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Advances on Dual-Steel Shell Self-centering Bridge Column Technologies

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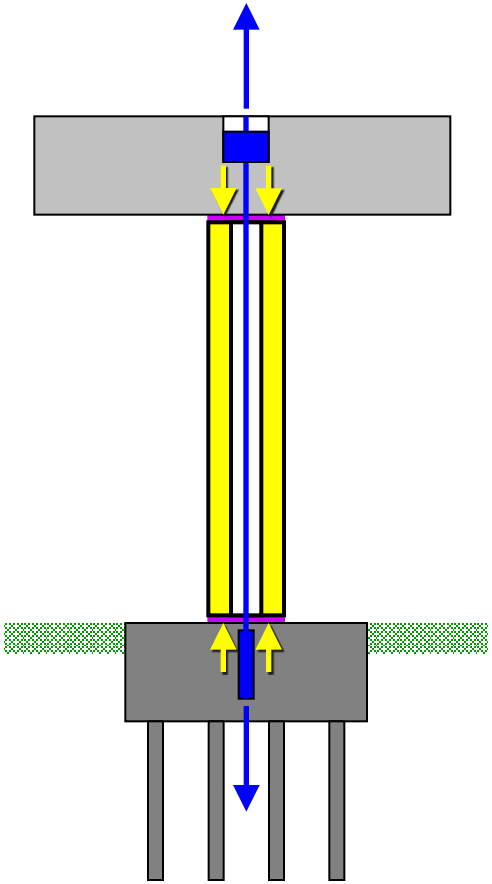
Project Description

- Development of Accelerated Bridge Construction Solutions in line with Caltrans & FHWA Goals:
  - *Get in, Get out, and Stay out*

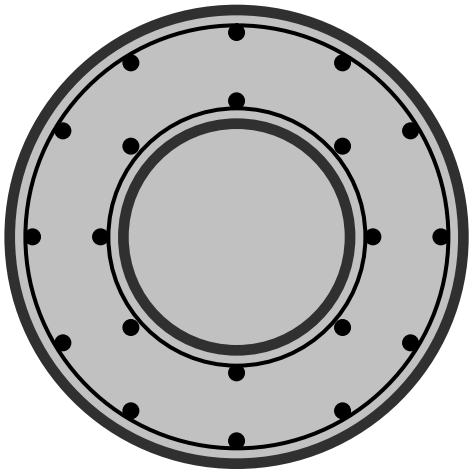
- Bridge piers with improved seismic resiliency
  - Two dual-steel shell systems developed
  - Proof-concept tests to be conducted within the next 3 months

Dual-Shell Technology

Advantages



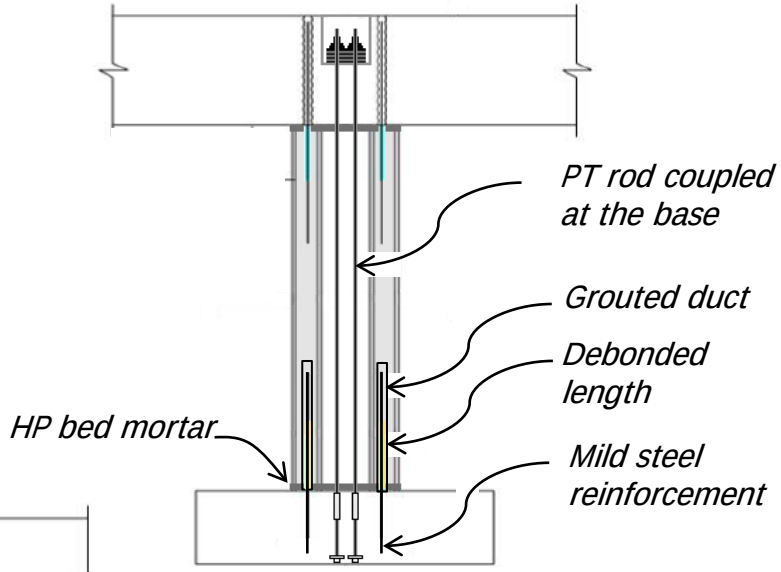
- Precast construction w/ permanent formworks
- Reduced column weight (hollow section)
- No reinforcing cage- reliance made on external shell for shear, confinement and flexural resistance away from column ends
- Reduced construction time
- External or internal hysteretic energy dissipators
- PT protection and removal
- Recentering characteristics



