EFFECT OF THE ASSUMED DESIGNINGSEISMIC COEFFICIENT ON SAFETYMARGIN AGAINST PROGRESSIVECOLLAPSE OF STEEL, MOMENT RESISTINGFRAME BUILDINGS

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ABSTRACT

Progressive collapse began with local destruction of one or more parts of structure. Then, it extends into significant part of building, being no proportional to initial collapse. Usually, buildings are designed for normal loads, such as, dead, live, wind and earthquake. Nevertheless, there are other possible risks and loads, including firing, vehicle collision, explosion and etc. having less occurring possibility, but, they shall cause terrible collapse, in case of occurring.

Some structures should be safe against progressive collapse; therefore sufficient safety margin should be regarded in the designing phase. It is generally clear that considering higher base shear for a structure, leads to greater safety margin against progressive collapse. In this study, the effect of the considered seismic base shear in increasing safety margin, against progressive collapse is quantitatively studied for a four-story, steel moment resisting frame building. Different structures are designed for the building, for low- to – very high seismic hazard regions, and investigated for sudden removal of critical members, in first floor.

Subsequently, relation of the assumed seismic base shear and potential of the progressive collapse is shown quantitatively for different seismic zone of Iran.

INTRODUCTION

For designing structures to resist progressive collapse, generally the alternate path method, among different methods, has been recommended by guidelines. In this method, a structure is designed in such manner that if one element failed, the alternate paths would be exist to carry loads and the structure would be able to bridge over the removed element and disproportionate collapse of whole or a large part of the structure would not occur. Simplicity and directness are some of the advantages of this approach. There are different analysis procedures for the alternate path method that have been suggested in guidelines. This procedures are linear static, linear dynamic, nonlinear static and nonlinear dynamic.The linear static procedure is the simplest analysis option and often offers conservative assessment of the progressive collapse potential.The nonlinear static procedure, as an intermediate analysis option, involves modeling of both geometrical and material nonlinearities but for conducting progressive collapse analysis, it is not required to perform time history analysis. The nonlinear dynamic procedure is the most accurate option that is also the most computationally expensive procedure. Marjanishvili and Agnew (2006) evaluated and compared these methods and mentioned that, though these four procedures had their own advantages individually, it is better that the static and the dynamic analysis properly be incorporated so that the best results can be achieved for