

**P
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Characterization of Building Component Response

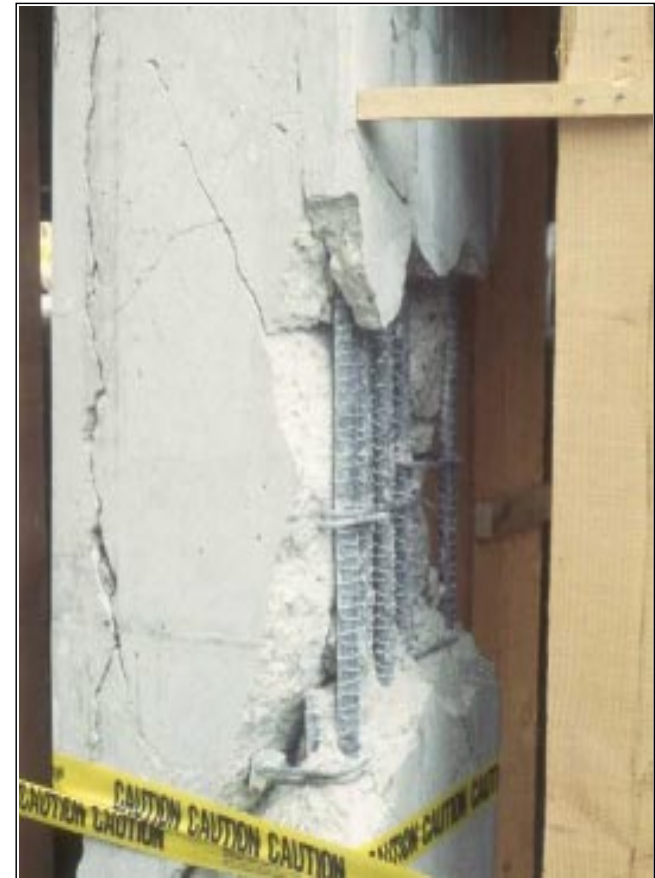
Thrust Area 5 - Capacity Assessment

Dawn Lehman

University of Washington



Observed Damage: Columns



Observed Damage: Joints



Influence on System Performance



Component



Non-Structural

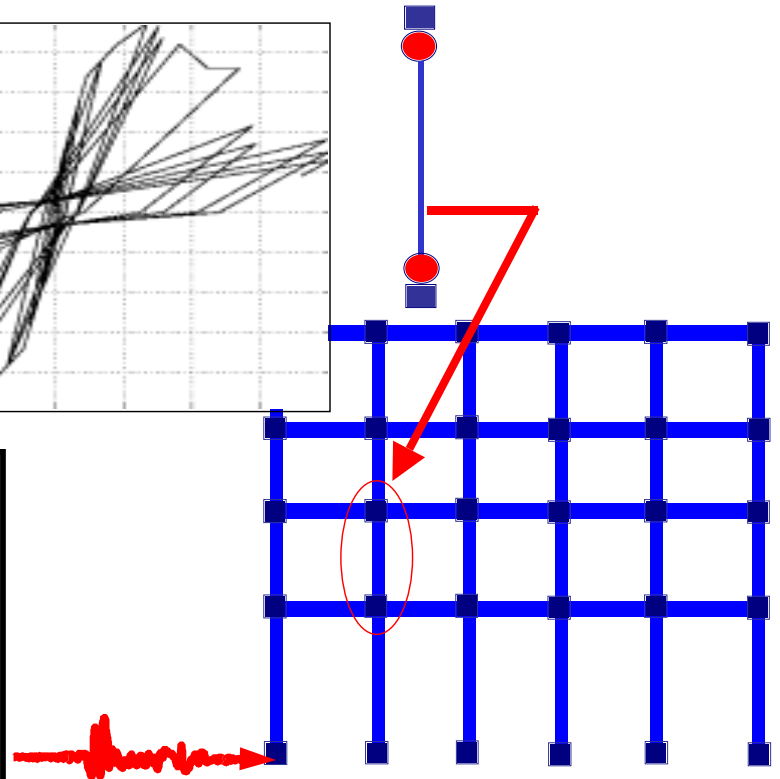
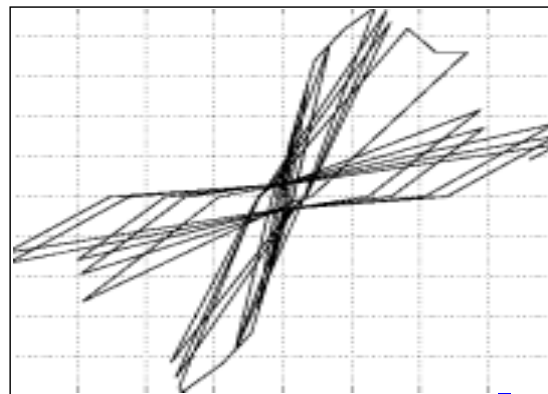
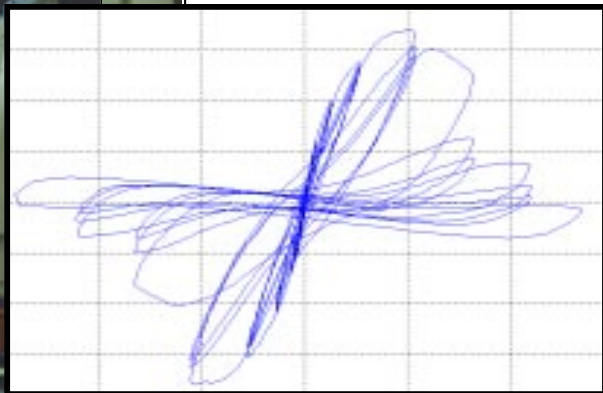
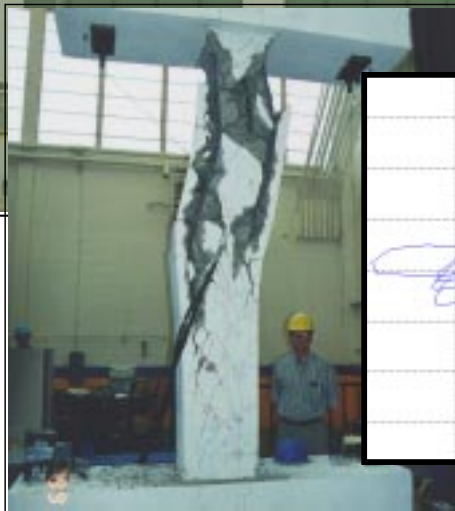
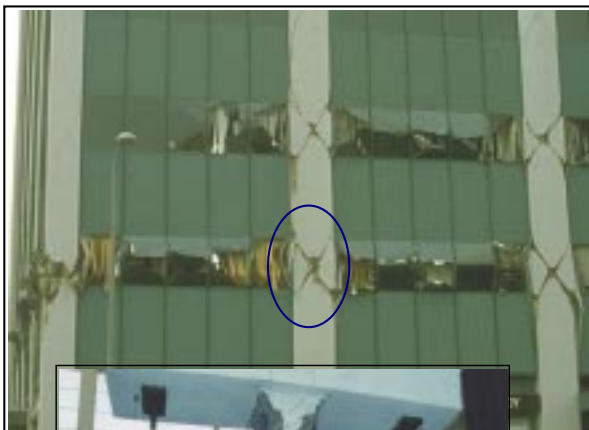


