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COMPUTATIONAL NONLINEAR DYNAMIC FRAME ANALYSIS TECHNIQUES

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ABSTRACT

The computational algorithms to analyze structural frames subjected to earthquake ground motion require the information on the hysteresis behavior of the critical frame zones. The nonlinear hysteresis behavior is implemented as material, geometric, and/or contact nonlinearities in such formulations. This study presents the nonlinear dynamic analysis of frames in which the nonlinear beam-to-column connection mathematical bilinear hysteresis models are implemented into the analysis algorithm. The bilinear mathematical models are obtained from a series of full-scale cyclic experimental connection tests. The hysteresis models are used as the material nonlinearity for the isolated connection element in the finite element solution algorithm. The differential equation of motion is solved incrementally within a converged time step to obtain an energy-based converged coupled nonlinear solution. A parametric study is conducted to evaluate the effects of different frame/connection geometric variables on the frame's lateral sway when subjected to earthquakes with different frequencies.