REPAIR OF DAMAGED PRESTRESSED CONCRETE GIRDER

AASHTO Midwest Bridge Preservation Conference, Detroit, MI

Presented by:

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Acknowledgments:

Bridge Owner: NDOR
Retrofit Designer: HNTB
Contractor: Simon Contractors

Bridge Impact Data

	Nebraska	United States
	800 overhead bridges	91,000 overhead bridges
	10 impacts in past year	Approx. 1,100 impacts

- Traditionally, damaged pre-stressed concrete girders are replaced.
  - Costly
  - Major traffic delay
  - Cold joints on deck
- Girder repair by splicing strands is an attractive option.

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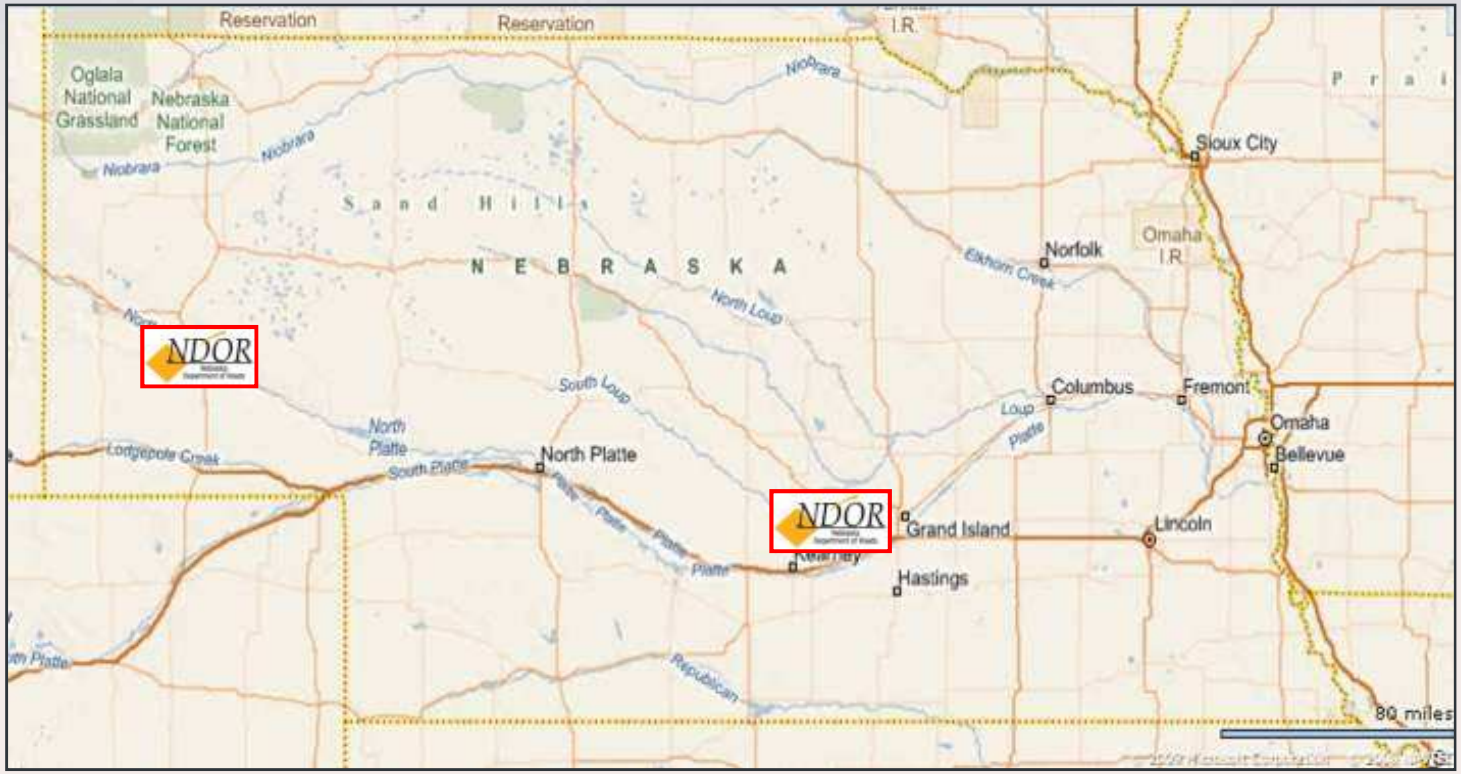
Bridge Locations

