

FDOT Structures Research Update

SAM FALLAHA, PE



Outline

- ▶ The Structures Research Center
- ▶ Recent projects
 - ▶ Long Spans with Transportable Precast Prestressed Girders
 - ▶ Validation of Bridge Design Specifications for Barge Impact
 - ▶ Repairs of Impact Damaged Poles with FRP
 - ▶ Shear Strength of Anchors with Stand-Off Base Plates
 - ▶ Fracture Critical Bridges
 - ▶ Etc.....

Structures Research Center(SRC)



- ▶ We are part of the Structures Design Office of the Florida Department of Transportation and we report to the State Structures Design Engineer.
- ▶ We are a team of four engineers and five technicians, one administrative assistant and several part time students.

SRC Functions

- ▶ Structures Research
 - ▶ In-House
 - ▶ By University
- ▶ Bridge Testing
- ▶ Other testing

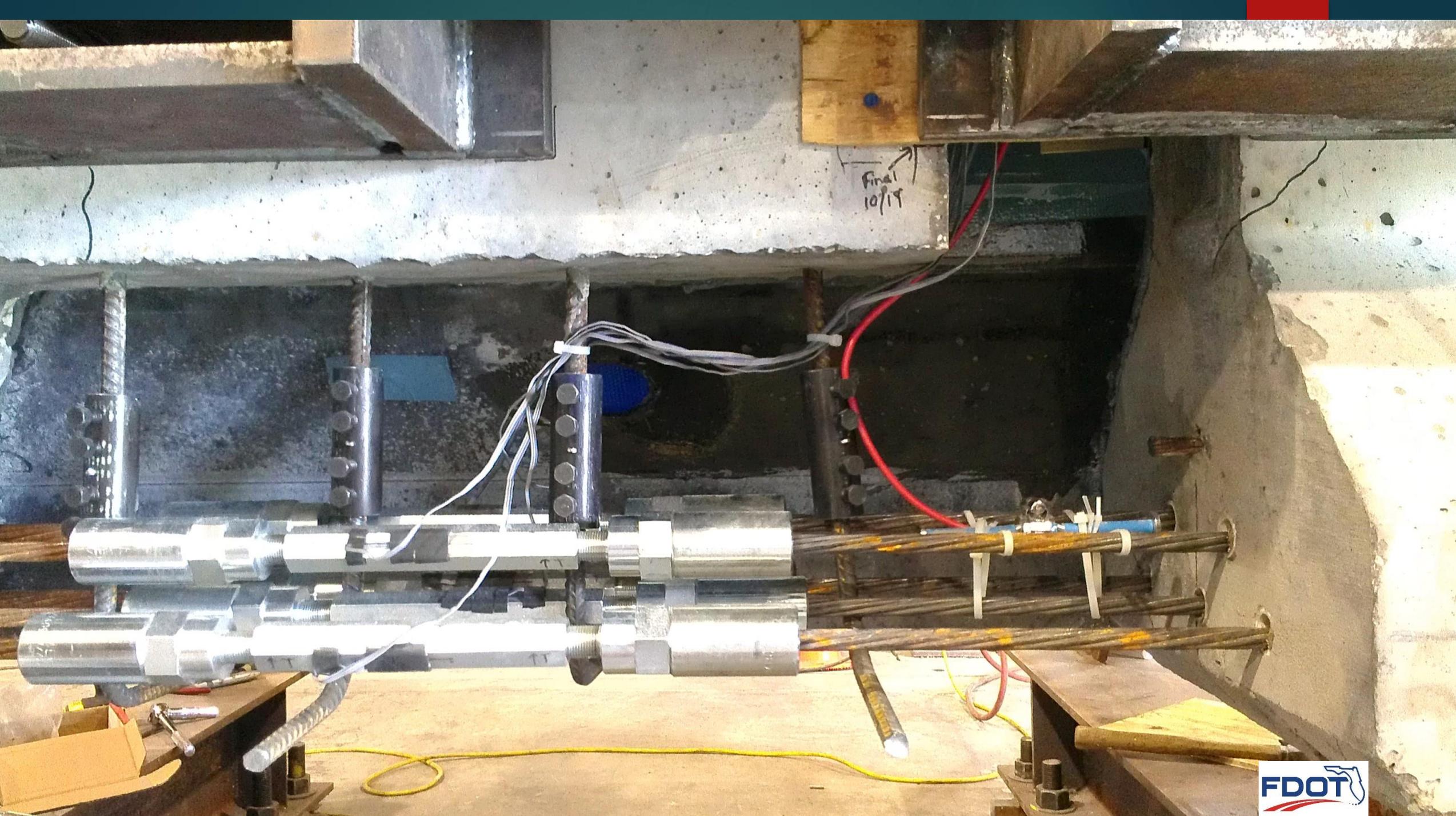




Long Span with Transportable precast prestressed Girders

- ▶ Objectives: Splice Prestressed Girders without Post-tensioning
- ▶ 9 AASHTO Type II beams were constructed, 3 control specimens and six splice specimens. Test matrix included loading in shear, flexure and fatigue.
- ▶ Splicing: The beam segments were set then the strands were spliced using grab-it. The strands were tensioned by jacking the beams apart.
- ▶ Conclusion: the splice methodology may work, however it is not easy to construct.