Collapse



PEER Framework Equation

$$\lambda(\underline{DV}) = \iint G(\underline{DV} | \underline{DM}) dG(\underline{DM} | \underline{IM}) d\lambda(\underline{IM})$$



PEER Research Program



Shear-Critical Columns

Moehle, University of California, Berkeley

Columns with Splices

Wallace, UCLA



Interior Beam-Column Joints

Lehman and Stanton, UW

Exterior Beam-Column Joints

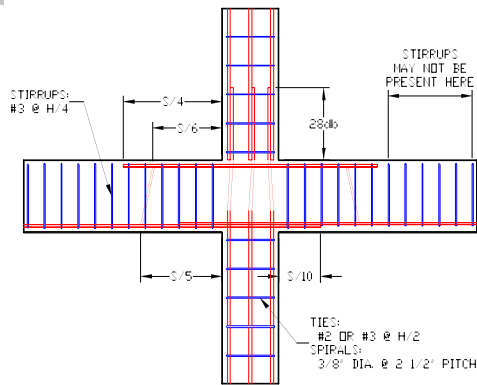
Pantelides, University of Utah



Slab-Column Connections

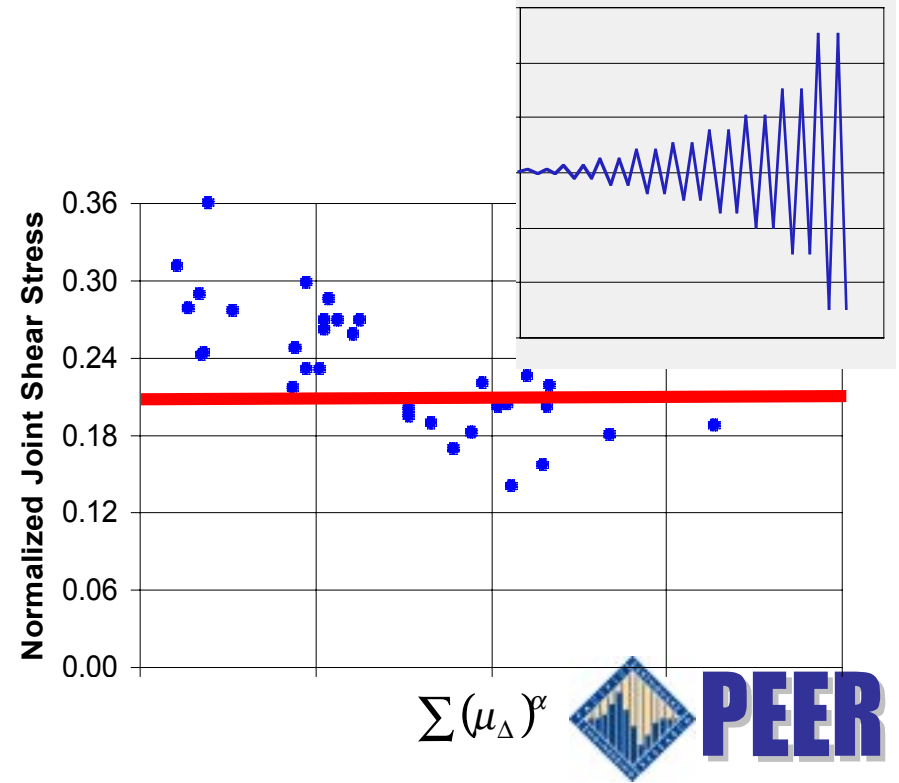
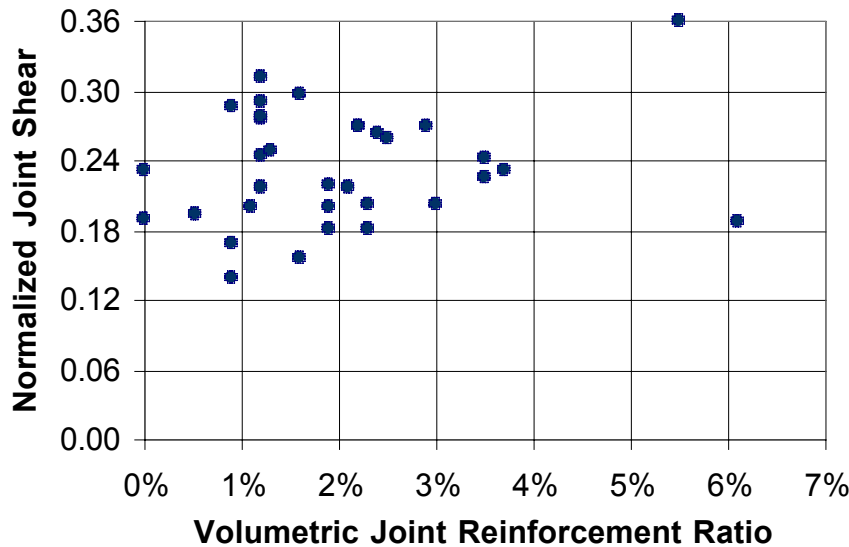
Robertson, University of Hawaii

