Assessment of Seismic Response Reduction Factor of Multistorey Reinforced Concrete Framed Structures Using Nonlinear Dynamic Analysis

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Abstract

The inelastic design seismic forces are generally calculated equal to corresponding elastic ones divided by response reduction factor (R) that depends on structural Ductility, Over-Strength, and Redundancy. Many studies have attempted to quantify the potential of structural systems to delimit the level of force imposed by virtue of their ductility and energy absorption capacity. Most of practice design codes give values of (R) factor for a building as function of its structural system only excluding the effect of important factors such as: the geometrical configuration, reinforcement ratio, concrete strength, yielding stress of reinforcement, and earthquake magnitude. A parametric study was conducted to investigate the effect of those parameters on RC Ductile Frames Structures using Applied Element Method, where a nonlinear dynamic analysis was carried out in the time domain for multistory reinforced concrete framed structures. Results showed that (R) factor is greatly affected by earthquake magnitude, moderate effect by geometrical configuration, and material properties. The results also showed the (R) factors recommended in current design codes are unconservative and overestimated for the majority of studied cases.

Keywords: Response modification factor, Seismic design, Ductility, Over-Strength, Design spectrum, Non-linear analysis.