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Title : EFFECT OF STRENGTH AND STIFFNESS DISTRIBUTIONS ON THE DISPLACEMENT DEMANDS OF ASYMMETRIC REINFORCED CONCRETE BUILDINGS

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Torsional response characteristics of forty building models of elastic and inelastic asymmetric reinforced concrete buildings were studied by analyzing the near-fault and far-fault ground motions recorded during seven-pairs of recent earthquakes. The strength and stiffness eccentricities are the main parameters used in the present study contributing to the strength and stiffness distributions of building models under five main-models and eight submodels, respectively. The displacement demands of all buildings under the stiff and flexible sides were obtained from the analysis due to different values of fundamental period of vibrations as well as behavior factors by using RUAUMOKO-3D program before raw data of lateral displacement at each node were extracted using FORTRAN program. All data were then summarized in accordance to the strength and stiffness distributions in order to determine the impact of either strength distribution or stiffness distribution to the torsional behavior of one-story asymmetric reinforced concrete buildings. The torsional behavior of all building models were presented in terms of the normalized displacements at the stiff and flexible sides by the ratio of the maximum lateral displacement at the stiff and flexible sides to the maximum lateral displacement at the center of the building models. The results were finally analyzed by using MINITAB software for statistical analysis. The results of this study indicate that the torsional behavior of asymmetric reinforced concrete buildings were mainly depend on the stiffness distributions of lateral load resisting elements in the buildings rather than the strength distributions. The results of these investigations also indicate that the fundamental period of vibrations and behavior factors may increase the lateral displacements depending on the strength and stiffness distributions of buildings. Besides, the displacement demand was found insignificant regardless of the elastic and inelastic systems due to both near and far-fault ground motions. The normalized displacements were found significant to visualize the torsional behavior of asymmetric reinforced concrete building. Nevertheless, the value of elastic and inelastic normalized displacement at stiff and flexible sides was conservative regardless of different fundamental period of vibrations as well as behavior factors, which obey Equal Displacement Rule as used in all seismic design provision including Eurocode 8, considered in this study.