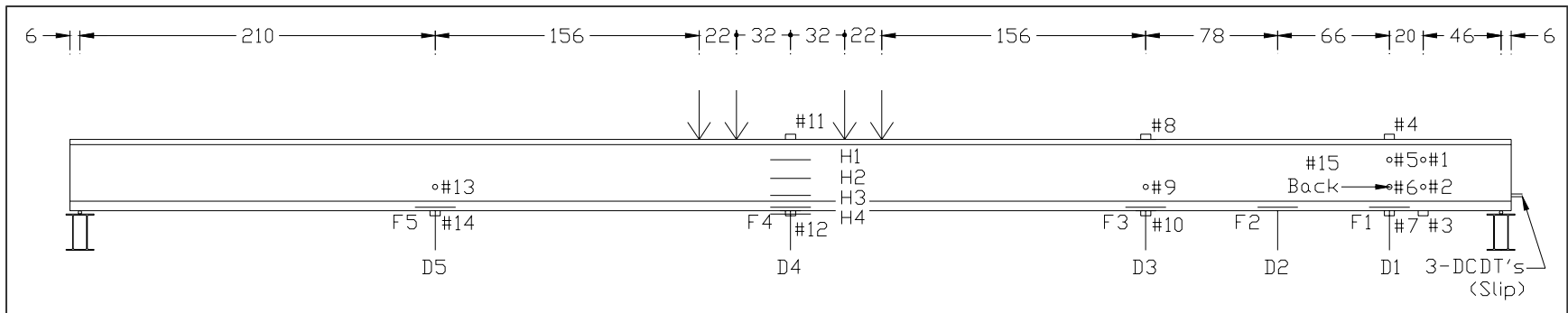
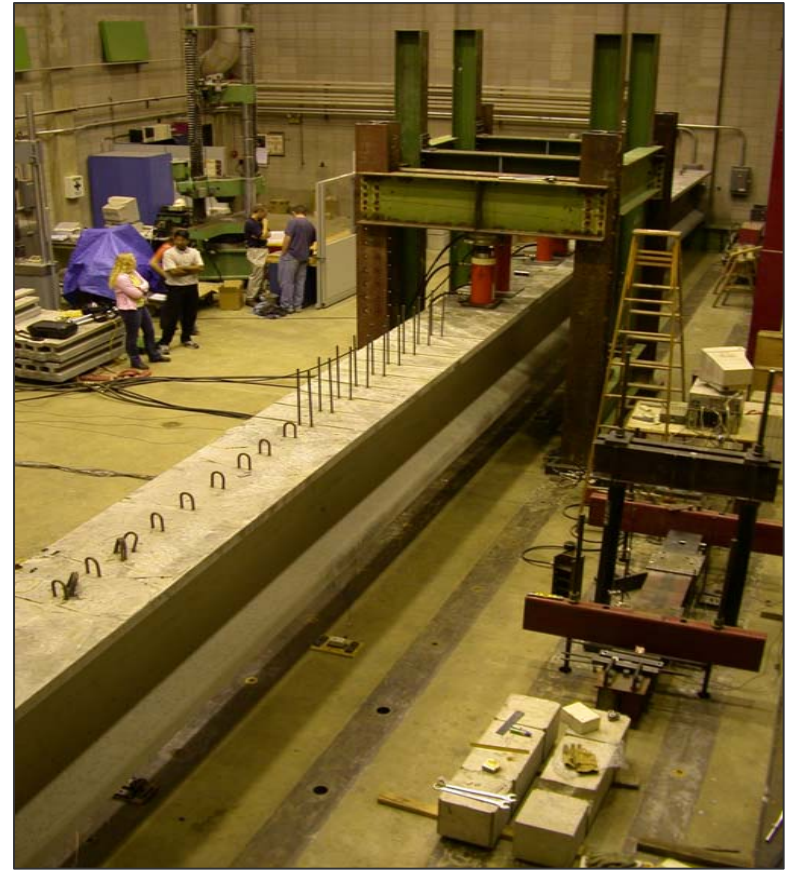


# Summary of Ultra-High Performance Concrete Laboratory Testing

# UHPC Testing Objectives

- Confirm adequacy of the Wapello County bridge design
- Investigate flexural behavior
- Investigate shear behavior

