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Overnight Deck Replacement of the I-190 Grand Island Bridge

Presented at:
IBC
June 5-8, 2011

IBC 11-62

By:

Mark G. Horschel, P.E. – Bergmann Associates
Christian S. Hulse, P.E. – NYSTA

Presentation Outline

- **Mark**
  - **Introduction**
  - **Design**

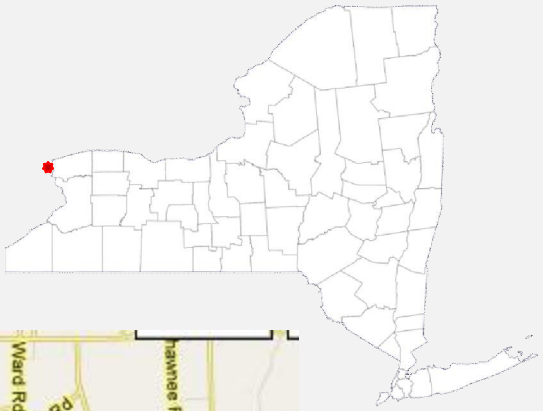
- **Chris**
  - **Construction**
  - **Summary**

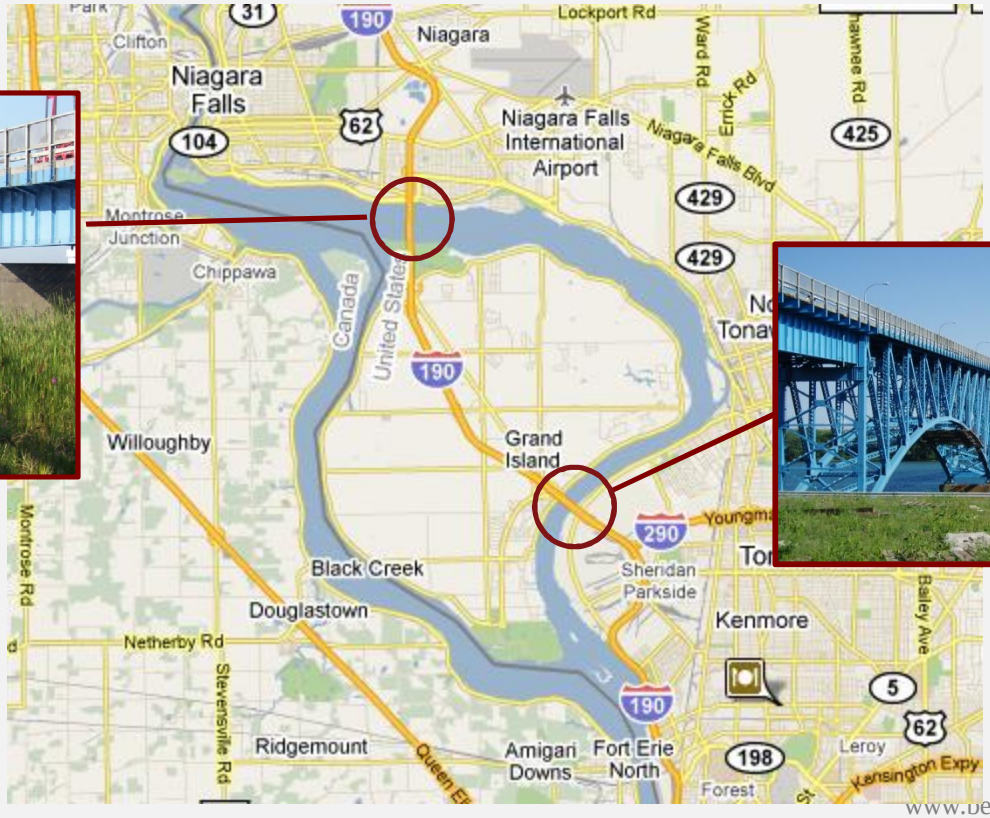
Introduction

- **Four Grand Island Bridges**
  - ✓ North GIB Southbound & **South GIB Northbound** Constructed in the 1960's
  - ✓ North GIB Northbound and South GIB Southbound Constructed in the 1930's

Project Location

- Grand Island
- Erie County





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TAN 08-30B South Grand Island Bridges Rehabilitation Project

- Contractor: American Bridge
- Bid Price: $48,234,109.50

Bridge Facts – South GIB, Northbound

- Geometric Features:
  - Two 12-foot Wide Vehicular Travel Lanes
  - No Shoulders
  - One Sidewalk
  - 4% Grades
  - Bridge Length: 3,383 feet

- Traffic (2001):
  - Two-Way AADT: 65,500
  - ADTT: 9-10%

Bridge Facts – Cont'd.

