Laboratory and Field Evaluation of the 24th Street Bridge

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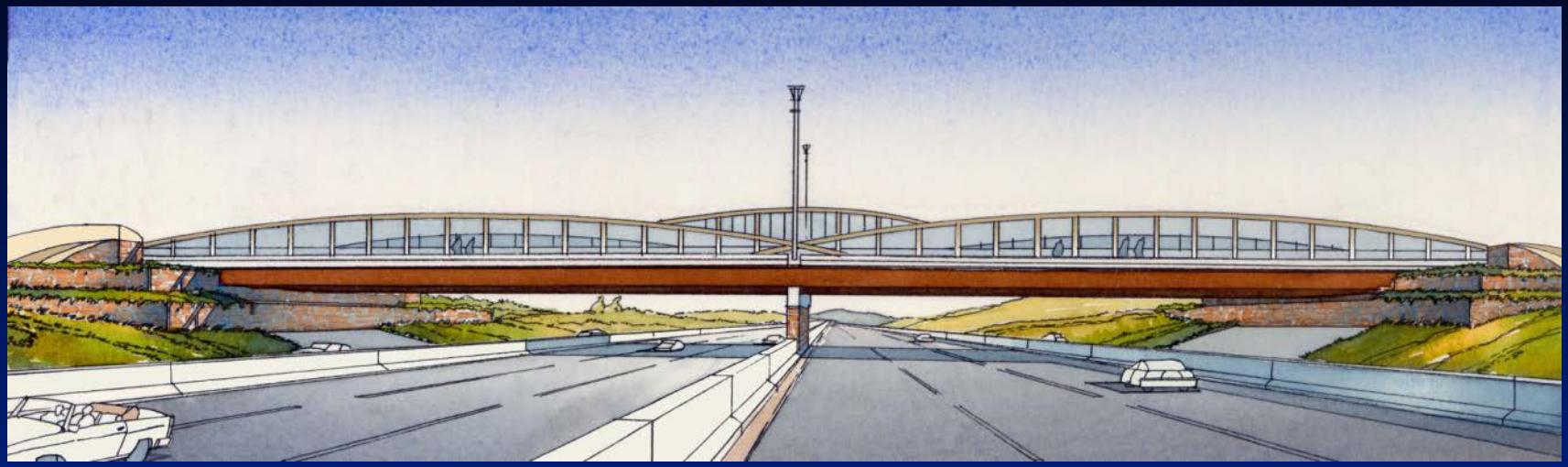
August 20, 2009

