

Evaluation of Reduction Factor for Precast Concrete Frames with Semi-Rigid Connections

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With increasing population and need of building construction in low cost and little time, we require using the precast structures. Precasting is defined as the production of prefabricated segments in factory and install and connecting them in the site. Important advantage of this industry is the production of precast segments in large numbers with little time. Because the concrete is one of the best primary materials for building industry, using precast concrete buildings is developed more than before. In spite of many studies on performance of this type of structures in low seismic regions, due to some problems, the precast industry has not reached to its whole potential yet. The main problem is due to precast concrete connections. It causes the difference between seismic behavior of precast and monolithic structures. Therefore little information exists about these structures. Nowadays the main parts of seismic design building codes use linear analysis. The reduction factor is an important factor in linear analysis that indicates inelastic behaviors of structure such as resistance and ductility in nonlinear stage. This factor is obtained from three coefficients: ductility reduction factor, over strength factor and allowable stress factor. In seismic codes, this coefficient is just written with a constant value. Whereas it depend on period, ductility, site condition and so on. Considering the effect of precast concrete connection on the seismic performance of precast structure and factor such as period and ductility, reduction factor of these structures are different from monolithic one. So determining of this factor is necessary for these structures. In this research, moment resisting frames and dual systems in 4, 6, 8 stories with 1, 3, 5 bays were investigated by means of Perform 3D software. The effect of four types of typical beam to column connections and two types of horizontal and vertical panel connections were evaluated. Nonlinear static pushover in three forms of triangular, uniform and modal was used. At the end the effect of factors such as the semi rigid connections, the number of bays, the number of stories and the effect of distribution of lateral loads were studied. The results indicate precast concrete moment resisting frames with semi rigid connections have reduction factor smaller than monolithic moment frames and precast dual systems could have values equal or more than equivalent dual systems.

Keywords: precast moment resisting frame, precast dual system, reduction factor, semi rigid connection, pushover analysis.