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Simulating Effect of FRP Sheets on Nonlinear Behavior of Reinforced Concrete Beam- Column Connections

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The vulnerability and improper seismic behavior of beam-column connections in reinforced concrete structures designed based on past codes without seismic considerations has been established through data obtained from experiments and past earthquakes. In this research, the use of fiber-reinforced polymer (FRP) sheets attached to the surface of the member for strengthening connections was investigated. Here, an analytic model was presented for simulating the nonlinear behavior of connections strengthened with FRP sheets. In this model, the nonlinear behavior of the core zone of the connections was simulated with two diagonal linear springs. The corresponding load-displacement relationship in the linear springs is a function of the principal tensile stress-shear deformation in the core zone of the connection. Therefore, based on the behavioral mechanism of the connections and using the experimental results, the principal tensile stress-shear deformation relationships for reinforced concrete connections with different restraints for the longitudinal rebars of the beam were developed. Comparing the results of the numerical model with those obtained from the experiments verified the ability of the proposed model in predicting the nonlinear behavior of connections strengthened with FRP sheets.

Keywords: Reinforced Concrete Connections, FRP Sheets, Nonlinear Analysis, Seismic Strengthening, Simulation.

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