

New Generation of Sustainable Infrastructures **“ Current CFRP Research ”**

*Build a structure once, the right way, with the right materials,
while minimizing repair and maintenance over the lifetime of the structure
– and save taxpayer money*

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USA Bridge Inventory

As of August 14, 2007

<u>Category</u>	<u>Bridges</u>
• Urban	151,102
• Rural	448,791
• Total	599,893
• Structurally Deficient	72,264
• Functionally Obsolete	81,257



Rupture of Prestressing Strands

Spalling of Concrete

Beam Reinforcement Damage due to Corrosion in Salt Environment at Longitudinal Cracks



Lawrence Tech University, Southfield, MI “Center for Innovative Materials Research (CIMR)”

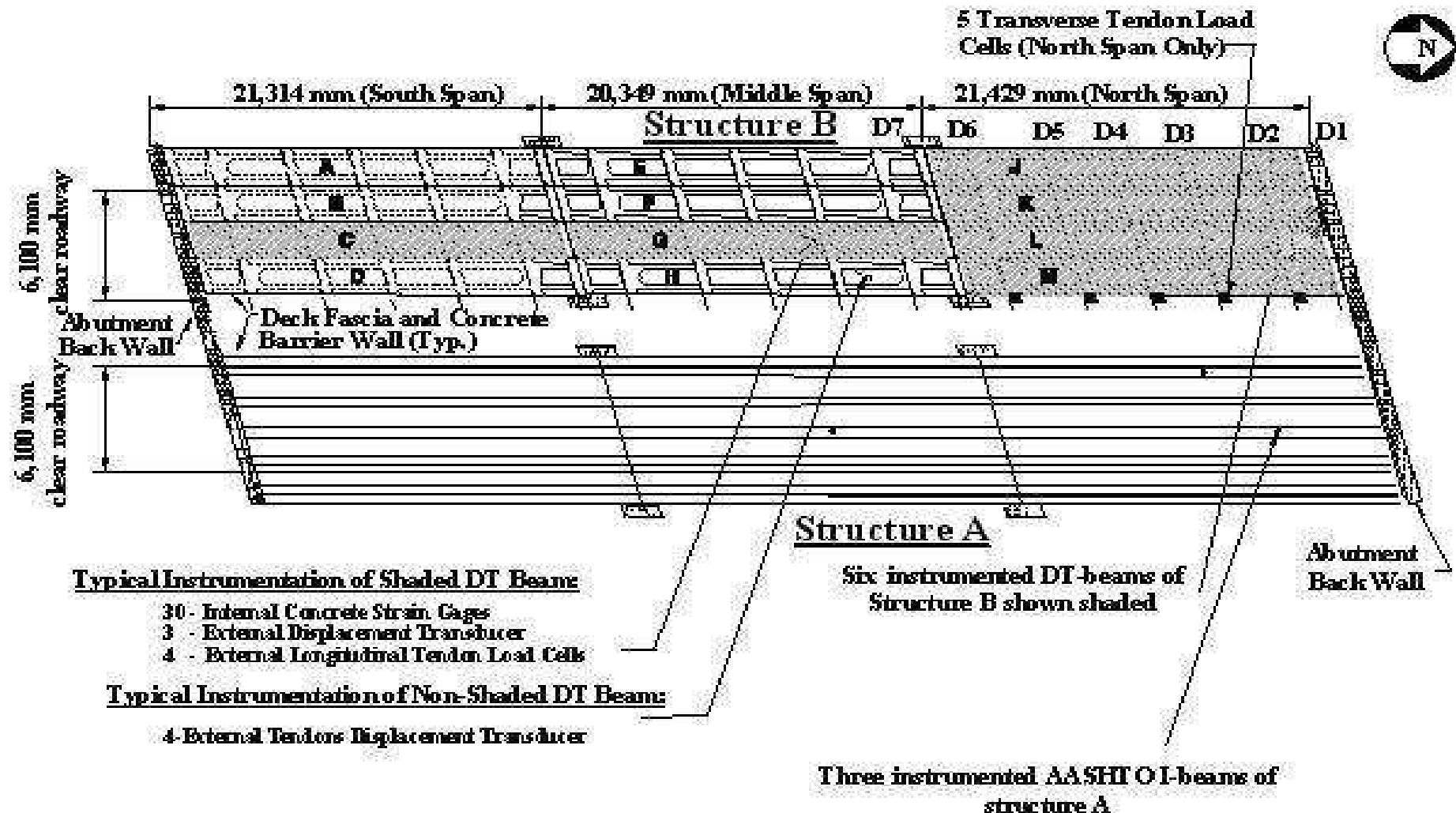




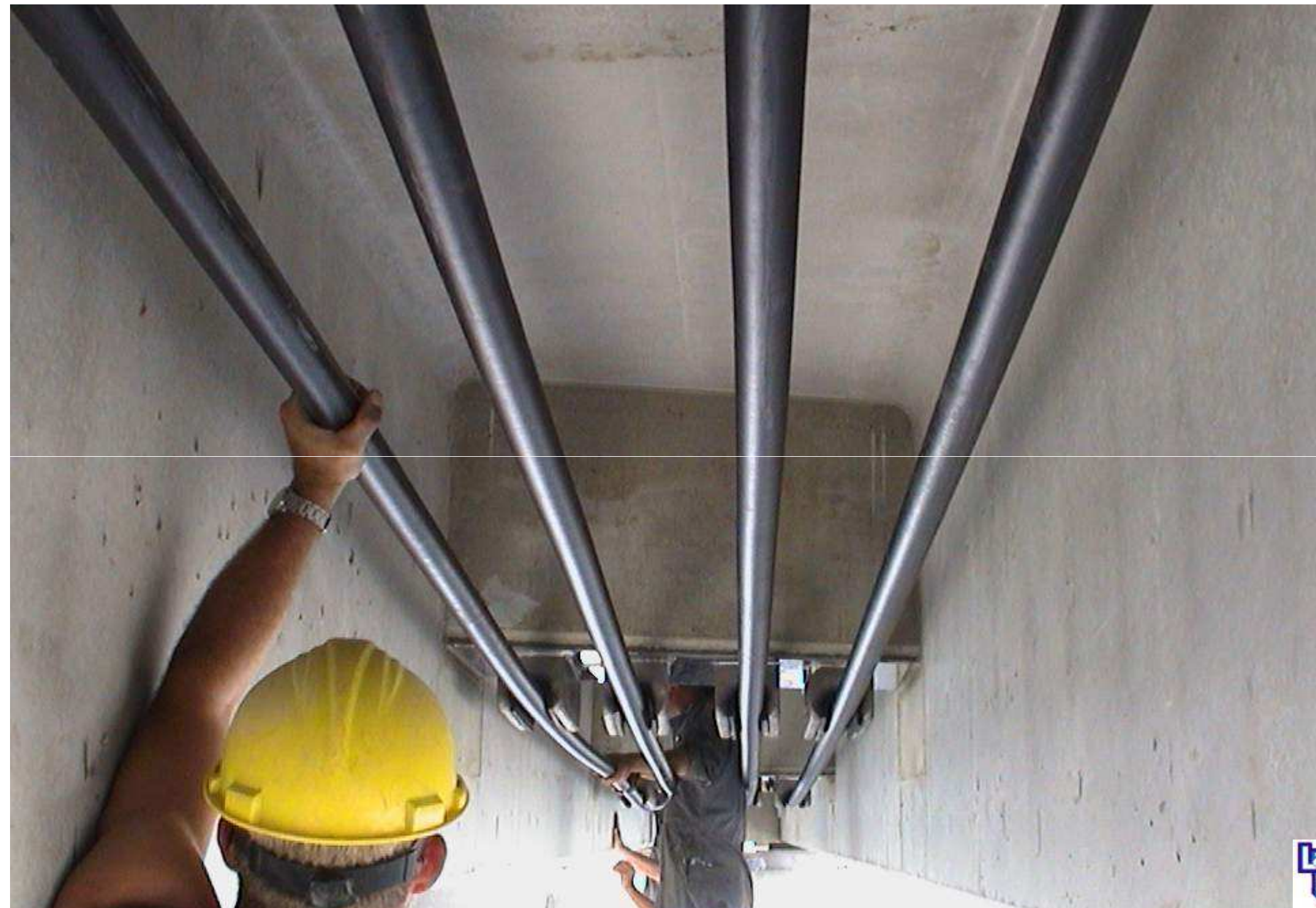
Three-Span Rouge River Bridge



Bridge Street Bridge Deployment Project Consists of Two Parallel and Independent Bridges (Structures A and B).







