

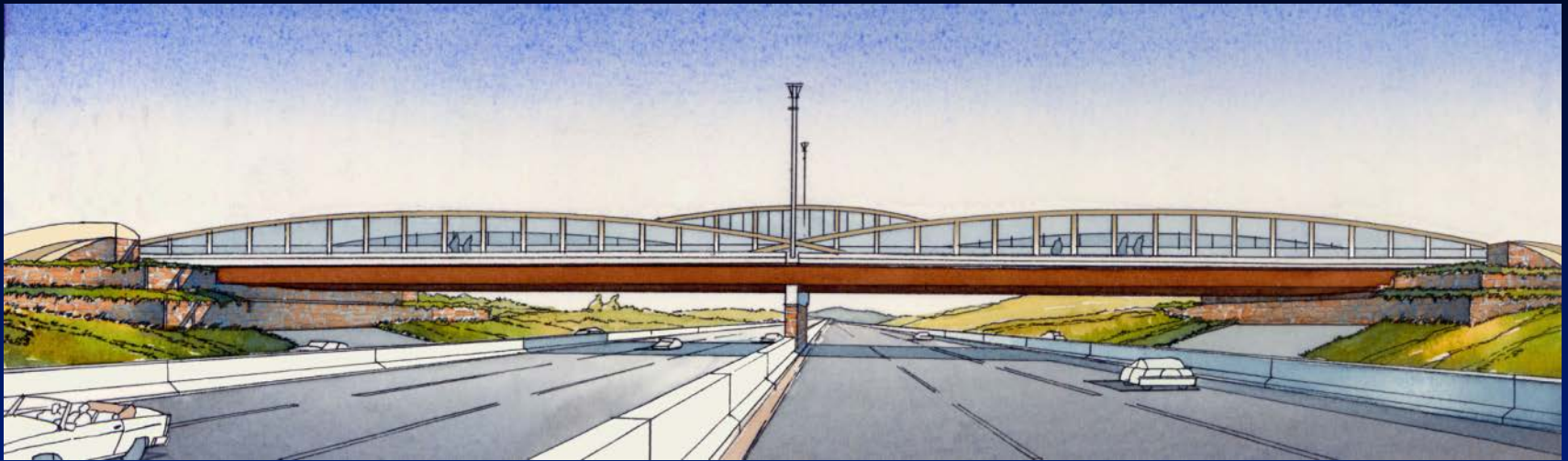
Laboratory and Field Evaluation of the 24th Street Bridge

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August 20, 2009



24th Street Bridge Background



- Council Bluffs, Iowa
- Over Interstate 80/29
- Constructed in two phases
- Opened in Spring of 2009

Objectives

- Document the effectiveness of innovative construction techniques
 - Laboratory component
 - » Answer design and construction questions
 - Field component
 - » Evaluation during and after construction



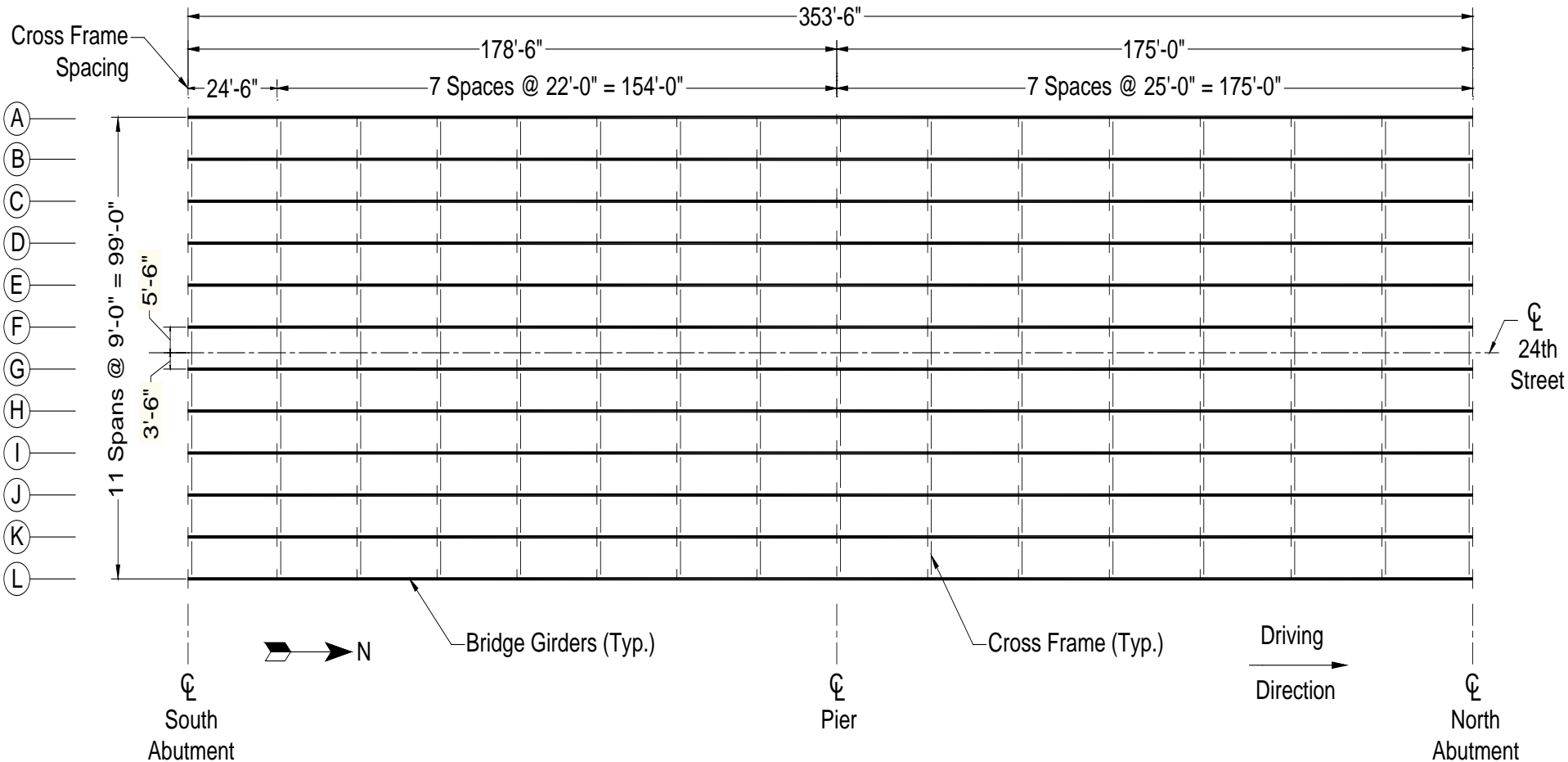
Bridge Description

- Two spans
- 353.5 ft long
- 6 lanes plus sidewalks (99 ft wide)
- Precast deck panels (post tensioned)
- Composite steel girders