- Original Construction: 1960
- Major Rehabilitations:
  - 1984 – Steel Repairs, Full and Partial Depth Deck and Sidewalk Repairs, Joint Replacement
  - 1986 – Substructure and Bearing Rehabilitation
  - Mid-2000's – Painting & Misc Steel Repairs

General Work to be Completed

SGIB - Northbound Bridge

- Panelized Deck Replacement (90,307 SF)
- Sidewalk Replacement (15,876 SF)
- Deck Joint Replacement (4 modular, 24 armorless)
- Parapet & Rail Replacement
- Abutment and Pier Rehabilitation
- Bearing Replacement
- Various Approach Slab Replacements
- Conduit Installations

General Work to be Completed

SGIB - Northbound & Southbound Bridges

- Substructure Rehab.
- Pedestal Replacement (Non-Truss Bearing Locations)
- Elastomeric Bearing Replacement
- Nested Roller Expansion Bearing Rehabilitation Work
- Ultrasonic Pin Testing (96 pins)

Project Schedule

SGIB - Northbound Bridge Contract Requirements

- Bearing and Substructure Work – 2009
- Deck, Parapet, Railing, Sidewalk, Approach Slabs – 2010
- Nightly bridge closure, both lanes open by 6am Monday thru Thursday mornings. No Friday or Saturday night northbound bridge closures were allowed.

Liquidated Damages

- Daily Liquidated Damages:
  - $500/minute from 6:00 to 6:30 AM
  - $1000/minute after 6:30 AM
  - Maximum Assessment per day $125,000

- Assessed when bridge not fully opened to traffic.