POST-TENSIONING OF LONGITUDINAL CFCC STRANDS



Hydraulic Jack



Load cell at dead end of CFCC strand of the bridge DT-beam













Penobscot Narrows Bridge & Observatory

Design / Construction





Carbon Fiber Composite Cable Research Project

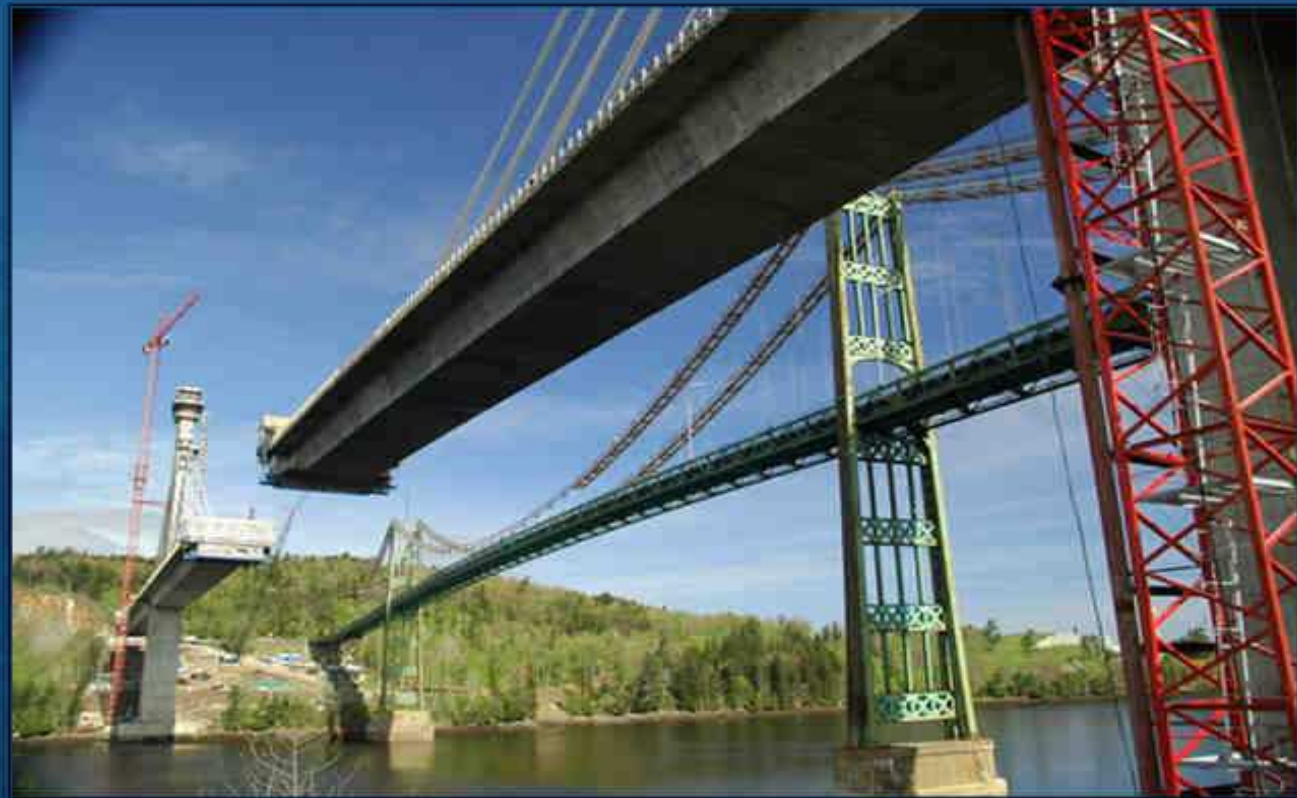
In Observation pylon - stay 2, 10 and 17 reference strands will be replaced with carbon fiber composite cable