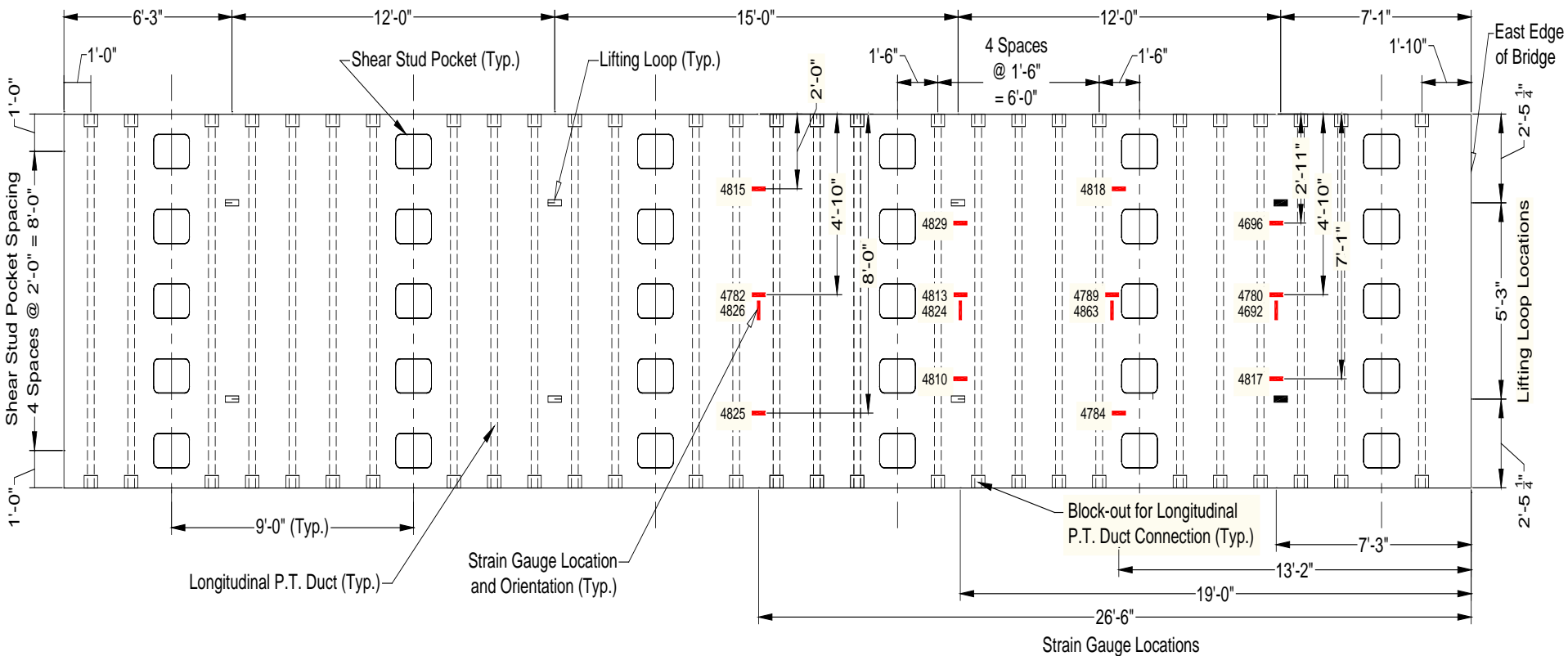


Bridge Plan/ Girder Layout





Precast Panel Plan

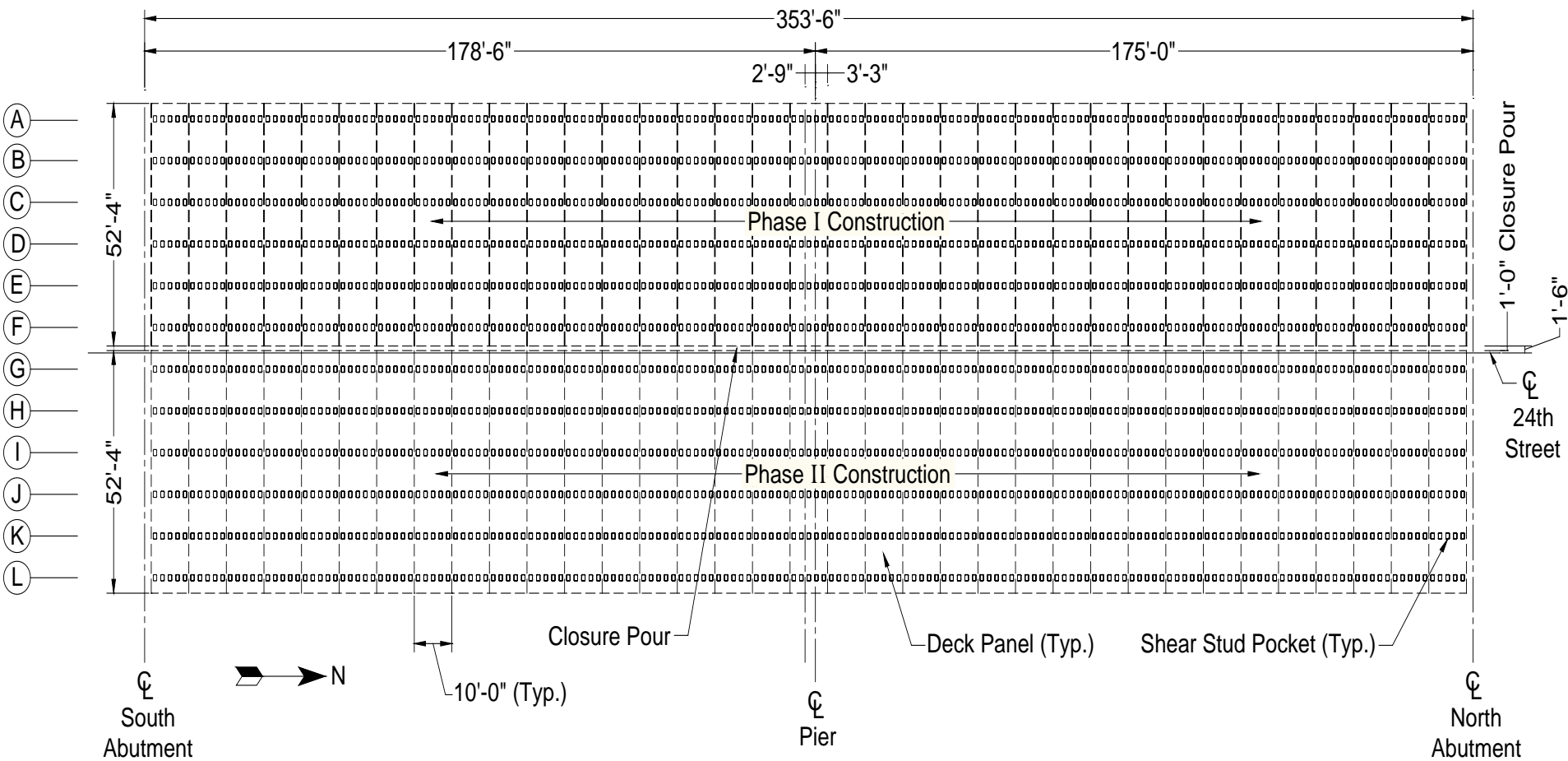


Precast Panel





Bridge Plan/ Panel Layout

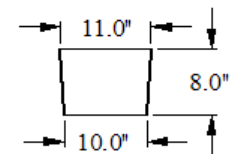