SEP 26 2006


SEP 22 2006

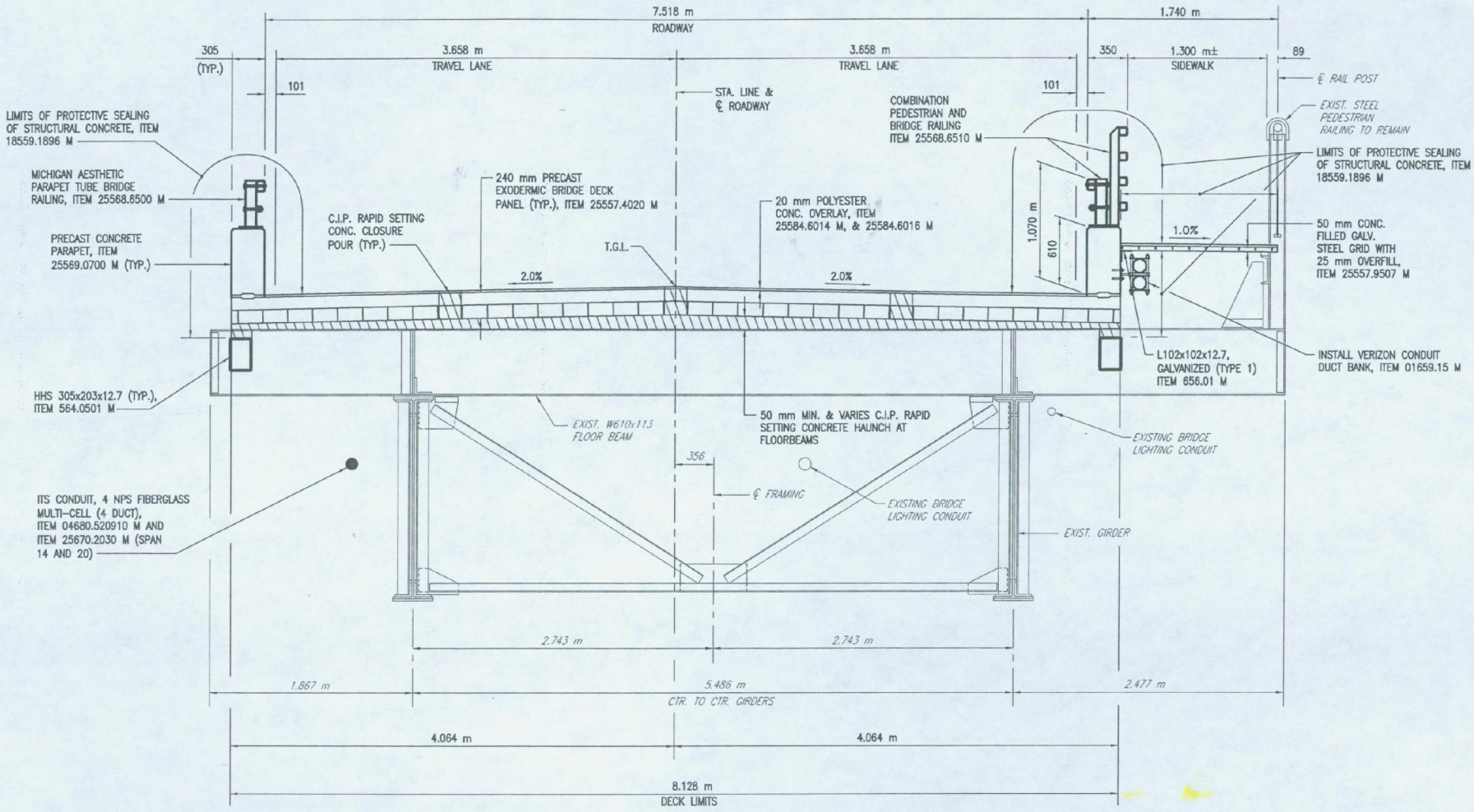

SEP 22 2006

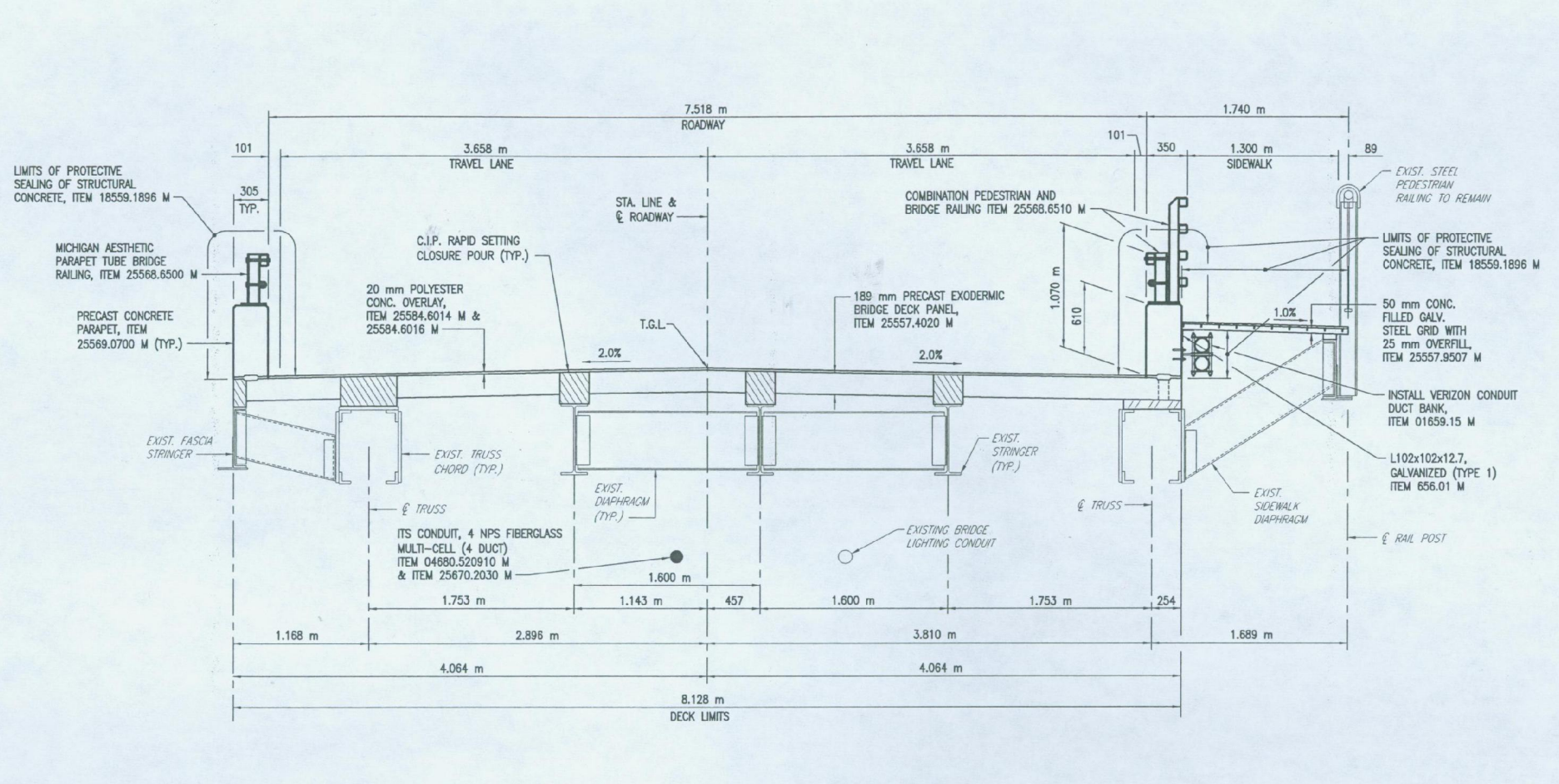
Crossover / MPT Setup

- South crossover constructed.
- Crossover construction creates need for temporary entrance for Toll Plaza employees.

Crossover / MPT Setup

- North crossover repaved.
- Detour signs uncovered/covered, cones placed/taken down every night.