- **Wood River Interchange**

  Highway N-11 and I-80, approx. 4 miles S of Wood River

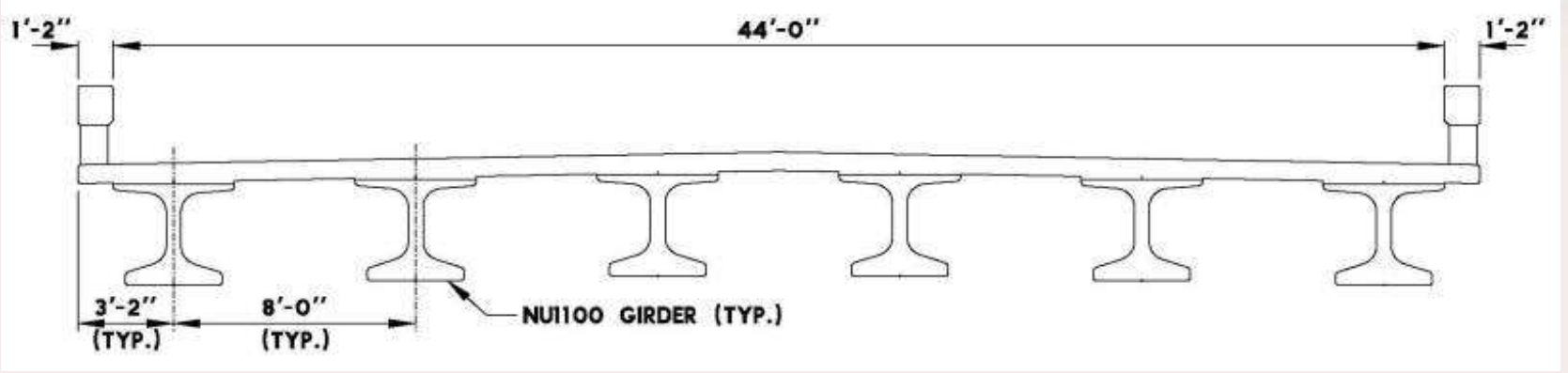
- **Gering By-Pass**

  Highway N-71, approx. 2 miles SE of Gering



Wood River Bridge

- Two lane bridge over I-80
- Two span 145’ - 145’
- Continuous for Dead Load and Live Load



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In Depth
Field
Inspection

- March 16 & 17, 2009
- Duration of traffic control – 3 to 4 hours
- Inspection tasks included:
  - Document damage – field notes, photos
  - Inspect impact location and load path
  - Measure extent of visible damage
  - Sounding of girder concrete
  - Measure loss of camber using level rod