Final
10/19



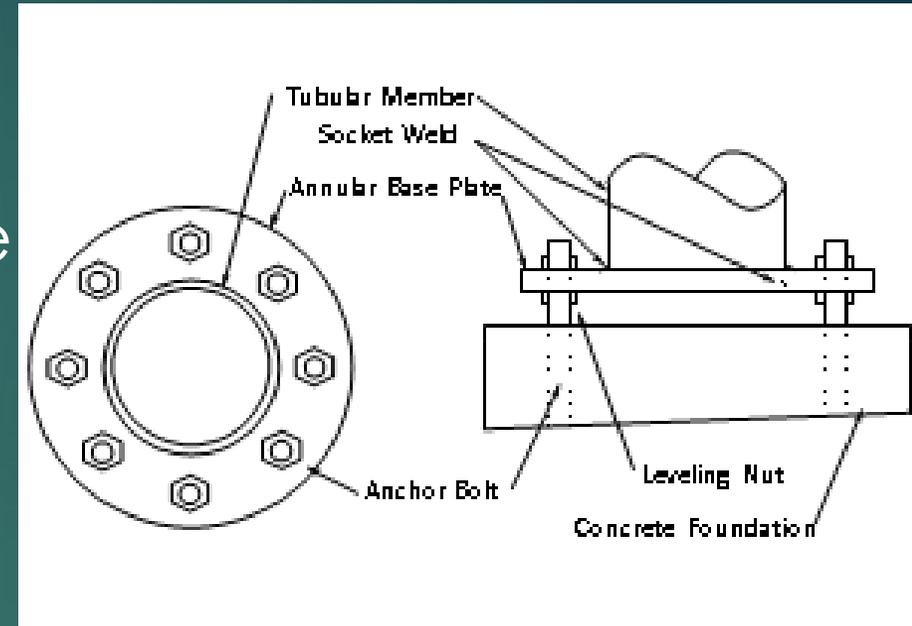




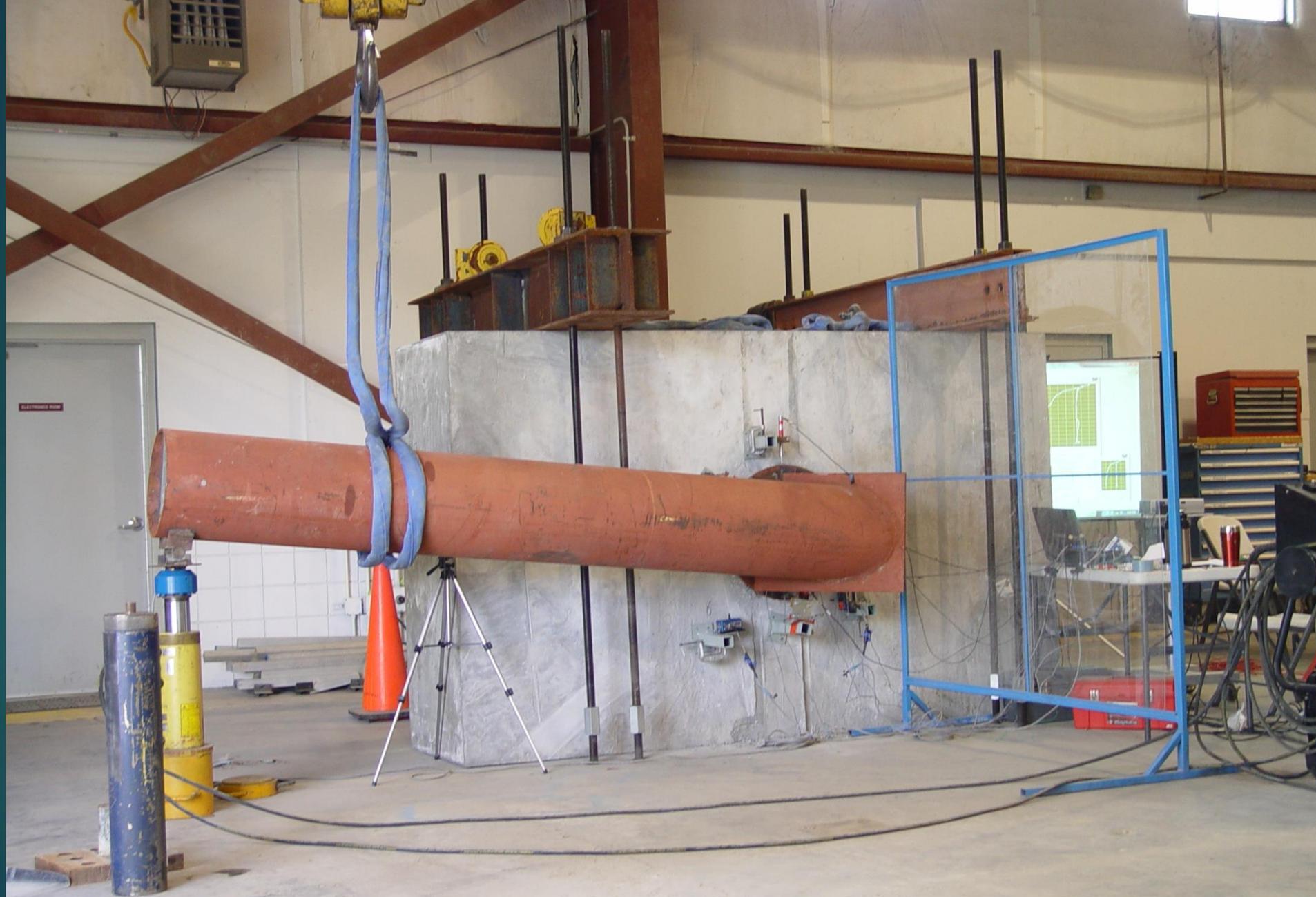


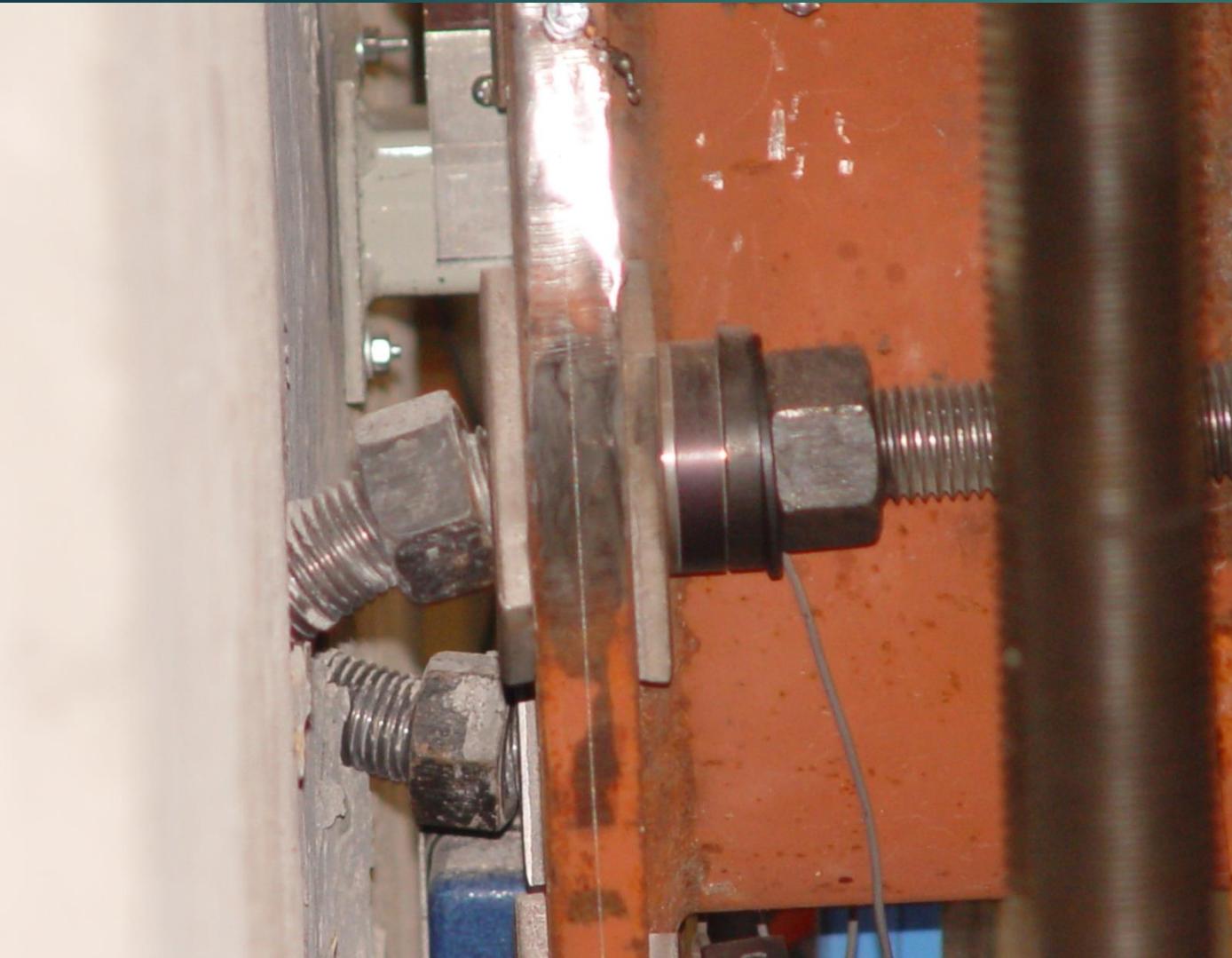
Steel Shear Strength of Anchors with Stand-Off Base Plates

- ▶ Objective: Evaluate the design methodology for shear strength to assure safety of large cantilever sign structures
- ▶ Individual bolt testing at the University of Florida, Full scale testing at the SRC.
- ▶ Four full scale assemblies were constructed and tested with varying stand of distance.
- ▶ Conclusion, the current specification needs to be modified.



