^0-type zigzag theory for accurate thermomechanical analysis of laminated composites

Jang-Woo Han[a], Jun-Sik Kim[b], and Maenghyo Cho[a*]
[a] *School of Mechanical and Aerospace Engineering, Seoul National University, Seoul 08826, Republic of Korea*
[b] *Department of Mechanical System Engineering, Kumoh National Institute of Technology, Gyeongbuk 39177, Republic of Korea*

Abstract

A new method based on the C^0-type efficient higher-order zigzag theory (EHOZT) is proposed for the efficient and accurate thermomechanical analysis of laminated composite plates. In this method, the transverse shear strain energy is modified according to the mixed variational theorem (MVT). The transverse stress field is defined by the arbitrary *m*-th order zigzag model including the transverse normal strain effect to improve the accuracy, while the displacement field is obtained from the C^0-type EHOZT to amplify the benefits of the numerical efficiency. The transverse displacement field is assumed to be a smooth parabolic distribution to consider the transverse normal strain effect, which has a significant role in predicting the thermal deformation. Derivative components of the transverse displacement field are eliminated from the in-plane displacement field of the C^0-type EHOZT by the transverse shear stress condition. The resulting strain energy expressions are collectively referred to as the C^0-type EHOZT via the MVT. The proposed theory has the computational advantage of utilizing the C^0-continuity condition for finite element implementation while allowing local distributions of the transverse stress to be improved via the recovery procedure. The obtained displacements and stress distributions were compared with data available in the literature for validation.

* Corresponding author. Tel/Fax: +82-2-880-1693/+82-2-886-1645.
E-mail address: mhcho@snu.ac.kr (M. Cho)