EVALUATION OF ADAPTIVE PUSHOVER METHODS IN STRUCTURES WITH VERTICAL STRENGTH IRREGULARITIES

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ABSTRACT

In recent years, many studies have been performed to develop and improve various methods for performance evaluation of structures. One of the most practical tools for this purpose is nonlinear static analysis procedure or so called pushover analysis. Nonlinear static procedures (Push Over) have attracted special attention of researchers due to simplicity of implementation (Chopra, 2002) and ease of results interpretation. The main disadvantage of the common nonlinear static procedures in the current Codes and regulations is that a constant lateral load pattern is applied during the analysis and the changes in the modal characteristics of the structure due nonlinear behavior cannot be applied. Another dis advantage of these method is their weakness in performance evaluation of irregular structures. In these structures the estimation of nonlinear static procedures experiences meaningful errors and diverge from the result of more exact procedures such as nonlinear dynamic analysis. To overcome such a disadvantage, Adaptive Push over Procedure has been introduced by a number of researchers in recent years. In this procedure, lateral load pattern is changed in accordance with the instant stiffness matrix (Gupta and Kunnath, 2000).

In this study the ability of this method on performance evaluation of irregular building in height was examined. Different nonlinear static procedures are evaluated by applying constant and adaptive loading patterns on 20-story steel moment frames irregular in height. Seismic demands obtained from nonlinear static procedures were compared with exact results obtained from the nonlinear time history dynamic analysis. The results indicated that among chosen method, Shear-based Adaptive Procedure (SAP) has the best performance in predicting the seismic demands among other Adaptive Procedures in performance evaluation of irregular buildings.

INTRODUCTION

Irregular structures are generally divided into two groups of structures irregular in plan and elevation. Irregularity in plan is due to non-compliance of the centers of mass and stiffness. While irregularity in height, is due to the change in dynamic specifications of the structure in vertical direction. This will cause significantly different values of mass, stiffness and strength at different stories if the structure. This type of