Why More Tests?



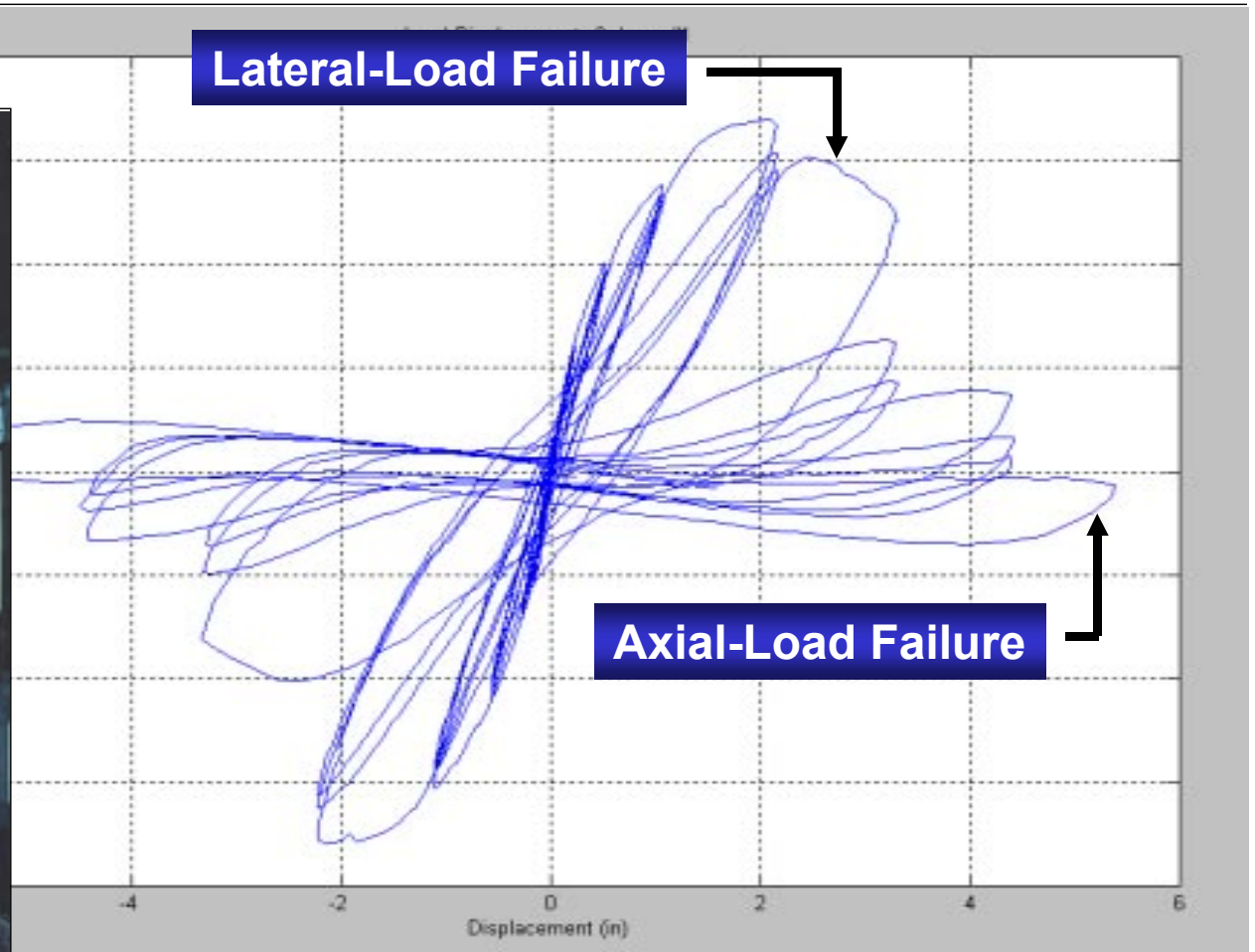
① To characterize performance of components with non-ductile details

② To assess influence of important parameters (displacement history)