Energy Dissipation

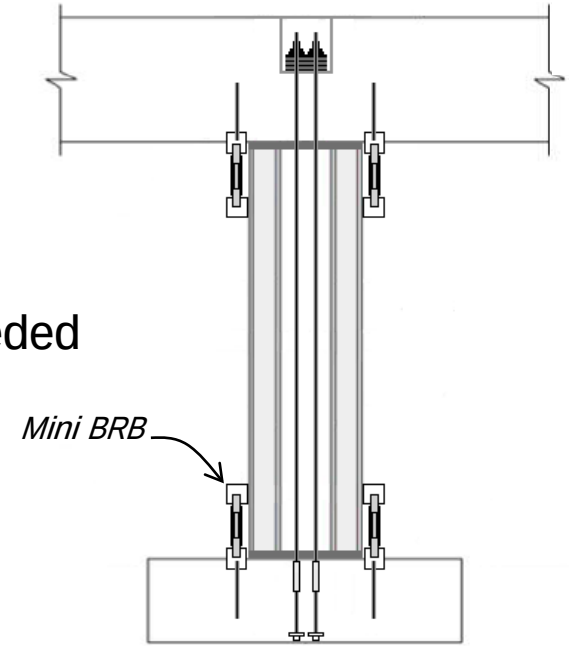
Internal

- Aesthetically ok
- Hard to repair/replace



External

- Easy to repair/replace
- Aesthetic mitigation needed

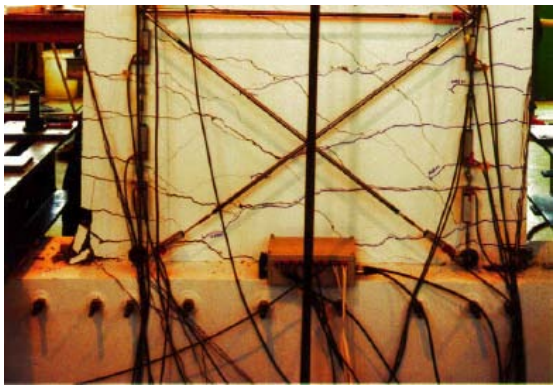


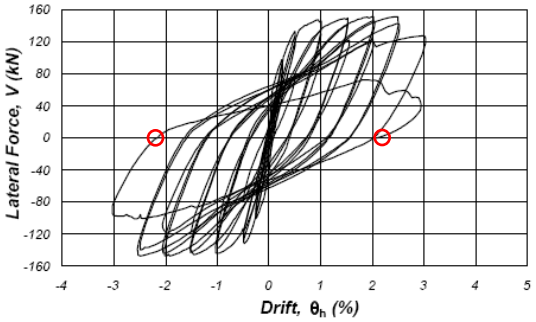
Self-Centering Behavior

Advantages

- Limited structural damage compared to monolithic systems
- Small residual displacements compared to monolithic case
- Operability right after strong shakes
- Added energy dissipation

Monolithic system

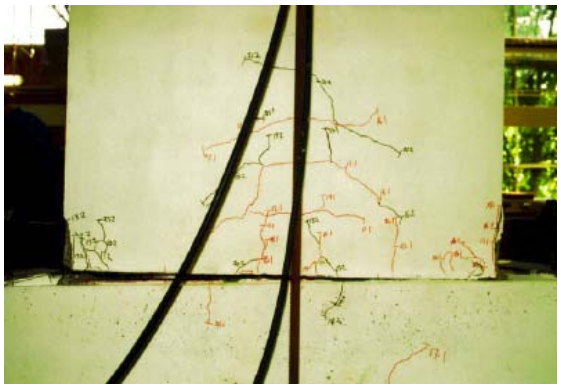


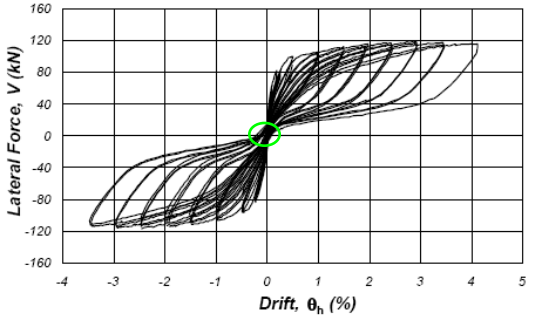


Shear-wall test results

(Restrepo, Mander, Holden)