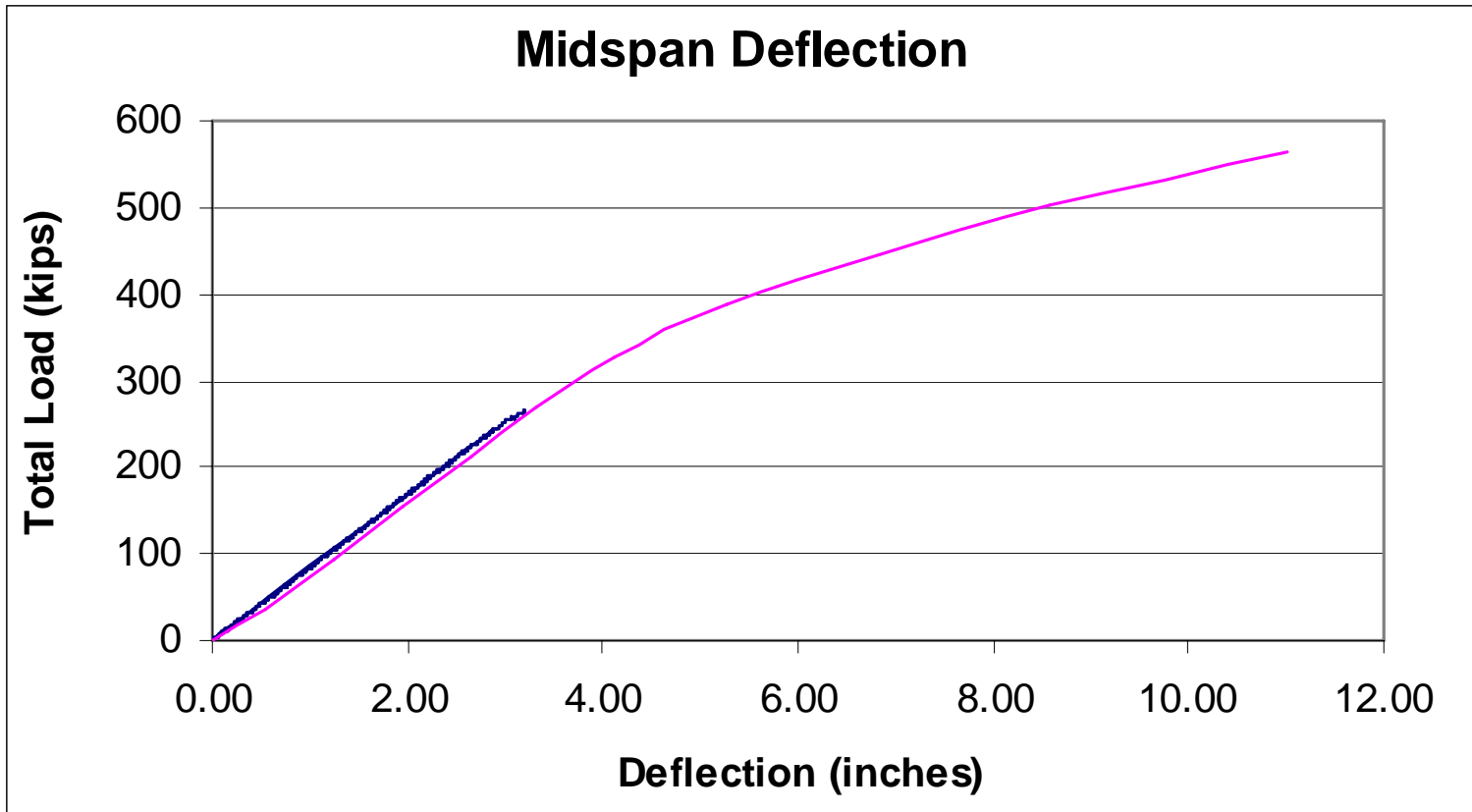
# Flexural Test Setup



# Flexural Test Results

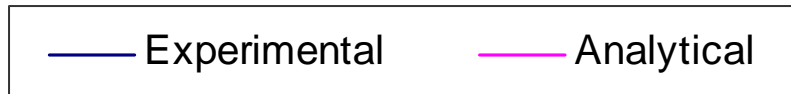
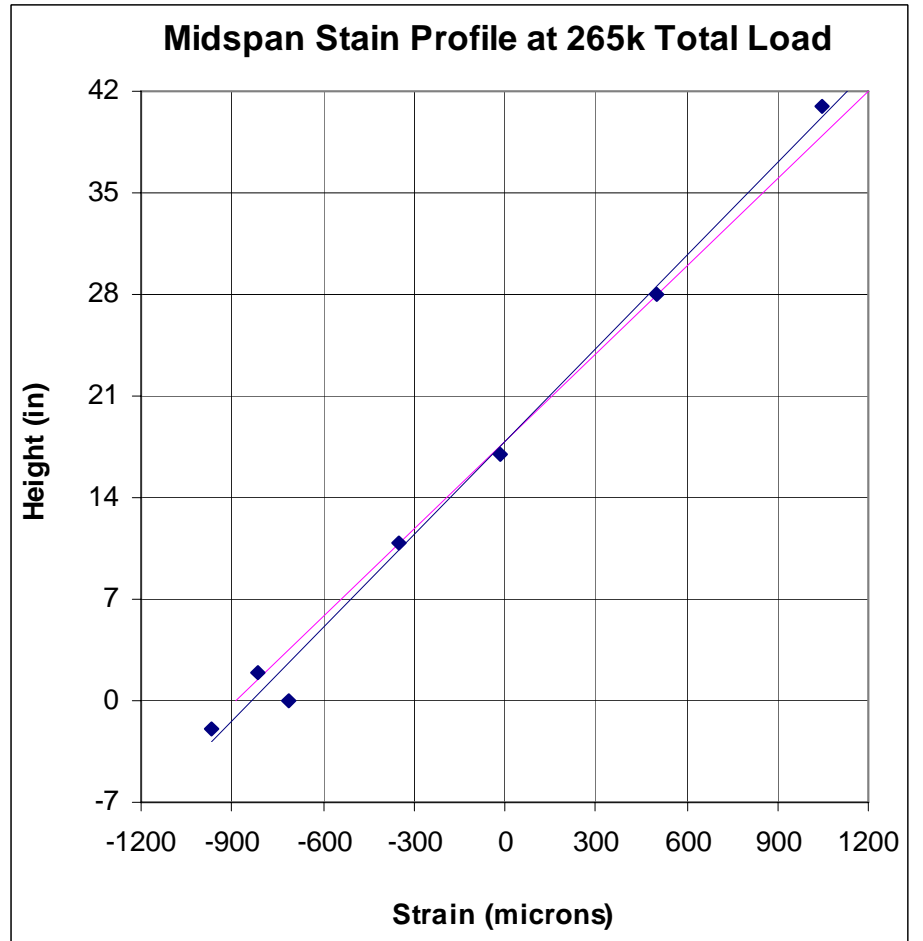
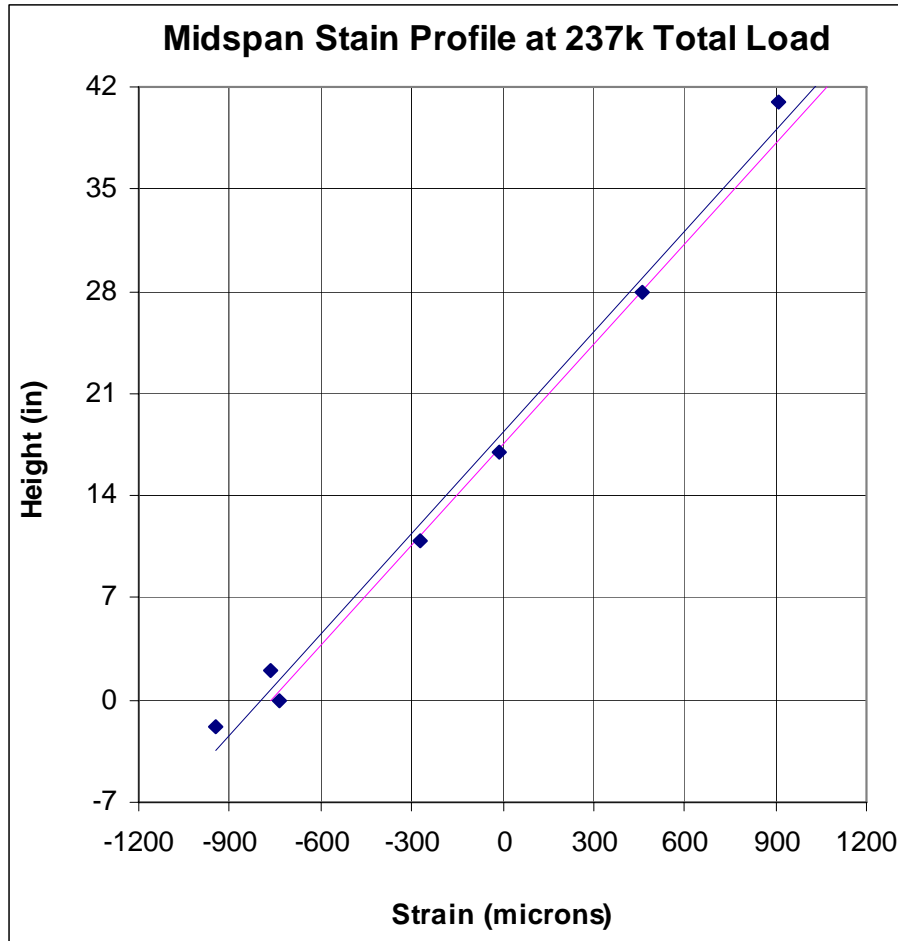
- Estimated prestress force, 1420 kips
- Flexural cracking
  - 3727 ft-k, 2.8 in., 1.10 ksi (T)
  - Anticipated service stress= 0.70 ksi (T),  
design allowable= 1.00 ksi (T)
- Final load, 265 kips
  - 4159 ft-k, 3.2 in., 1.13 ksi (T)
- Ultimate capacity was not tested
  - Predicted= 8968 ft-k, Required= 7356 ft-k
- Analytical & experimental results correlated well