7.518 m
ROADWAY
1.740 m
305
(TYP.)
3.658 m
TRAVEL LANE
3.658 m
TRAVEL LANE
350
1.300 m±
SIDEWALK
89
101
101
STA. LINE &
℄ ROADWAY
℄ RAIL POST
EXIST. STEEL
PEDESTRIAN
RAILING TO REMAIN
LIMITS OF PROTECTIVE SEALING
OF STRUCTURAL CONCRETE, ITEM
18559.1896 M
COMBINATION
PEDESTRIAN AND
BRIDGE RAILING
ITEM 25568.6510 M
LIMITS OF PROTECTIVE SEALING
OF STRUCTURAL CONCRETE, ITEM
18559.1896 M
MICHIGAN AESTHETIC
PARAPET TUBE BRIDGE
RAILING, ITEM 25568.6500 M
240 mm PRECAST
EXODERMIC BRIDGE DECK
PANEL (TYP.), ITEM 25557.4020 M
20 mm POLYESTER
CONC. OVERLAY, ITEM
25584.6014 M, & 25584.6016 M
1.070 m
610
1.0%
50 mm CONC.
FILLED GALV.
STEEL GRID WITH
25 mm OVERFILL,
ITEM 25557.9507 M
C.I.P. RAPID SETTING
CONC. CLOSURE
POUR (TYP.)
T.G.L.
PRECAST CONCRETE
PARAPET, ITEM
25569.0700 M (TYP.)
2.0%
2.0%
L102x102x12.7,
GALVANIZED (TYPE 1)
ITEM 656.01 M
INSTALL VERIZON CONDUIT
DUCT BANK, ITEM 01659.15 M
HHS 305x203x12.7 (TYP.),
ITEM 564.0501 M
EXIST. W610x113
FLOOR BEAM
50 mm MIN. & VARIES C.I.P. RAPID
SETTING CONCRETE HAUNCH AT
FLOORBEAMS
EXISTING BRIDGE
LIGHTING CONDUIT
356
℄ FRAMING
ITS CONDUIT, 4 NPS FIBERGLASS
MULTI-CELL (4 DUCT),
ITEM 04680.520910 M AND
ITEM 25670.2030 M (SPAN
14 AND 20)
EXISTING BRIDGE
LIGHTING CONDUIT
EXIST. GIRDER
2.743 m
2.743 m
1.867 m
5.486 m
CTR. TO CTR. GIRDERS
2.477 m
4.064 m
4.064 m
8.128 m
DECK LIMITS


7.518 m
ROADWAY
1.740 m
101
3.658 m
TRAVEL LANE
3.658 m
TRAVEL LANE
101
350
1.300 m
SIDEWALK
89
LIMITS OF PROTECTIVE SEALING OF STRUCTURAL CONCRETE, ITEM 18559.1896 M
305
TYP.
STA. LINE & ℄ ROADWAY
COMBINATION PEDESTRIAN AND BRIDGE RAILING ITEM 25568.6510 M
EXIST. STEEL PEDESTRIAN RAILING TO REMAIN
MICHIGAN AESTHETIC PARAPET TUBE BRIDGE RAILING, ITEM 25568.6500 M
C.I.P. RAPID SETTING CLOSURE POUR (TYP.)
LIMITS OF PROTECTIVE SEALING OF STRUCTURAL CONCRETE, ITEM 18559.1896 M
20 mm POLYESTER CONC. OVERLAY, ITEM 25584.6014 M & 25584.6016 M
1.070 m
610
189 mm PRECAST EXODERMIC BRIDGE DECK PANEL, ITEM 25557.4020 M
1.0%
50 mm CONC. FILLED GALV. STEEL GRID WITH 25 mm OVERFILL, ITEM 25557.9507 M
PRECAST CONCRETE PARAPET, ITEM 25569.0700 M (TYP.)
T.G.L.
2.0%
2.0%
INSTALL VERIZON CONDUIT DUCT BANK, ITEM 01659.15 M
EXIST. FASCIA STRINGER
EXIST. TRUSS CHORD (TYP.)
EXIST. STRINGER (TYP.)
L102x102x12.7, GALVANIZED (TYPE 1) ITEM 656.01 M
EXIST. DIAPHRAGM (TYP.)
℄ TRUSS
℄ TRUSS
EXIST. SIDEWALK DIAPHRAGM
ITS CONDUIT, 4 NPS FIBERGLASS MULTI-CELL (4 DUCT) ITEM 04680.520910 M & ITEM 25670.2030 M
EXISTING BRIDGE LIGHTING CONDUIT
℄ RAIL POST
1.600 m
1.753 m
1.143 m
457
1.600 m
1.753 m
254
1.168 m
2.896 m
3.810 m
1.689 m
4.064 m
4.064 m
8.128 m
DECK LIMITS

Panelized Deck Replacement Nightly Construction Sequence

Exodermic Deck Panel Specification

- Rapid setting concrete and rapid setting grout: CTS Cement Manufacturing Corp only. (3000 psi – 30 to 45 minutes)
- Trial batching required.
- Exodermic bridge deck panels: shop drawings required.
- Concrete precast in panels: Wet curing required.
- Defects in precast concrete: Repairable defects in concrete reduces reimbursement to as low as 85%. Defined in spec.

