



Assessing the Effect of Deformation and Energy Damage Indices in Seismic Vulnerability of Steel Moment- Resisting Frames

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ABSTRACT

In evaluating the degree of structural damages after a destructive event like an earthquake, the assessment of damages in different points of the structure is very important. Thus, it becomes necessary to introduce some indices to assess the seismic damages in the structural elements. The deformations and amount of dissipated energy of earthquake by the elements are usually considered in defining damage indices. Some damage functions take only one of the above-mentioned parameters and some others might consider the associated effect of deformation and amount of energy dissipation of elements. In this paper, after designing steel moment resisting frames with 4, 7, 10, 15, 20, and 25 story with considering 3 and 5 bays, they are modeled in OpenSees software in order to investigate the performance of steel moment-resisting frames under seismic excitations by using deformation, energy, and Park-Ang damage indices. The values of damage indices have been calculated on the basis of nonlinear dynamic time history analysis under 4 near-fault ground motion records. The results revealed more effective role of deformation than dissipated energy and combined parameters in quantitative expression of seismic damages.

Keywords:

Damage index, Deformation, Dissipated energy, Park-Ang, Nonlinear dynamic time history analysis, Near-fault ground motion.