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Seismic Behaviour of Regular and Vertically Irregular Reinforced Concrete Building for 3D and MDOF Model

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Abstract

Buildings behaviour in seismic forces is dependent on the structural configuration of the building. Regular buildings have more stable and predicted behaviour than the irregular one. Irregular configuration in plan or in elevation is one of the major causes of failure of building during earthquakes. Vertical irregularity is mainly due to strength, stiffness and mass irregularities, are the main cause of failure of the building during the earthquake. Damages mainly due to vertical irregularities were seen in the Bhuj Earthquake in 2001. This irregularity is more vulnerable and also less attempted by the researcher. To find out the most vulnerable condition of vertical irregularity during the earthquake is the main focus of the paper. 3D and MDOF medium rise RC building models are analyzed using SAP 2000 NL and compared for finding the results reliability of both the models. The results are analyzed by considering seismic parameters such as fundamental time period, frequencies, base shear and displacement of irregular buildings compared with a regular building. The 3D model is more difficult to analyze than the MDOF model but results obtained by the 3D model are similar and realistic to the real structure than the results obtained by the MDOF model. Displacements in 3D models are observed more than the displacement in MDOF models. Eigenvalue results variation of the first mode in 3D and MDOF models is under 5%. Overall base shear results are observed more in case of MDOF model as compared to 3D model. Model 2 i.e. double height storey at middle floor is more flexible in case of 3D system and model 4 i.e. floating columns structure is more flexible in case of MDOF system.

Keywords: Seismic behaviour, Vertical irregularity, 3D and MDOF model