Evaluation of Gravity-Load Carrying Capacity

- Full-scale
- $L = 120$ in.
- $s = d/2$

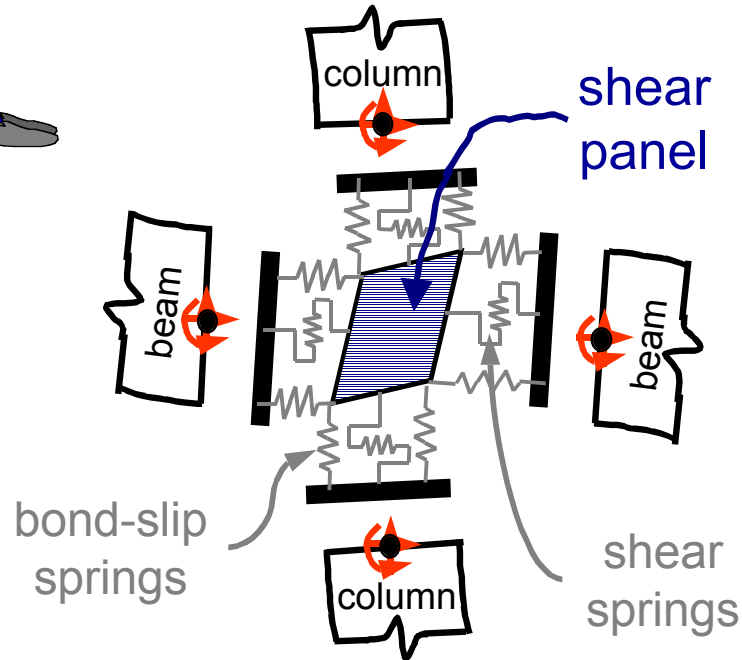


Moehle et al. 2000



End Users of Experimental Data

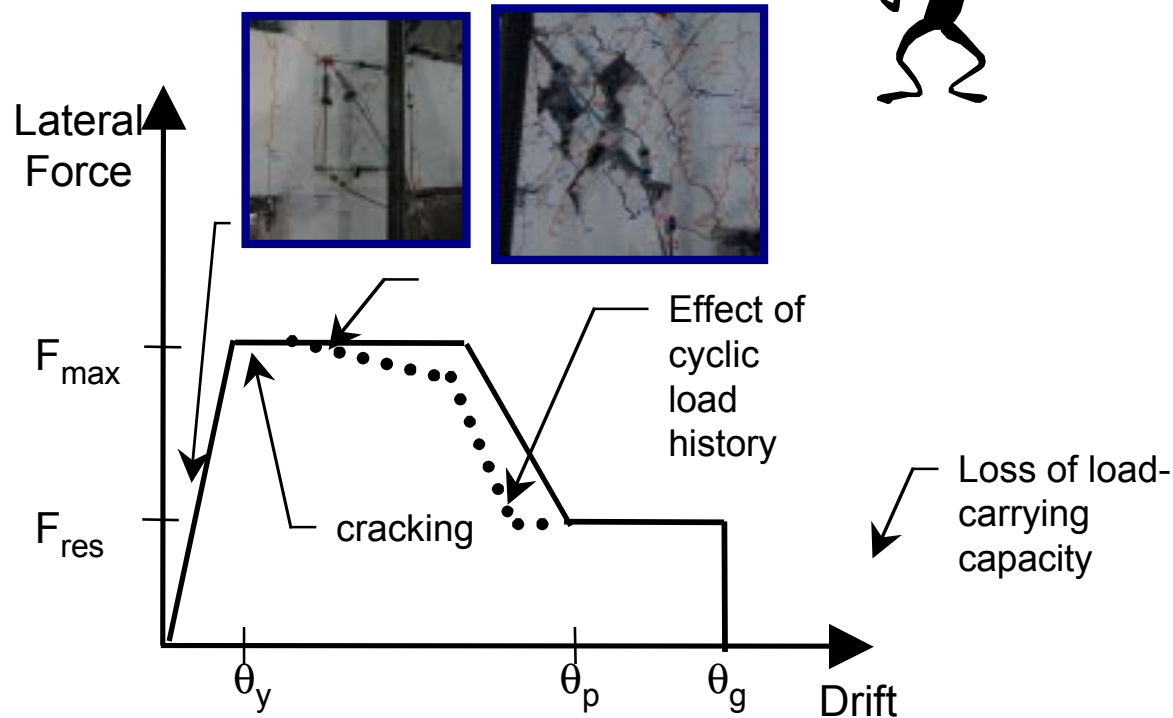
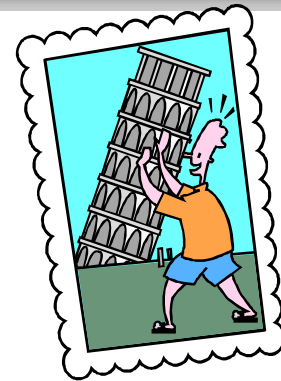
Analysts