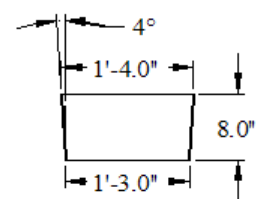


Bridge / Panel Layout

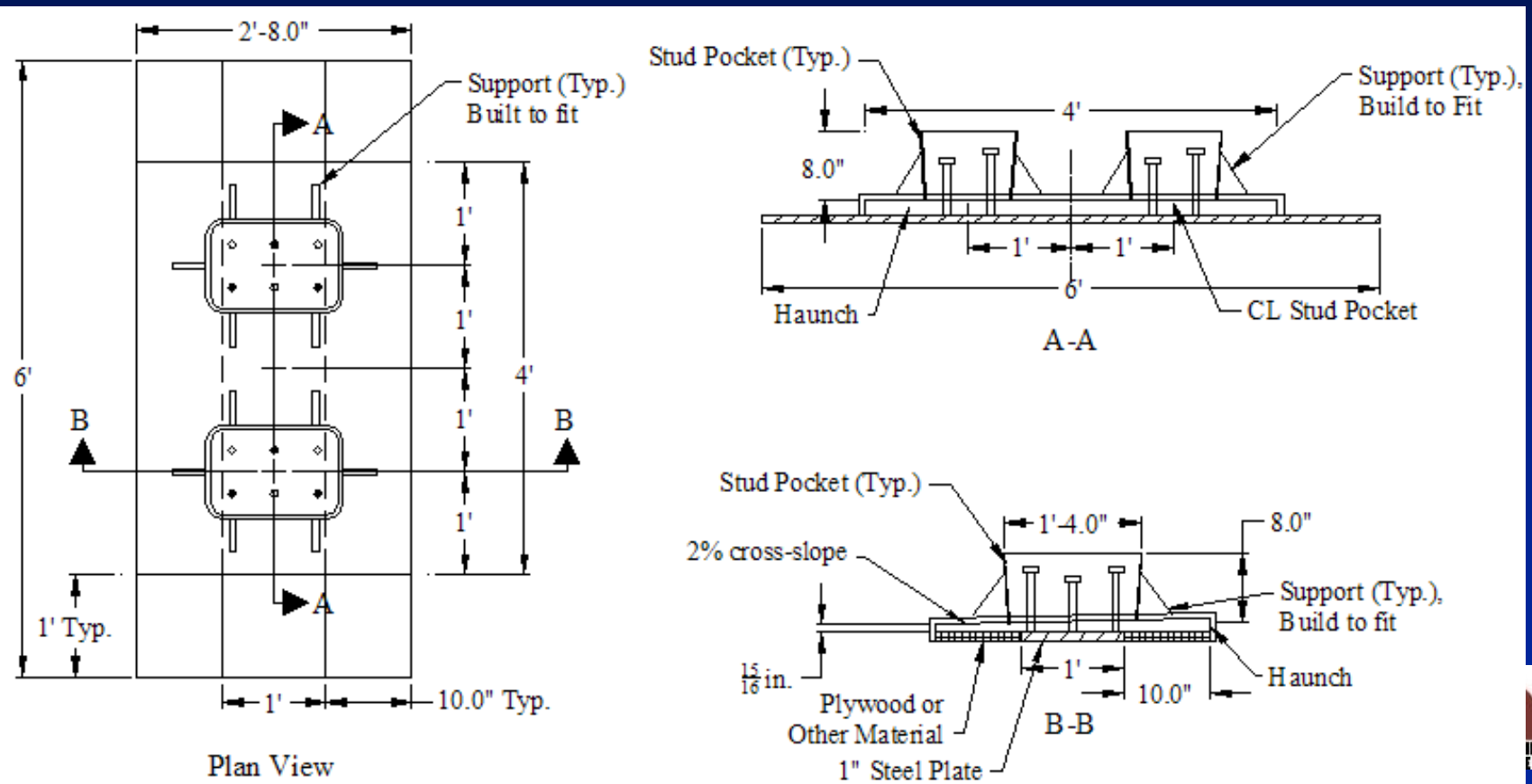


Laboratory Testing

- Stud pocket bend test
 - Confined space in pocket
 - Able to conduct bend test on all studs



