ABSTRACT

Composite materials composed of Concrete filled steel tube (CFT) have been widely applied in high strength column design due to their advantages such as high-strength, stiffness, ductility and better seismic resistance. However, the conventional CFT system has a critical disadvantage which is the significant strength reduction after yield of steel tube caused by plastic local buckling. To improve this problem of CFT system, new CFT column system with additional transverse confinement is proposed. This proposal is intended to study the confined CFT (CCFT) columns for better ductility and improved seismic design by controlling the plastic local buckling. To validate the effectiveness of confinement in CCFT, new confinement scheme is experimentally examined through axial compression test and the results shows that it is possible to increase the compressive strength and reduce the local plastic buckling by carbon-fiber-reinforced plastics (CFRP) confinement jacket. The two different confinement models either with or without a gap between the steel tube and the CFRP confinement were examined and the strengths and deformability of both models have significantly increased due to the CFRP confinement. Also the local buckling of the CCFT columns can be reduced and more deformability can be obtained by introducing the cushion gap between the steel tube and the CFRP confinement. Also, the ultimate strength of the confined CFT columns is mainly dominated not by the existence of the cushion gap but by the ultimate strength of the CFRP confinement. In addition to experimental approaching, Analytical and numerical method are adopted to provide correlation with experimental results.

Keywords: CCFT, CFT, Composite, Confinement, Columns, Buckling, Ductility.