

**Evaluation of Corrosion
Resistant Steel Reinforcing in
the Deck Slab of a Three-span
Prestressed Concrete Girder
Bridge**



Objective and Scope

- Investigate and evaluate the field performance of new reinforcing steel and compare with conventional reinforcing steel
- Corrosion sensors embedded in deck slab to be monitored
- Data collected occasionally to assess performance in terms of corrosion resistance



MMFX vs. Epoxy coated steel

- Micro-composite Multi-structural Formable Steel (MMFX)
 - Relatively new form of corrosion resistant material
- Epoxy coated steel (ECS)
 - Conventional black steel coated with epoxy



Bridge Description



MMFX bridge



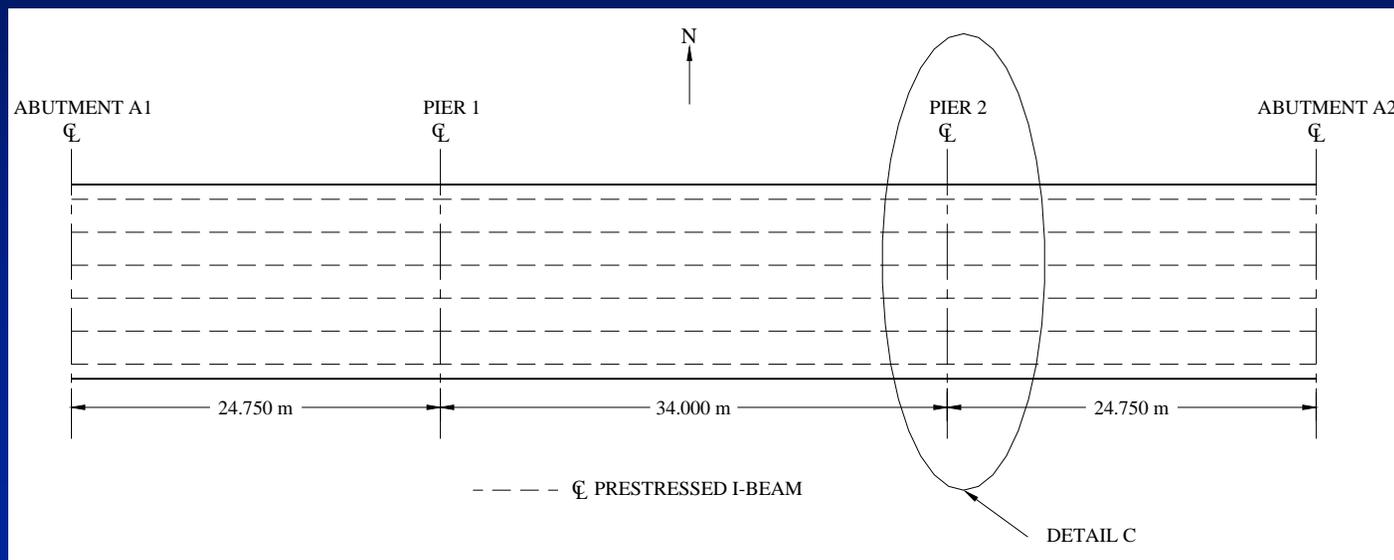
Epoxy bridge

- Twin 83.5m x 12m three-span prestressed concrete girder bridges constructed in May 2002, and open to traffic in Aug 2003
- Located in Grundy County, IA carrying relocated Highway U.S. 20
- Each bridge deck constructed with different types of reinforcing steel
 - East bound : MMFX steel (MMFX bridge)
 - West bound: Epoxy coated steel (Epoxy Bridge)