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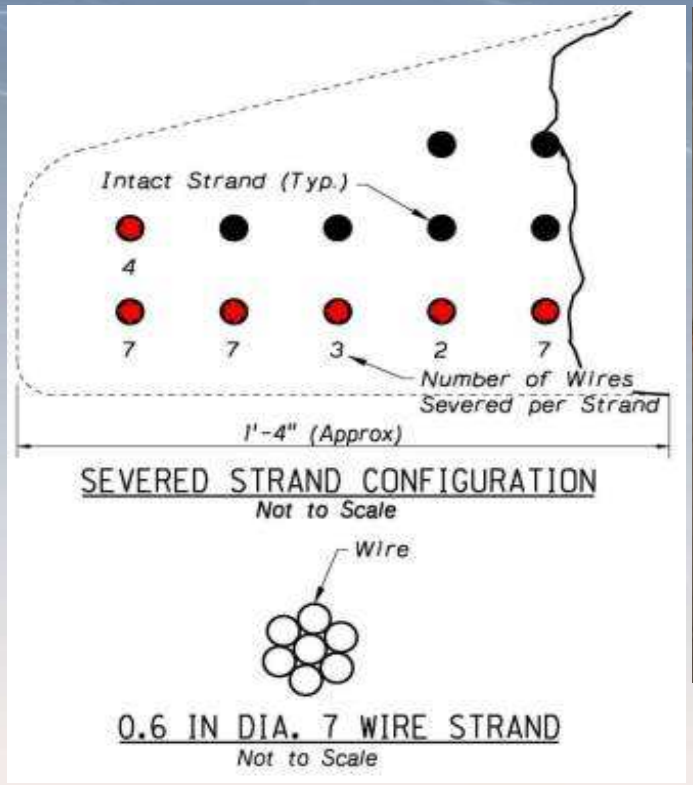
Wood River Bridge



Comparative Camber < 1.48”

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Objectives of Repair

- **Regain original condition and performance by:**
  - **Splicing the broken strands,**
  - **Recovering moment capacity,**
  - **Preventing corrosion of strands and reinforcing steel, and**
  - **Using compatible grout to replace the broken concrete.**

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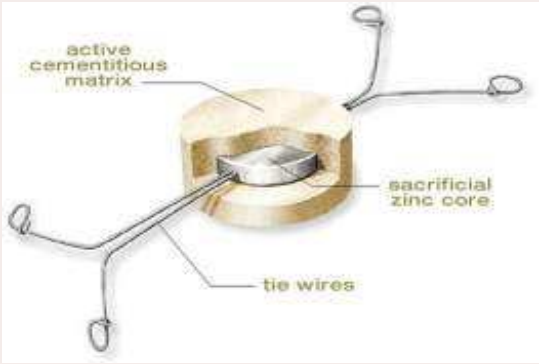
Corrosion Protection

- **Corrosion protection is <u>critical</u>:**
  - Concrete reactivity decreases with age. New concrete has greater reactivity & corrosion potential.
- **To protect against corrosion:**
  - Blast clean exposed reinforcement.
  - Use anodic protection for reinforcing



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Grout Selection Criteria

- **Tensile Zone Impacts**
- **Non-shrink**
- **Compatible with Anodes, i.e., electrical resistivity < 15,000 ohm-cm.**
- **No Construction Joints**

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Girder Repair Sequence

- Chip concrete in 90^0 cuts.
- Load alternate span with live load.
- Splice strands to full tension.
- Place anodes and finish forming.
- Shift live load to damaged span.
- Place non-shrink grout.
- Cure the grout and remove live load.