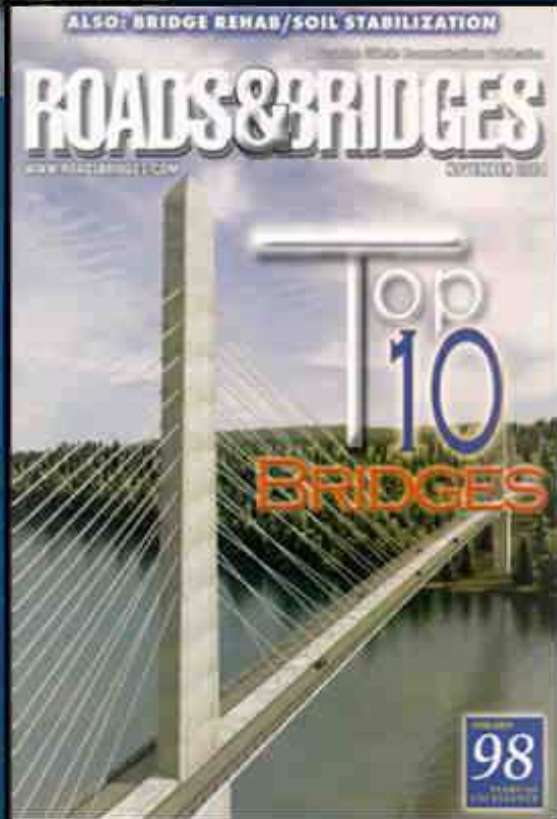


Design Features Expedite Project Completion

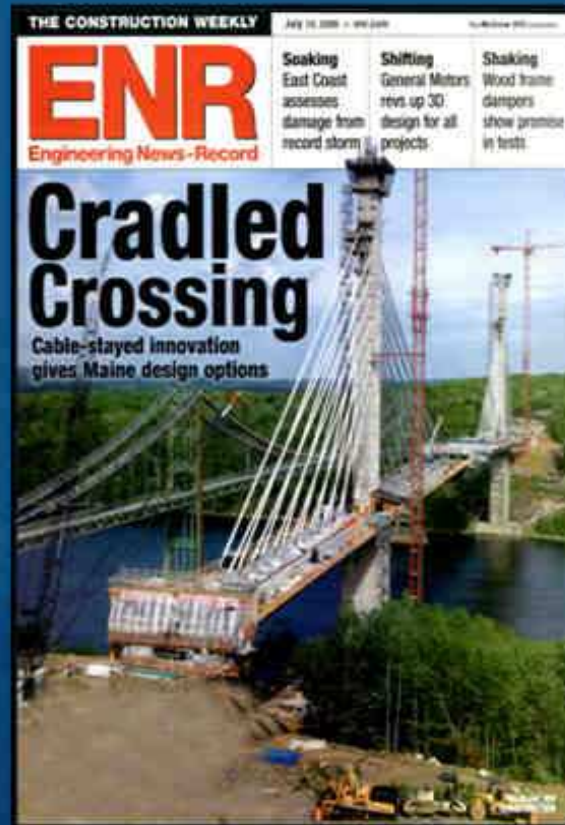
- **Foundations placed on land**
 - Streamlined permit process (avoid wetlands)
 - Ship impact, ice, and tidal loadings avoided
 - Construction access easier
- **Incorporated CIP Segmental box girder details to keep casting operations repetitive**



Penobscot Narrows Bridge & Observatory



2004 #1 Bridge in America



July 10, 2006 ENR Cover

Winner of 10 Design Awards including FHWA "Innovation Award"





AASHTO Bridge Model at Failure (MEDC Project)





