Advanced Precast Concrete Dual-Shell Steel Columns

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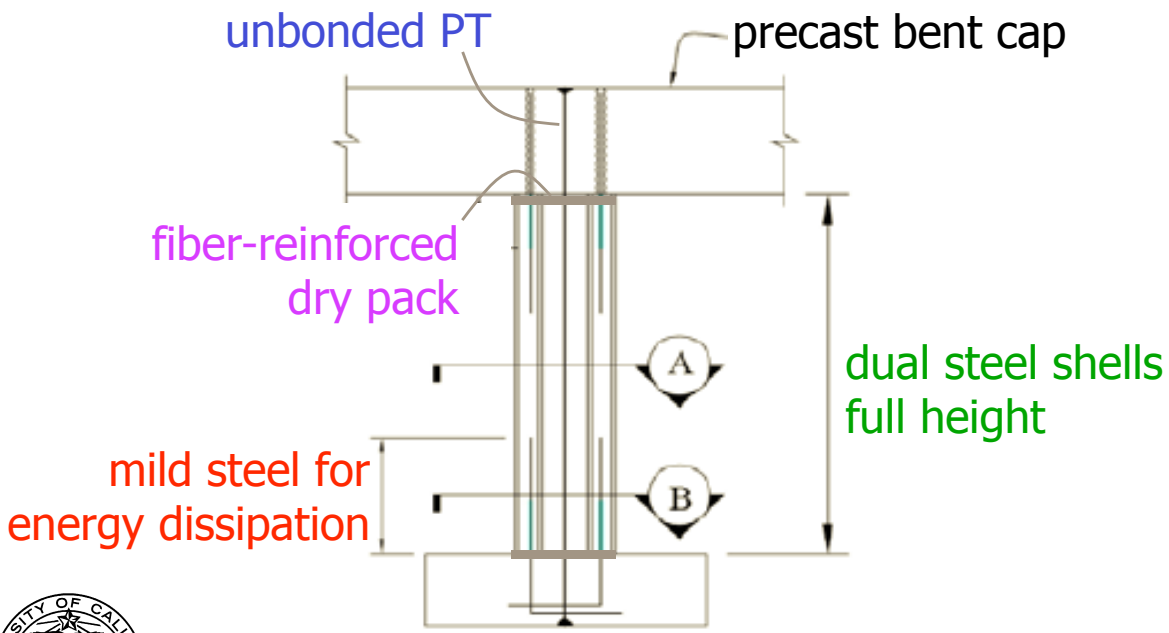
Project Description

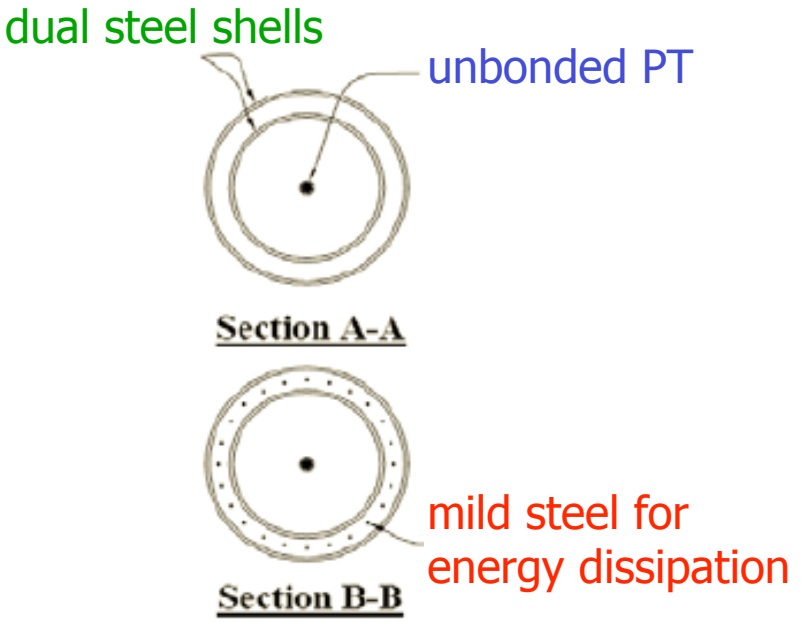
Goals

- Accelerated bridge construction (ABC - CalTrans)
- Improved bridge seismic performance

Main features

- Dual steel shells
- Postensioning / recentering
- Energy dissipation
- Fiber-reinforced dry pack

