SEISMIC EVALUATION OF LOW-RISE MOMENT-RESISTING STEEL FRAMES

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ABSTRACT

The objective of this study is to assess the seismic performance comparisons of steel structures with different structural systems and ductility. The structural systems used in the study are divided into three categories: 1) moment resisting frames, 2) concentric braced frames, and 3) eccentric braced frames. In each structural system, the frames consist of 3 ductility, namely, 1) ordinary, 2) intermediate, and 3) special ductility. The 8-storey steel buildings are located in Bangkok, Thailand. The design and assessment the seismic performances of the building were carried out by nonlinear static pushover analysis. The masonry infilled walls are modelled by a single-strut model. The results show the failure behaviour of structural steel buildings from elastic to inelastic behaviour in the capacity curve with concern of masonry wall effects. Capacity curves that show the relationship between base shear and roof displacement are shown and compared with structural steel buildings with vary lateral resisting systems and ductility. The hinge mechanism patterns in various steel frames are also presented. Among the four structural systems of the 8-storey steel buildings located in Bangkok, special moment-resisting frames exhibit the highest level of ductility but the lowest stiffness and strength. High-to-low- base shear capacity is ranking as follows: ordinary concentric braced frames (OCBFs), special concentric braced frames (SCBFs), eccentric braced frames (EBFs), and special moment-resisting frames (SMFs), respectively. Furthermore, the 8-storey IMRFs/BKK with infill-walls can increase the maximum capacity by up to 48.6%. This study is useful for guideline to appropriately select lateral resisting system and ductility for designing the earthquake resistant structural steel buildings in Bangkok, Thailand.

Key Words: Seismic Evaluation, Steel Frames, Moment Resisting Frames, Braced Frames