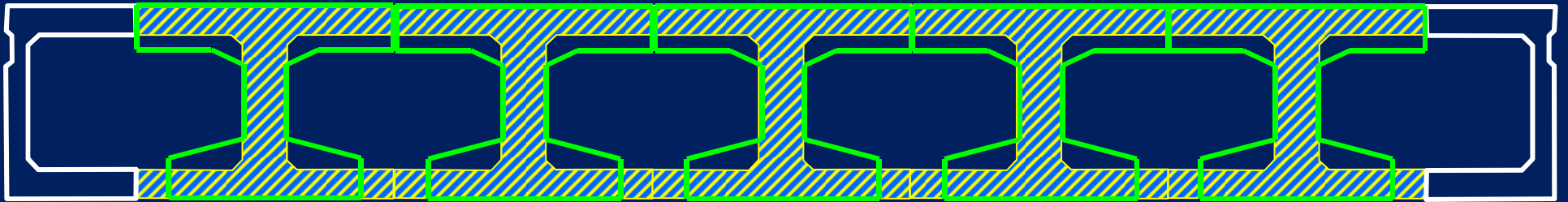
Traditional Highway Box-Beam Bridges



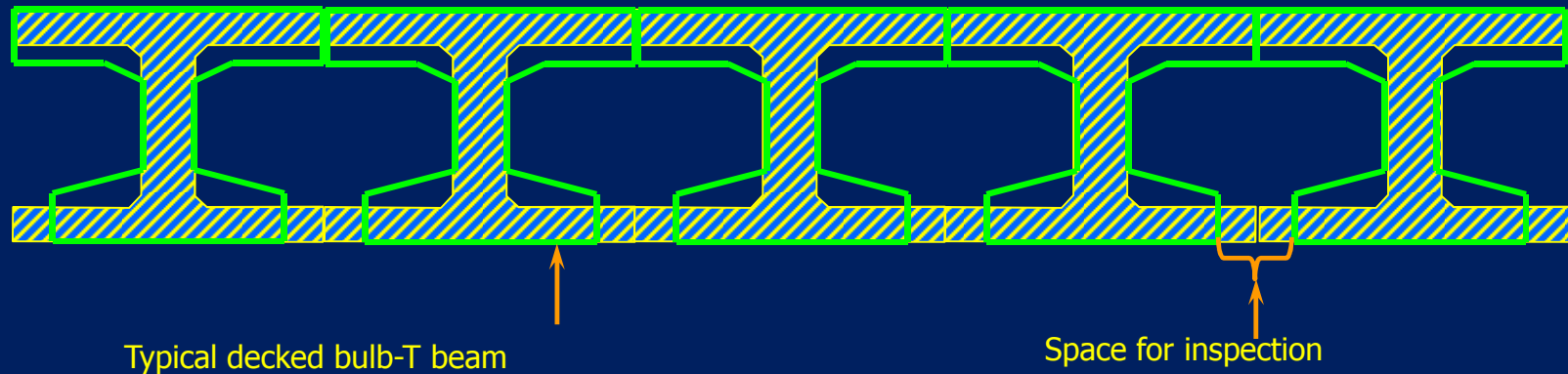
Alternative solution:

➤ Corrosion-Free Decked Bulb-T beams

Traditional Highway Box-Beam Bridges



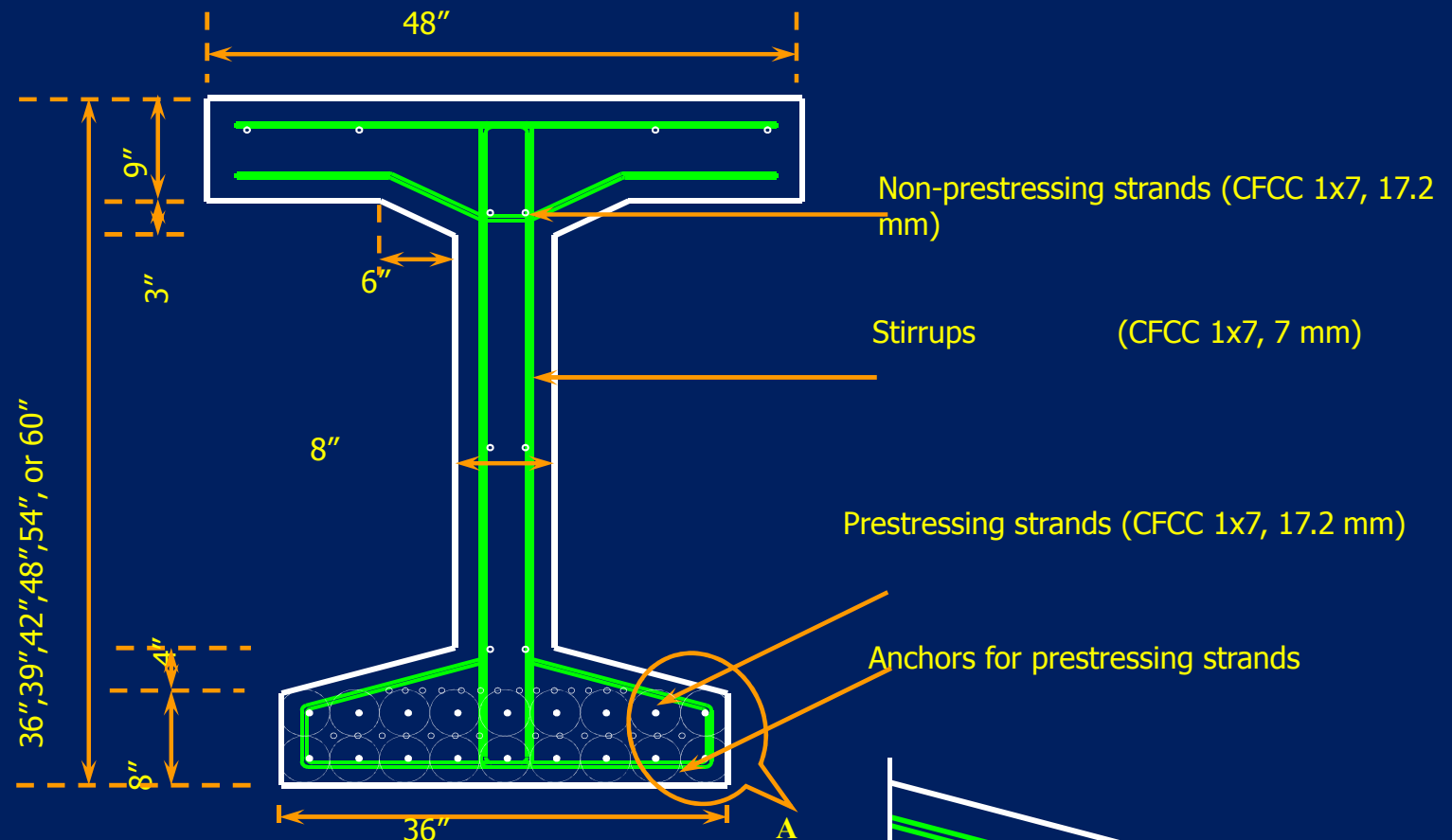
Traditional Highway Box-Beam Bridges



decked bulb T beam advantages:

- Similar structural integrity and advantages of box-beams
- Hassle-free from grouting and inspection problems
- Simpler in construction and easy to replace damaged fascia beams