24th Street Bridge Background



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

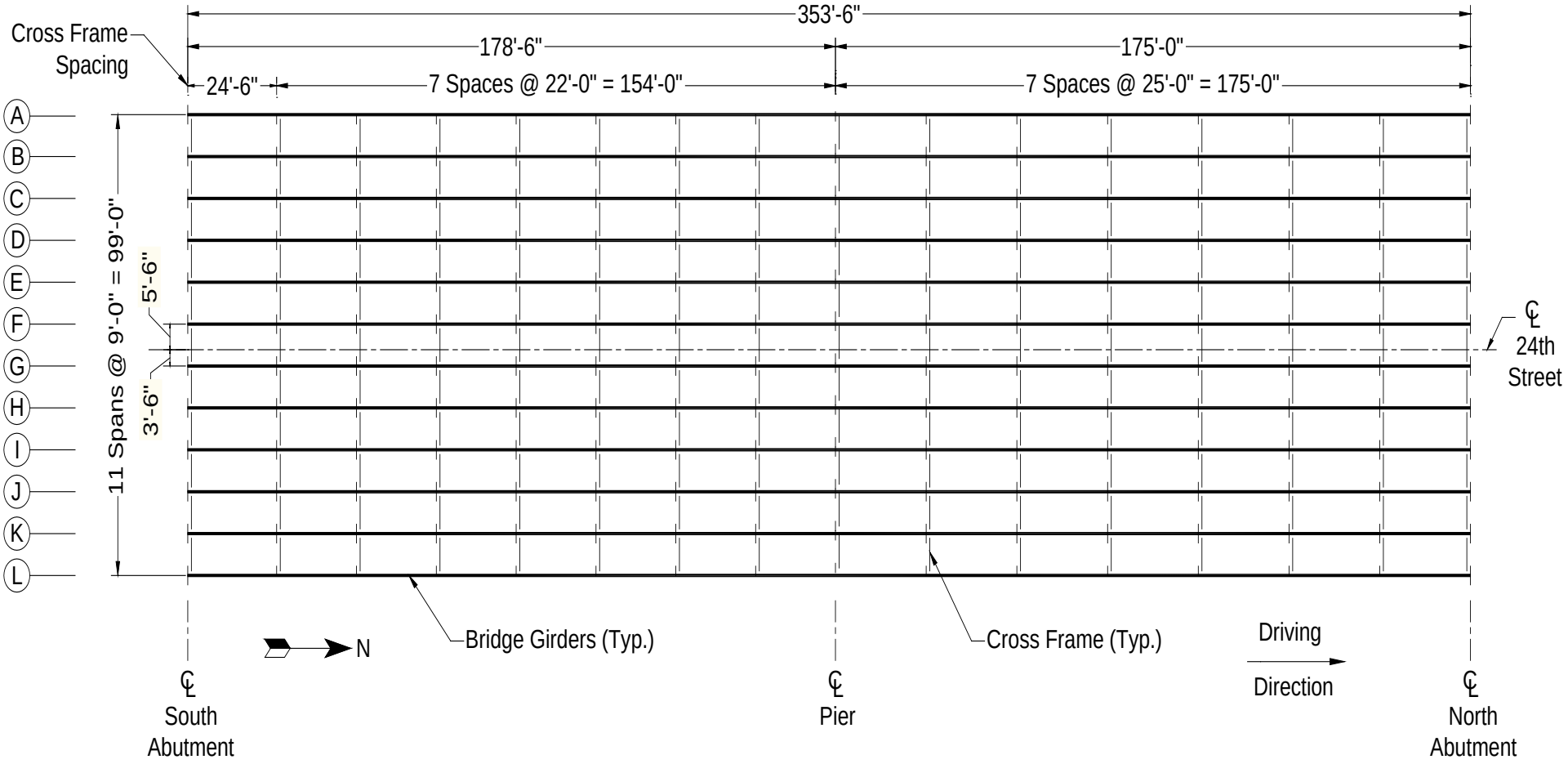
Objectives

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

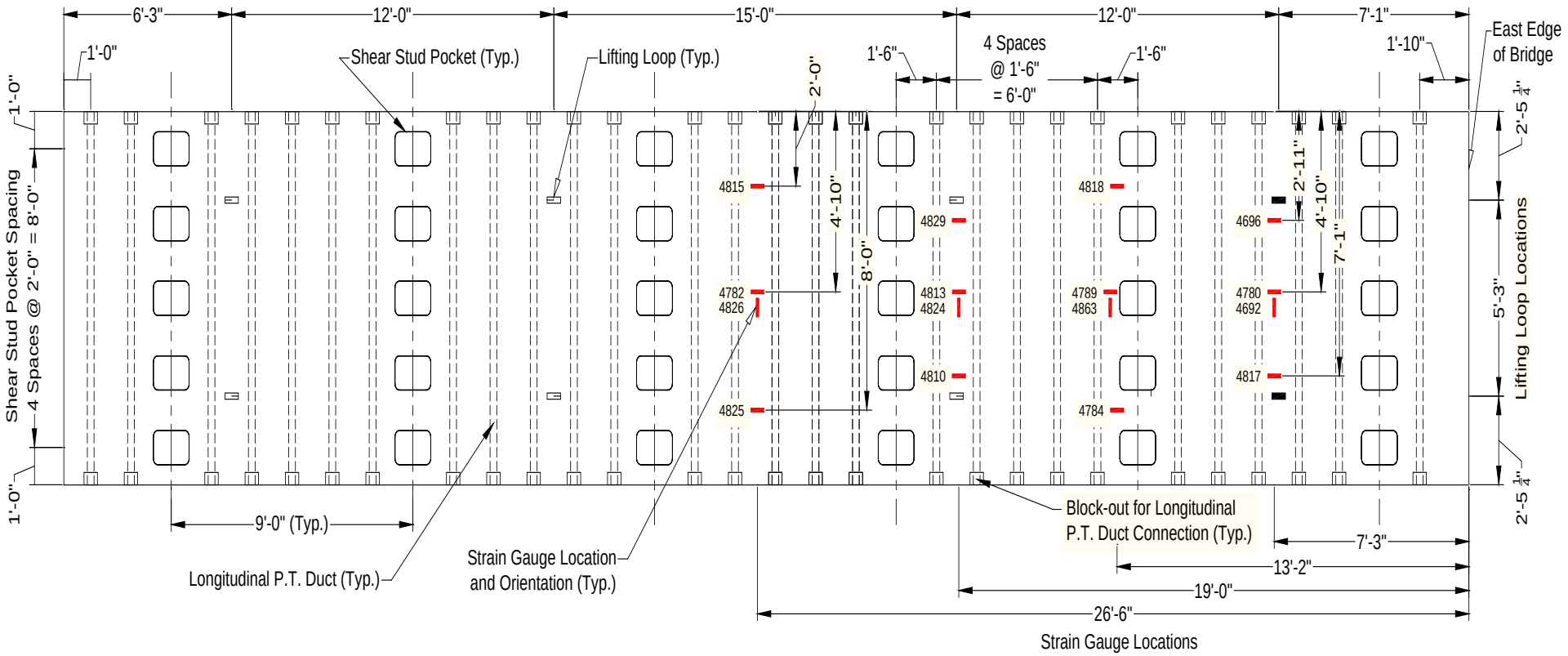
Bridge Description

- 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

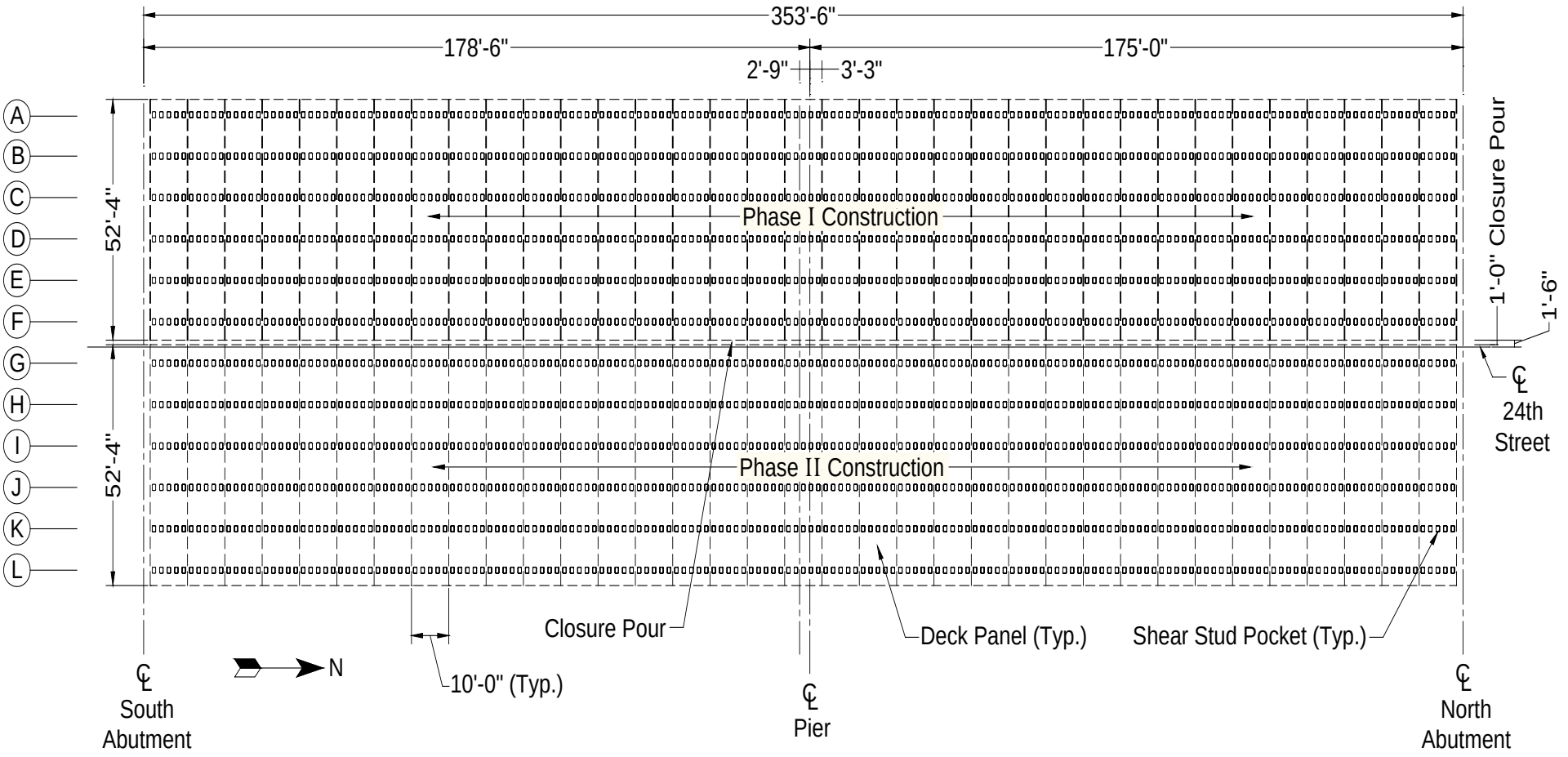