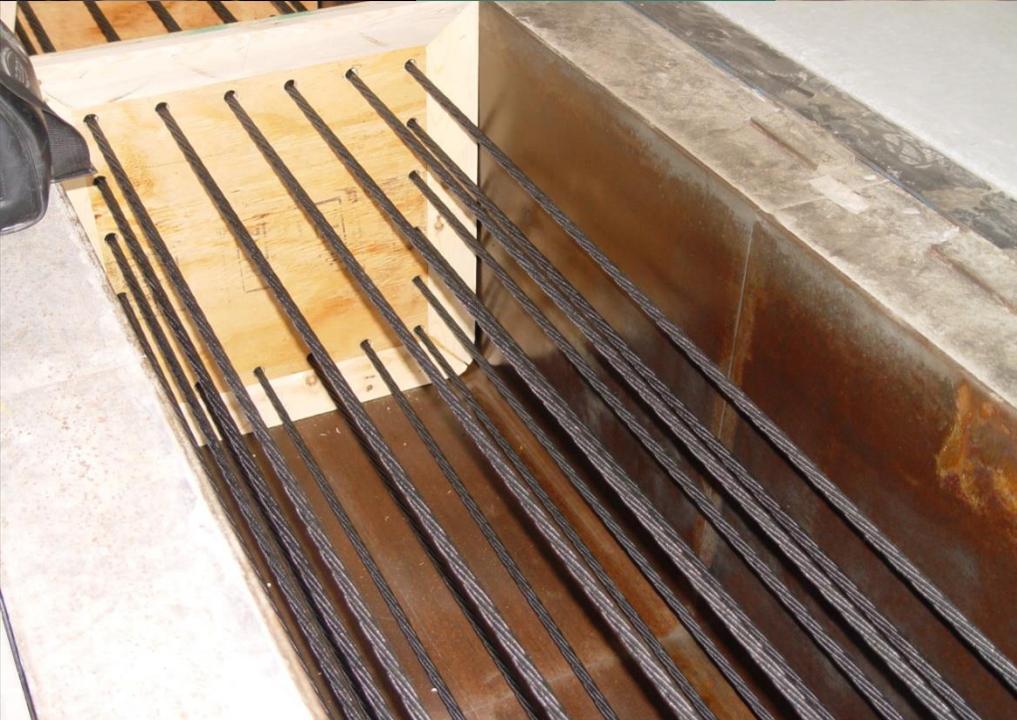






Investigation of Carbon Fiber Composite Cable (CFCC) For Prestressed Concrete Piles

- ▶ Objective is to develop steel free pile, where the prestressing and the mild reinforcing is replaced with Composites for coastal bridges. Corrosion free piles would extend the service life of coastal bridges.
- ▶ 3-40' and 2-100' long piles were fabricated.
- ▶ Two piles were tested.
- ▶ 2- piles are scheduled to be driven in January 2014.





