Effect of Unreinforced Masonry Infill Walls on Seismic Performance of Reinforced Concrete Framed StructuresAbstract

Abstracts:

Unreinforced Masonry infill walls (URM) are commonly used in the Reinforced Concrete (RC) framed structures as interiors and exteriors partition walls. Although they usually are not considered in the structural analysis and design, their influence on the seismic performance of the framed structures is significant. A common practice in the modern and old RC buildings is to remove the URM walls in the lower stories for commercial reasons; garages, storages, shops, etc. In the present work, the effect of the URM walls on seismic performance of the RC framed structure will be studied. For that, three groups of 2-D three-bay framed structures, which are fully and partially infilled with the URM walls, will be studied. These groups are classified as three stories, six stories, and nine stories RC framed structures representing low, medium and, high rise buildings; respectively. In each group, different infill panels' configuration will be studied in order to simulate the cases of ignoring or considering the stiffness and strength of the URM. Double-strut nonlinear cyclic model for masonry panels has been utilized in order to account for the structural action of the URM walls. Pushover analysis is adopted for the evaluation of the seismic response of the frames considering the material inelasticity and the geometric nonlinearity in the analysis. Some selected numerical simulation results in terms of base shear forces, lateral deflections, and inter-story drift ratios are obtained for all the considered configurations and presented in comparative way. The regular distribution of the infill walls can improve the framed structure performance. However, omitting the infill from the ground story leads to soft story phenomena as the columns in this story are more vulnerable due to the shear forces acting on them.

Seismic Evaluation of Reinforced Concrete Structures Infilled with Masonry Infill Walls

Abstracts:

The current research work aims to investigate the seismic performance of the reinforced concrete structures fully, as well as, partially infilled with masonry infill (MI) walls. For that, a numerical study of three groups of two-dimensional framed structure has been conducted under dynamic time–history analysis. The three building groups are classified as nine, six and three stories representing high-rise building, medium-rise building, and low-rise building, respectively. Different infill walls' configurations have been studied for each group to simulate the bare frame, the infilled frame, the open ground story frame, and the partially opened ground story frame. Double-strut nonlinear cyclic model for MI walls has been utilized to represent nonlinear behavior of infill walls in the framed structures using the structural software package SeismoStruct software. Dynamic time–history analysis, using three different ground motion records to represent wide range of frequency content, has been utilized to study the performance of the studied cases under seismic loading conditions. Based on the obtained results, the seismic performance of the framed structures is strongly influenced after using the infill walls. However, removing the MI walls from the ground story leads to soft story phenomena and makes the structures vulnerable to collapse especially in moderate-to-severe earthquakes.