Precast Panel Plan



Precast Panel

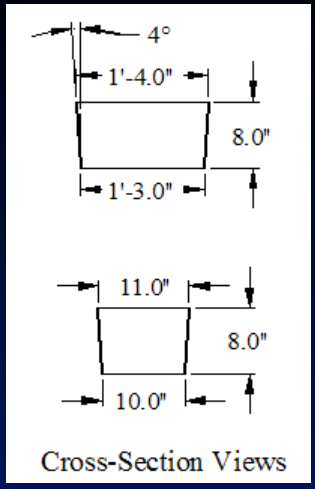
Bridge Plan/ Panel Layout

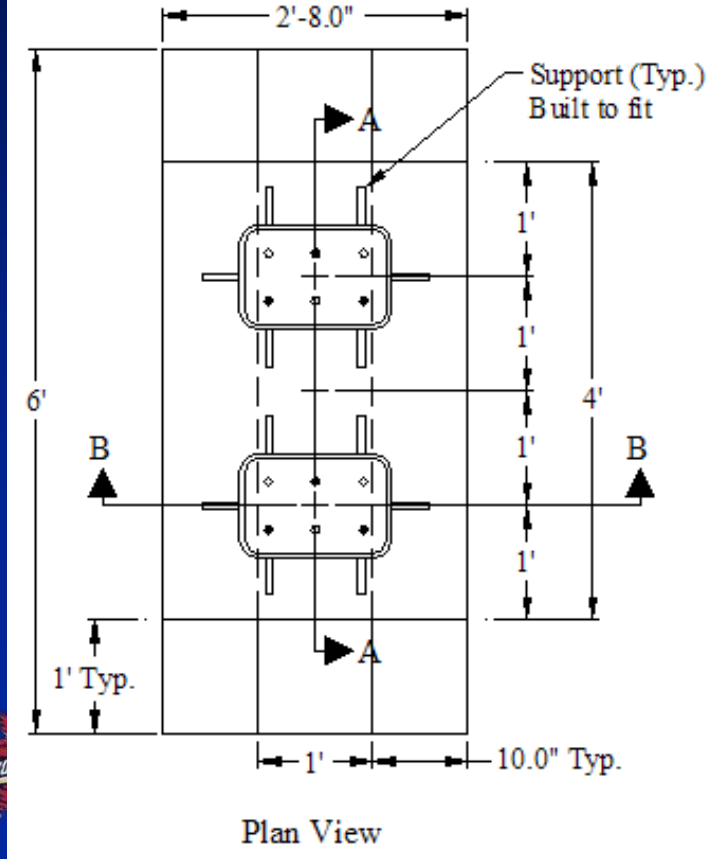


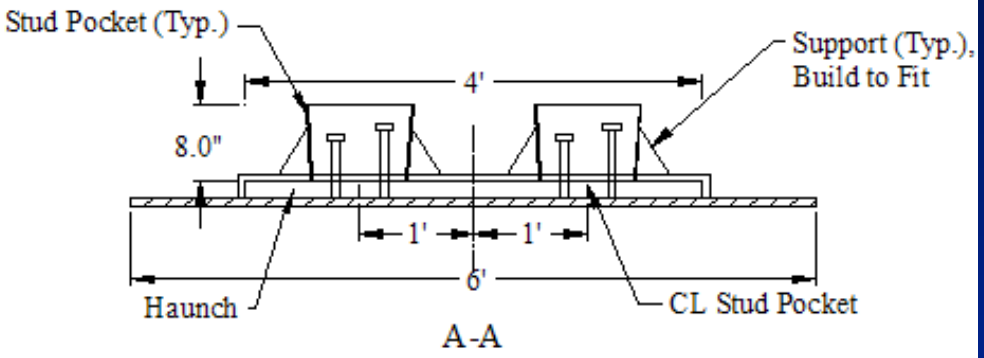
Bridge / Panel Layout

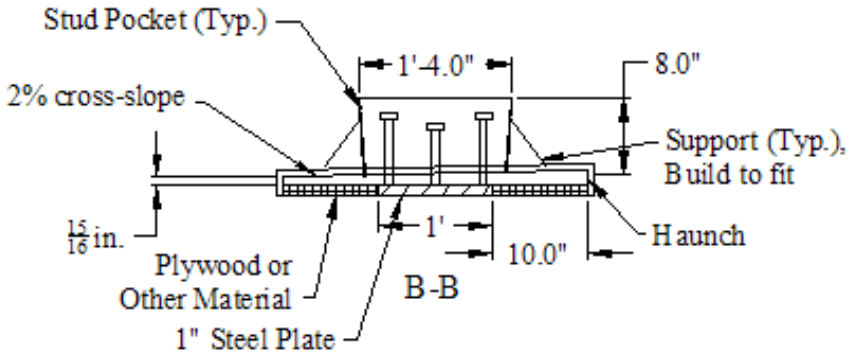
Laboratory Testing

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









Laboratory Testing

