

Performance of Continuous and Segmented Post-Tensioned Concrete Filled Fiber Tubes

Description

Meta Fields

Category : Completed Projects

Group : Seismic

Subject : Columns

Abstract :

This research investigated the performance of continuous and segmented post-tensioned concrete-filled fiber tubes as columns. Four post-tensioned specimens were compared against a typical monolithic RC specimen with 8 in. diameters and approximate column heights of 60 in. The four post-tensioned specimens used fiber reinforced polymer tubes as confining reinforcement, shear reinforcement, and construction formwork. The specimens were subjected to increasing levels of cyclic lateral displacements. Specimens were compared based on performance, damage, and energy damping. The specimens were also compared to one analytical model to predict performance and a finite element analysis using ABAQUS/standard to predict performance. The specimens utilizing fiber reinforced polymer tubes had four configurations. Two configurations tested the specimens with no additional energy dissipation devices in a single 60 in. segment, while a second specimen tested a segmental column consisting of four 15 in. segments totaling 60 in. Additionally two specimens consisting of four 15 in. segments tested additional energy dissipation devices. Rubber sheeting was placed between the interfaces of one specimen to allow the hysteretic displacement of the rubber to dissipate energy and lengthen the period. In the final specimen steel angles were affixed to both the supporting base and the column to plastically deform during testing in order to dissipate energy. Failure of the monolithic RC specimen was typical of the construction type. Significant spalling of concrete with formation of a plastic hinge occurred prior to failure of the specimen. Energy dissipation of the monolithic RC specimen was the greatest out of all tested specimens. For the four specimens utilizing fiber reinforced polymers failure through damage did not occur. All specimens completed the lateral displacement cycles without significant damage. Force displacement characteristics of the rubber sheet specimen was significantly lower than that of the remaining post-tensioned specimens which all exhibited similar force displacement characteristics. However, in all post-tensioned specimens a rigid rotation about the column base occurred which caused a permanent elongation in the post-tensioning bar. This permanent elongation had significant impact on the performance of the column in subsequent displacement cycles.

Budget : 0.00

Other Documents 0 Other Documents File : 1947

Project Starting Year : 2008

Project Completion Year : 2008