

Review of the steel moment resisting frame and presenting the improvement methods of seismic behavior

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During the recent years, improper seismic behavior of structures designed according to the "Strength Design" guidelines led to think about the performance design method. On the other hand, seismic rehabilitation and retrofitting of existing buildings received quite a bit of attention on the part of structural engineers especially in seismic prone countries.

Until now, the performance based design method was used for evaluation, retrofit or rehabilitation purposes in the structures. Different guidelines such as ATC40, Fema273, and Fema356 were specially published to explain this method. The advantages of the performance design method encourage the engineers to acquire and develop a better knowledge of the system. The related applicable procedures have been more or less carried out. Some countries have already introduced the philosophy of the base performance design method in their seismic design guidelines.

Considering the fact that the method is newly implemented the applicable procedures need to be improved for different structural systems. In our research, we have tried to clarify the application of the method by using some practical examples.

The most common and accredited design procedures established on performance based design method are "Capacity Spectrum Method (C.S.M)", mostly used by ATC40 and "Displacement Coefficient Method (D.C.M)" which is mostly used by FEMA356 and the Iranian seismic retrofitting guidelines.

In this research, we have considered four buildings of 2,5,10 and 15 stories. The steel structures were designed according to Iranian steel structures design codes (ASD) and seismic provisions for buildings (code No. 2800). We have carried out the performance based design method using both linear and non-linear analysis. We have compared these analyses with the seismic provisions (code No. 2800).

Considering the results, it appears that nonlinear static analysis (pushover) using displacement coefficient method is a reliable way to evaluate the structures. Our results confirm that the seismic provisions for buildings (code No. 2800) are also reliable for construction design.

KEYWORDS: Steel structure, Moment resisting, Linear & Nonlinear analysis, Earthquake, Improvement, Performance level