A NOTE ON THE SEISMIC RESPONSE PARAMETERS OF RGULAR AND BRB DIAGONAL BRACED STRUCTURAL SKELETONS IN STEEL MIDRISE BUILDINGS

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In this study, the seismic performance of a steel midrise building with diagonal bracing system in three types of Regular, Stiffened regular and BRB configurations were evaluated and the analytical results were compared. A ten-story skeletal building with seven bays of 6m in x and y directions of the plan were considered, as shown in Figure 1. The lateral load resistant system of the studied structures is consisted of a configuration of diagonal single braced panels as well as the applied assumption of pinned connections between beam and column elements. The story height of the building is 3.50m. All braced bays are symmetrically located along the exterior perimeter of the building (Figure 1). The three studied models with the aforementioned structural skeleton were designed according to the Iranian seismic code 2800 (3rd Edition). A number of nonlinear dynamic time history analyses were carried out for all studied models subjected to an ensemble of seven strong near-field strong records.

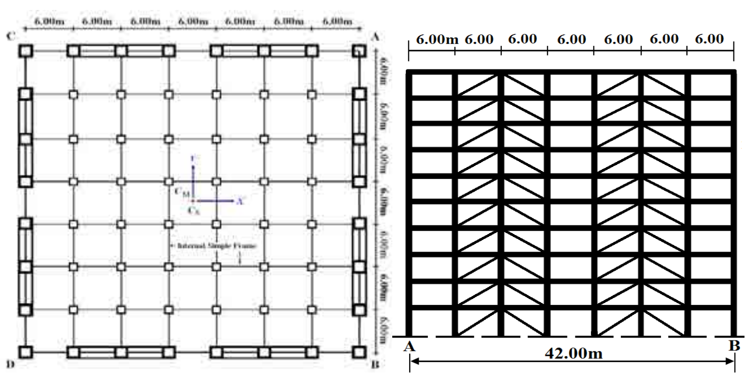

Figure 1. Plan view and braces configuration of the studied buildings, C_M: mass center, C_S: shear center

In Figure 2, the time history of ground velocity corresponding to the fault normal component of the main records of two famous Iranian powerful earthquakes i.e. the Bam 2003, and the Tabas 1978 are shown. It is shown that there are high amplitude and long period velocity pulses which are obviously displayed in the both time histories. The results of accomplished studies on near field strong earthquake records denote that simultaneous groups of acceleration spikes and corresponding coherent velocity pulses are usually appeared in the time history of ground motion. It is noticeable that during the pulse period, a large amount of kinematic energy of a strong near field record which contains forward directivity effects is intensively released.

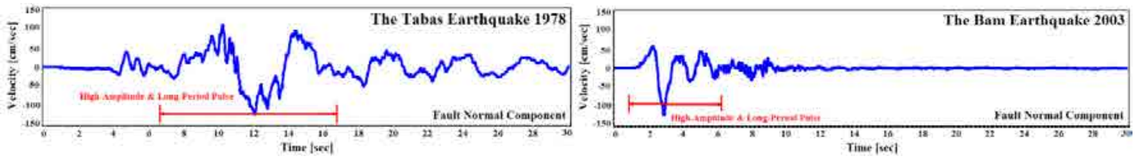

Figure 2. Ground velocity time history corresponding to the fault normal component of main record of the Bam and the Tabas earthquakes in Iran which both contain long-period and high-amplitude coherent pulses

Figure 3 illustrates the overall changes of the maximum drift parameter corresponding to X direction of the plan of the studied structures with the resistant system of stiffened diagonal bracings and the other one with BRB elements. Based on Figure 3, there are sharper changes in the diagrams of the drift parameter related to the studied structure with stiffened regular bracing system than the model with BRBs resistant system. The main reason is the existence of severe interaction between both, the dynamic shear and the axial force resultants in overall seismic behavior of each of stiffened bracing elements. Furthermore, this process would be strongly influenced by the intensive propagation of higher frequency earthquake waves as well as the more effective exhibition of higher vibration modes in the dynamic deformation of the structure.

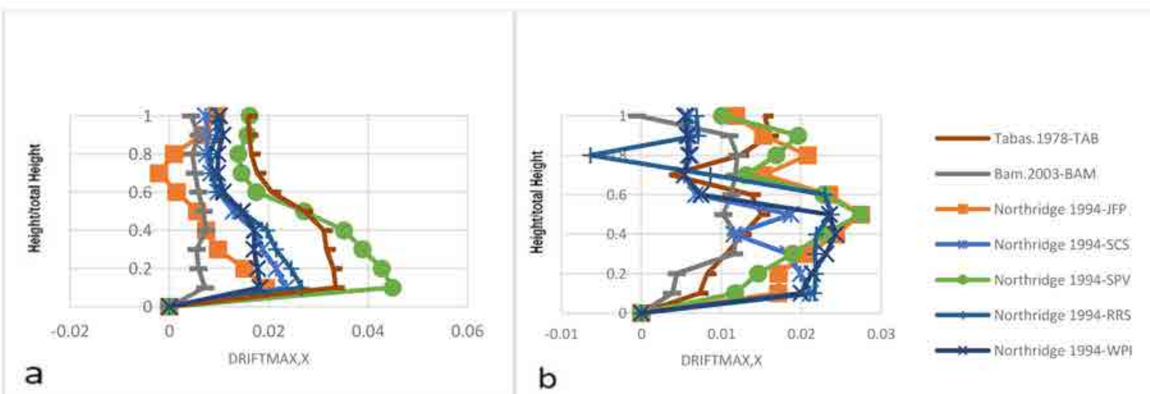

Figure 3. Interstory drift ratio; (a) the case study of BRBs system, (b) the case study of stiffened regular braces

The results of this research demonstrate that the application of BRBs system with single diagonal configuration is suitable for steel mid-rise buildings. There is more appropriate general seismic performance compared to both, the regular and the stiffened bracings resistant structural skeletons.

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