# Deflection

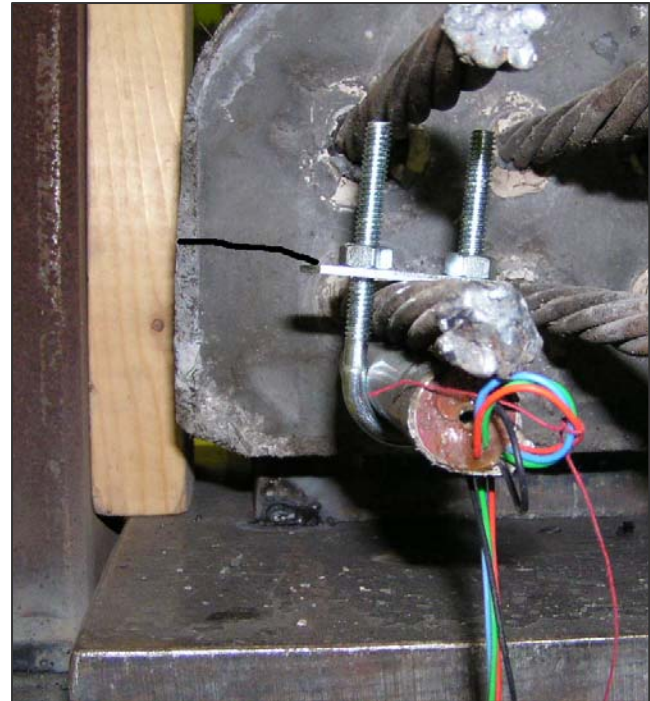
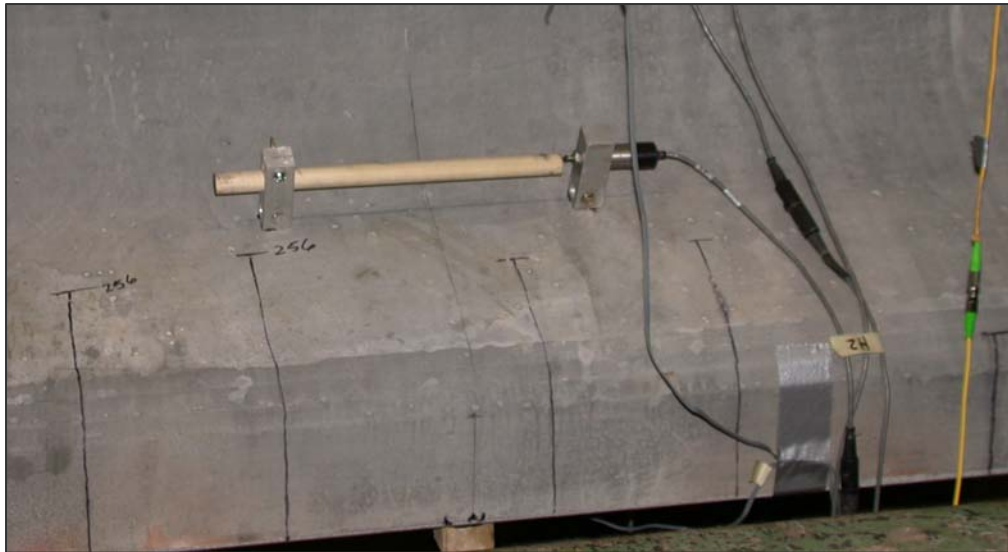


