Comparative Study on Seismic Behavior of SCBF With EBF Systems

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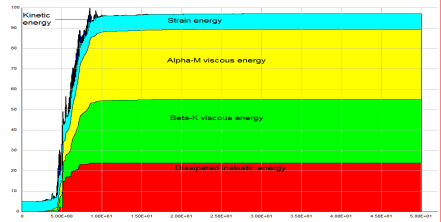
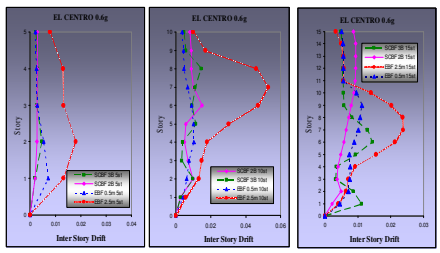
Summary: **According to extensive damage of CBF systems in recent earthquakes, the Special Concentrically Braced Frames (SCBF) and Eccentrically Braced Frames (EBF) have been introduced in recent years. In this study The behavior of SCBF systems have been compared with EBF in 5, 10 and 15 stories buildings. Global ductility, maximum story drift and roof drift for two types of bracing frames have been investigated after nonlinear dynamic analysis. Input ground motions used in dynamic analysis is both near field and far field motions. Results show that the frames both in modified CBF and EBF systems behave in an acceptable manner. Whereas the stiffness of SCBF systems is more than EBF systems and it could suffer more base shears. The conclusions of investigating some parameters like global ductility and maximum dissipated inelastic energy are discussed in this study. These parameters also depend on level of PGA and frequency of contents of seismic motions.**



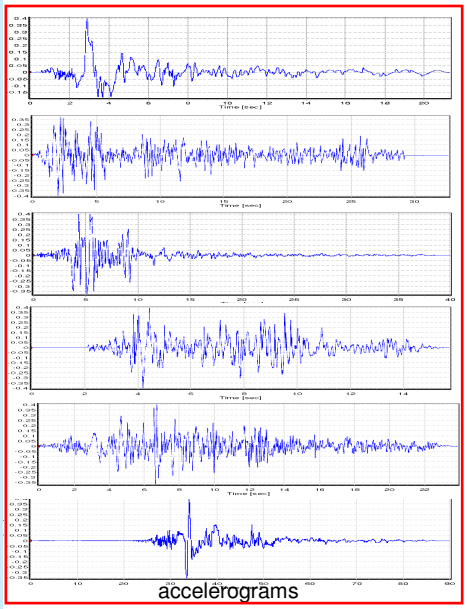
Energy break-down for 5 story SCBF 2Bay



comparisons of 5, 10 and 15 story drifts for different systems under El Centro earthquake with the PGA 0.6g

MODELING & ANALYZING:

Two EBF models both with 2 braced spans have been analyzed. One of the EBF models has link beam with length of 0.5m that represented shear-link beam and the other has the link beam with length of 2.5m that represented moment-link beam. Also two SCBF models that have 2 and 3 braced spans have been analyzed. All models have been analyzed with 5, 10, and 15 numbers of floors. Modeling of buildings has been done by using Programs ETABS v8.45 and RAMPerform-3D. The models hinge properties have been modeled according to FEMA356. analyzing have been done by nonlinear dynamic method. To perform nonlinear dynamic analysis horizontal components of 6 strong motions have been applied to the models. (Tabas, Imperial valley, EL Centro, have been chosen as far-field records and Northridge, ChiChi, Erzincan have been chosen as near-field records.)



accelerograms

Results: The input energy that represents the demand on the structure and the hysteric energy to input energy ratios have been evaluated for the models. Also maximum base shear, the inter-story drifts and roof displacements have been investigated for models under dynamic loading and scaled PGAs amounts.

Conclusion:

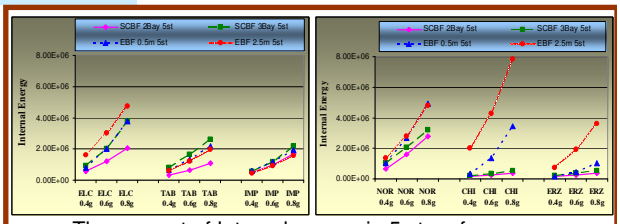
- The hysteric energy to input energy ratio is more in EBFs than the SCBF systems. The difference of this ratio for EBFs and SCBFs reduced by increasing in PGA values.

- By increasing the PGAs the maximum base shear increases too. It should be said that after some increases in PGAs the rate of the increase in maximum base shear reduced

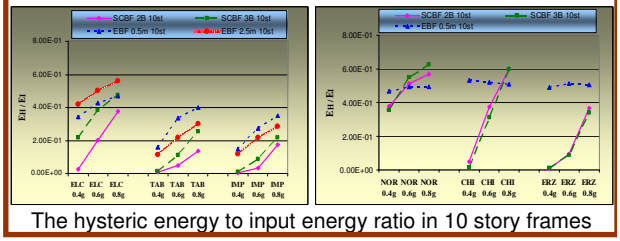
- The maximum base shear is the most in SCBF systems with 3 braced spans and reduced in order in SCBF systems with 2 braced spans, shear link-beam EBF systems and moment link-beam EBFs.

- In all frames corresponding all strong motions both near-field and far-field motions the shear link-beam EBF systems have less drifts than moment link-beam EBF systems, therefore the probability to form the flexible story in moment link-beam EBFs is more than shear link-beam EBFs.

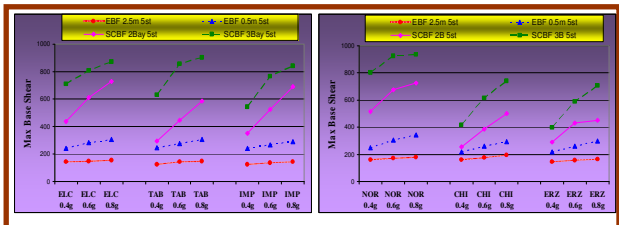
- As the height of frames goes upper, the increase in number of spans in SCBF systems causes the reduction of drifts specially in the upper stories.



The amount of Internal energy in 5 story frames



The hysteric energy to input energy ratio in 10 story frames



The maximum base shear in 5 story frames