

## Seismic damage based design of steel moment frames

### Abstract

One of the seismic design methods is the Force-Based Design (FBD) method, which forms the basis of many codes. In this method, the strength parameter is used as the design criterion while it is also necessary to use structural damages and deformations as design criteria. In current design methods, similar structural members are usually designed to have equal ductility capacities. However, in practice, only a few structural members use the ductility capacity and enter the plastic range under earthquake conditions. In most earthquakes the lower stories of structures are exposed to a greater risk of damage compared to other stories; also in earthquakes the distribution of damage in the height of the structure is mostly ununiformed, resulting in failure to use the optimal plastic capacity of the members in some stories. Therefore, in the present research a new method is developed according to the Park-Ang damage index for designing steel moment structures; this method can control damages to structures in earthquakes. To assess the performance of this method 3, 6 and 9-story buildings are designed using the proposed method and a 6-story building is designed also based on two other methods. The buildings are tested and compared under a number of consistent earthquakes. The results show that the proposed method can effectively rectify the weakness of the lower stories and control the values of damage in members, stories and the whole structure. The non-linear dynamic analysis is carried out using OpenSees software and the damage is calculated through a code written specifically by MATAB.