

Investigation of the Seismic Performance of RC Frames

Seyed Hamid Ziaolhagh, Farshid Jandaghi Alaei, Alireza Ahmadi

Shahrood University of Technology

Hamidz1984@yahoo.com

ABSTRACT

Conventional seismic design approach of structures is based on force and using a response modification factor (R); recent earthquakes have challenged this method. In recent years, new methods have been proposed for seismic analysis, evaluation and design of structures. These methods are mostly based on displacement and performance. The purpose of this study is to evaluate the seismic performance of reinforced concrete frames using pushover analysis. One of the most significant results of this analysis is the load-displacement response of reinforced concrete structures or their capacity curve; moreover, this analysis is one of the well-established ways in determining the response modification factor. In this paper, pushover analysis was performed using SAP2000 software. The seismic performances of conventional reinforced concrete moment frame structures were evaluated and R factors for these structures were derived.

Key Words: RC Frames, R Factor, Seismic Performance, Pushover Analysis

1 INTRODUCTION

In recent earthquakes, many concrete buildings have severely damaged or collapsed, this shows the necessity to evaluate the seismic adequacy of existing buildings, especially older concrete buildings in areas with high seismicity, in order to detect buildings possible to damage and improve their seismic safety to an acceptable level. For this assessment, simple linear elastic methods are not adequate and nonlinear methods should be used. An appropriate way to assess the vulnerability of buildings is a procedure which is named pushover analysis. Basically a pushover analysis is a set of incremental static analyses by which the capacity curve of the buildings can be obtained. One important application of this curve is in seismic design based on performance level which is the new generation of seismic design methods and structural engineering community is moving towards this approach. The objective of seismic design based on performance is designing structures such that their performance is predictable, in fact in this procedure the damage is quantified and the designer would be able to predict the amount of damages and make a conscious decision. The other name of this approach is displacement method since the quantifying of the damage is accomplished due to displacement. In methods based on performance, established upon the capacity curve, a target displacement which is an estimation of the displacement engendered by the design earthquake in the building is determined; amount of damage induced to the building in this target displacement indicates the damage to structures during the design level earthquakes. One of the major advantages of this method is that the force reduction factor of current regulations, which has been under discussion numerously, is not needed and nonlinear behavior of the structures is considered in other way. In the existing regulations the so-called response modification factors (R