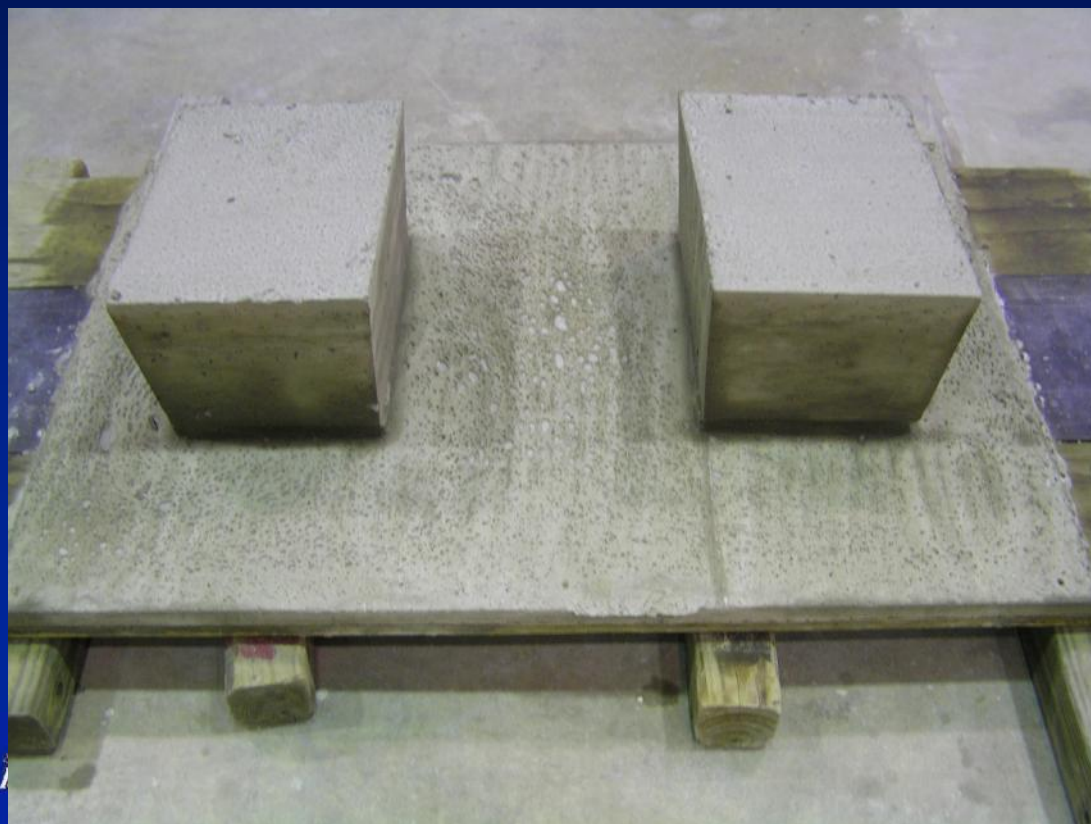
Cross-Section Views





Laboratory Testing

- Grout flowability
 - Sufficient grout flow from stud pockets to haunch



Laboratory Testing

- Duct splicing performance
 - 1 in. x 3 in. duct splice checked for grout tightness
 - Waterproof duct tape
 - » Simple
 - » Works

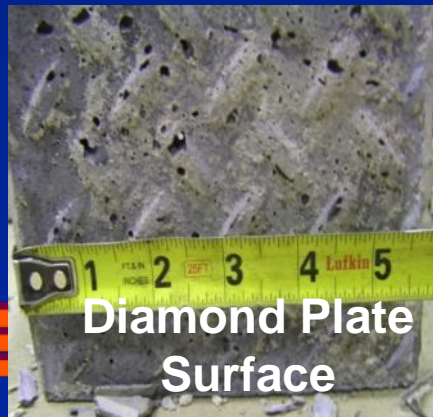


Laboratory Testing

- Panel transverse joint shear
- Surface treatments
 - Control (no roughing)
 - Diamond plate forms
 - Chemical etching
 - Sandblasting (best performance 578 psi)



Control Surface



Diamond Plate Surface



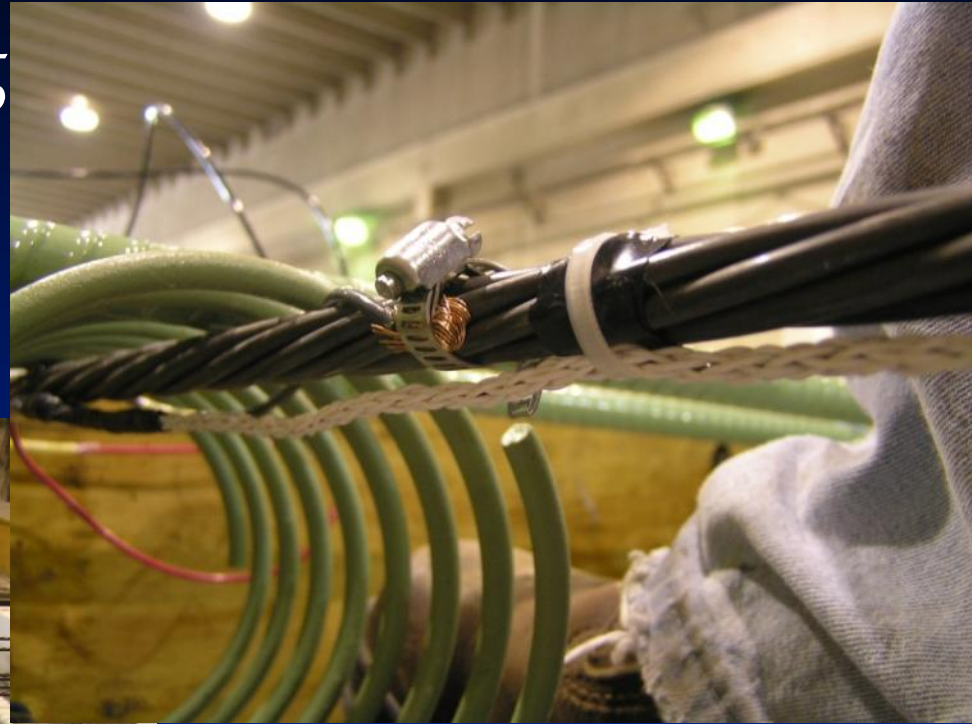
Chemical Etched Surface



Sandblasted Surface

Field Testing

- Corrosion Monitoring
 - 6 pre-stress strands
 - 6 sacrificial post-tensioning strands



