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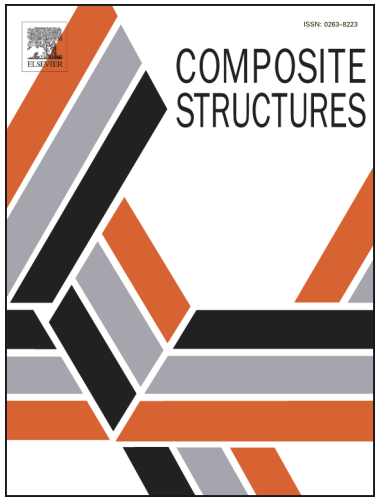

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PII: S0263-8223(17)32927-6
DOI: https://doi.org/10.1016/j.compstruct.2018.01.008
Reference: COST 9248

To appear in: *Composite Structures*

Received Date: 10 September 2017
Revised Date: 1 December 2017
Accepted Date: 3 January 2018

Please cite this article as: Liu, Q., Qiao, P., Buckling Analysis of Bilayer Beam-columns with an Asymmetric Delamination, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.01.008

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Buckling Analysis of Bilayer Beam-columns with an Asymmetric Delamination

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Abstract: A general analytical model is developed to evaluate buckling behavior of a bilayer beam-column with a through-the-width asymmetric delamination under simply supported boundary conditions. Both transverse shear deformation and local deformation at delamination tip are taken into account in the model by considering two sublayers in both delaminated and intact regions as two individual shear deformable ones. Interface continuity conditions, which account for effect of interface normal and shear stresses, are also introduced in the intact regions. Furthermore, the present model is capable of dealing with the case of delamination located arbitrary through thickness and along length of beam-columns. In comparisons with the results of classical Euler-Bernoulli beam model, Timoshenko beam model (rigid joint model) and finite element analysis, better agreements are achieved for the present flexible joint model, which captures local deformation at delamination tip due to consideration of interface normal and shear stress components. Parametric studies are conducted to evaluate influences of sublayer thickness ratio, delamination length, delamination location, specimen length, and material parameters on the critical buckling strain with emphasis on transverse shear deformation and local deformation at delamination tip. The developed model can be used with confidence in buckling analysis of layered structures with an arbitrary delamination through the length and thickness.

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