THE EFFECTS OF MASS ECCENTRICITY SCENARIO ON THE SEISMIC TORSIONAL BEHAVIOR OF RC/MR BUILDINGS

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ABSTRACT

In this study the effect of different mass eccentricity scenarios on the dynamic torsional behavior of an 8-story RC moment resistant building has been investigated. Firstly, to determine the range of the mass moment inertia (MMI) variation due to different mass distribution scenarios, three different scenarios which produce eccentricity were considered. These scenarios were applied to the plan of prototype structure and expressions were established to correlate MMI and mass eccentricity in each scenario. Result shows for slight eccentricities the variation of the MMI is negligible but as eccentricity is increased the range of the variation is extended.

At the second part of this study, 8-Story RC moment resistant building was designed according to the Iranian seismic code (Standard No. 2800, 3rd Edition). Sensitivity analyses based on finite element method and inelastic time history analysis have been carried out for determining the effects of MMI on the torsional response of the structure.The effects of the variation of MMI on the torsional response of the structure at 2 level of mass eccentricity including slight and severe is investigated and described in detail.

INTRODUCTION

For asymmetric structures subjected to seismic excitation, rotational response is expected to occur. As a result displacement demands on the elements at a particular floor level of structure is no longer uniform (Beyer, 2007). For this reason stress and strain concentration is happened at the edge element of the structures prone to torsion which causes sever damage due to seismic excitation. Different example of this type of damage has been reported during the past earthquakes. Torsional behavior of the asymmetric buildings due to inelastic response has been the focus of many different researches. In this regard, different design procedures have been developed for considering torsional response of asymmetric buildings. A large number of parameters affect inelasticresponse of asymmetric buildings. One of the most important ones which affects dynamic characteristics of the buildings is MMI. This parameter directly depends on the unbalanced mass distribution scenario which produces the eccentricity in layout. Considering constant mass, corresponding to a given mass eccentricity, probably there are infinite unbalanced mass distribution scenarios. Therefore for a known mass eccentricity a range of MMI is expected.The main objective of this study is to determine the variation range of MMI due to different unbalanced mass distribution scenarios and then investigate the effects of this variation on the dynamic torsional behavior of mass eccentricreinforced concrete moment resistant building.