- No corrosion taking place as of June



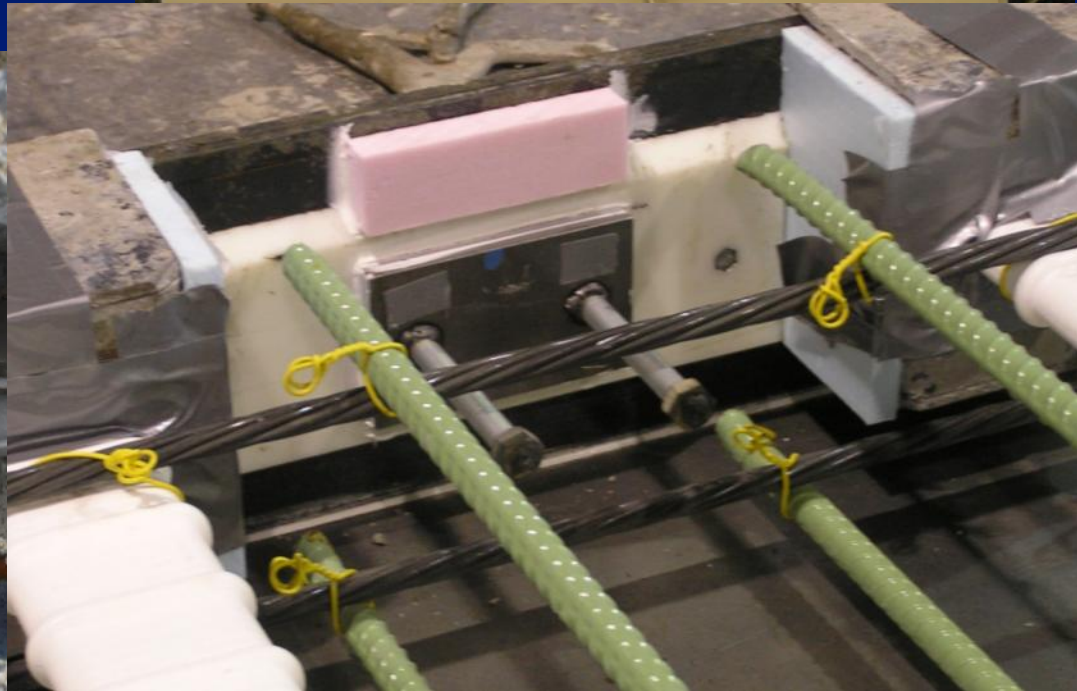
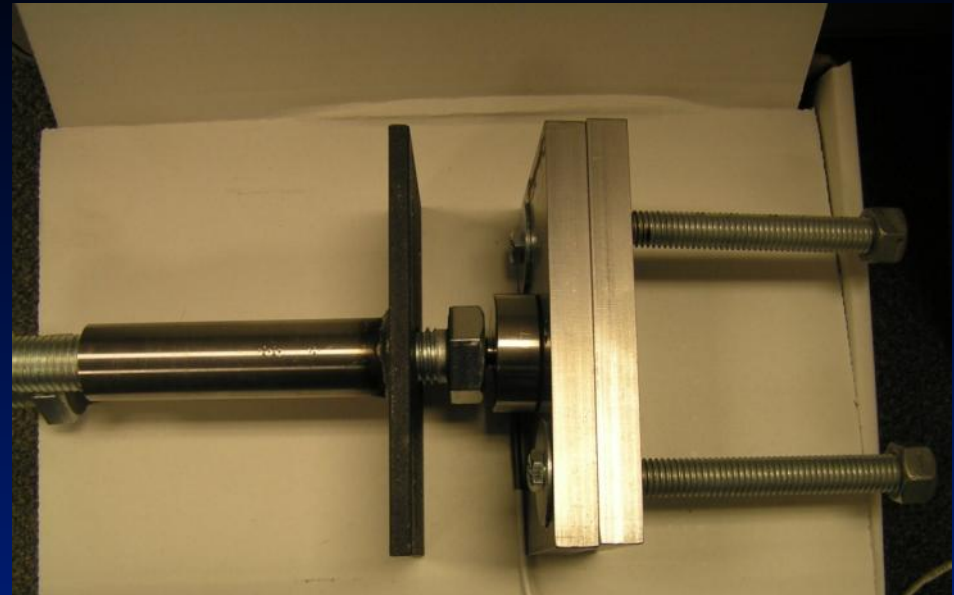
Field Testing

