Seismic Assessment of Framed Structures Reinforced with Superelastic Shape Memory Alloy

Abstract:

Superelastic shape memory alloy (SMA) is a smart material that has the ability to experience large deformations and retrieve its original shape upon unloading along with possessing a high resistance to corrosion. Providing it as reinforcement at the critical regions like plastic hinge in Reinforced Concrete structures can relieve problems with permanent deformations. Therefore, the current research work aims to study the seismic performance of concrete framed structures reinforced with SMAs in the whole structure as well as in the plastic hinge areas of the beam-column areas along with conventional steel reinforcement in other parts of the structure. In order to achieve this goal, a numerical study of a 2-D six-story RC framed building has been conducted. Five different configurations for the use of the SMA reinforcement have been considered. Static pushover analysis, as well as, dynamic time history analysis, using three different ground motion records to represent wide range of frequency content, has been used to perform the seismic analysis of the considered model configurations. 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 a comparative way