



Structural Performance of Hill Buildings During Earthquakes

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Abstract

The dynamic behaviour of reinforced concrete (RC) buildings in hilly areas varies from building stocks on flat terrains. Due to the inherent mass, stiffness, and structural irregularity, buildings on slopes experience amplified torsional forces under seismic excitations. Some typical structural configurations of buildings in hill cities were identified. Dynamic analyses were carried out on the analytical models simulating the hill building configurations. These models were then subjected to seismic excitations along and across slope directions. The dynamic characteristics and seismic responses of these hill buildings were recorded. The findings of the analysis are presented and discussed in terms of the fundamental period of vibration, storey drift, maximum top storey displacements, base shear and are finally compared within the considered configurations of hilly buildings. Analysis results reveal that the shorter columns on the uphill side being stiffer attract a higher amount of shear force, eventually leading to the collapse. Thus, short column effect is one of the critical patterns of structural response observed amongst buildings on slopes. This study concludes that the buildings on hills possess lower seismic capacity and are more prone to damage during seismic events than regular symmetric buildings on flat terrain. Some insights and suggestive measures to help reduce the failure of building stocks in hilly areas are also discussed.

Keywords: Random hill slopes, Earthquakes, Irregularity, Ground slope, Short column effect