Details of the Proposed Decked Bulb-T Beam



No. of prestressing strands = 18

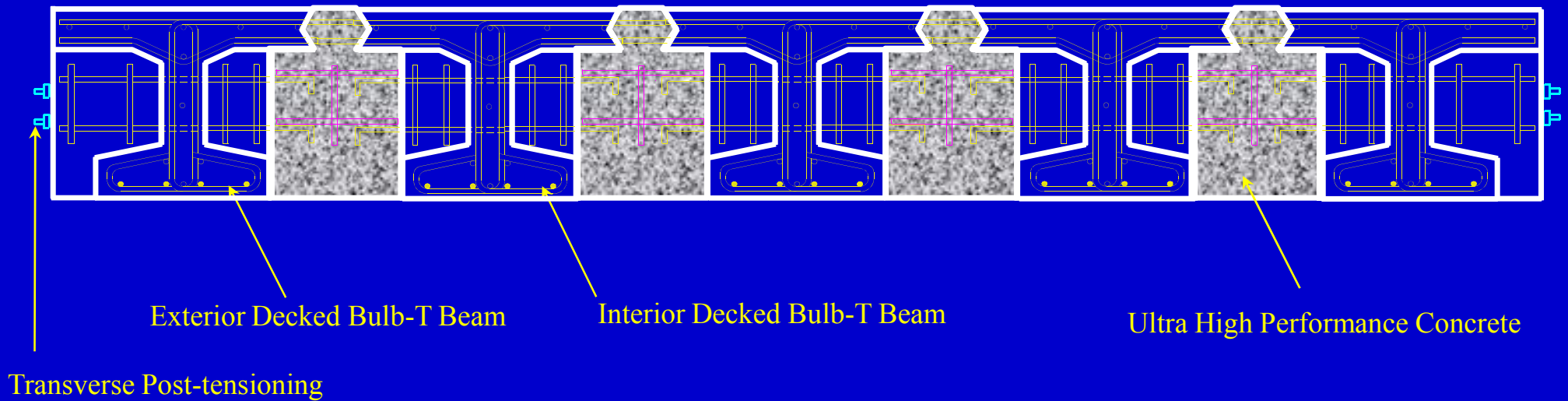
No. of non-prestressing strands = 42

Prestressing force for each strand = 40 kip

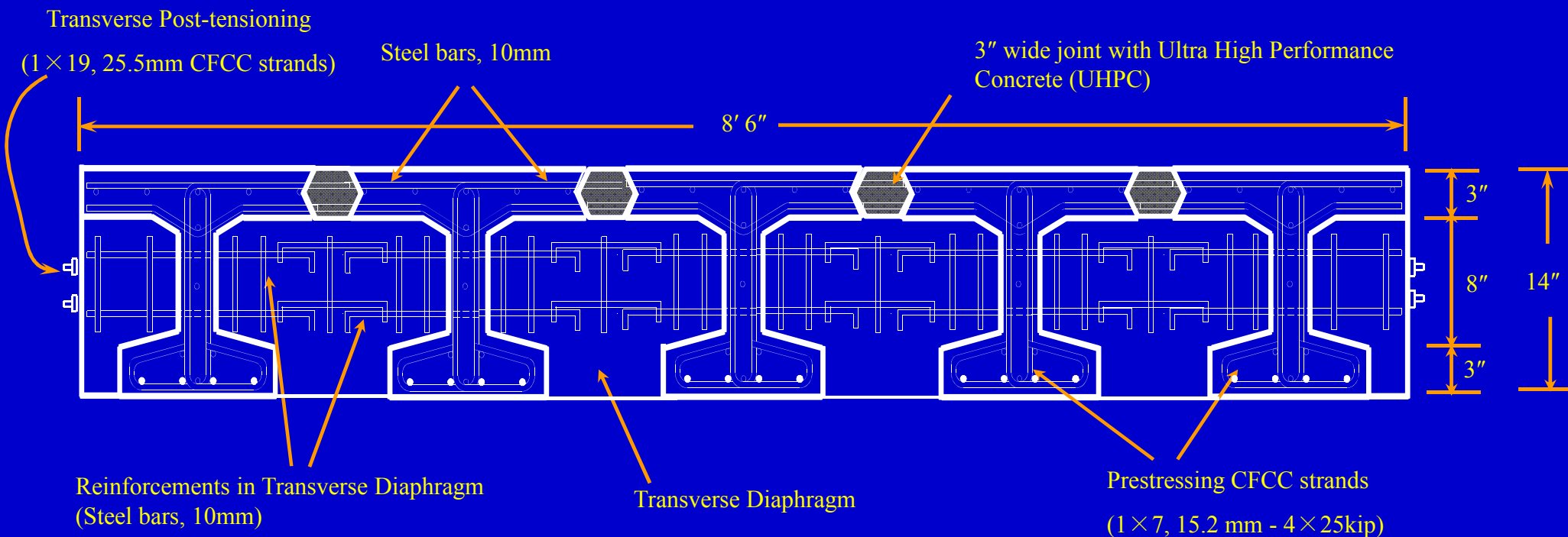
Guaranteed breaking load = 78 kip

Prestressing force available in beam = 720 kip

Construction Sequence of Decked Bulb-T Beam Bridges



Cross-Section of CFCC Decked Bulb T- Bridge Model



Pretensioning of CFCC Strands