- **Deck**
  - ✓ Exodermic Deck System
    - – Girder Span Weight: 85 psf w/overlay
      - » 6’- 8” by 37’ max. panel
      - » Pick Weight: 7 to 9 tons
    - – Truss Span Weight: 80 psf w/overlay
      - » 8’- 4” max. by 26’- 8” panel
      - » Pick Weight: 8.4 tons max.

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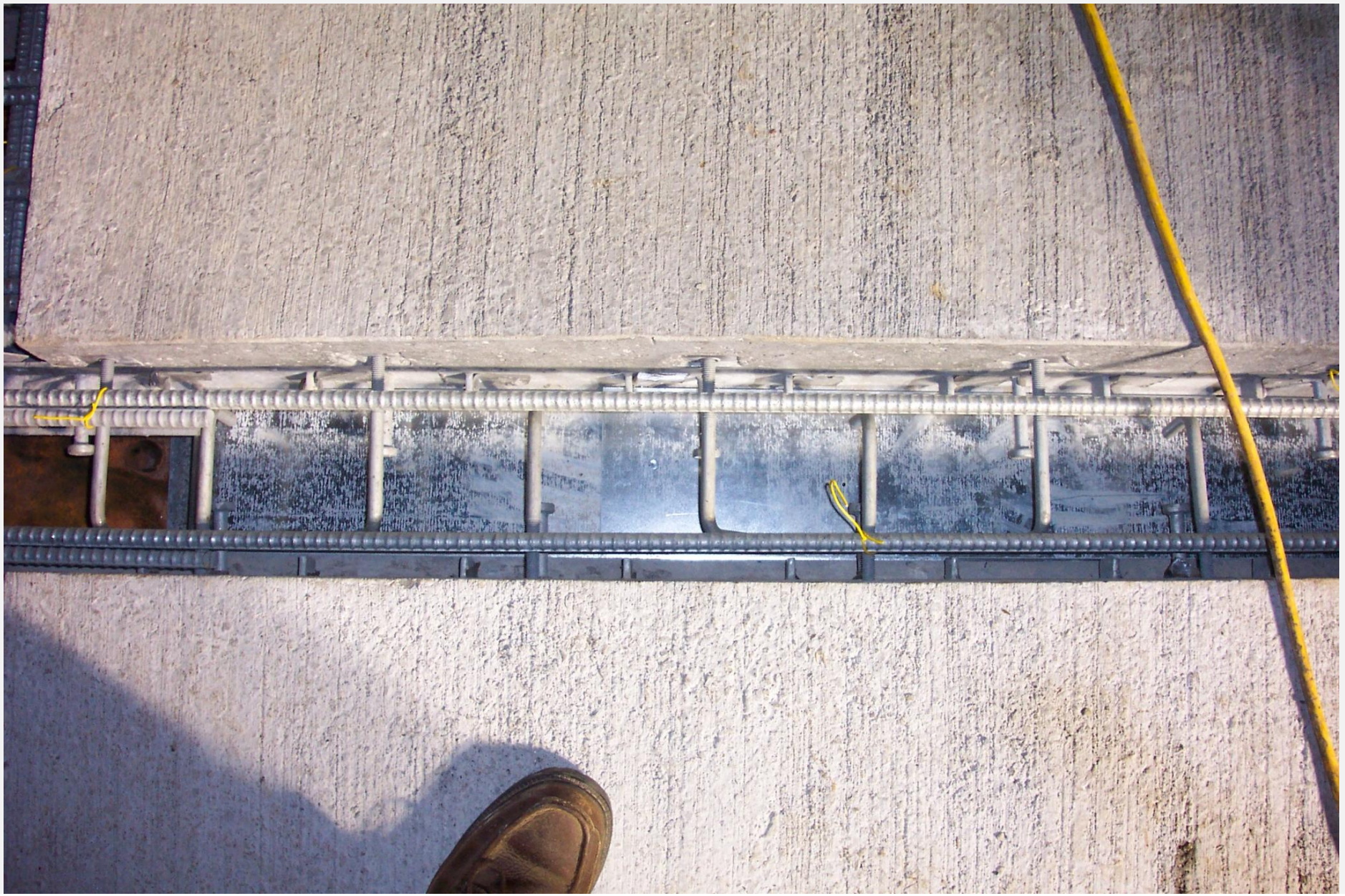
125



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Maxwell House

Parapets


08/12/2010


08/11/2010

Panelized Deck Replacement Nightly Construction Sequence

Girder Spans:

- **Prior to Nightly Work**
  - ✓ Remove existing sidewalk, install parapet support beams, install needle beams and install new bolts at sidewalk railing posts.
  - ✓ Sawcut deck & curb night before


08/12/2010


5' 1 5/8"

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Panelized Deck Replacement
Nightly Construction Sequence

- **Nightly Work:**
  - ✓ Remove railings, lift out deck slab, remove needle beams.
  - ✓ Sandblast top of floorbeams, set & adjust new panels.
  - ✓ Weld shear studs, place haunch rebars, install forms.
  - ✓ Splice rebars to previously installed panel.
  - ✓ Place rapid setting concrete.
  - ✓ Install concrete parapets and rail posts/tubes.
  - ✓ Install temporary railing transitions.
  - ✓ Place temporary pavement transitions and striping.

