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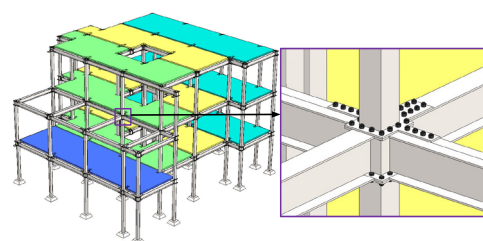


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Performance and design of an bolted joint connecting H-shaped beams and square hollow steel columns

This paper presents a bolted joint to connect H-shaped steel beam to square hollow steel (HSS) column and connect upper and lower columns in a multi-stored modular steel structure. The modular components are welded at the factory, while the assembly is completed on site using high-strength bolts. Moreover, the resulting structure has a desirable seismic performance. Rigid connections or connections with variable stiffness between beams and columns can be achieved by adjusting the number of bolts or the specifications of the bolts. In terms of connection with variable stiffness, the stiffness of bolted connection between beams and columns changes with the applied load. During minor earthquakes, rigid connections can be achieved, while during moderate and major earthquakes, the cover plate slips relative to the beam flange to dissipate energy. In this paper, the model tests and finite element analysis for the seismic performance under cyclic loads was conducted on six full-size connections. Meanwhile, a finite element model of welded connection is compared with bolted connections. The failure mode of the bolted connection and the slippage between the cover plate and the beam flange are analyzed. Seismic performance parameters including hysteretic behavior, skeleton curve, ductility, rotational capacity and stiffness degradation of the connections are obtained. The influence of parameters such as the number of bolts and the cover plate thickness on the mechanical properties is studied, as well as the evolution and distribution of the bolt tension forces. The results show that the large bolt hole on the cover plate and the beam flange can facilitate installation and improve the deformation capacity, ductility and energy dissipation capability without significantly affecting the load carrying capacity of the connection. The proposed bolted connection is suitable for use in structure located in seismic zones.



Recent Publications

- 1.Liu X C, Yang Z W, Wang H X, et al. (2017) Seismic performance of H-section beam to HSS column connection in prefabricated structures. Journal of Constructional Steel Research; 138: 1-16.
- 2.X C Liu, SH Pu and A L Zhang (2017) Performance analysis and design on bolted connections in modularized prefabricated steel structures. Journal of Constructional Steel Research; 19(9): 183-195.

Biography

Xuechun Liu is a Vice-Professor in the Beijing Engineering Research Center of High-rise and Large-span Pre-stressed Steel Structures at the Beijing University of Technology. He has received his PhD in Structural Engineering from the Beijing University of Technology. His research areas include steel structures, prefabricated steel structures and pre-stressed steel structures.

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