— Experimental      — Analytical

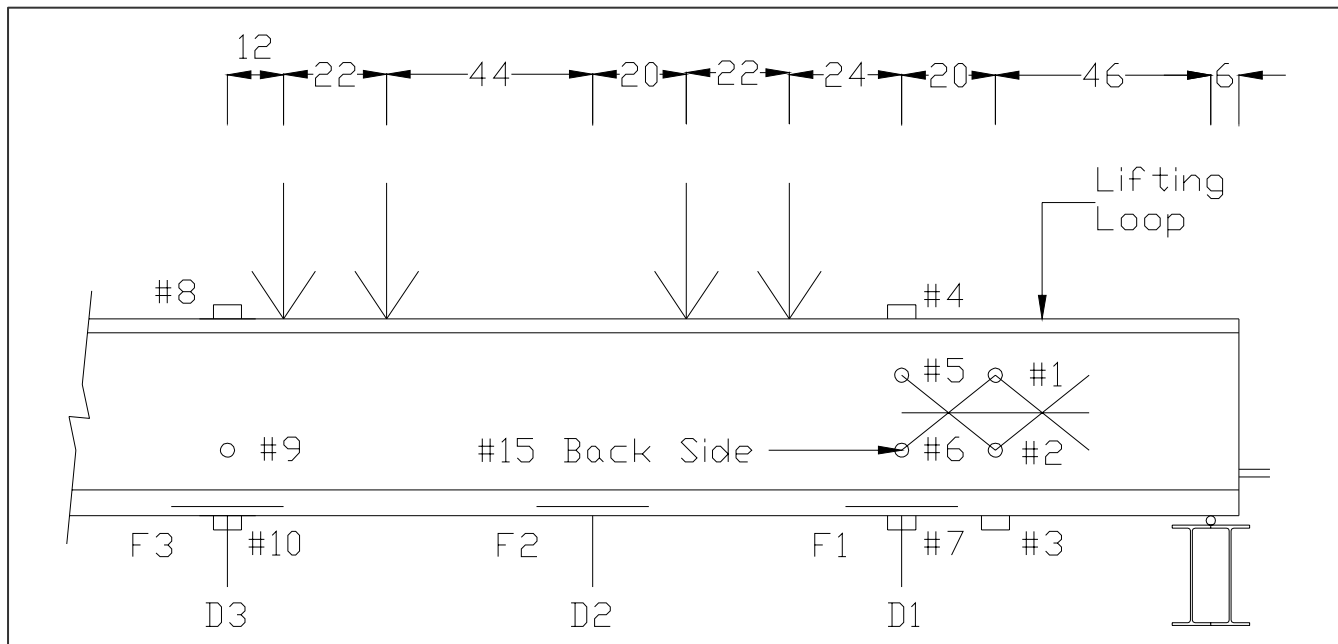
# Strain Profile



# Flexural Cracking



# Shear Test Setup

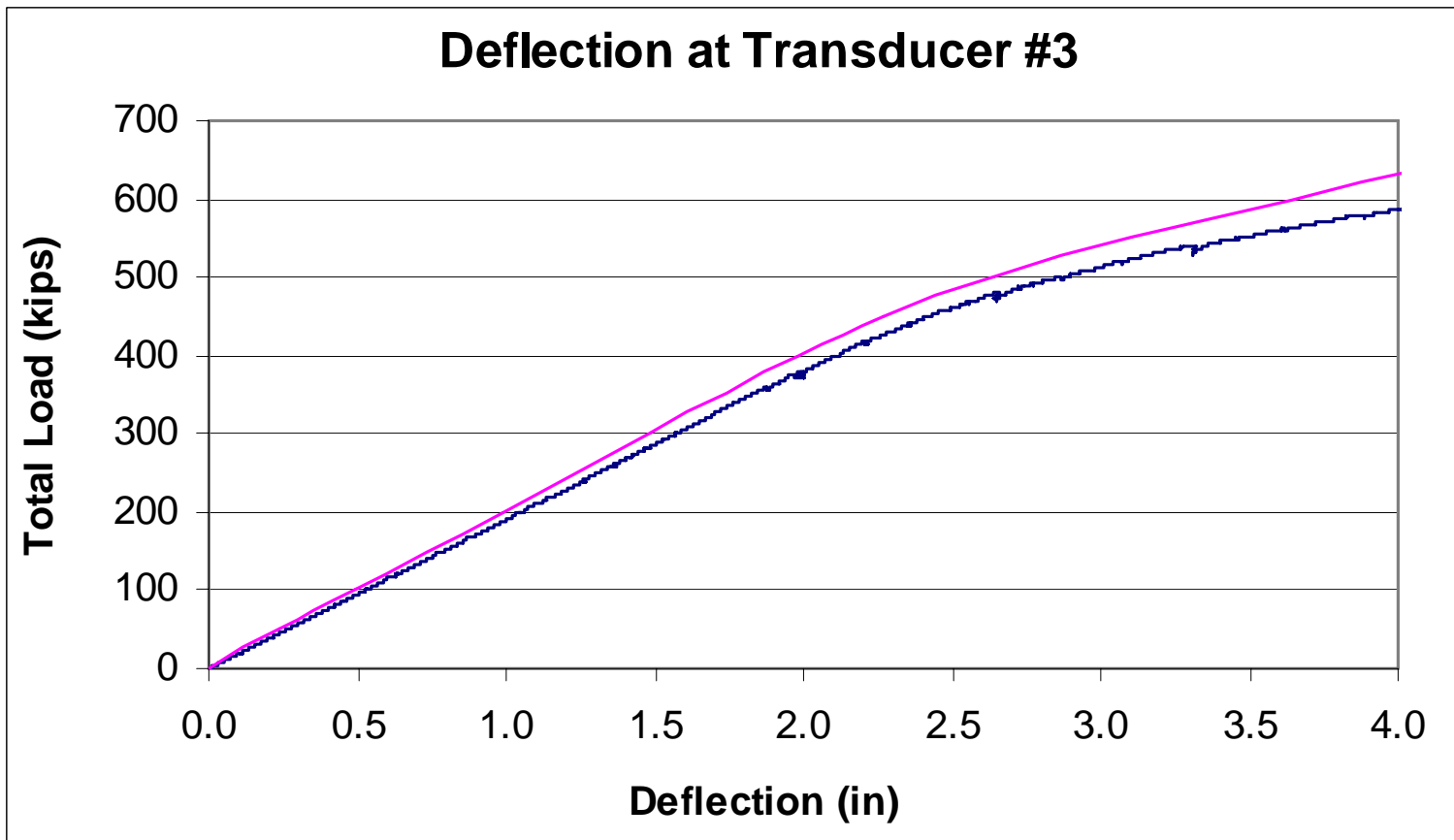




# Shear Test Results

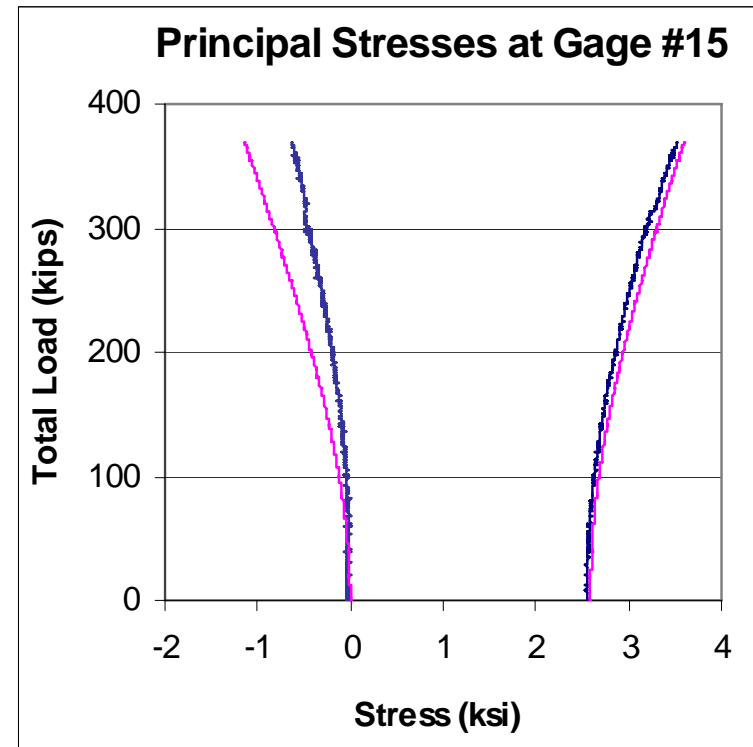
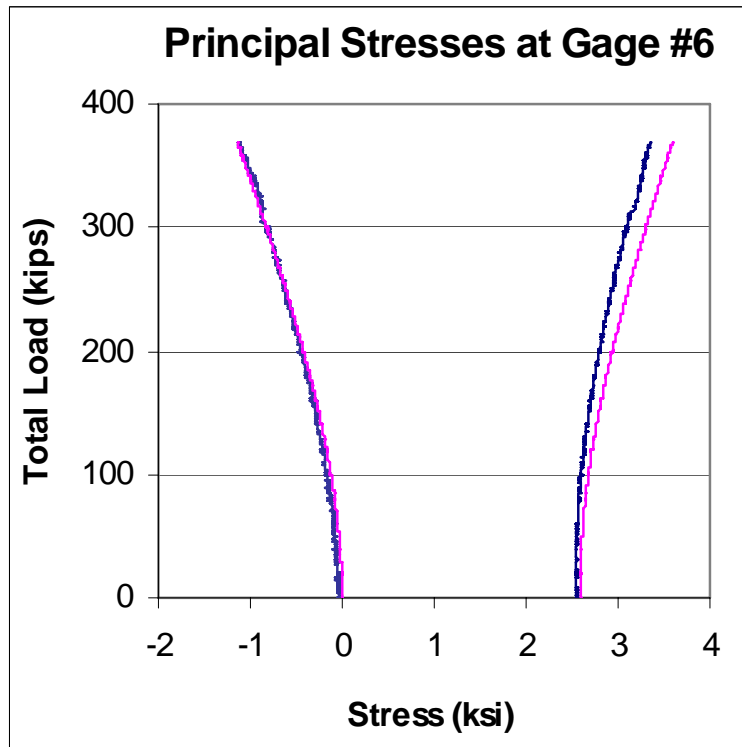
- Shear cracking, 370 kips
  - Shear of 315 kips, 189 kips required
- Flexural cracking, 398 kips
  - 3576 ft-k, 2.01 in., 1.10 ksi (T)
- Failure, 594 kips
  - Shear of 501 kips, 301 kips required
  - Did the lifting loop add extra strength?
- Analytical & experimental results correlated well