Panelized Deck Replacement Miscellaneous Details

- Nightly transition between existing 0.7% and proposed 2% cross slope .
- Nightly transition between existing and proposed bridge guide rail/parapet systems.
- Nightly transition between existing and proposed deck systems @ joint locations.


08/12/2010


08/11/2010


08/11/2010


08/11/2010


11 13:24

Panelized Deck Replacement Nightly Construction Sequence

Polymer Concrete Overlay

- Overlay: High molecular weight Methacrylate Primer, Polyester resin & initiator and aggregate.
- Surface Preparation: Automatic steel shot blasting.
- Equipment: Automatic mixers & slip-form paving equipment. All special equipment.
- Trial overlays required.
- Achieved 3000 psi in 2 hours

Panelized Deck Replacement Nightly Construction Sequence

Polymer Concrete Overlay cont'd

- Profilograph after placement of panels. Diamond grind to meet tolerances.
- Profilograph after placement of overlay. Diamond grind to meet tolerances.
- Opening to traffic: Option 1- Time & temperature or Option 2 – testing with a rebound hammer.

Bridge Joints

- Armorless Expansion Joints at Girder Spans
- Modular Expansion Joints at Truss Spans

Unit Costs

- Deck Panel Costs: $86/SF
- Polyester Polymer Concrete: $12/SF
- Precast Concrete Parapet Costs: $350/FT
- Underdeck Scaffolding: $59/SF
- Rapid Setting Concrete: $765/CY

Production Rates

- **Panel Placement:**
  - Girders: 4 Panels/Night (Approx. 900 SF/Night/Crew)
    - 208 Panels Total
  - Truss Spans: 2-4 Panels/Night (400-800 SF/Night/Crew)
    - 224 Panels Total

- **PPC Overlay**
  - 2400 SF/hr

Construction Highlights

CATAGORIES:

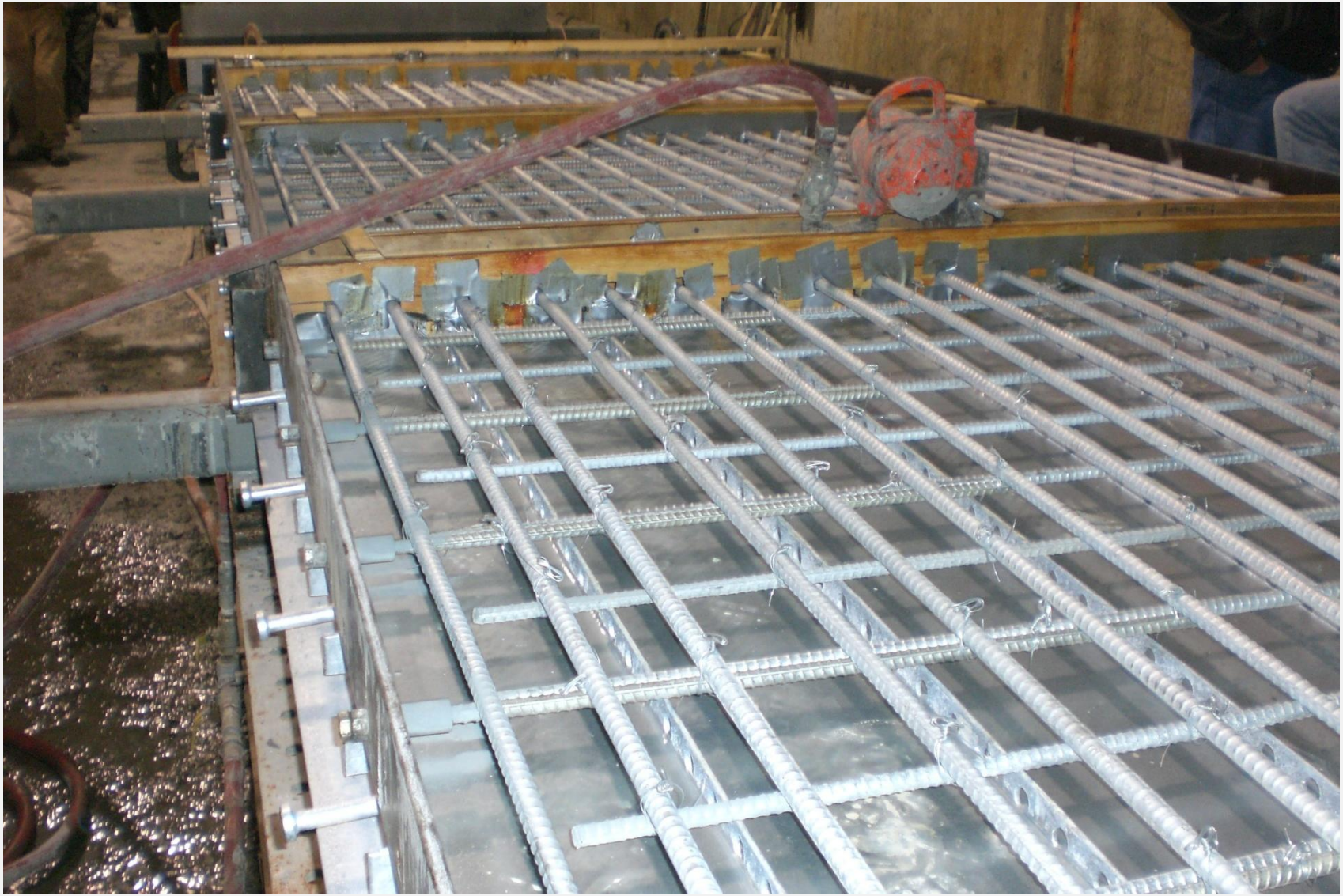
- Substructure Repairs
- Manufacturing
- Deck replacement

