Lateral response of double skin tubular column to steel beam composite frames

Ahmed Dalaf Ahmed1,2 , Esra Mete Güneyisi *

Abstract

Concrete filled double-skin steel tubular (CFDST) column comprises two inner and outer steel tubes with infill concrete between tubes. CFDST columns are used in many structural systems such as offshore structures and high rise buildings. The aim of this research is to examine the performance of composite frames composed of CFDST columns and steel beam under the influence of lateral loading. The frames were modeled and analyzed utilizing ANSYS finite element (FE) software. The linear and nonlinear behavior of steel and concrete materials and confinement effects of inner and outer steel tubes on the infill concrete were considered in the analysis. Three key parameters were considered in the present study. They are the axial load and slenderness ratios of CFDST column as well as linear stiffness ratio of the beam–column. The effects of these parameters on the behavior of the composite frames were evaluated comparatively. Load-deformation responses were achieved for various cases of the investigation. The verification of the developed FE model was evaluated by considering the analysis results with the experimental data existing in the literature. The findings attained from the FE modeling were in consonance with the experimental results. Besides, it was observed that the above parameters had a substantial influence on the load-displacement relationship and the performance of the studied composite frames.