From Lowes and Altoontash, 2000

End Users of Experimental Data

Practicing Engineers



End Users of Experimental Data

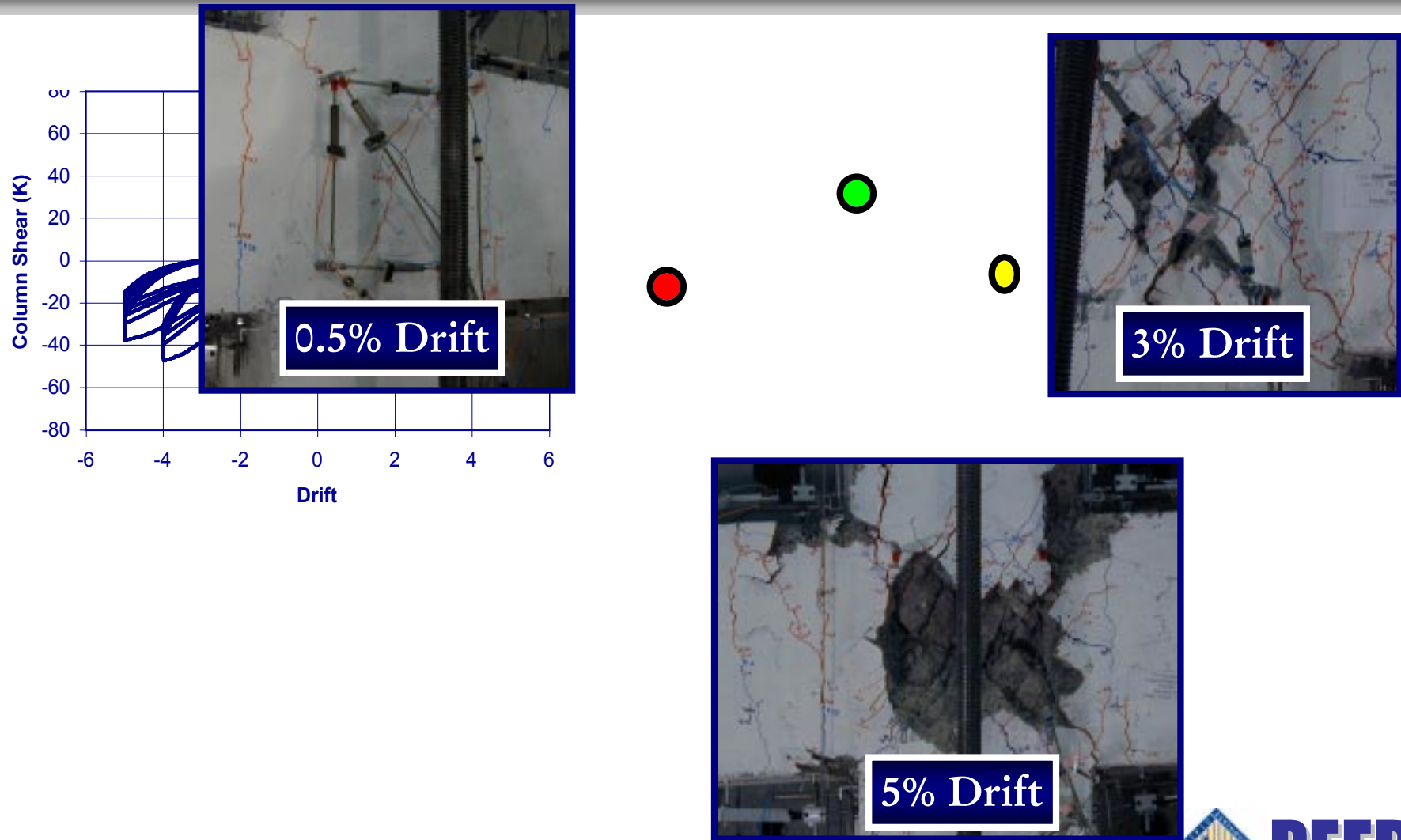
Socio-Economic Assessment



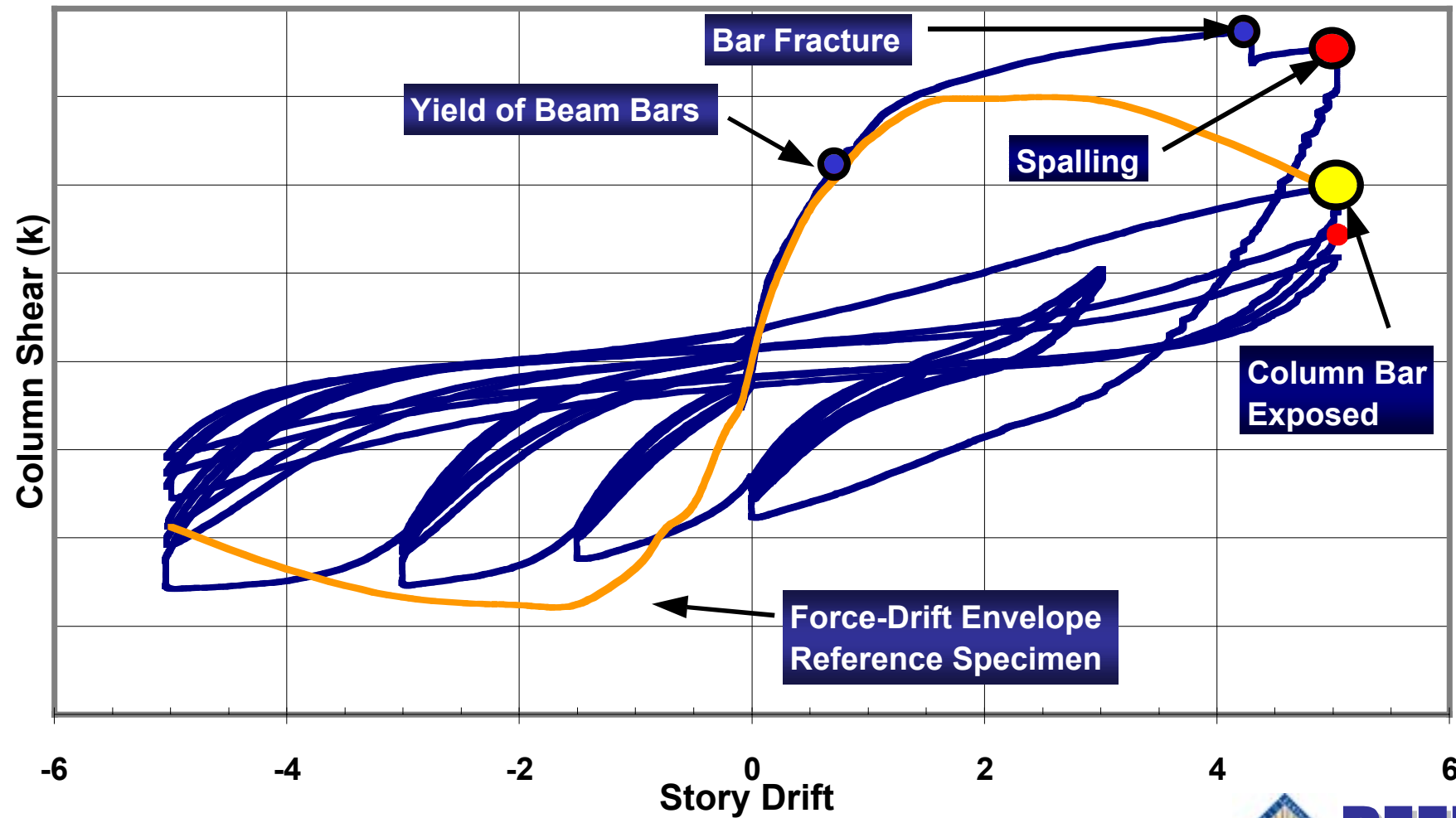
Research Objectives

- To link component damage and engineering limit states (DV/DM)
- To develop *design and assessment tools* for use in conceptual design and engineering evaluation
- To support development and calibration of response-history models
- To support validation of detailed models for parametric study to develop DV/DM relationship