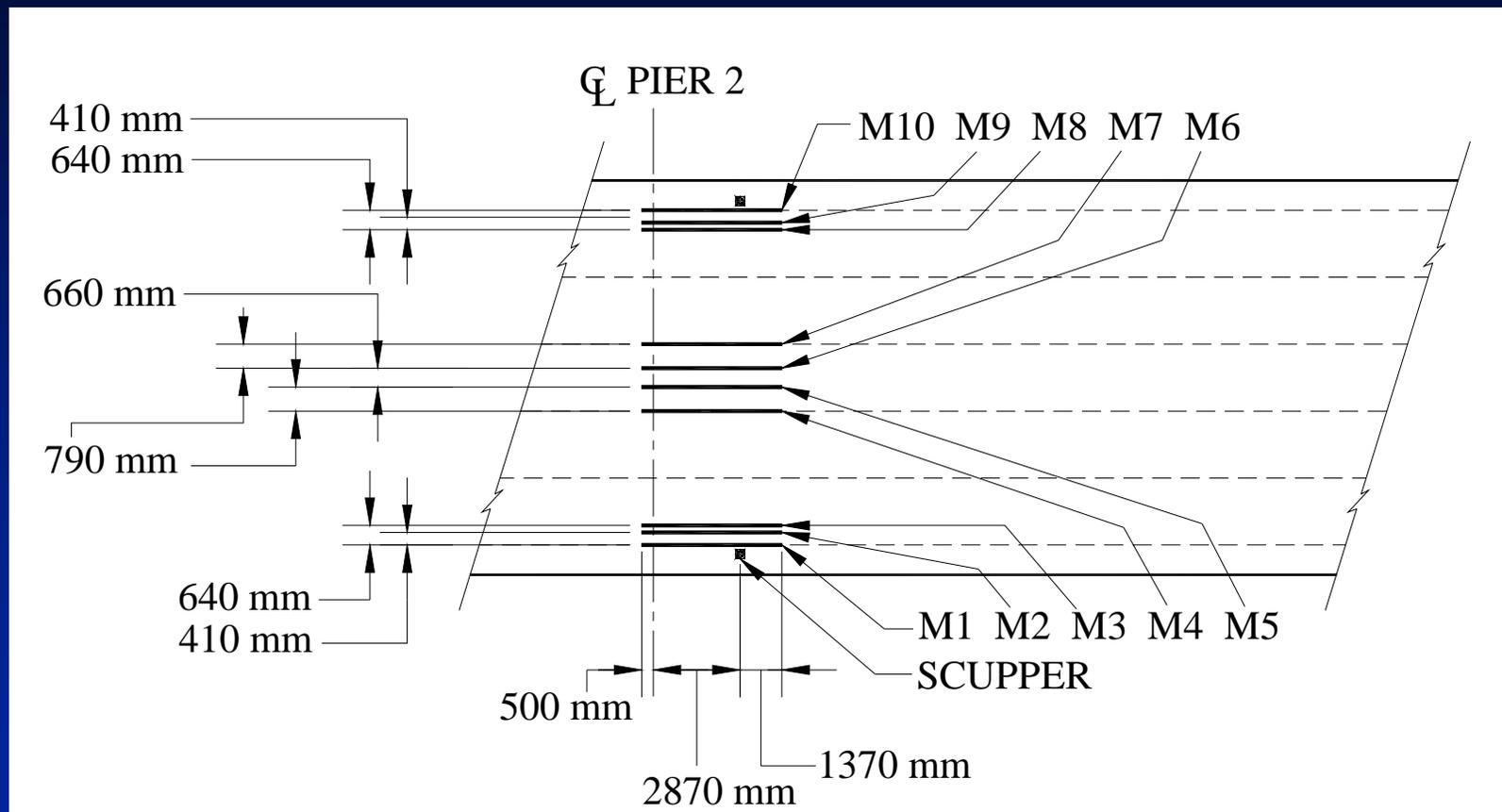


Instrumentation

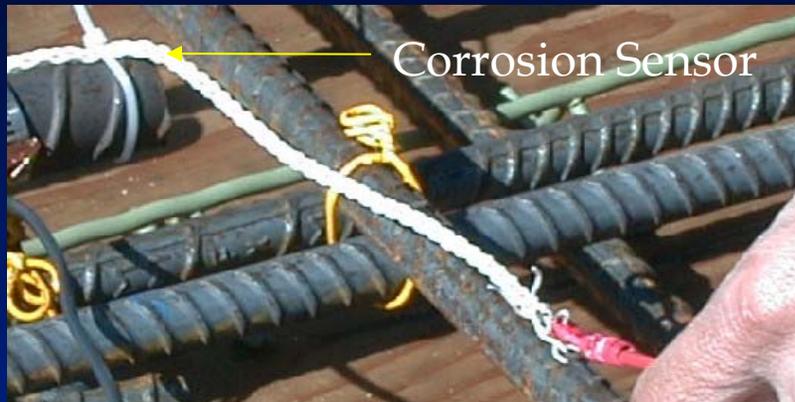
- Sensors on Ten bars in each bridge deck
- Negative bending moment region near the eastern drainage points



Instrumentation (Detail C - MFMX Bridge)



Instrumentation



- Lead wires run out of deck to measure voltage and electric current

Completed installation



Monitoring Concept

- Increase in electric potential and internal voltage with presence of active corrosion
- DC voltage and DC current measured with a Voltmeter