# Deflection

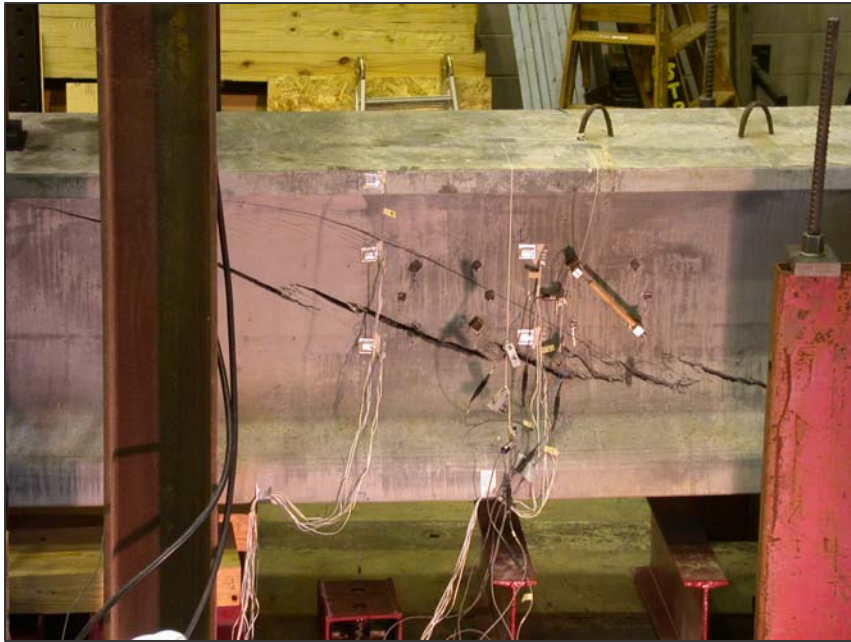


— Experimental      — Analytical

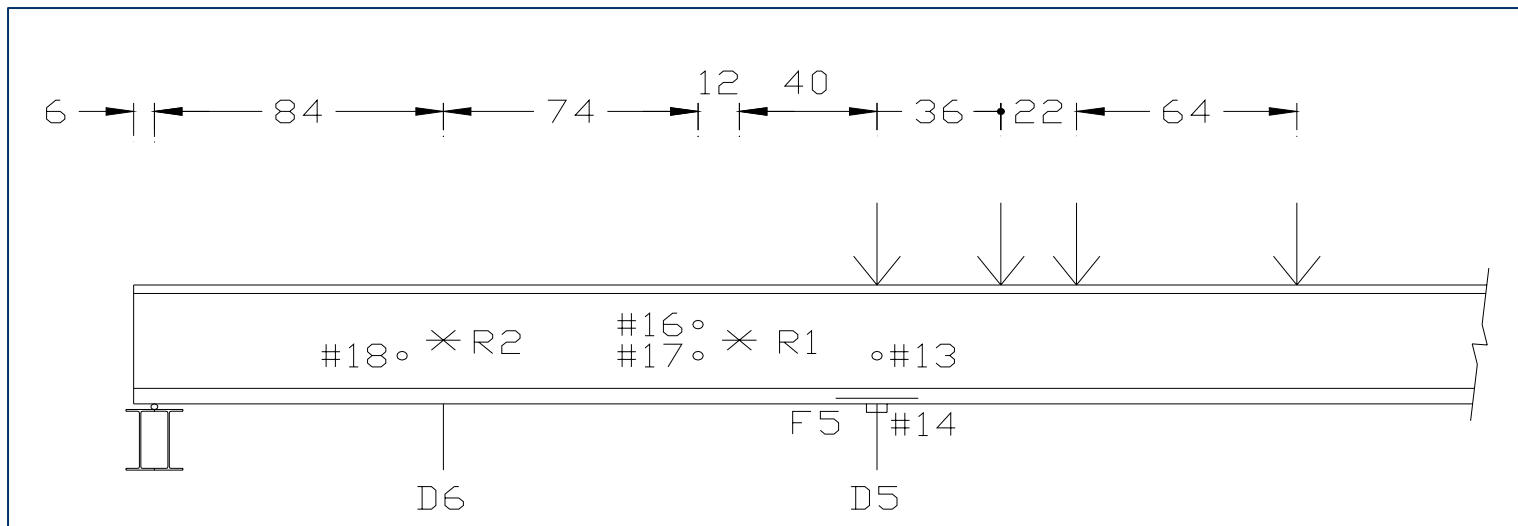
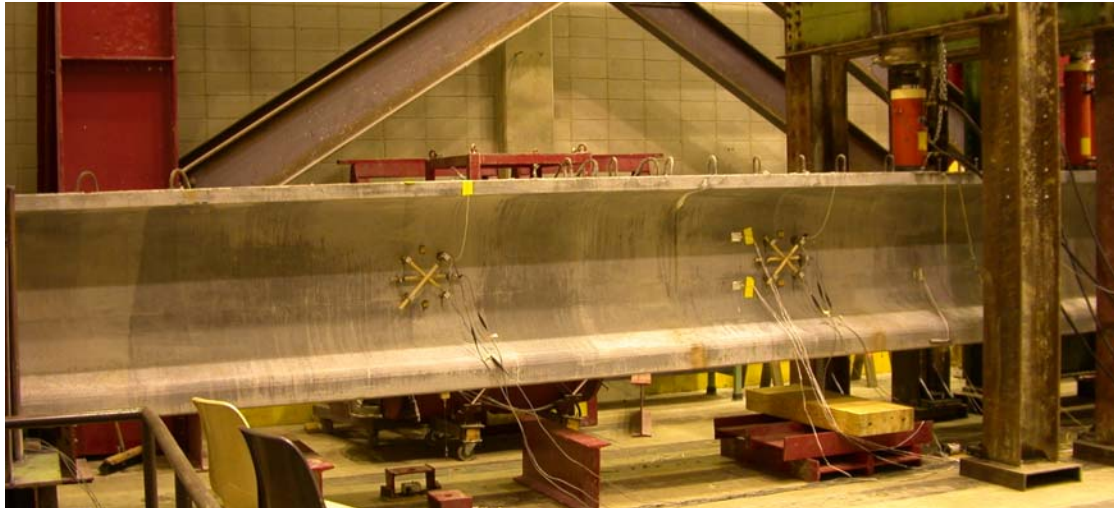
# Principal Stresses