- Handling Performance



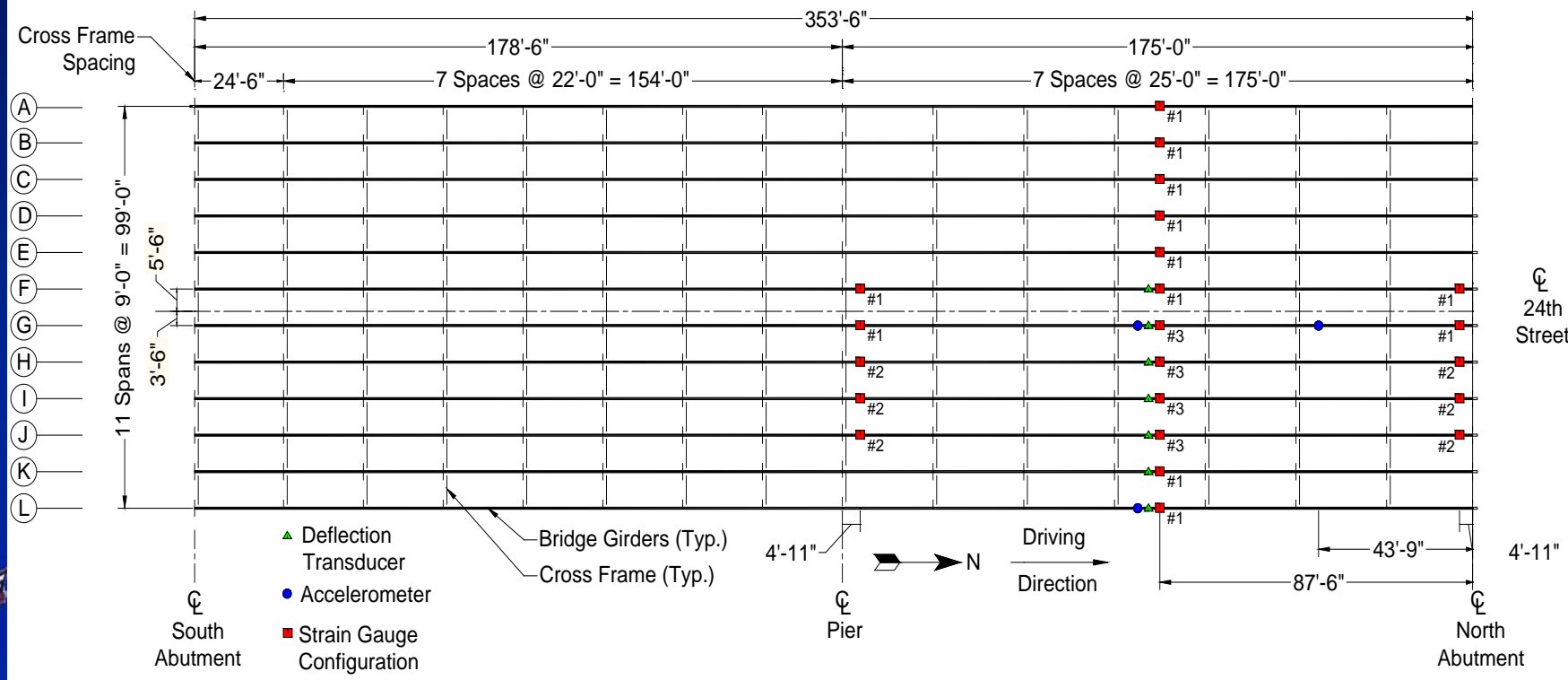
Field Testing

- Panel Joint Pressure
 - Monitored during post-tension



Field Testing

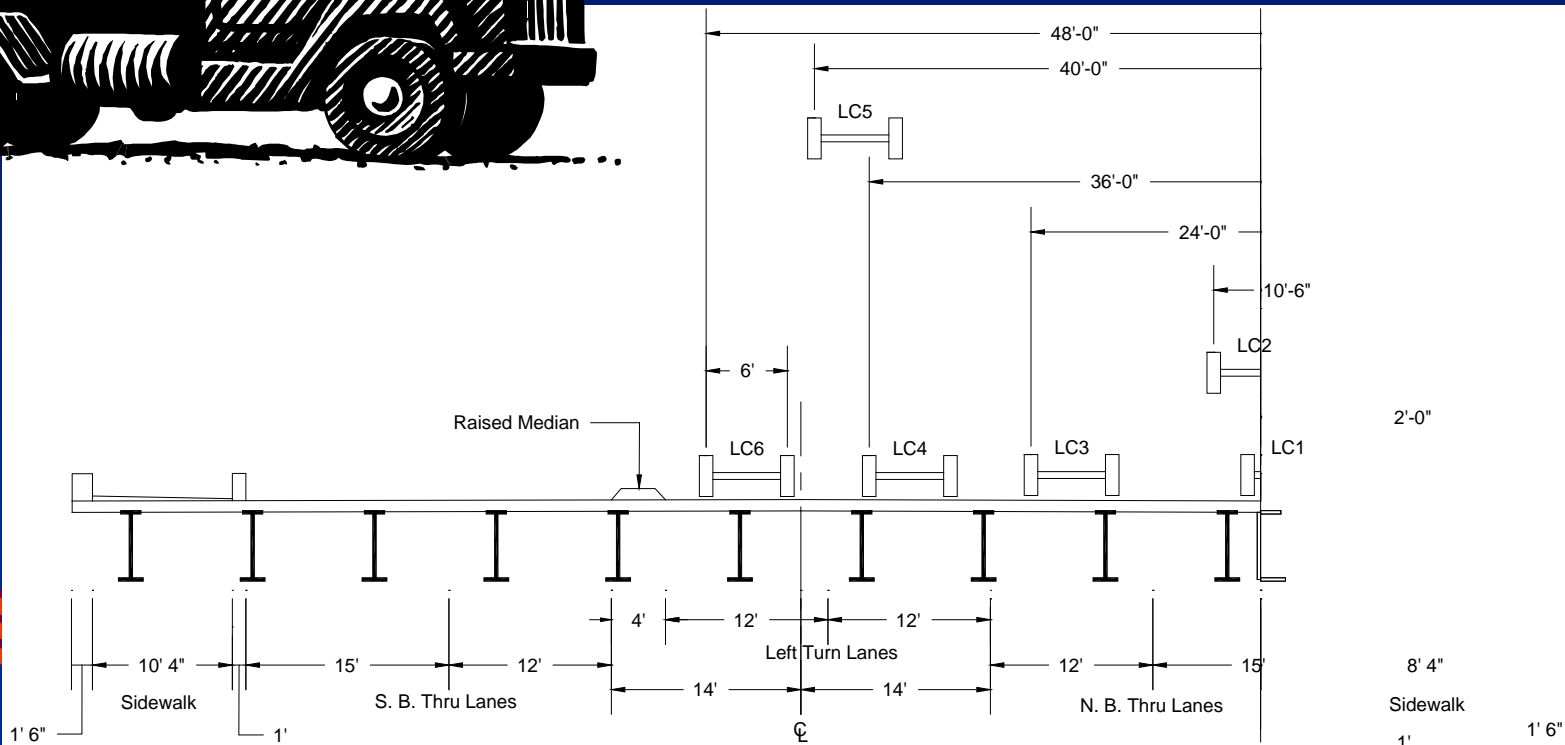
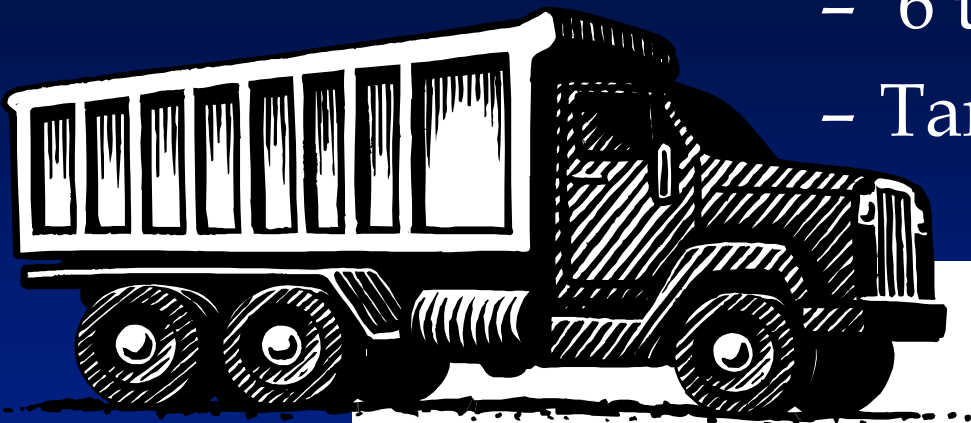
- Live load testing
 - Gauges located on north span
 - » Deflection, Strain, & Acceleration