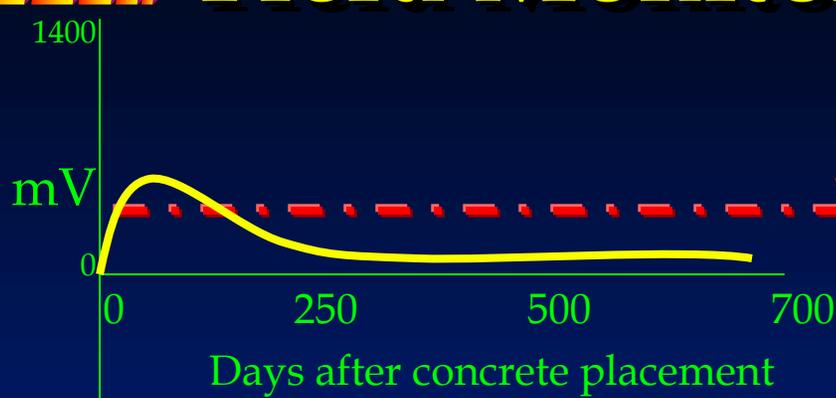
Voltmeter

Monitoring Concept

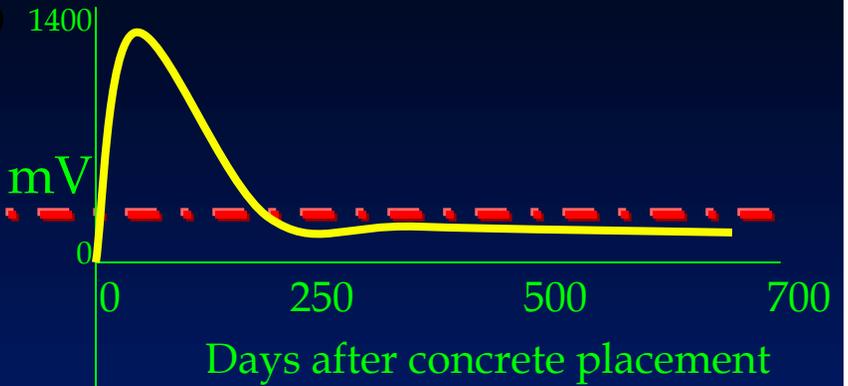
- Output dependent on conditions of concrete after placement
- Normal to expect high voltage levels with fresh and uncured concrete (could be over 1000 mV)
- Initial “spike” subsides back to within the “normal” range of less than 400 mV
- Corrosion indication
 - Electric Current above 0.100 mA (1000 μ A)



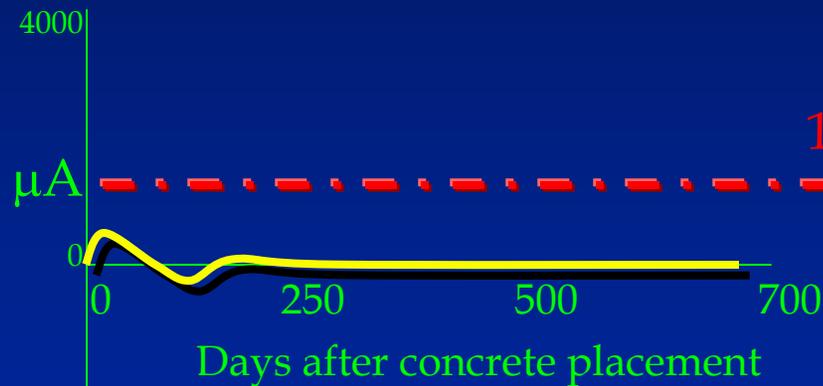
Field Monitoring



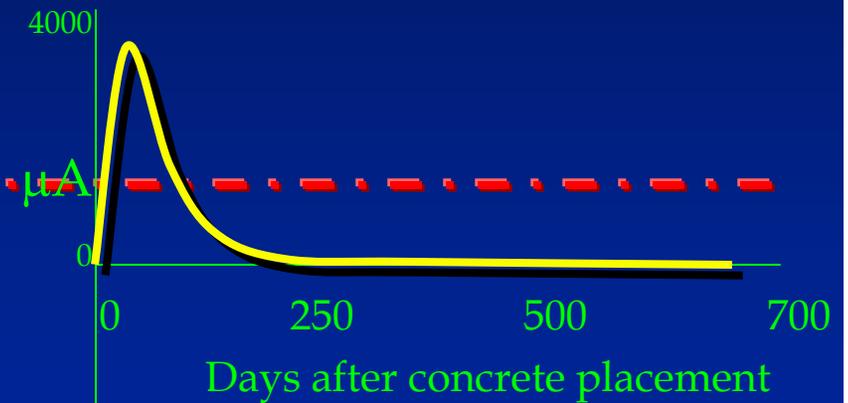
MMFX bridge



Epoxy bridge



MMFX bridge



Epoxy bridge



Overall to date

- In general, Readings on MMFX bridge lower than Epoxy bridge
- No significant active corrosion
 - Electric Current reading close to zero
- On-going investigation
 - More Data to be collected



Acknowledgement

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Questions?

