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EXAMINING THE EFFECTIVE PARAMETERS OF FUSE IN SEISMIC BEHAVIOR OF LOW DAMAGE STEEL-BRACED FRAME SYSTEMS

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Past earthquakes experiences identifies the need for buildings which are less vulnerable to damage and easier to repair after a major earthquake. Applying new types of structural systems which is known as low damage systems is promoted in framework of a resilience based design.

These systems include components of rocking able frame, replaceable fuses and vertical post tensioning tendons to return the structure to its initial state.

Low damage system is a resisting system with high performance against earthquake. An important class of this system has controlled rocking frames and replaceable fuses that is combination of conventional steel braced frame characteristics and energy dissipating devices.

The proposed model includes three story braced steel frame. Initial model has selected from SAC studies and altered to a low damage system therefore all columns can rock. For nonlinear dynamic analyses of the model, seven records have selected. These records include earthquakes with magnitude up to 6.

For examining effects of parameters on the behavior of fuse and steel braced frame, following steps have been followed: At first, seven records of earthquake with magnitudes up to 6 have been taken from PEER database and the steel braced frame with low damage system subjected to these records has been analyzed. Outputs include tension and compressive axial forces of columns in the first floor, uplifts, drifts, horizontal and vertical accelerations of floors. All the results and diagrams are average of maximum responses. In continue, each of effective parameters has been increased or decreased while other parameters are constant, and with that values the system has been run and outputs are compared with the original system. The original values of these parameters have been taken from experiments that Medina et al. had done in Stanford University. Complement report of these experiments have been brought from NEEShub.

Effective parameters of fuse that have examined in this study are (Figure 1):

1. Yield strength (Fy)
2. Elasticity Module: slope of line D(E)
3. Post capping slope, as a ratio of the initial stiffness (alpha cap)
4. Pinching parameter-displacement factor (alpha pinch)
5. Pinching parameter-force factor (beta cap)
6. Strain in plastic region (delta cap)
7. Residual strength: ratio of strength point C to strength point A (Resid.)

Finally, according to the studies and experiments that have been done, low damage structural system has a better performance in large earthquakes compared with common structural systems. In this article, effective parameters on behavior of fuse are introduced and examined. According to the results, yield strength, alpha cap and delta cap should not be changed and increased from their original amounts. Amount of elasticity module parameter should not be increased from the original amount. Beta cap parameter should not decrease from the original amount. Changes of alpha pinch parameter did not have remarkable effect. Last parameter is residual strength that the frame is sensitive to its changes. It is better that amount of this parameter neither reduced from the original amount nor significantly

increased. Within these limits, it is expected that this frame with low damage system can have the best performance in large earthquake.

Figure 1. Stress-Strain curve for fuse panel.

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