





**American Concrete Institute®**  
*Advancing concrete knowledge*

## Post-Earthquake Repairs, Part 2

ACI Spring 2012 Convention  
 March 18 – 21, Dallas, TX



**Sarah Witt, LEED® AP - Senior Vice President - Engineering Services.** Ms. Witt graduated from University of Colorado with a Master's of Science in Civil Engineering. While completing her degree, Ms. Witt also worked in the composites lab at University of California, San Diego. She has been with Fyfe Company since 2000 and now serves as the head of Engineering Services. She is co-chair of ACI 440, Subcommittee on Externally Bonded FRP Systems.



## Post-Earthquake Repair of Circular Reinforced Concrete Columns

Sarah Witt – Fyfe Company  
 Dr. Rudi Seracino – North Carolina State University

ACI Convention – March 18, 2012


## Earthquake Damaged Columns

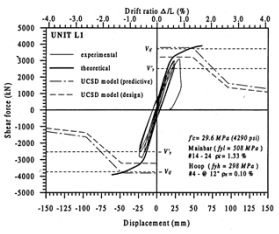


## Fiberwrap Materials

A combination of high strength fibers and a polymer matrix material


## Research and Development

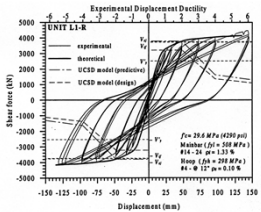


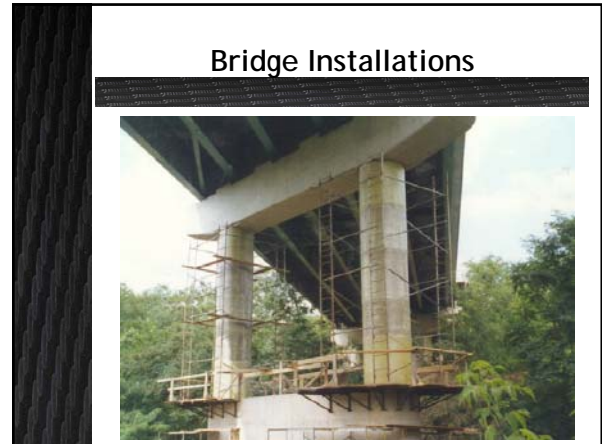


### Research and Development

**Strengthened**









### Rapid Repair of Columns


The overall objective is to rapidly repair damaged RC columns using FRP systems




### Damage Classification

“Moderately Damaged”  
Buckled reinforcing bars




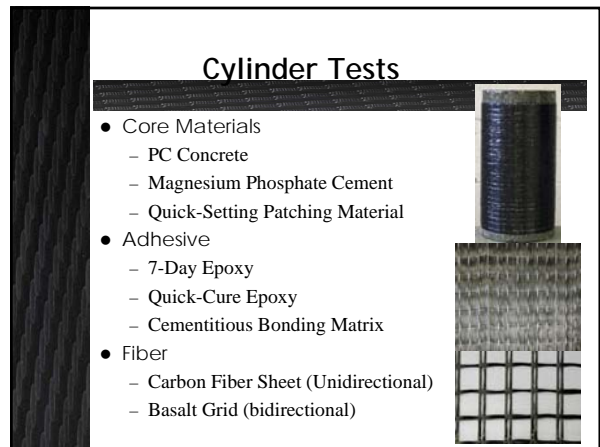
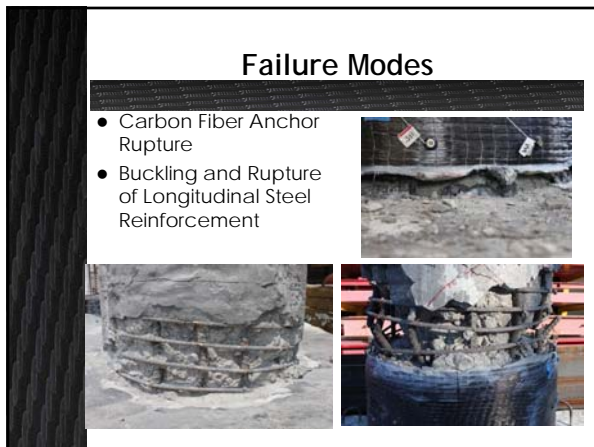
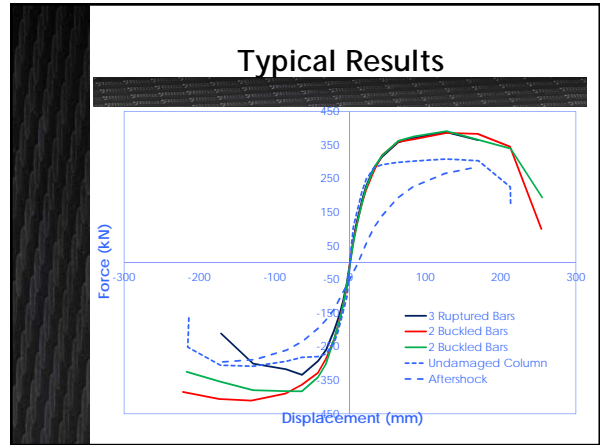
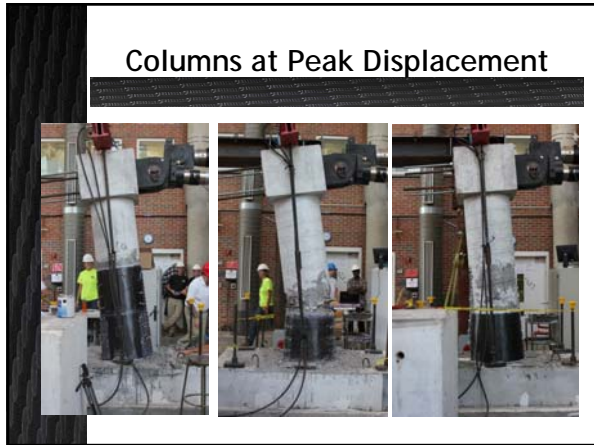
“Severely Damaged”  
Ruptured reinforcing bars



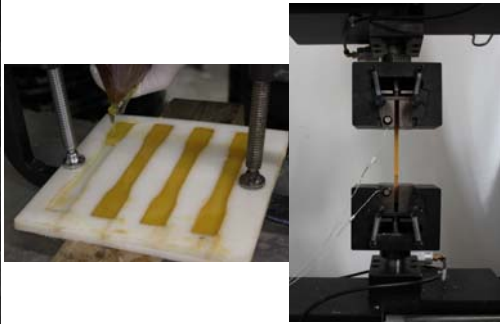
### Repair Philosophy

- Plastic hinge relocation
- Design FRP anchors to transfer axial force into footing





### Material Property Testing



### Typical Test Results



### Summary

It has been demonstrated that it is possible to design and successfully repair severely damaged reinforced concrete columns... but more research is still required...

THANK YOU