World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:12, No:02, 2018

Structural Behavior of Non-Prismatic Mono-Symmetric Beam

Authors : Nandini B. Nagaraju, Punya D. Gowda, S. Aishwarya, Benjamin Rohit

Abstract : This paper attempts to understand the structural behavior of non-prismatic channel beams subjected to bending through finite element (FE) analysis. The present study aims at shedding some light on how tapered channel beams behave by studying the effect of taper ratio on structural behavior. As a weight reduction is always desired in aerospace structures beams are tapered in order to obtain highest structural efficiency. FE analysis has been performed to study the effect of taper ratio on linear deflection, lateral torsional buckling, non-linear parameters, stresses and dynamic parameters. Taper ratio tends to affect the mechanics of tapered beams innocuously and adversely. Consequently, it becomes important to understand and document the mechanics of channel tapered beams. Channel beams generally have low torsional rigidity due to the off-shear loading. The effect of loading type and location of applied load have been studied for flange taper, web taper and symmetric taper for different conditions. Among these, as the taper ratio is increased, the torsional angular deflection increases but begins to decrease when the beam is web tapered and symmetrically tapered for a mid web loaded beam. But when loaded through the shear center, an increase in the torsional angular deflection can be observed with increase in taper ratio. It should be considered which parameter is tapered to obtain the highest efficiency.

Keywords : channel beams, tapered beams, lateral torsional bucking, shear centre
Conference Title : ICASCM 2018 : International Conference on Aircraft Structures and Composite Materials
Conference Location : Paris, France
Conference Dates : February 19-20, 2018