

Simplified Analysis Procedure for Seismic Evaluation of Tall Building at Structure and Component Level

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Abstract : Simplified static analysis procedures such Nonlinear Static Procedure (NSP) are gaining popularity for the seismic evaluation of buildings. However, these simplified procedures accounts only for the seismic responses of the fundamental vibration mode of the structure. Some other procedures which can take into account the higher modes of vibration, lack in accuracy to determine the component responses. Hence, such procedures are not suitable for evaluating the structures where many vibration modes may participate significantly or where component responses are needed to be evaluated. Moreover, these procedures were found to either computationally expensive or tedious to obtain individual component responses. In this paper, a simplified but accurate procedure is studied. It is called the Uncoupled Modal Response History Analysis (UMRHA) procedure. In this procedure, the nonlinear response of each vibration mode is first computed, and they are later on combined into the total response of the structure. The responses of four tall buildings are computed by this simplified UMRHA procedure and compared with those obtained from the NLRHA procedure. The comparison shows that the UMRHA procedure is able to accurately compute the global responses, i.e., story shears and story overturning moments, floor accelerations and inter-story drifts as well as the component level responses of these tall buildings with heights varying from 20 to 44 stories. The required computational effort is also extremely low compared to that of the Nonlinear Response History Analysis (NLRHA) procedure.

Keywords : higher mode effects, seismic evaluation procedure, tall buildings, component responses

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