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THE SEISMIC BEHAVIOR OF VERTICALLY IRREGULAR RC BUILDINGS IN EGYPT

By

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ABSTRACT

The influence of vertical irregularity on the structural response of RC structures when subjected to seismic loading is considered in a large portion of the modern urban infrastructure. Past earthquakes have shown that buildings with irregular configuration or asymmetrical distribution of structural properties experience significant increase in seismic demand, causing greater damage. Therefore, seismic codes provide elaborating empirical rules for the classification of buildings into regular, and various irregular categories as a function of asymmetries, to evaluate seismic demand. The main objective of this research is to evaluate the seismic performance of vertically irregular reinforced concrete buildings due to discontinuity of vertical elements. Two models with different structural systems are analyzed. The first has a continuous vierendeel girder at the first floor while, in the second a conventional girder system is used. Both models are designed according to ECP201, 2012. A parametric study is performed including three distinct scenarios, changing in span, heights and, applying a concentrated mass at the top floor. This study aims to assess their effects on the seismic performance of those buildings. Non-linear static pushover analysis is employed using the Zeus-NL software (Elnashai et al, 2004). The results indicate that, the irregular buildings are more vulnerable than regular ones. Moreover, the shear capacity of the structure of vierendeel girder has been decreased by 17% when increasing the span of the vierendeel by 33%. Although, the increasing of the vierendeel story height by 25% and 50% have not significantly affected the shear capacity or the story shear. While in the structure of the transfer girder, the shear capacity has been decreased by 13%

when increasing the span of the girder by 33%. The existence of soft story in the ground level in case of studying dynamic analysis leads to magnifying the drift ratios at that level comparing to its values obtained from static pushover analysis. Furthermore, the results show a significant difference between the static pushover and the dynamic analysis results.