



A user-code computer program to obtain the performance point, effective damping and bilinear capacity curve representation of structures

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Abstract

Performance Level is served as an index defining the state of damage occurred in a building under specific ground motions, determining of which contains complex and iterative procedures that may not be straight-forward and accurate enough. This research aims to provide user-friendly and compatible tools in the form of a computer program in order to evaluate the performance level and seismic parameters of a structure, the capacity (pushover) curve data of which is obtained using any admissible method. The user-code is written in MATLAB programming and EXCEL spread-sheet environments. It is capable of determining the performance point of the structure using ATC-40 instructions, within a 0.5% tolerance. The exact bilinear representation of the capacity curve is also obtained, from which seismic parameters are extracted. The demand curves are automatically constructed by user-specified parameters according to the Iranian seismic code (Standard No.2800) for different seismic hazard levels and underlying soil types, as well as different ratios of structure's effective damping.

Keywords: Performance point, Effective damping, Bilinear representation, Pushover, Nonlinear static analysis

1. Introduction

Performance Level is served as an index expressing the state of damage occurred in a structure under specific ground motions, determining of which contains complex and iterative procedures that may not be straight-forward and accurate enough. Different instructions have provided theoretical and practical procedures for determining the performance point and, consequently, the performance level of a structure. However, not all of them have been widely accepted. One of the most, if not the most, widely-accepted and convenient instructions for this objective is given in ATC-40 [1], a report by American Technology Council for seismic evaluation and retrofit of concrete buildings. Although this report focuses on concrete buildings in different aspects, the procedure suggested for performance evaluation of the structure is not dependent on the concrete-based assumptions and can also be used for steel-structured framed buildings.