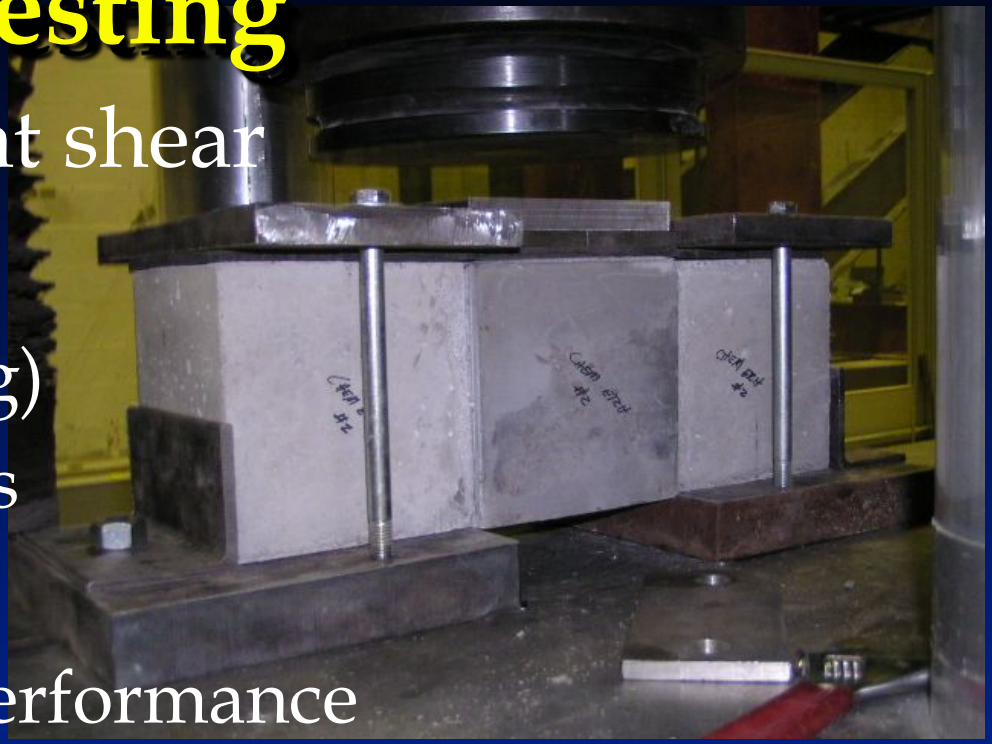
- Grout flowability
  - Sufficient grout flow from stud pockets to haunch

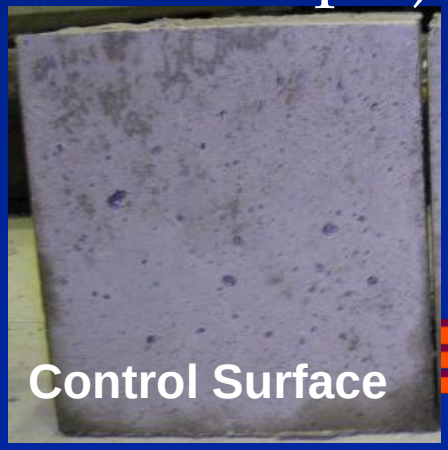
Laboratory Testing

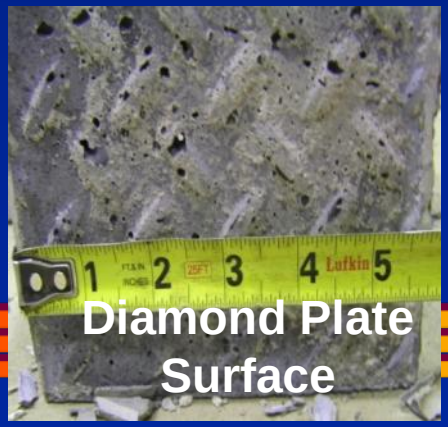
- Duct splicing performance
  - 1 in. x 3 in. duct splice checked for grout tightness
  - Waterproof duct tape
    - » Simple
    - » Works

