



A Precast Concrete Bridge Bent Designed to Re-center after an Earthquake

Description

Meta Fields

Category : Completed Projects

Group : Seismic

Subject : Self Centering Bent

Abstract : In this study the post-earthquake residual displacements of reinforced concrete bridge bents were investigated. The system had mild steel that was intended to dissipate energy and an unbonded, post-tensioned tendon that was supposed to remain elastic and re-center the column. The columns tested had different mild steel to prestress ratios, which affected their re-centering ability. A re-centering ratio developed by Hieber (2005), which took into account the external axial load, initial prestress force, and the mild steel ratio, was used to predict these re-centering capabilities.

Two 40 percent scale specimens with large-bar connection details and a central unbonded, post-tensioned tendon were tested by using pseudo-static loading. The large-bar system is a rapidly constructible precast system for use in seismic regions. The test columns had re-centering ratios of 1.6 and 1.2. A column with the same connection details but no prestress and a re-centering ratio of 0.9 was used as a reference. The displacement at zero force in the test was used as a proxy for the residual displacement after an earthquake.

The tests showed that columns with a larger re-centering ratio did experience lower residual drifts, although this distinction only became clear for drift ratios that exceeded 2 percent. The tests also showed that increases in post-tensioning force led to slight increases in damage at high drift ratios.

Key Words : Posttensioning, precast concrete, bridge substructure, columns, residual displacement, residual drift

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