Influence of Displacement History

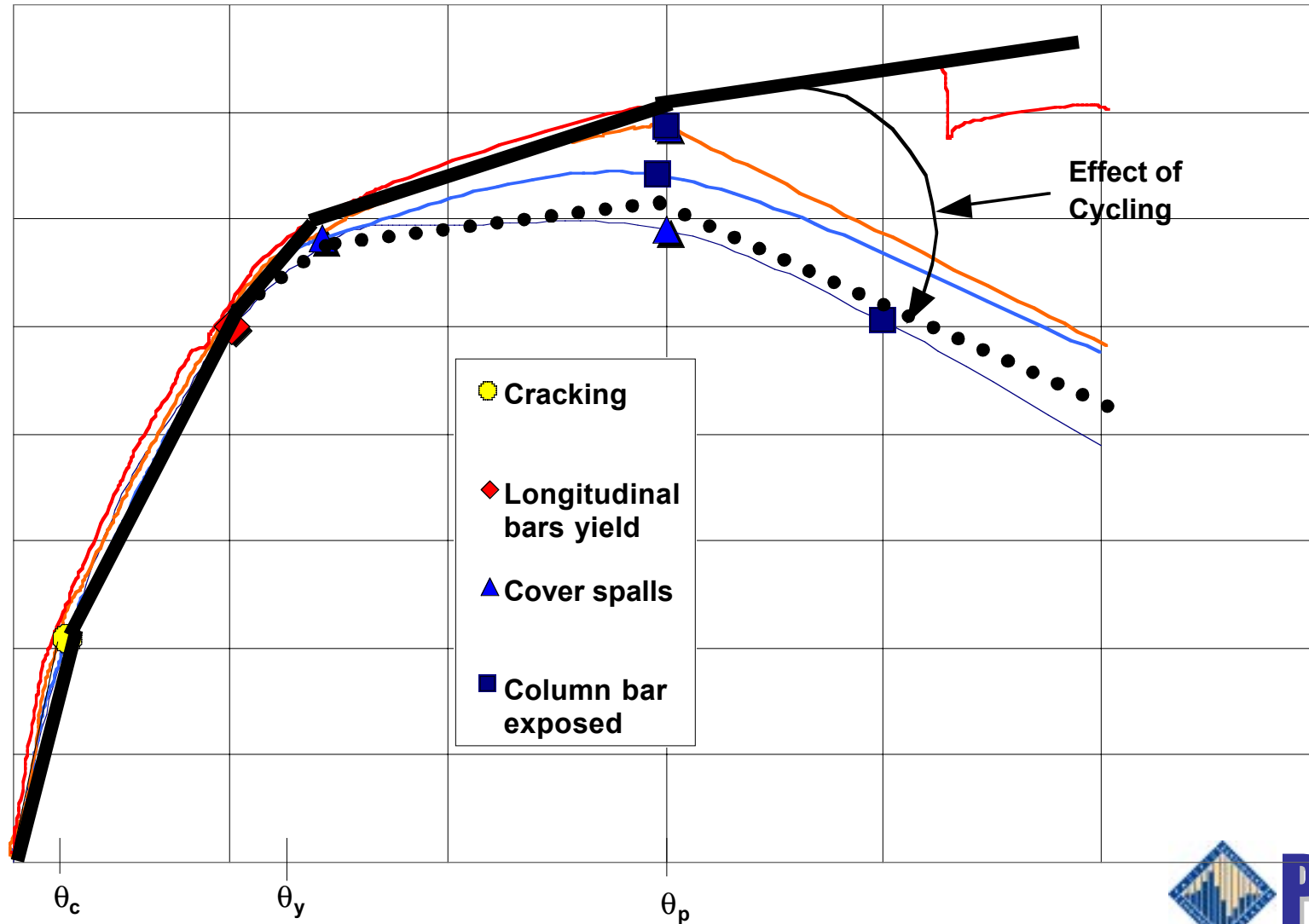


Influence of Displacement History

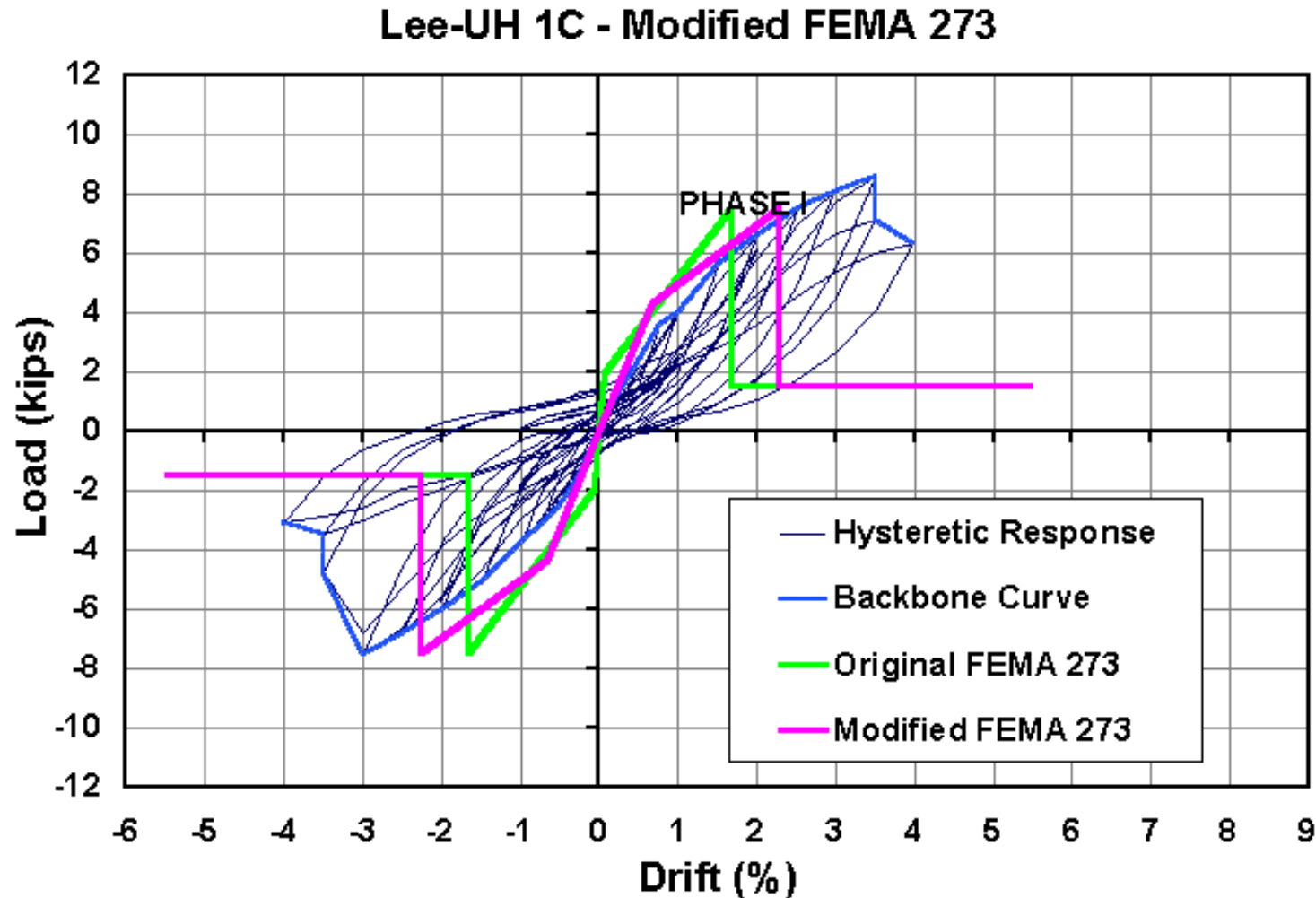


Limit-State Model

Damage Related to Drift

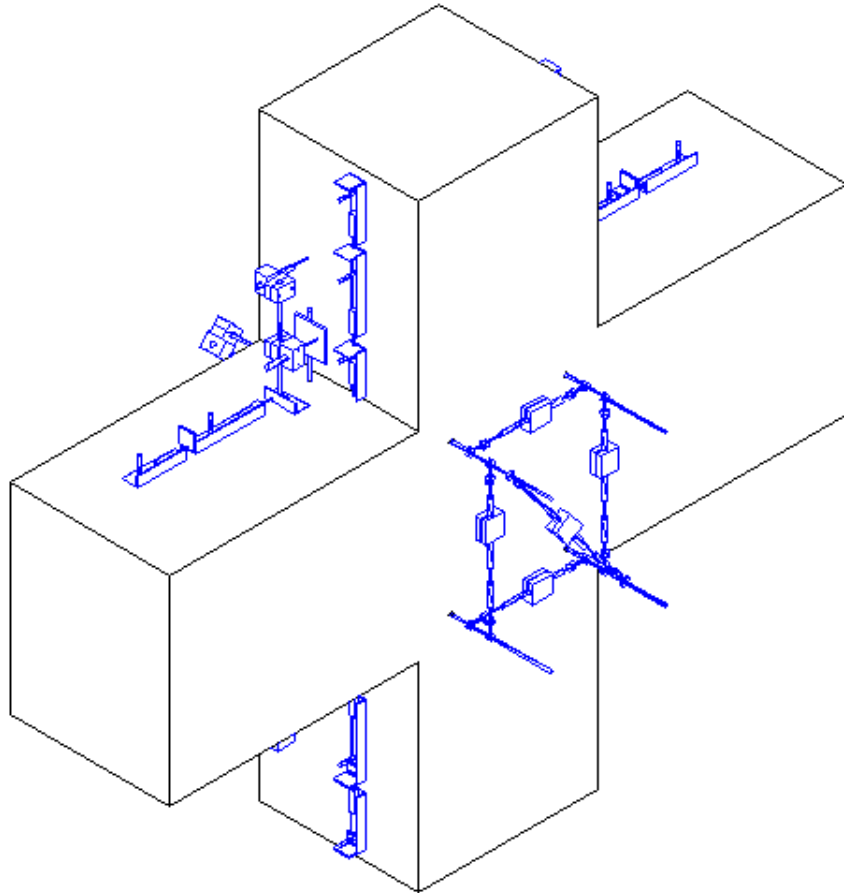


Slab-Column Response



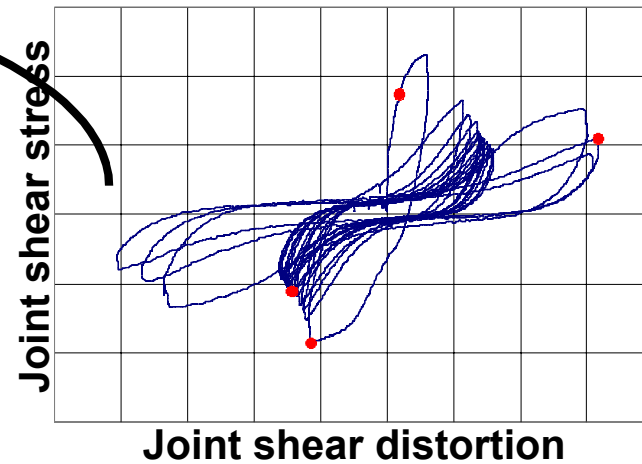
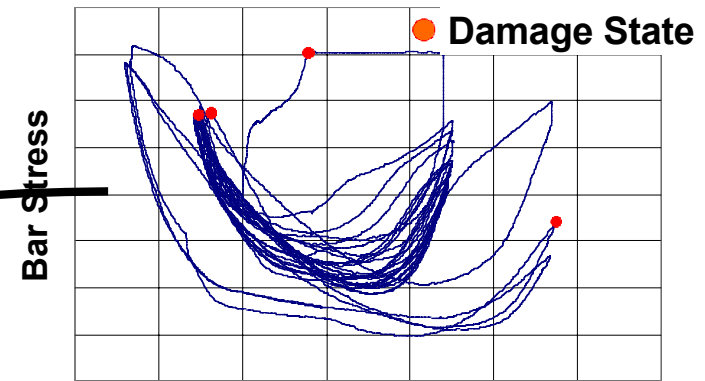
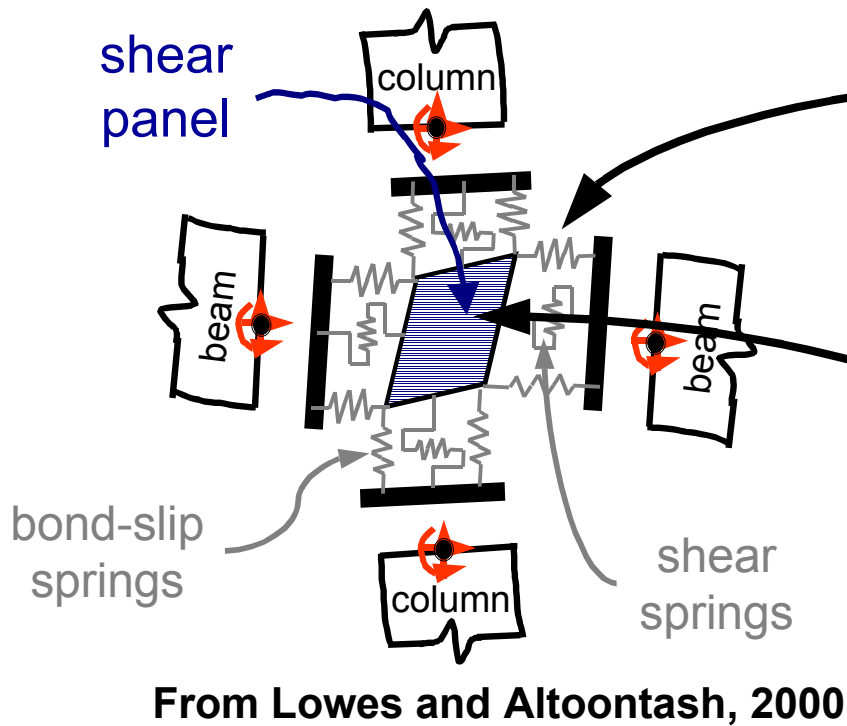
