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Cyclic Performance Evaluation of Interlinked Coupler-box Confinement as a Local Retrofitting Technique

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Abstract

An innovative coupler-box confinement technique is proposed to interconnect the longitudinal reinforcing bars of columns at their potential plastic hinge locations. Displacement-controlled reverse cyclic tests are conducted on columns with the recommended coupler-box assemblies and the conventional stirrup-bound couplers. Efficiency of the proposed confinement technique is evaluated by comparing the hysteresis behaviour, performance index parameters of energy dissipation and ductility, along with the damage pattern and failure analysis in tested columns. The experimental test results validate the competency of proposed coupler-box confinement in enhancing the hysteretic performance of column with improved energy dissipation and ductility. The column with conventional stirrup-bound coupler experiences failure at a lower lateral drift of 3 %, whereas the column with suggested coupler-box confinement fails at 6 % drift which is higher than the collapse prevention drift level of 4 %, as recommended by FEMA codal guidelines. This experimental study manifests the use of coupler-box assembly as a probable futuristic approach in seismic retrofitting of severely damaged reinforced concrete frame buildings, where the buckling failure of longitudinal rebars at the plastic hinge location of columns is inevitable.

Keywords: Rebar coupler sleeve, Coupler-box assembly, Interlinking, Seismic retrofitting, energy dissipation