# Shear Cracking



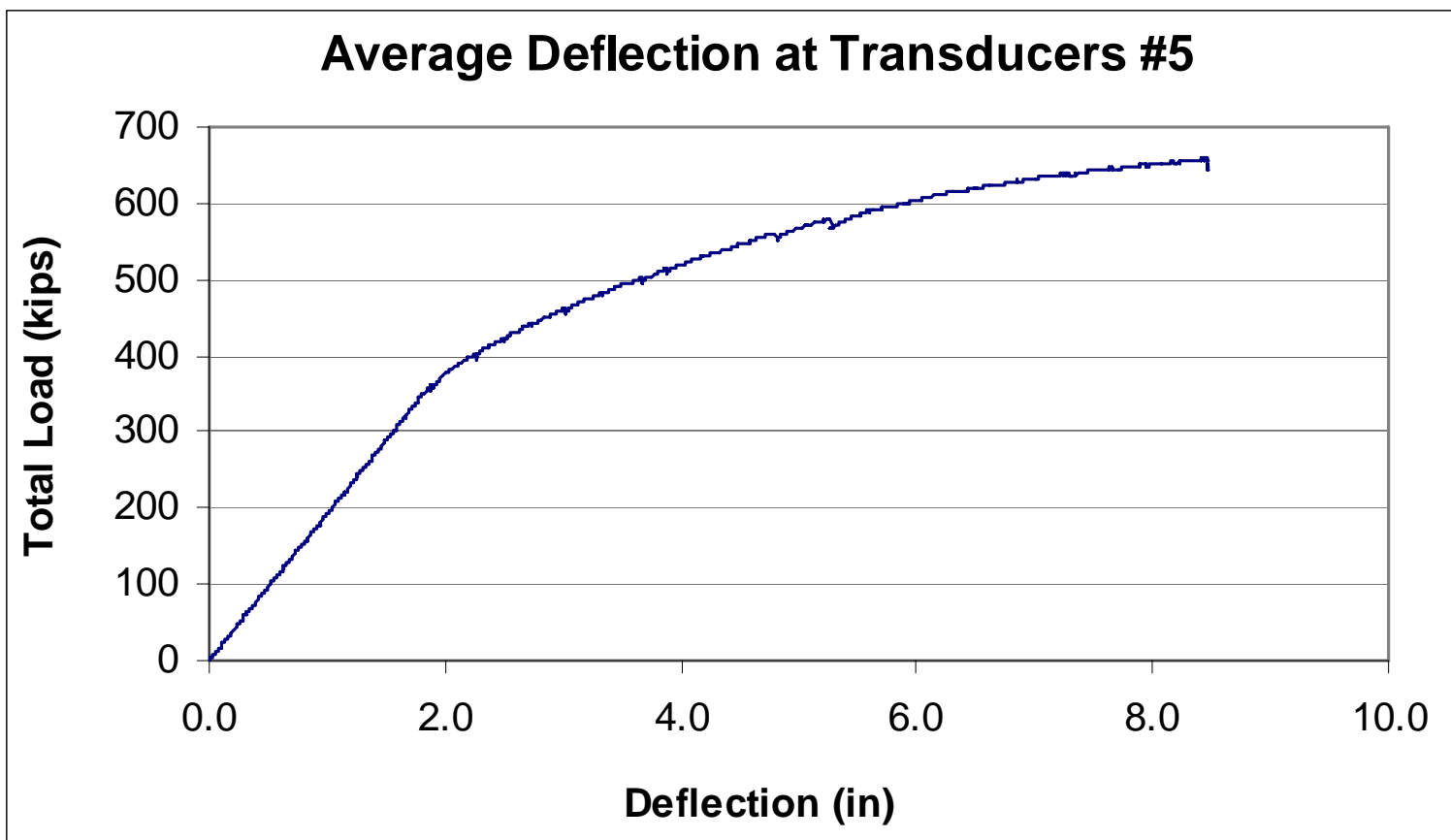
# Flexure-Shear Test Setup



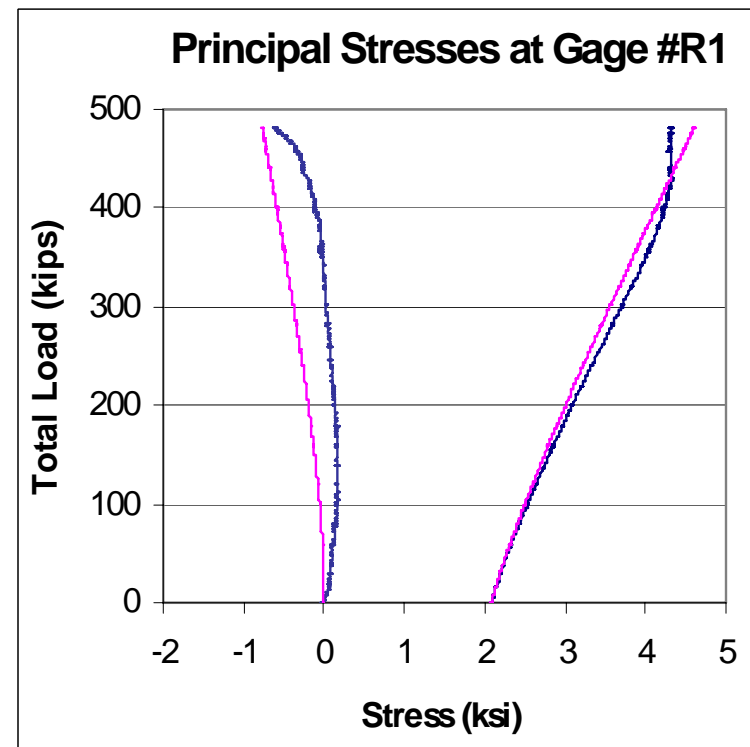
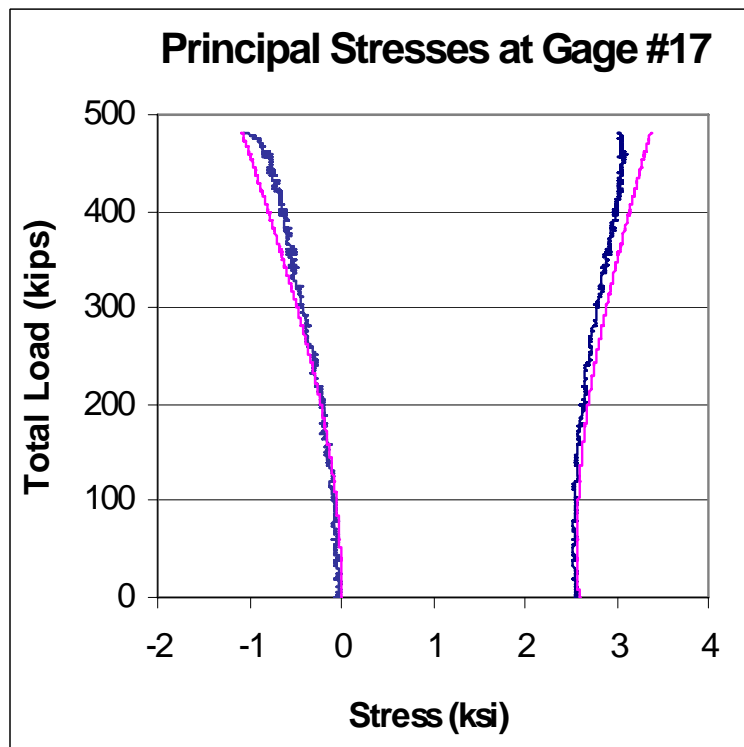
# Flexure-Shear Test Results