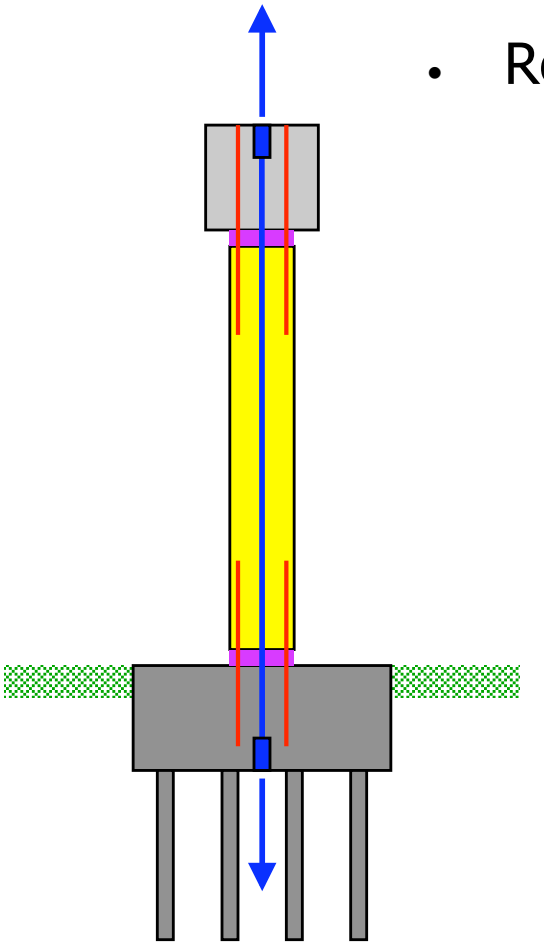


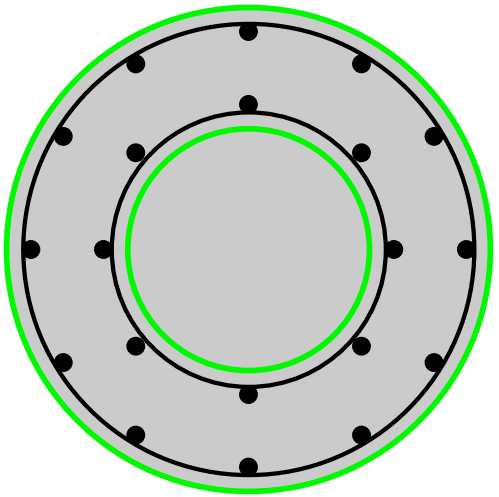


Dual-Shell Technology

Advantages

- Precast construction w/ permanent formworks
- Reduced column weight (hollow section)
- No reinforcing cage
- Reduced construction time



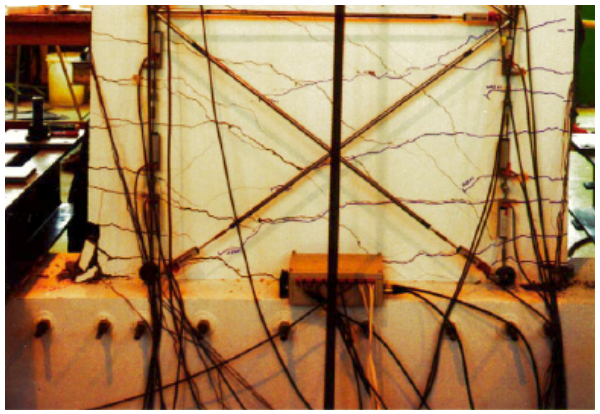


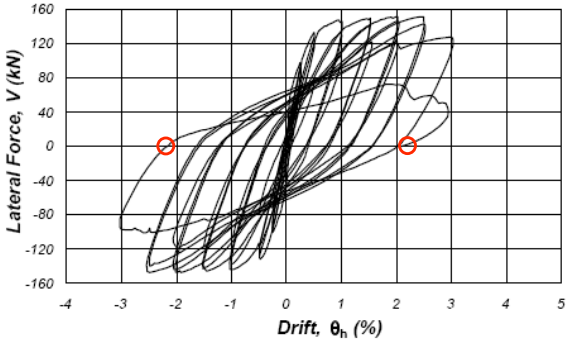
Self-Centering Behavior

Advantages

- Limited structural damage
- Small residual displacements
- Energy dissipation by specific devices
- Operability right after strong shakes

Monolithic system

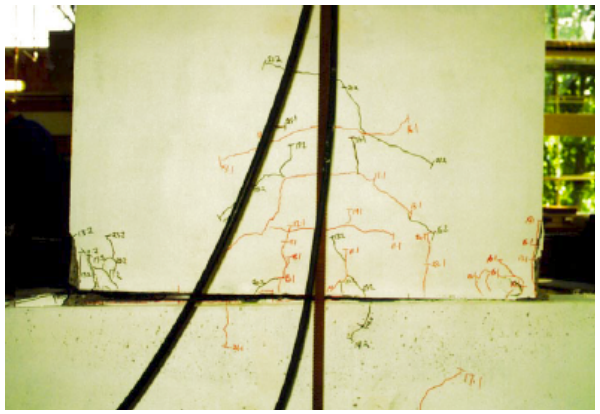


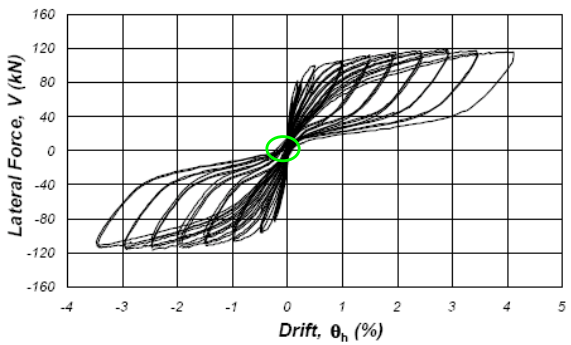


Shear-wall test results

(Restrepo, Mander, Holden)