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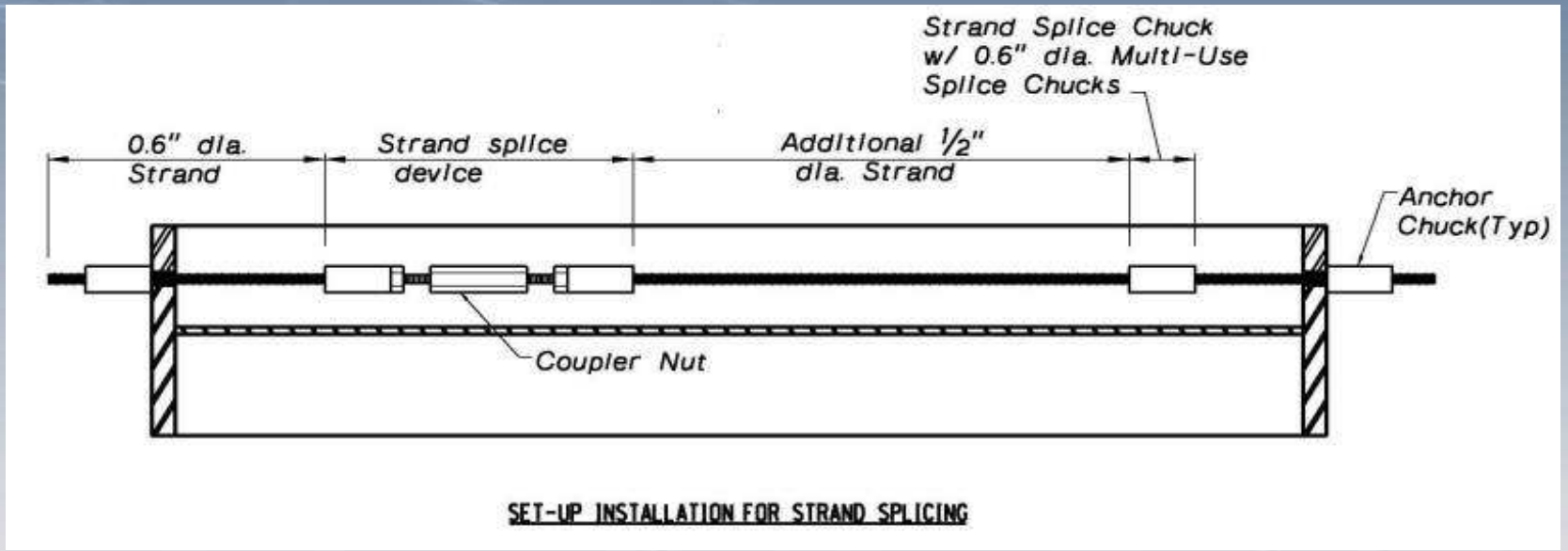
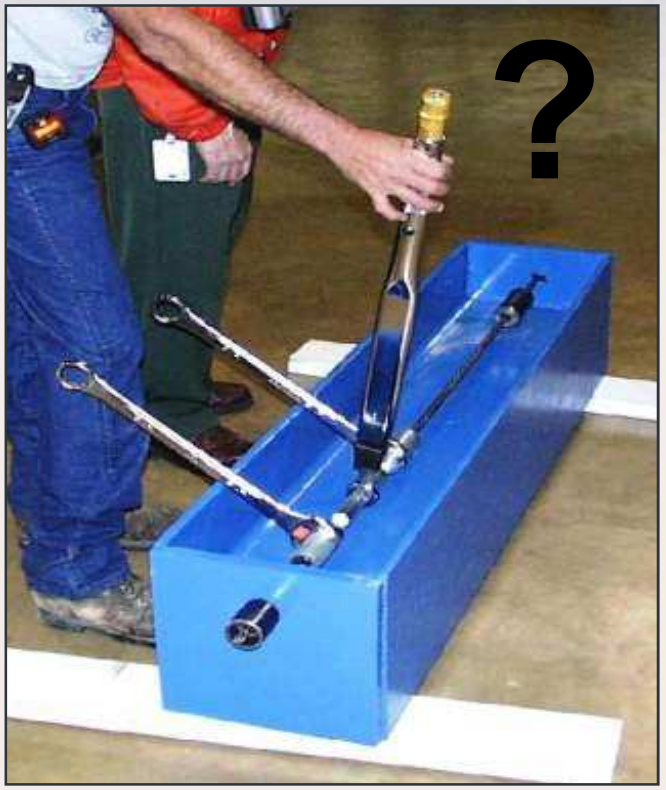
Strand Splicer Mock-Up



SET-UP INSTALLATION FOR STRAND SPLICING

Design for $\phi M_n > M_u$



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Calibrate the torque meter.

Strand
Splicing
Hardware

Practice the procedure.

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Surface Prep and Strand Cutting

Remove damaged concrete.

Cut damaged strands.

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Strand Splicing

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Completed forms

Forming and Placing Grout

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Finished
Repaired
Surface

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WS DOT Guidelines

Repair
VS
Replace

- Repair if < 25% strands are damaged.
- Check girder alignment, excessive cracking.
- There should be no cracking at harping point.
- Check strength/damage of adjacent girders.
- Repair cost is < 70% of girder replacement.

Questions?

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