Laboratory Testing

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







Field Testing

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

- No corrosion taking place as of June

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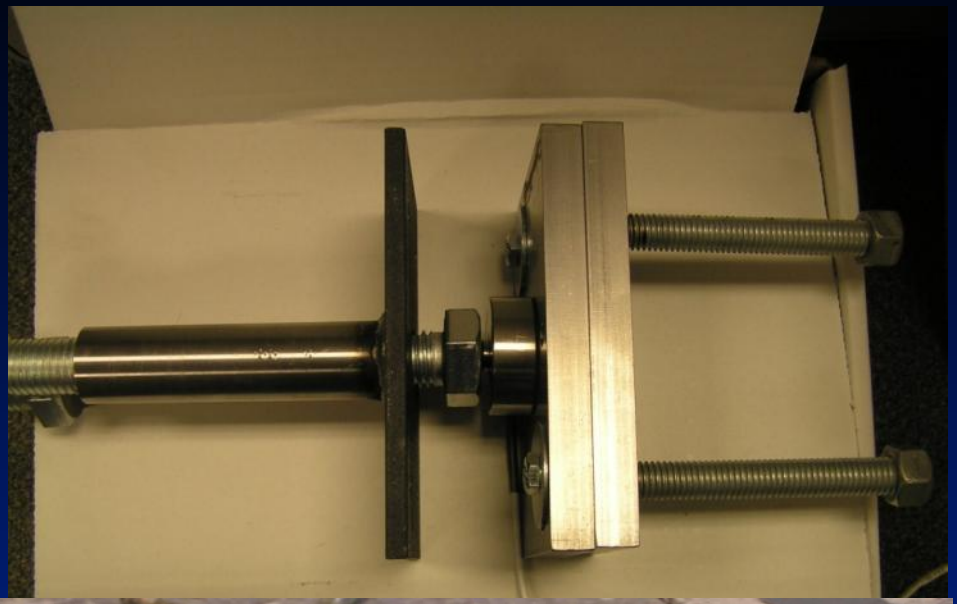
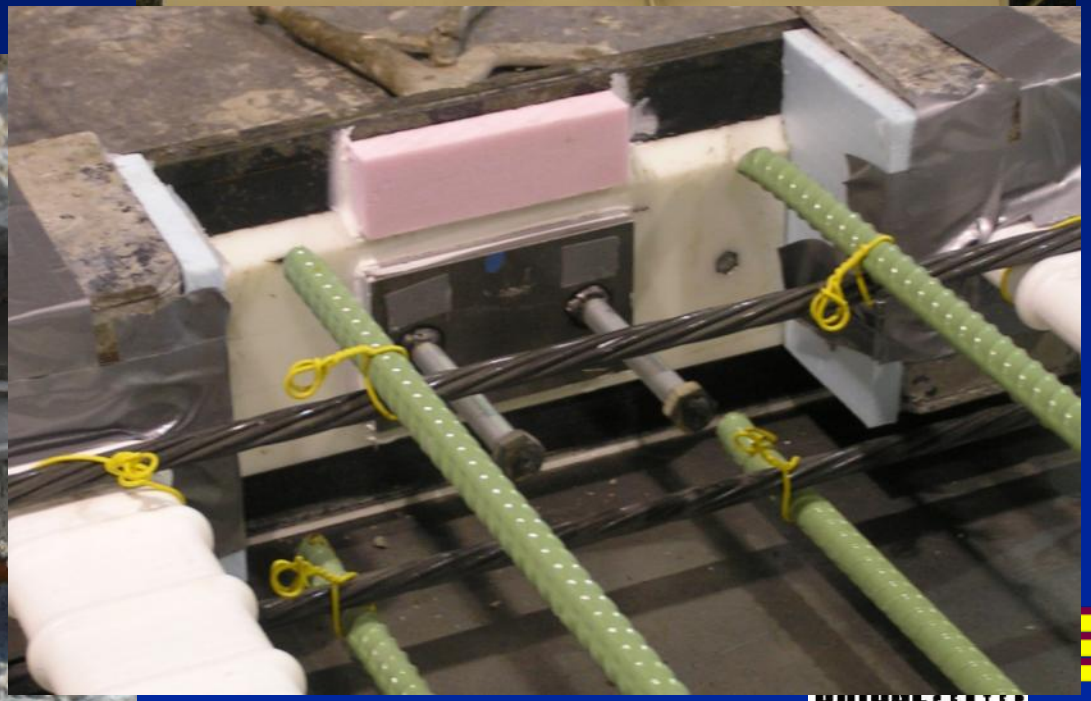
Field Testing

