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Numerical Investigation of Beam-Columns Subjected to Non-Proportional Loadings under Ambient Temperature Conditions

Authors : George Adomako Kumi

Abstract : The response of structural members, when subjected to various forms of non-proportional loading, plays a major role in the overall stability and integrity of a structure. This research seeks to present the outcome of a finite element investigation conducted by the use of finite element programming software ABAQUS to validate the experimental results of elastic and inelastic behavior and strength of beam-columns subjected to axial loading, biaxial bending, and torsion under ambient temperature conditions. The application of the rigorous and highly complicated ABAQUS finite element software will seek to account for material, non-linear geometry, deformations, and, more specifically, the contact behavior between the beam-columns and support surfaces. Comparisons of the three-dimensional model with the results of actual tests conducted and results from a solution algorithm developed through the use of the finite difference method will be established in order to authenticate the veracity of the developed model. The results of this research will seek to provide structural engineers with much-needed knowledge about the behavior of steel beam columns and their response to various non-proportional loading conditions under ambient temperature conditions.

Keywords : beam-columns, axial loading, biaxial bending, torsion, ABAQUS, finite difference method
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