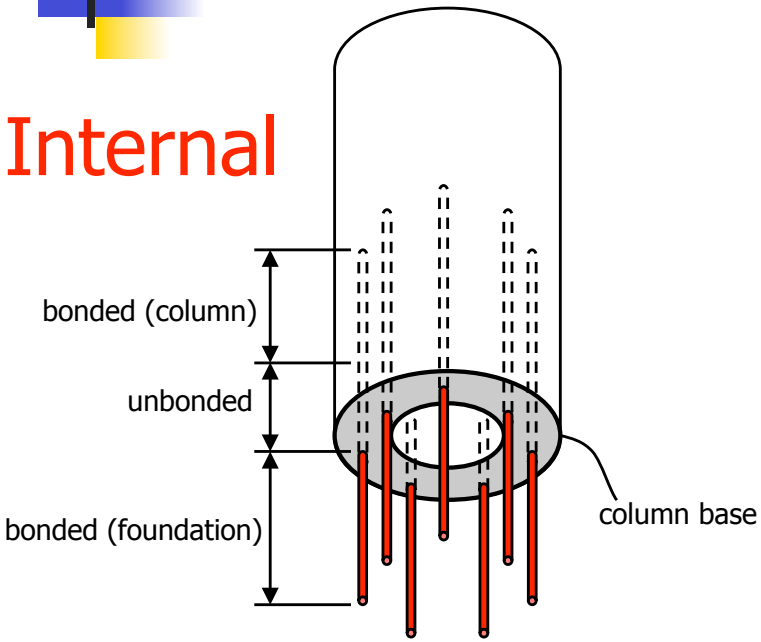
Self-centering system



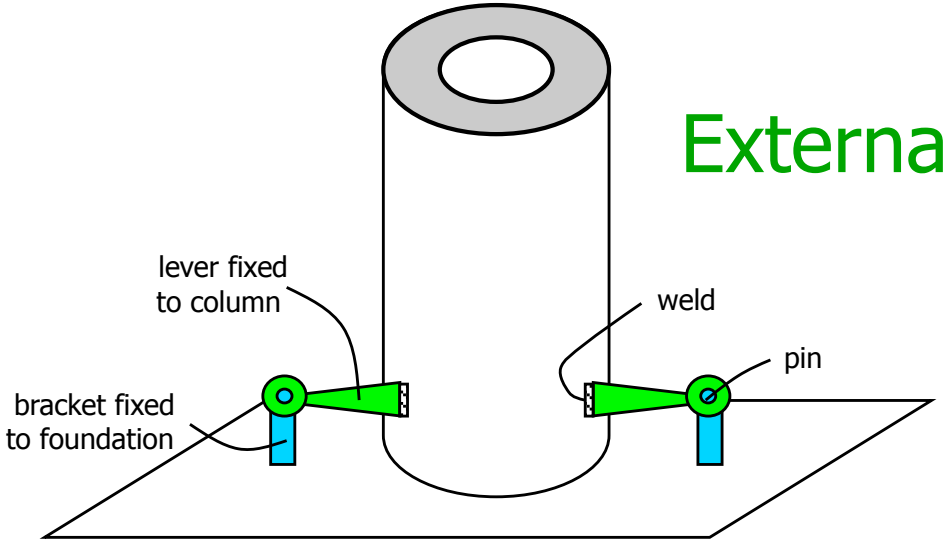


Energy Dissipation

Internal



External



Aesthetically ok

Advantages

Easy to repair/replace

Hard to repair/replace

Drawbacks

Aesthetic mitigation needed

Project Tasks

Project starting this quarter (Fall 2009)

Project Tasks

1. Prototype bridge
   - 2-span ordinary skew bridge
   - Modified DBD by Panagiotou & Restrepo, T_R = 475 years
2. Analytical modeling
   - TH analyses (Opensees) with 7 scaled records
   - Selection of bi-directional test protocol
   - FE analyses (Abaqus) of external energy dissipators
3. Experimental tests
   - Design of two units: internal vs. external energy dissipators
   - Hysteretic characterization of external energy dissipators
   - Construction and test of the two units
4. Final report

THANK YOU

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