- Handling
- Performance

Field Testing

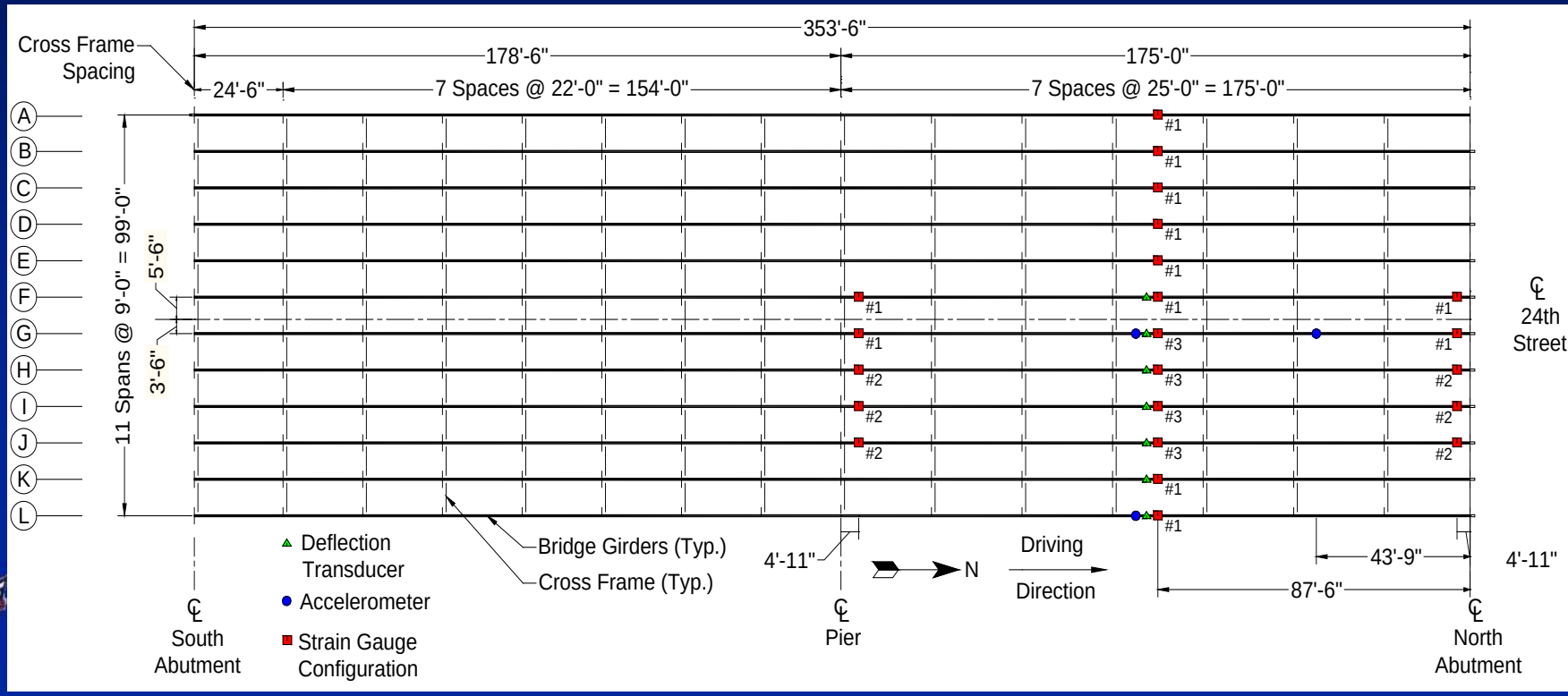
- Panel Joint Pressure
  - Monitored during post-tension





