

Study on seismic performance of steel beam-to-column connection and performance evaluation of existing structures

This study investigates seismic performance and design method of welded beam-to-column connections for steel moment resisting frames. The major findings are as follows: (1) The method of evaluating the flexural strength of a beam end joint connected to a square tube column are proposed. The flexural strength demands for moment connections are revealed from cyclic loading tests. Based on these results, the design method to prevent premature fracture of welded moment connections is presented. (2) To evaluate seismic performance of existing steel buildings, welding inspection and loading tests are conducted to beam-to-column connections cut out from several existing buildings constructed in the 1960s to 1980s. From the results of thorough welding inspections characteristics of welding defects are investigated. Dynamic loading tests are also conducted on the beam-to-column connections of existing buildings, the influence of defects on the deformation capacity and the failure procedure are revealed. (3) Seismic response of high-rise buildings subjected to long-period ground motions predicted in Kansai area during large earthquakes along the Nankai Trough are investigated by numerical analysis and demand of plastic deformation for steel moment frames and moment connections are revealed. Full-scale loading tests are conducted to evaluate deformation capacity and failure mode.