SUBSTRUCTURE REPAIRS

- Safespan Access Platform
- Class D Repairs
- Bearing Replacement
- River Work
- Tube Beam Installation For Parapets

MANUFACTURING OF DECK PANELS & PARAPETS

- Steel Deck & Sidewalk Panels @ IDSI & Young galvanizing
- Pre-Cast Deck panels@ AC Miller
- Pre-cast Parapets @ Kistner Concrete Products




EXIT

DECK REPLACEMENT

- Nightly Bridge Closures
- Demolition
- Deck Panel Installation
- Deck Closure Pours
- Pre-Cast Parapets
- Transitions
- Polyester Overlay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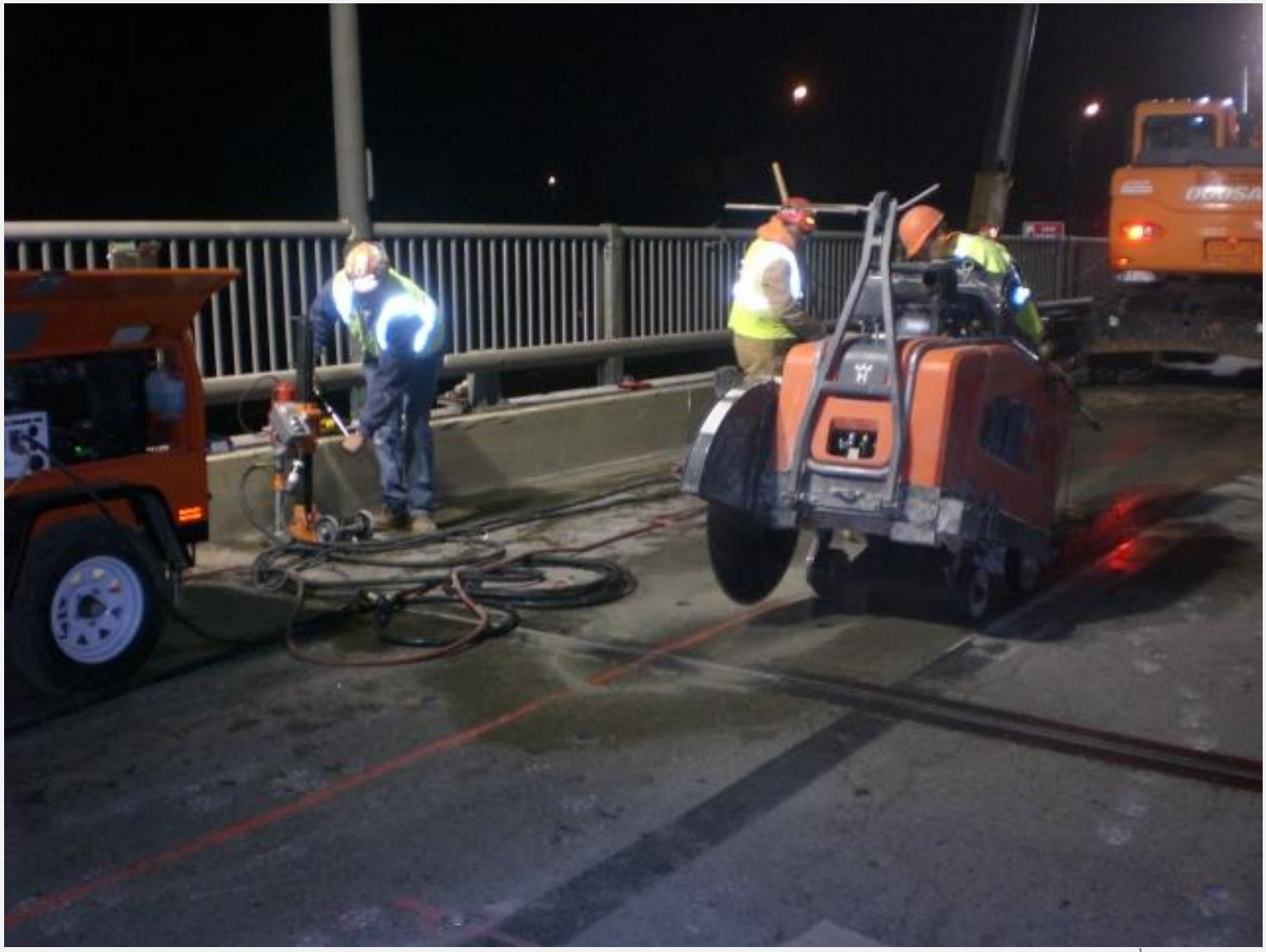