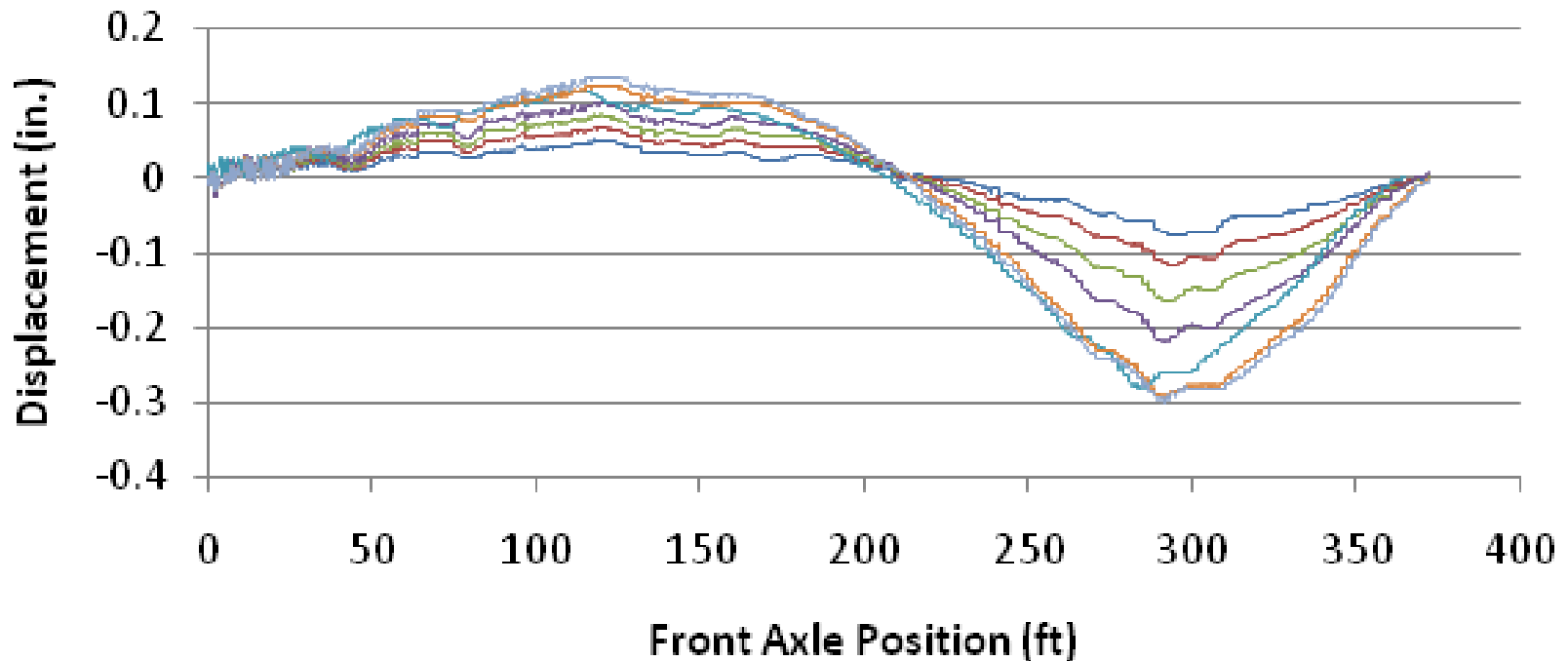
Field Testing

- Live load testing
 - 6 transverse load positions
 - Tandem axle dump truck



Field Testing

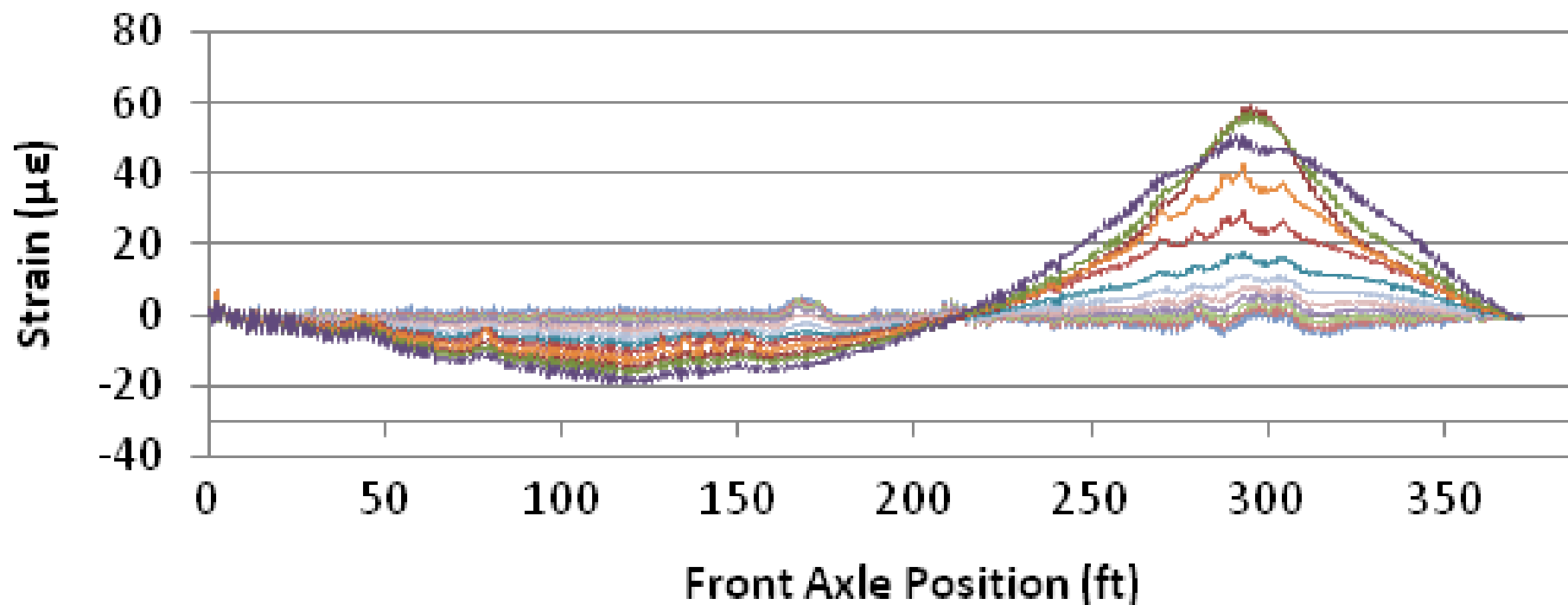
- Live load testing
 - Deflection @ midspan of north span
 - Truck on south span: max 0.15 in.
 - Truck on north span: min -0.31 in.





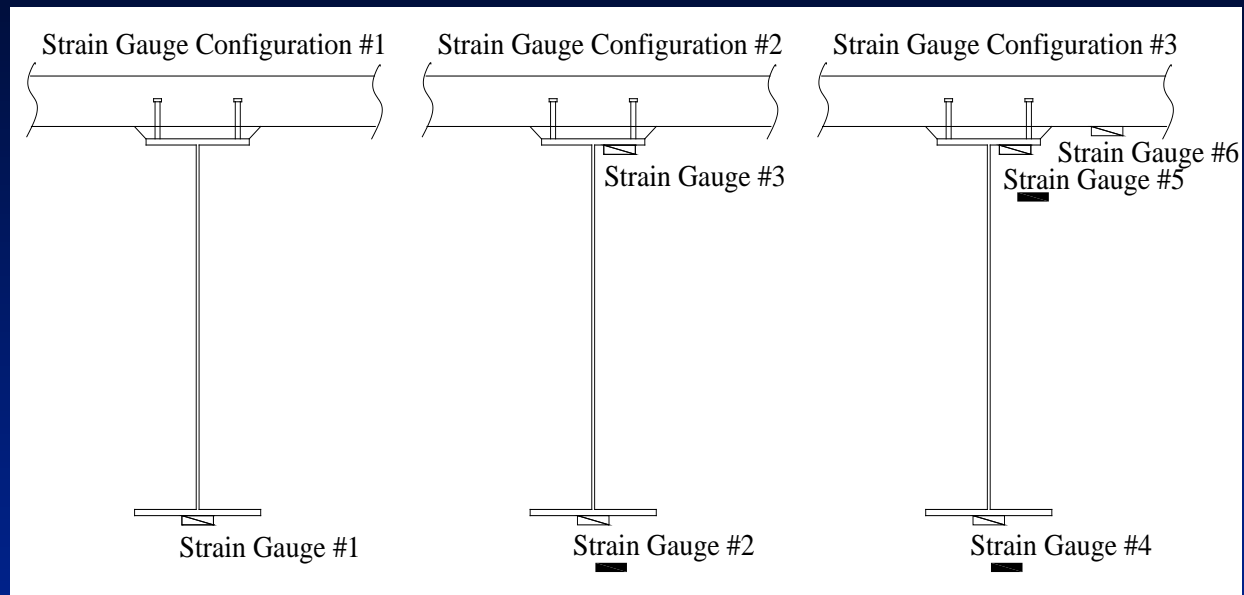
Field Testing

- Live load testing
 - Strain



Field Testing

- Live load testing
 - Strain



Strain ($\mu\epsilon$)

Gauge Location	Bottom Flange	Top Flange	Bottom of Slab
Abutment	-4 to +14	-5 to +6	NS
Pier	-16 to +3	-1 to +5	NS
Mid-span	-22 to +66	-5 to +5	-2 to +6