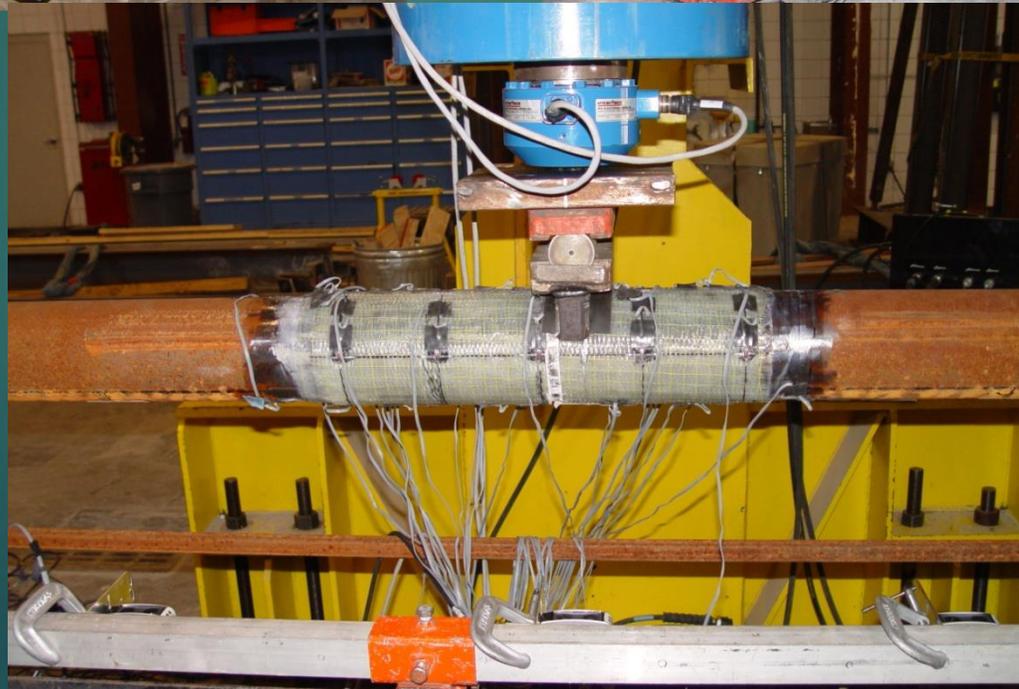


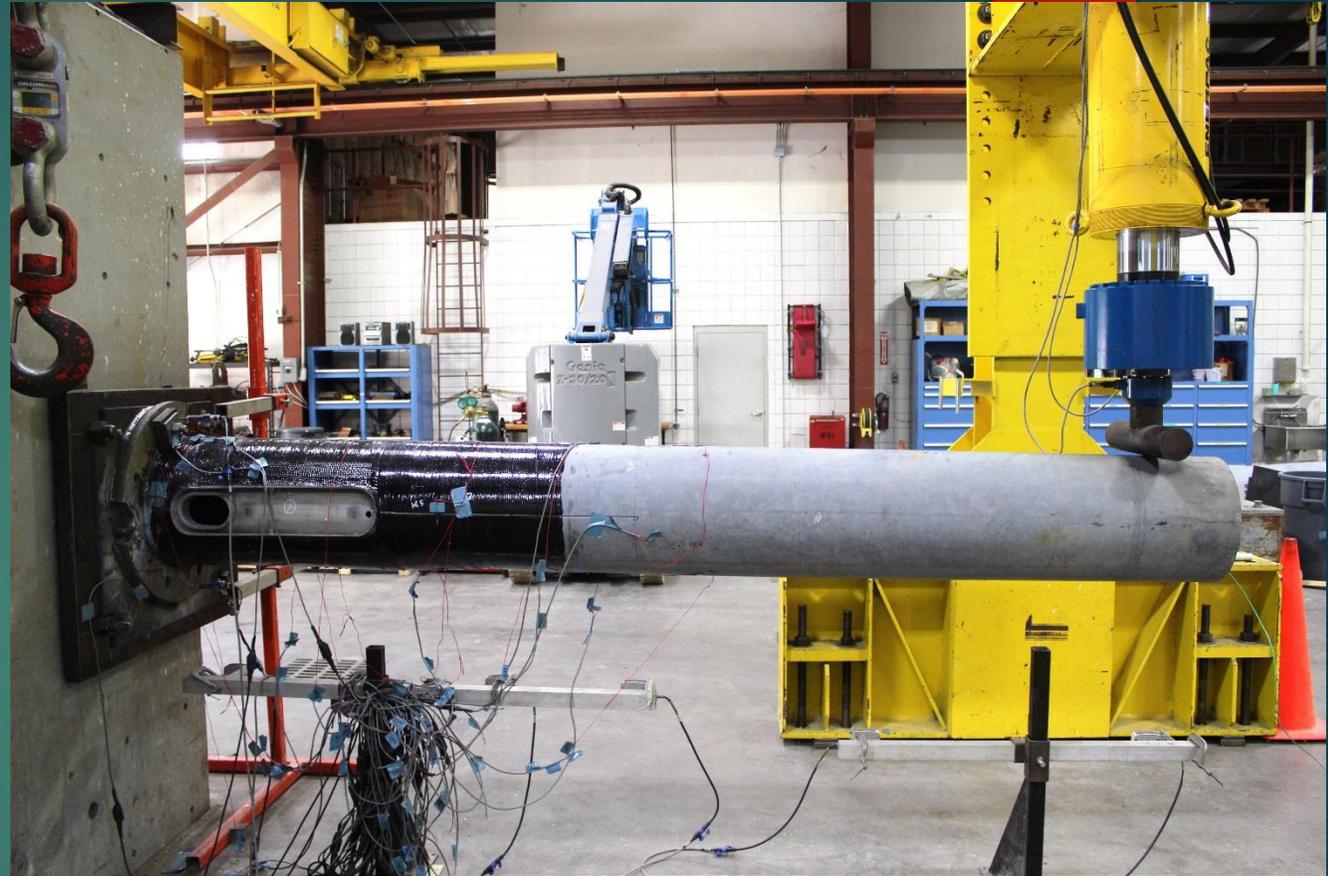


Repair of Impact Damaged Poles

- ▶ Objective is to repair impact damaged poles in place rather than replacing them.
- ▶ A number of field and lab damaged poles are to be repaired and tested to assure that the strength has been restored.
- ▶ Intend to develop guidelines defining the extent of damage that is repairable and the repair procedure.