Self-centering system



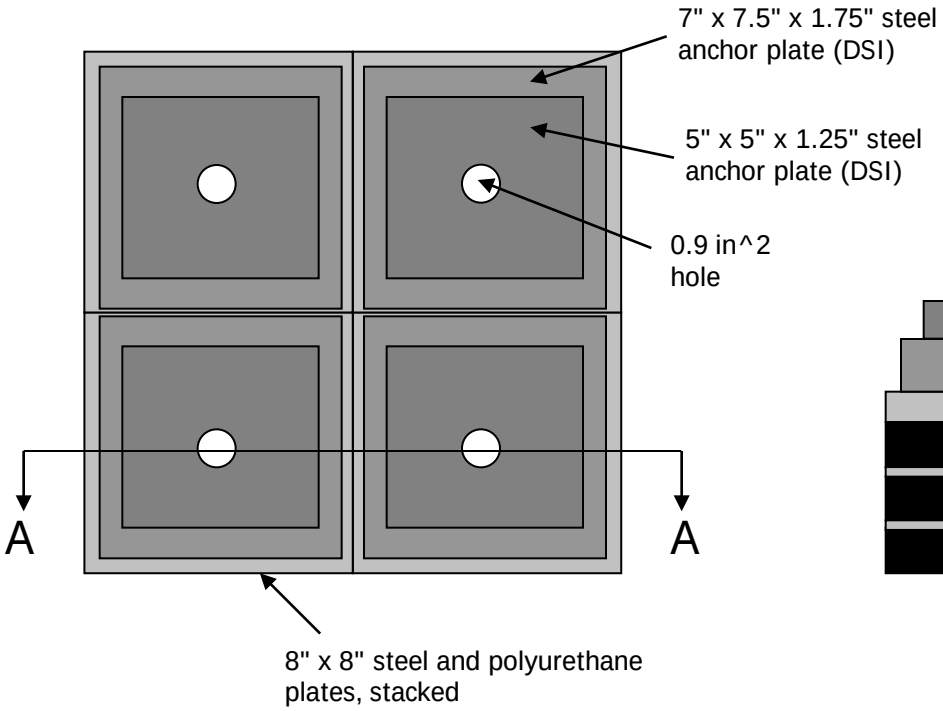


Self-Centering Behavior

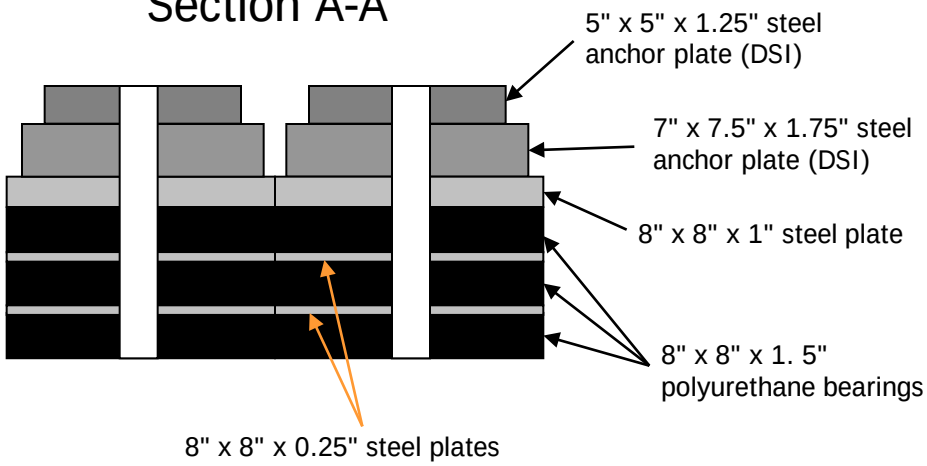
- PT threaded rods on a flexible bearing

Post-tensioning

Top view



Section A-A



Construction Progress

Footing


Load Stub


Column


Shims and Mortar Bed between Column and Footing


Column + Footing Assembly

Metallic/Quartz Aggregate Mortar Bed Tooled to Ensure No Contact with External Shell

Questions?

UCSD Jacobs