EVALUATION OF EFFECTIVE PARAMETERS ON SEISMIC BEHAVIOR OF STEEL BRACED FRAME WITH CONTROLLED ROCKING APPROACH

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During a large earthquake, traditional seismic lateral resisting systems can experience significant damage distributed throughout the structural system, and residual drifts that make it difficult, if not financially unreasonable, to repair. A controlled rocking system has been devised which virtually eliminates residual drifts and concentrates the majority of structural damage in replaceable fuse elements. The controlled rocking system consists of three major components: 1) a stiff steel braced frame that remains virtually elastic, but is not tied down to the foundation and thus allowed to rock, 2) vertical post-tensioning strands that anchor the top of the frame down to the foundation, which brings the frame back to center, and 3) replaceable structural fuses that absorb seismic energy as the frames rock. (Ma et al., 2008). The configuration is shown in Figure 1.

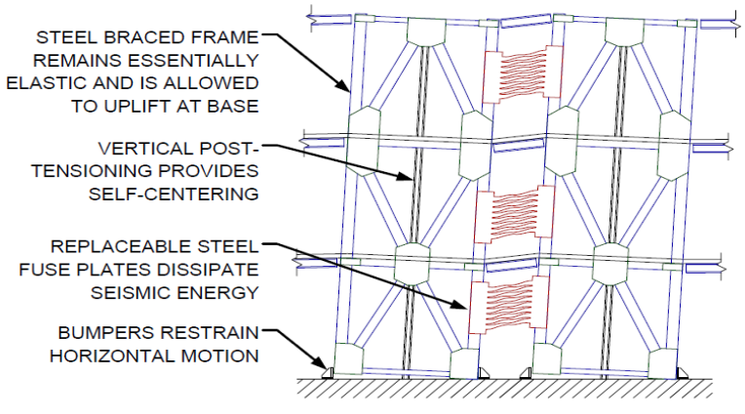

Figure 1. Controlled Rocking System (Hajjar et al., 2013)

Inorder to simulate this mechanism for a relatively comprehensive parametric study, nonlinear time history analyses are carried out using the SAP 2000 software.

In this study seismic performance of rocking structures are compared with those of the traditional structures. In addition, seismic performance of the controlled rocking frame is obtained by changing fuses parameters and their location, location of post-tensioning tendons, their cross section and their pre-stressed load.

The response parameters are the axial force in the first floor columns, the maximum horizontal acceleration in floors, base shear, the uplift force in first floor columns and base uplift.

Figures 2 and 3 are the sample of response parameters in rocking frame.

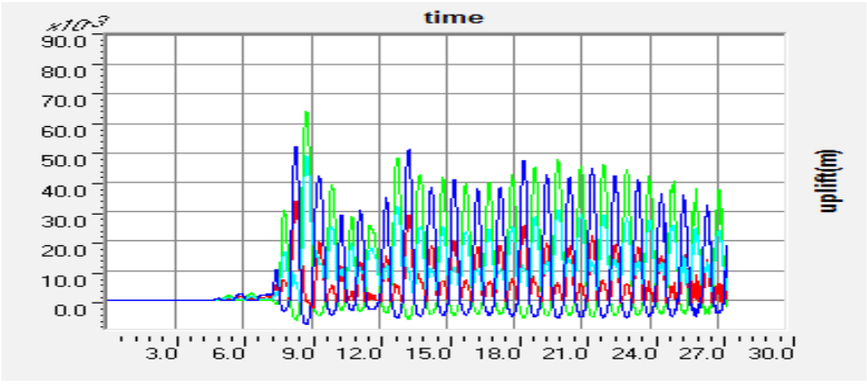

Figure 2. Uplift in base of first floor columns

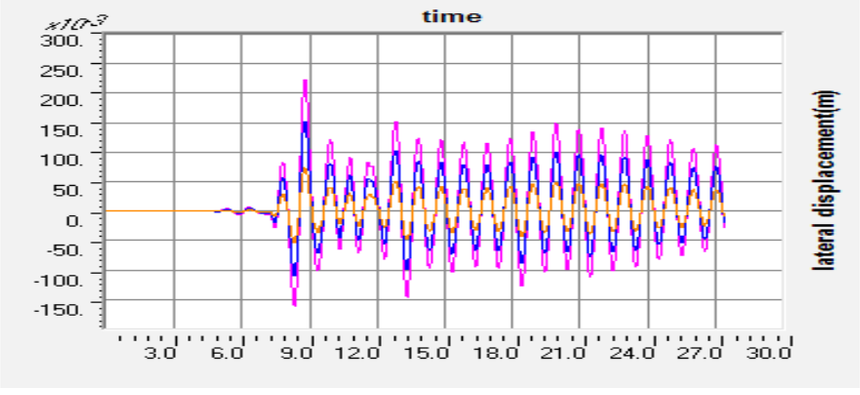

Figure 3. Lateral displacement of floors

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