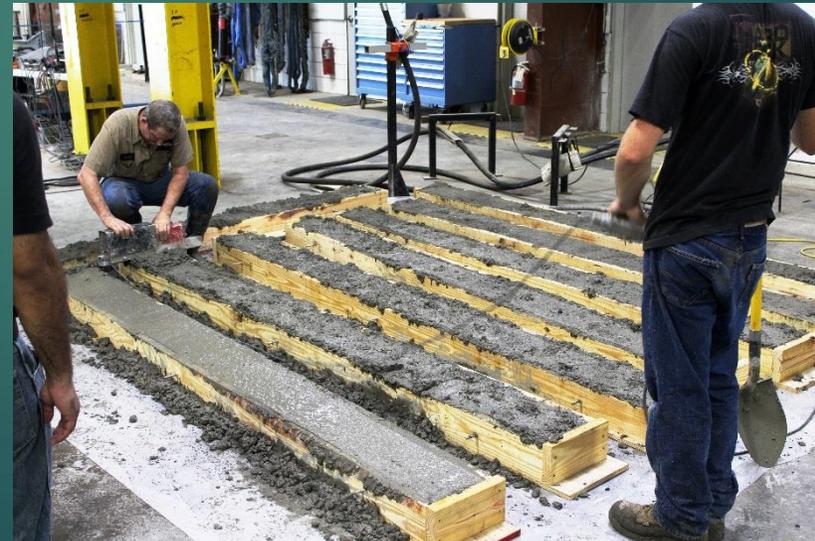
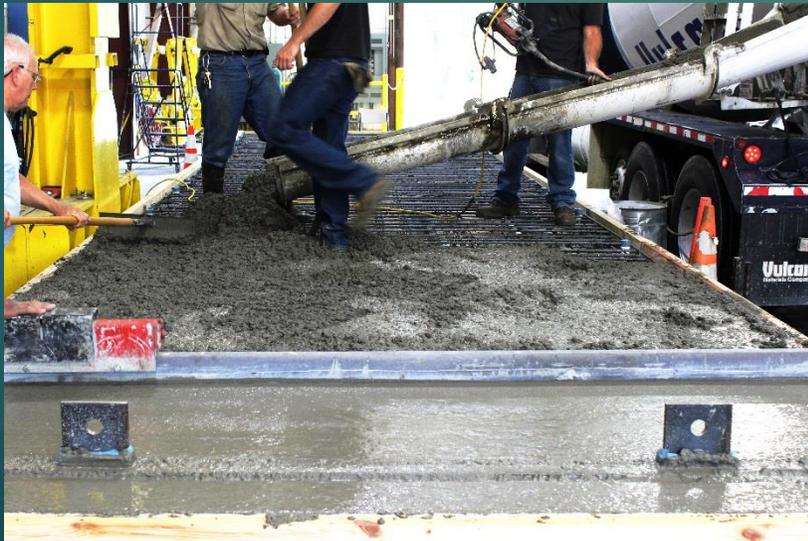




Managing Florida's Fracture Critical Bridges

- ▶ Fracture Critical Bridges are a bridges that include a member which if fractured or lost, causes the bridge to collapse.
 - ▶ Ex: truss bridges, two-beam bridges
 - ▶ Must be inspected every 2 yr.
- ▶ Objective: to determine if double box steel girder bridges with composite deck are fracture critical.

Construction/Fabrication



Test Matrix

- ▶ Cut bottom flange of one girder at midspan
 - ▶ Perform cyclic loading over cut girder
 - ▶ Track crack growth up the webs
- ▶ When web crack reaches top flange
 - ▶ Visual inspection and data analysis
 - ▶ Perform further cyclic loading
 - ▶ Watch for crack growth into top flange
- ▶ Perform ultimate load test to failure of the structure.



Validation and Implementation of Bridge Design Specification for Barge Impact

- ▶ This effort to update the AASHTO specification for vessel collision.
- ▶ CVIA: Coupled Vessel Impact Analysis is dynamic analysis
- ▶ OPTS: One pier two spans analysis model to simplify calculation
- ▶ Will be implemented in FB-MultiPier





Other Projects

- ▶ Pendulum Impact testing of Metallic, Non-Metallic and Hybrid Sign Posts.
- ▶ Design and Fabrication of Curved Precast Pretensioned U-Beams.
- ▶ Grouting of Post-tensioning Anchors without Vent Holes.
- ▶ Precast Deck panels with no reinforcement going thru the Joints.

Thank you

▶ Questions

▶ <http://www.dot.state.fl.us/structures/structuresresearchcenter>