

A New Bilinear Approach for Seismic Retrofitting Design of Steel Frames

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Abstract

The study presents the development of a bilinear criterion for retrofitted steel frames by a load-carrying knee bracing frame consisting of steel knee bracing elements and steel frame structures with simple or rigid beam to column connections. This makes a perfect argument to design this type of steel structures, by new passive control system. The development is based on nonlinear analysis, using a worthy nonlinear finite element modeling and introducing active parameters to describe the behavior of the proposed system subjected to specified loads, followed by a suggested bilinear algorithm and a design procedure based on the regular codes requirements. Finite element analyses have been performed accounting for nonlinear behavior of the proposed system with critical frame geometry and ductile knee bracing locations. The study also discusses difficulties in developing the system and presents an innovative solution to cope with code specified seismic loads that in most cases govern the design of the frame structures.

Keywords: parametric study, nonlinear behavior, bilinear approach, nonlinear F.E. modeling, seismic design, retrofitting.