A MODAL PUSHEROVER ANALYSIS PROCEDURE FOR ESTIMATING SEISMIC DEMANDS FOR BUILDINGS

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SUMMARY

Developed herein is an improved pushover analysis procedure based on structural dynamics theory, which retains the conceptual simplicity and computational attractiveness of current procedures with invariant force distribution. In this modal pushover analysis (MPA), the seismic demand due to individual terms in the modal expansion of the effective earthquake forces is determined by a pushover analysis using the inertia force distribution for each mode. Combining these “modal” demands due to the first two or three terms of the expansion provides an estimate of the total seismic demand on inelastic systems. When applied to elastic systems, the MPA procedure is shown to be equivalent to standard response spectrum analysis (RSA). When the peak inelastic response of a 9-story steel building determined by the approximate MPA procedure is compared with rigorous nonlinear response history analysis, it is demonstrated that MPA estimates the response of buildings responding well into the inelastic range to a similar degree of accuracy as RSA in estimating peak response of elastic systems. Thus, the MPA procedure is accurate enough for practical application in building evaluation and design.