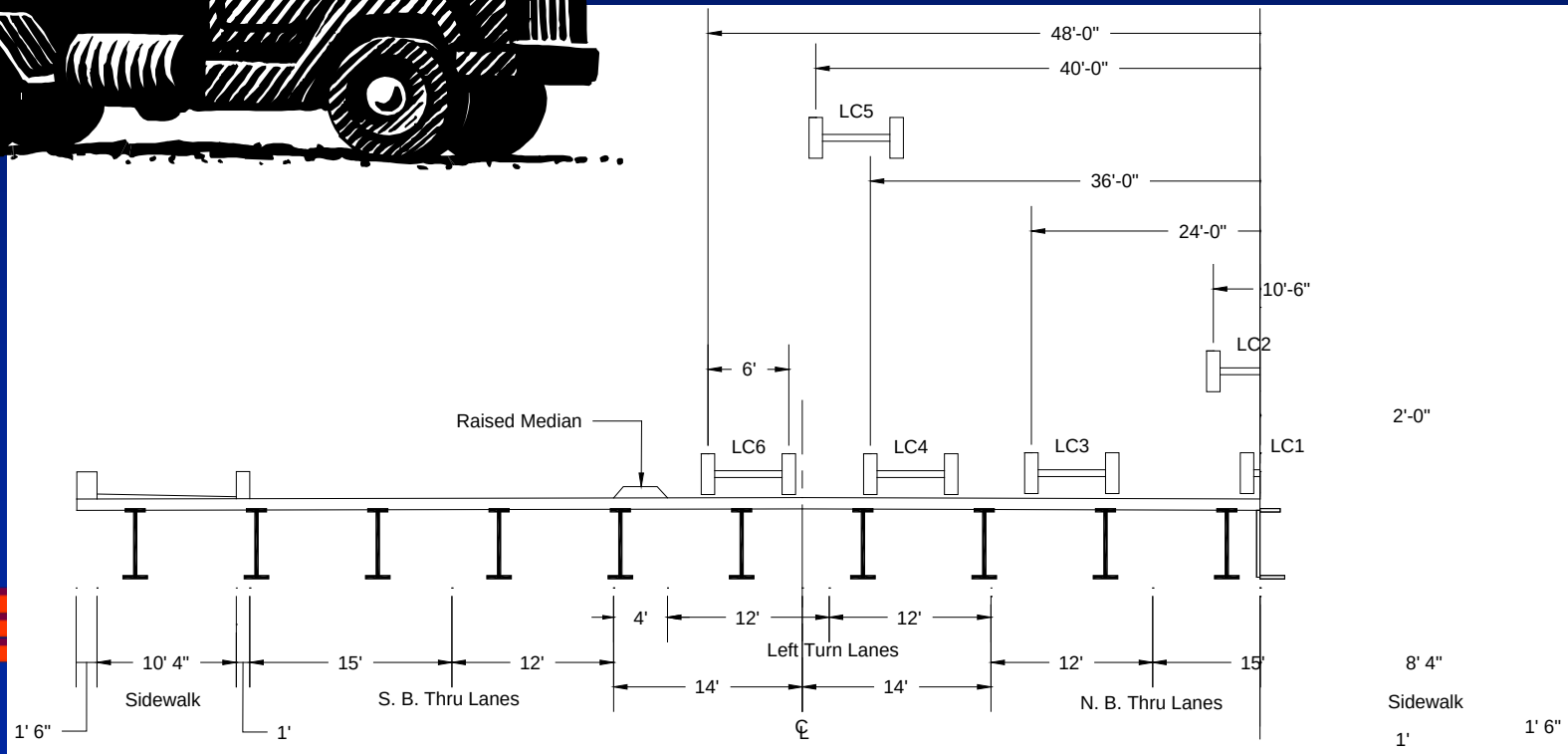
Field Testing

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



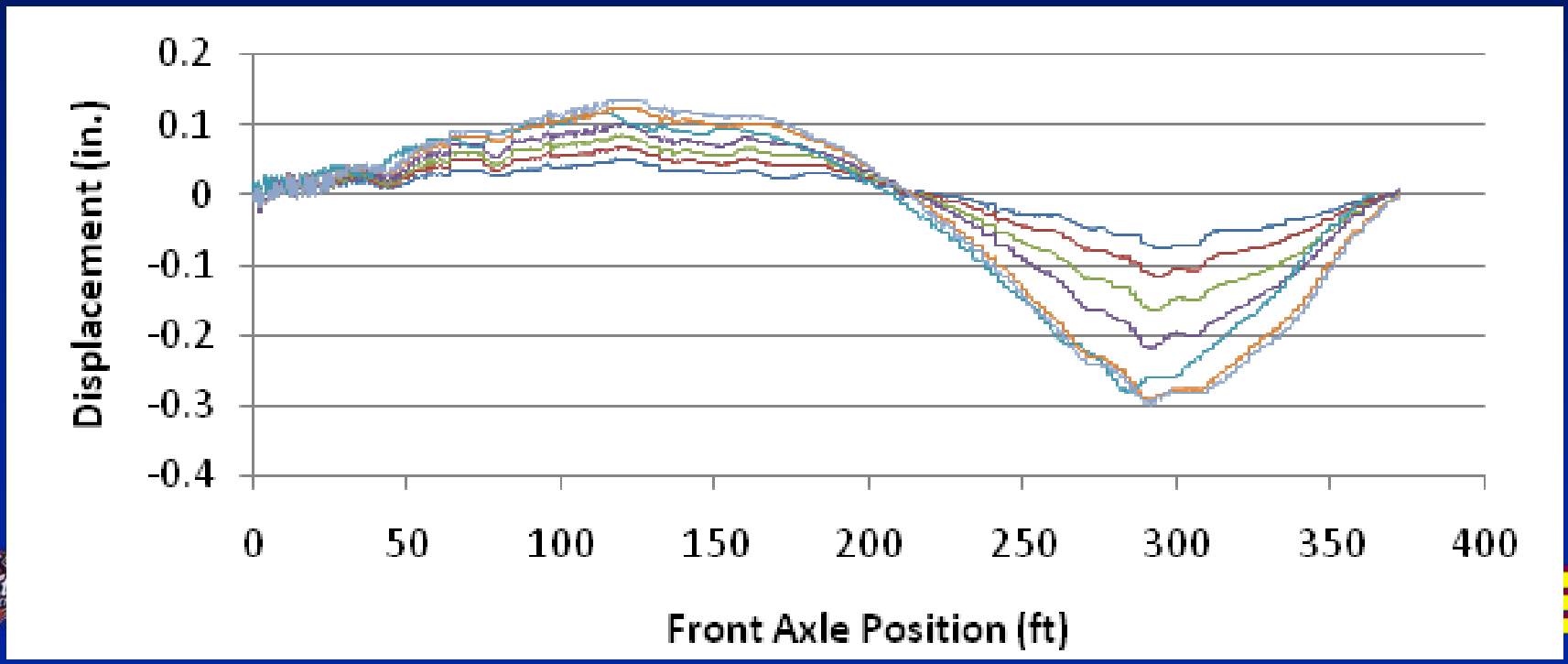
Field Testing

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



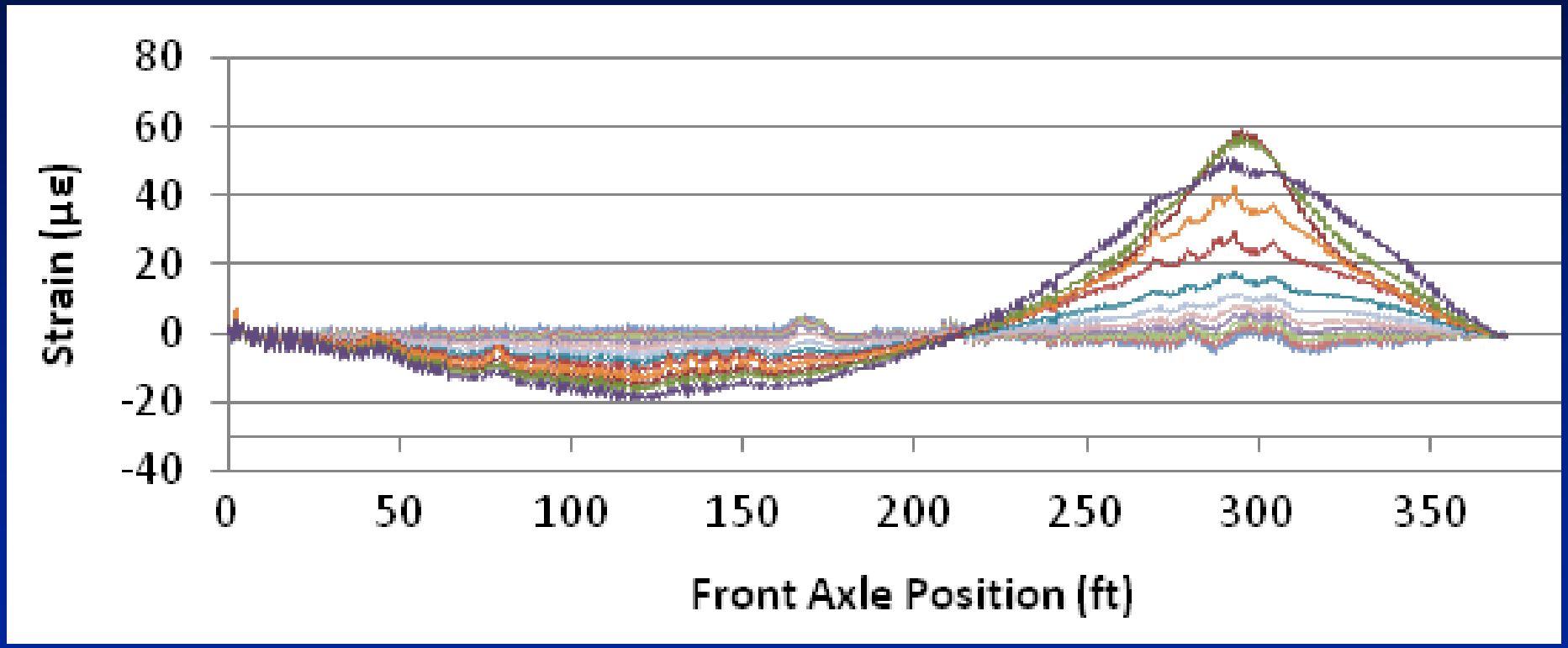
Field Testing

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



