

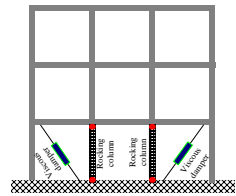
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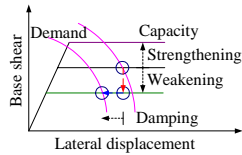
ABSTRACT

In yielding structures acceleration response is proportional to structural strength after yielding. Structural strength needs to be controlled in order to protect structural and nonstructural components. The current retrofit methods, such as bracing systems, lead to increase in the strength. Correspondingly, story accelerations are increased, while the displacement demands are decreased. Also the ductility demand is decreased. Damping and strength reduction can control both accelerations and displacement response. This study is only focused to the strength reduction technique defined here as "weakening". The weakening structure can be implemented by allowing the columns or beams to rotate freely at the connections. Rocking columns, the subject of this work, are alternative techniques for strength reduction. Globally however, the control of deformations should be done by other parts of the structural system. The simplified model of rocking column is proposed and compared with the experiment results conducted at University at Buffalo. The computational techniques for implementing the simplified model of the rocking column in IDARC2D are completed. Furthermore, the story displacement and strength of the global behavior is investigated with the one-third scale model structure.

BACKGROUND



Weakened and Damped structure



Capacity-Demand curve

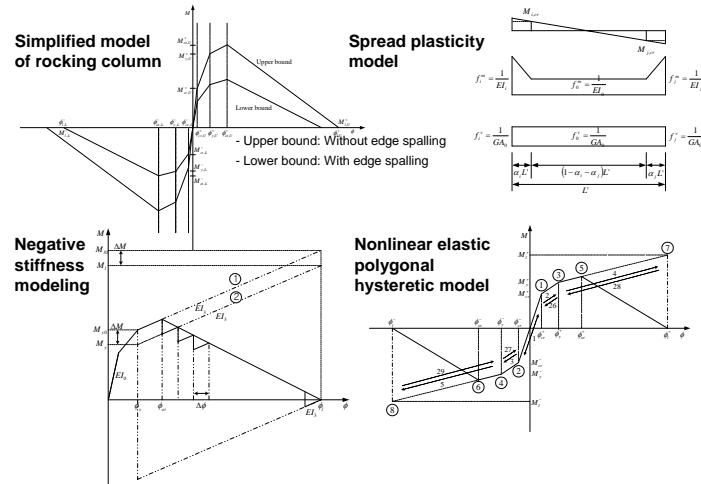
- Weakening structures: Reduce of strength response
- Damping structures : Reduce of displacement response

OBJECTIVES

- Development of simplified model of rocking column
- Implementation in computer program
- Verification of simplified model using the implemented computer program with experiment results
- Weakening effects of 1/3 scale lightly reinforced concrete structure

METHODS

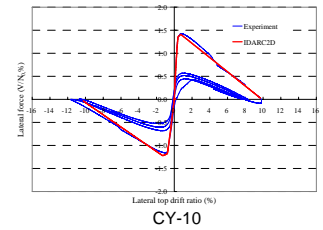
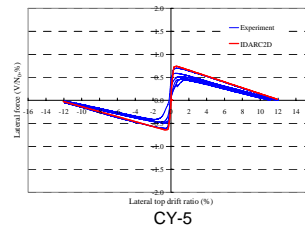
Simplified model of rocking column and IDARC2D implementation



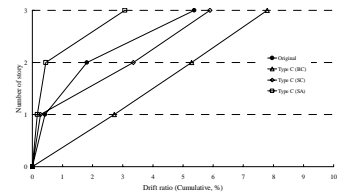
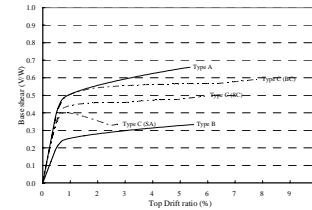
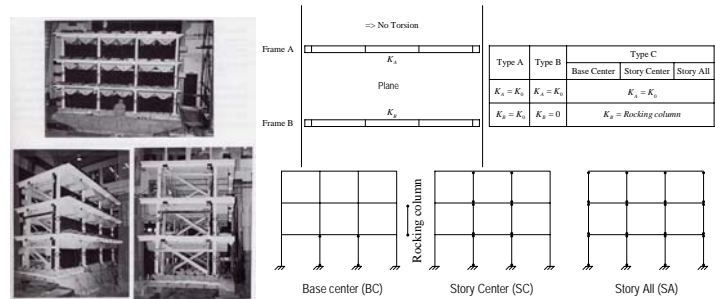
RESULTS

Comparison with experiment results

- Column length and depth: 48in. and 7in.
- Yield strength: 5.2ksi
- Yield strain: 0.0037
- Cyclic test : CY-5 & CY-10
- * 5 and 10 means the percentage of the applied axial load to the nominal strength



1/3 scale model structure: J. M. Bracci, A. M. Reinhorn and J. B. Mander (1992)



CONCLUSIONS

- The proposed simplified model of rocking column is comparable
- IDARC2D can simulate the rocking column element
- The capacities of global strength and top displacement are decreased depending on the position of rocking columns.
- When the rocking columns are provided to all structural column elements, the total displacement is localized on the top story.
- When the rocking columns are used for the base columns, the top displacement is a maximum. That is matched with the concept of weakening structure

ACKNOWLEDGEMENTS

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