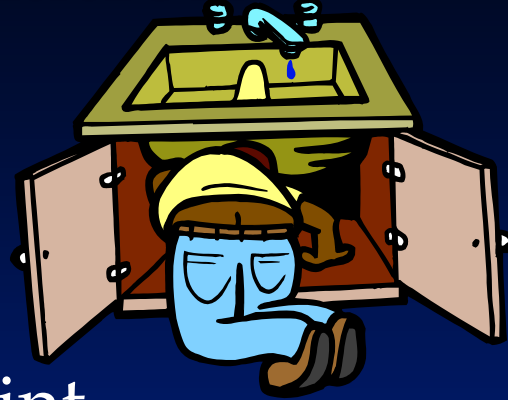
Conclusion & Recommendations

- Laboratory Testing
 - Stud pockets
 - » Installation
 - » Bend test
 - Grout can sufficiently flow from stud pocket into haunch
 - Waterproof duct tape is sufficient for sealing duct splices
 - Sandblasting surface of joint provide highest shear resistance



Conclusion & Recommendations

- Field Testing
 - No corrosion indicated
 - Minimal pressure at mid-span joint during post-tensioning
 - Deflections were less than $L/6770$
 - Max and minimum strain occurred at bottom flange mid-span
 - » Max tension $66\mu\epsilon$
 - » Max compression $22\mu\epsilon$



24th Street Bridge



• Questions??