

Structural Analysis of Composite Laminated Box-Beams under Various Types of Loading

Abstract:

Fiber reinforced polymer composite (FRP) is a new construction material, gradually gaining acceptance from civil engineers. In the past 15 years, experiments have been conducted to investigate the applicability of using FRP composite in bridge, and tunnel structures, including the applications of FRP composite beam, deck, and column. Beam is one of the most important structural elements in any structural system, so knowing the structural behavior of beams is very important. In this study an analytical solution for composite laminated beam with Box-section has been developed. The solution includes the structural characteristics which are often ignored in the most published studies such as axial and bending stiffness. Also, a finite element model has been developed using ANSYS software to validate the results obtained from the analytical solution and it has been seen a good agreement between results. Moreover, a parametric study has been conducted using the developed finite element model. The parametric study includes the effect of fiber orientation angle for symmetric angle ply Box beam on the axial, bending, and torsional deformations. Furthermore, the effect of changing the number of layers in both the web and flange laminates on the formerly mentioned deformations (i.e. axial, bending, torsional deformations) has been studied.