Hydraulic
jack



Bulkhead

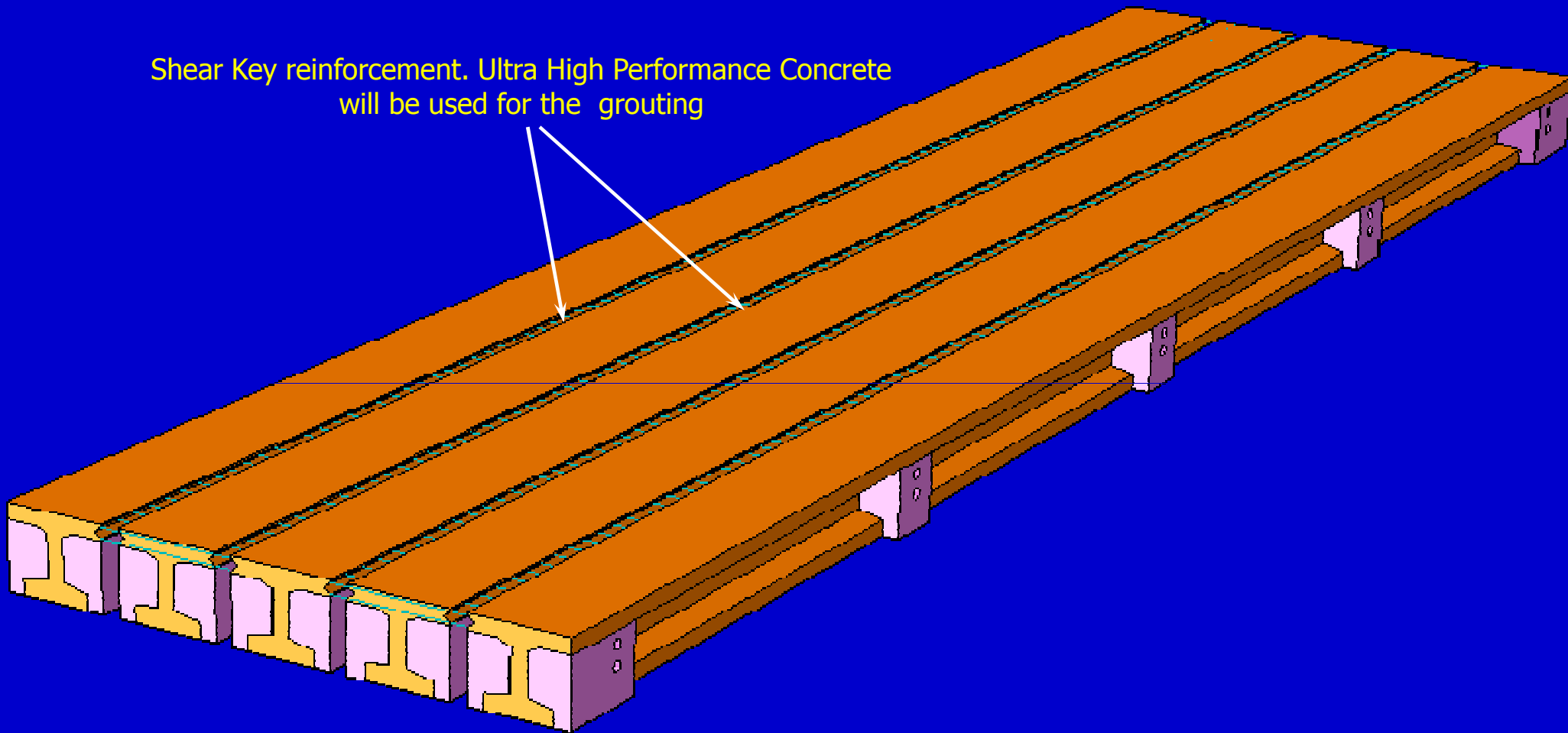
CFCC Strand
1x7, 15.2mm

Decked Blub –T Beams for Bridge Model



DECKED BULB-T BRIDGE MODEL

Shear Key reinforcement. Ultra High Performance Concrete
will be used for the grouting



Ultimate Load Test Setup of Control Beam

Two point loading spreader

Actuator

Decked Bulb-T Beam



Ultimate Load Test of CFCC Control Beam



Thank You



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