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Pushover Analysis of Masonry Infilled Reinforced Concrete Frames for Performance Based Design for near Field Earthquakes

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Abstract : Non-linear dynamic time history analysis is considered as the most advanced and comprehensive analytical method for evaluating the seismic response and performance of multi-degree-of-freedom building structures under the influence of earthquake ground motions. However, effective and accurate application of the method requires the implementation of advanced hysteretic constitutive models of the various structural components including masonry infill panels. Sophisticated computational research tools that incorporate realistic hysteresis models for non-linear dynamic time-history analysis are not popular among the professional engineers as they are not only difficult to access but also complex and time-consuming to use. And, commercial computer programs for structural analysis and design that are acceptable to practicing engineers do not generally integrate advanced hysteretic models which can accurately simulate the hysteresis behavior of structural elements with a realistic representation of strength degradation, stiffness deterioration, energy dissipation and 'pinching' under cyclic load reversals in the inelastic range of behavior. In this scenario, push-over or non-linear static analysis methods have gained significant popularity, as they can be employed to assess the seismic performance of building structures while avoiding the complexities and difficulties associated with non-linear dynamic time-history analysis. "Push-over" or non-linear static analysis offers a practical and efficient alternative to non-linear dynamic time-history analysis for rationally evaluating the seismic demands. The present paper is based on the analytical investigation of the effect of distribution of masonry infill panels over the elevation of planar masonry infilled reinforced concrete (R/C) frames on the seismic demands using the capacity spectrum procedures implementing nonlinear static analysis (pushover analysis) in conjunction with the response spectrum concept. An important objective of the present study is to numerically evaluate the adequacy of the capacity spectrum method using pushover analysis for performance based design of masonry infilled R/C frames for near-field earthquake ground motions.

Keywords : nonlinear analysis, capacity spectrum method, response spectrum, seismic demand, near-field earthquakes
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