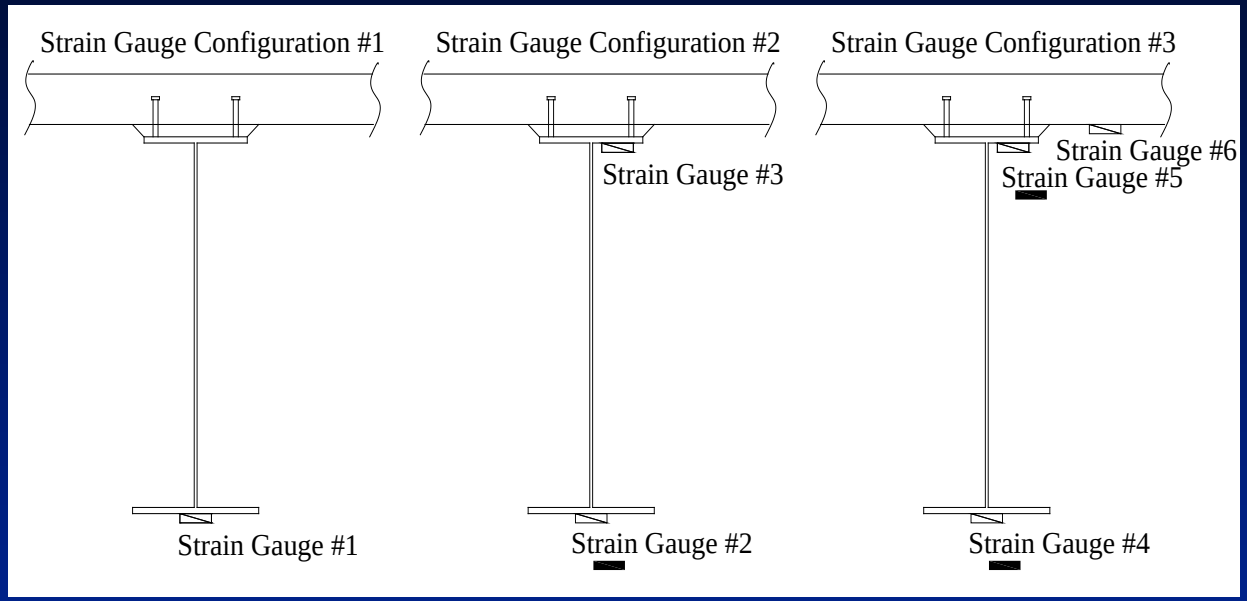
Field Testing

- Live load testing
  - Strain



Field Testing

- Live load testing
  - Strain



Strain (με)			
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 66με
    - » Max compression 22με

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24th Street Bridge

- Questions??