

Comparison between Pushover Analysis Techniques and Validation of the Simplified Modal Pushover Analysis

Authors : N. F. Hanna, A. M. Haridy

Abstract : One of the main drawbacks of the Modal Pushover Analysis (MPA) is the need to perform nonlinear time-history analysis, which complicates the analysis method and time. A simplified version of the MPA has been proposed based on the concept of the inelastic deformation ratio. Furthermore, the effect of the higher modes of vibration is considered by assuming linearly-elastic responses, which enables the use of standard elastic response spectrum analysis. In this thesis, the simplified MPA (SMPA) method is applied to determine the target global drift and the inter-story drifts of steel frame building. The effect of the higher vibration modes is considered within the framework of the SMPA. A comprehensive survey about the inelastic deformation ratio is presented. After that, a suitable expression from literature is selected for the inelastic deformation ratio and then implemented in the SMPA. The estimated seismic demands using the SMPA, such as target drift, base shear, and the inter-story drifts, are compared with the seismic responses determined by applying the standard MPA. The accuracy of the estimated seismic demands is validated by comparing with the results obtained by the nonlinear time-history analysis using real earthquake records.

Keywords : modal analysis, pushover analysis, seismic performance, target displacement

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