- Still Under Investigation
- Flexural and Shear Cracking Occurred
- Failure did not occur by breaking, rather the load vs. deflection curve became flat.

# Deflection



# Principal Stresses



— Experimental      — Analytical



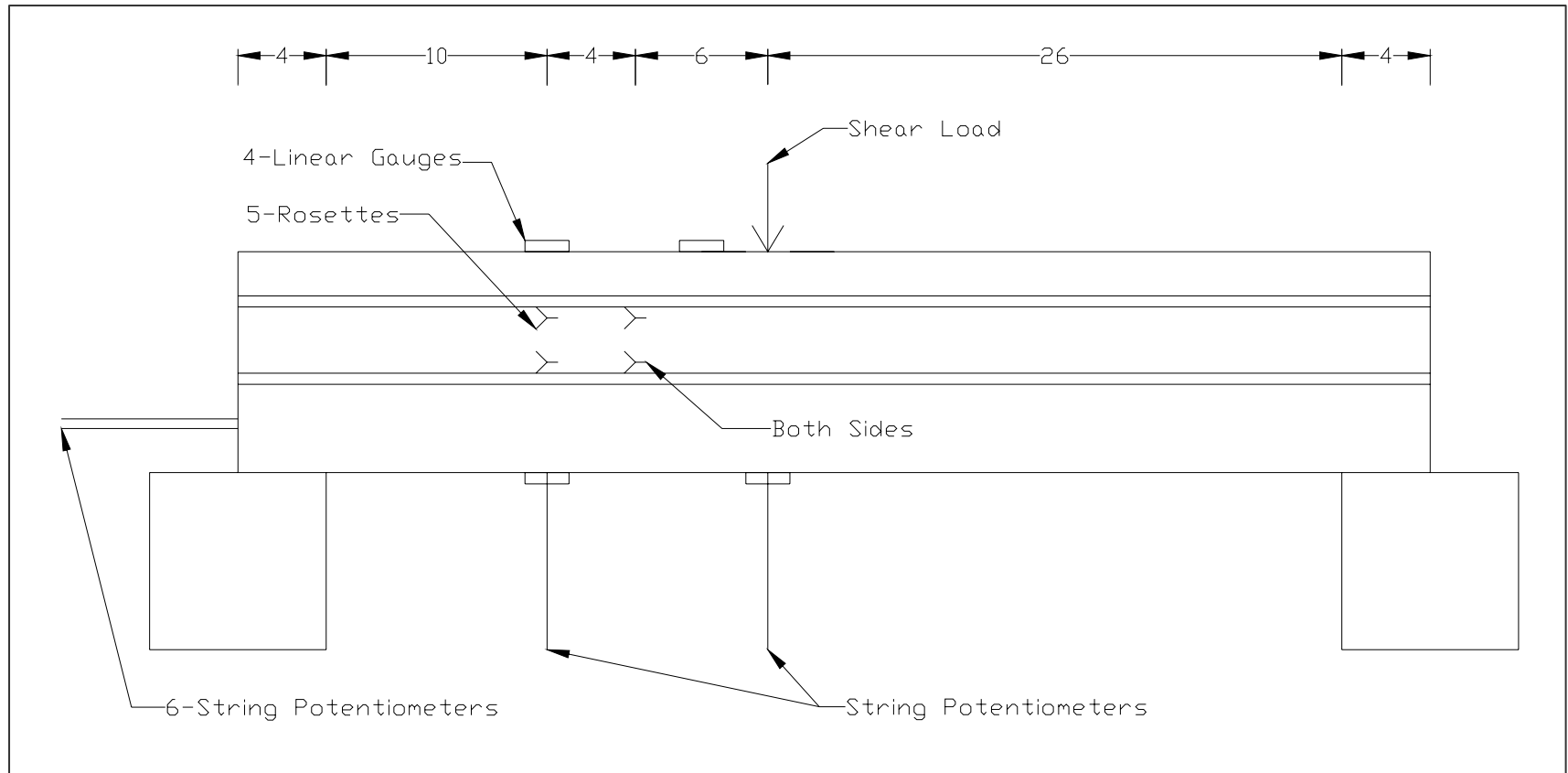
# Beam at Maximum Load



# Future Testing

- Small scale shear tests
- Live load testing

# Small Scale Shear Tests



# Live Load Testing

- Tandem axle dump truck
- Static loading

# Concluding Remarks

- Wapello County bridge design appears to be adequate
- Constitutive material properties still under investigation
- Shear design approach still under investigation

# Questions?