Lee and Robertson, 1999

Experimental Data

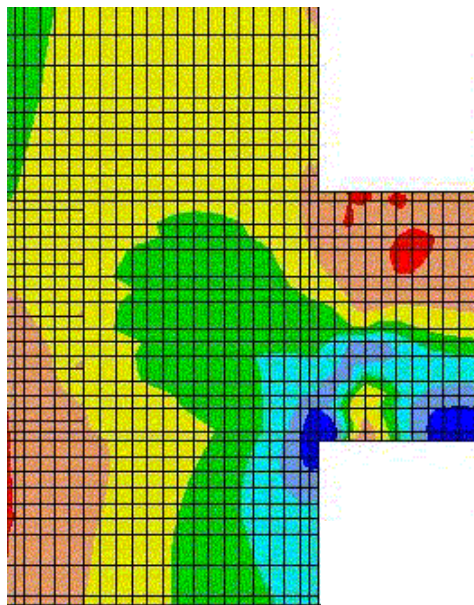


- Displacements, Drifts
- Component Contributions
(e.g., Column, Beam, Joint)
- Curvature Histories
- Strain Histories

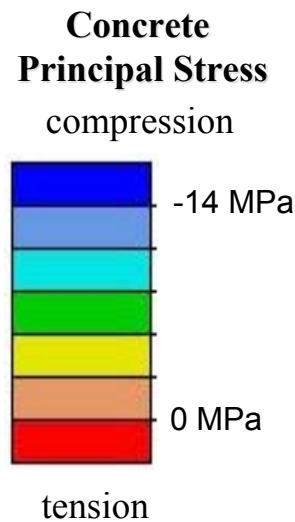
Calibration of Response-History Model



Assessment of Performance Models Using Finite Element Models



Lowes 1999



Pantelides 2000

Status of Research

- ☞ To link component damage and engineering limit states (DV/DM)
- ☞ To develop *design and assessment tools* for use in conceptual design and engineering evaluation
- ☞ To support development and calibration of response-history models
- To support validation of detailed models for parametric study to develop DV/DM relationship