

Seismic Performance Evaluation of the Composite Structural System with Separated Gravity and Lateral Resistant Systems

Authors : Zi-Ang Li, Mu-Xuan Tao

Abstract : During the process of the industrialization of steel structure housing, a composite structural system with separated gravity and lateral resistant systems has been applied in engineering practices, which consists of composite frame with hinged beam-column joints, steel brace and RC shear wall. As an attempt in steel structural system area, seismic performance evaluation of the separated composite structure is important for further application in steel housing. This paper focuses on the seismic performance comparison of the separated composite structural system and traditional steel frame-shear wall system under the same inter-story drift ratio (IDR) provision limit. The same architectural layout of a high-rise building is designed as two different structural systems at the same IDR level, and finite element analysis using pushover method is carried out. Static pushover analysis implies that the separated structural system exhibits different lateral deformation mode and failure mechanism with traditional steel frame-shear wall system. Different indexes are adopted and discussed in seismic performance evaluation, including IDR, safe factor (SF), shear wall damage, etc. The performance under maximum considered earthquake (MCE) demand spectrum shows that the shear wall damage of two structural systems are similar; the separated composite structural system exhibits less plastic hinges; and the SF index value of the separated composite structural system is higher than the steel frame shear wall structural system.

Keywords : finite element analysis, new composite structural system, seismic performance evaluation, static pushover analysis

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