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RELIABILITY EVALUATION OF ENGINEERING DEMAND PARAMETERS BASED ON THE LENGTH OF SEISMIC LINKS IN ECCENTRICALALLY BRACED FRAMESE

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ABSTRACT

Reduction in deviation of performance indexes coclude reduction of deviations in decision parameters. One approach for reducing the deviations is adjusting structural design specifications and utilizing appropriate seismic systems. Eccentrically braced frames (EBFs), One of prevalently employed seismic systems are very well-organized and adjustable systems for resisting earthquakes as they combine ductility that is the characteristic of moment frames and stiffness associated with braced frames. This study evaluates the seismic reliability of engineering demand parameters according to the different length of seismic links based on the first order second moment reliability method (FOSM).

The selected EDPs like most of the performance-based assessments are inter-story drift ratios (IDR) and peak floor acceleration (PFA) and two dimensional generic one-bay frames in different stories representative of typical structures with different heights and fundamental periods were employed subjected to two groups of near and far-field records. The median values of reliability index (β), representative of the results' dispersion around the median value, were calculated subjected to the drift and peak floor acceleration for each story of the models.

It has been discovered that, there is an efficient length of link beam that is located in the range of ratios between 0.25 to 0.33 (ratio of the length of link-beam member to the length of braced span) for each of the models with different number of stories conducting to the most reliable EDPs as well as very close compatibility of the efficient length of link beams for both drift and acceleration EDPs. It could also be concluded that the dispersion values subjected to far-field records are almost constant by altering the length of link-beams. Achievements could be straightforwardly utilized for risk assessment or design of EBF systems supporting appropriate length of link beams in countering reliability of EDP parameters.

INTRODUCTION

Performance-based earthquake engineering (PBEE) provides a quantitative basis in assessment of the seismic performance of structures and aims at the design of structures achieving expected acceptable performance levels during probable future earthquakes (FEMA450, 2003). One of very frequently used quantitative performance assessment method is the fully probabilistic methodology of Pacific Earthquake Engineering Research (PEER) Center that is divided into four basic stages accounting for the following: ground motion hazard of the site, structural response of the building, damage of building components and setting up decision variables (DVs) like economic loses, which could be employed by stakeholders to make more informed design decisions (Ramirez and Miranda, 2009). The outcomes of each stage serve as input to the next stage.