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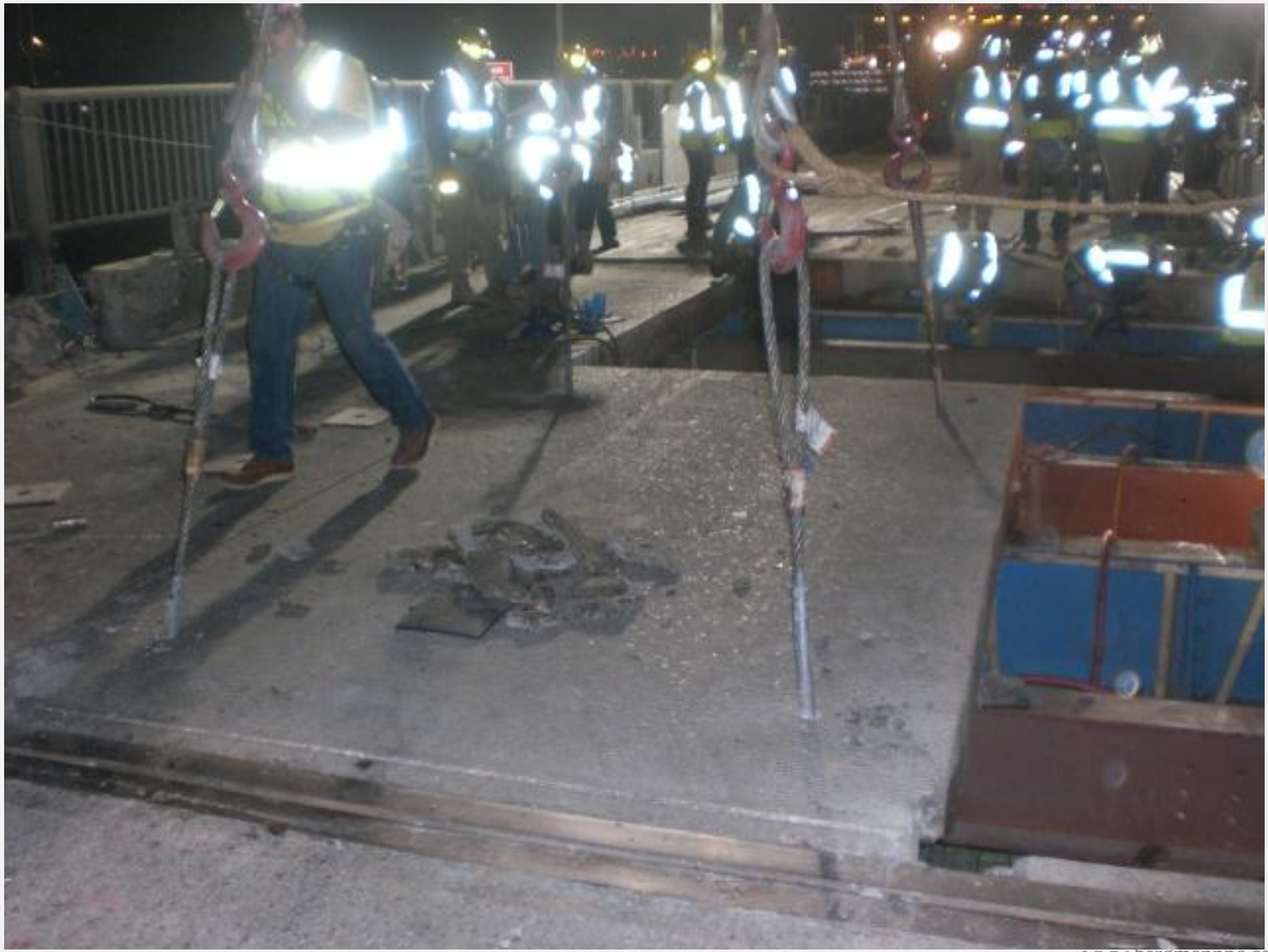


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6/3/2010


9' 2"
5/18/2010


5/20/2010


8/2/2010 23:27


TEREX | DEMAG


CRANE
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BAY CRANE
AB
ABI AB-814
TRI-STATE TRAILER
TRI-STATE TRAILER
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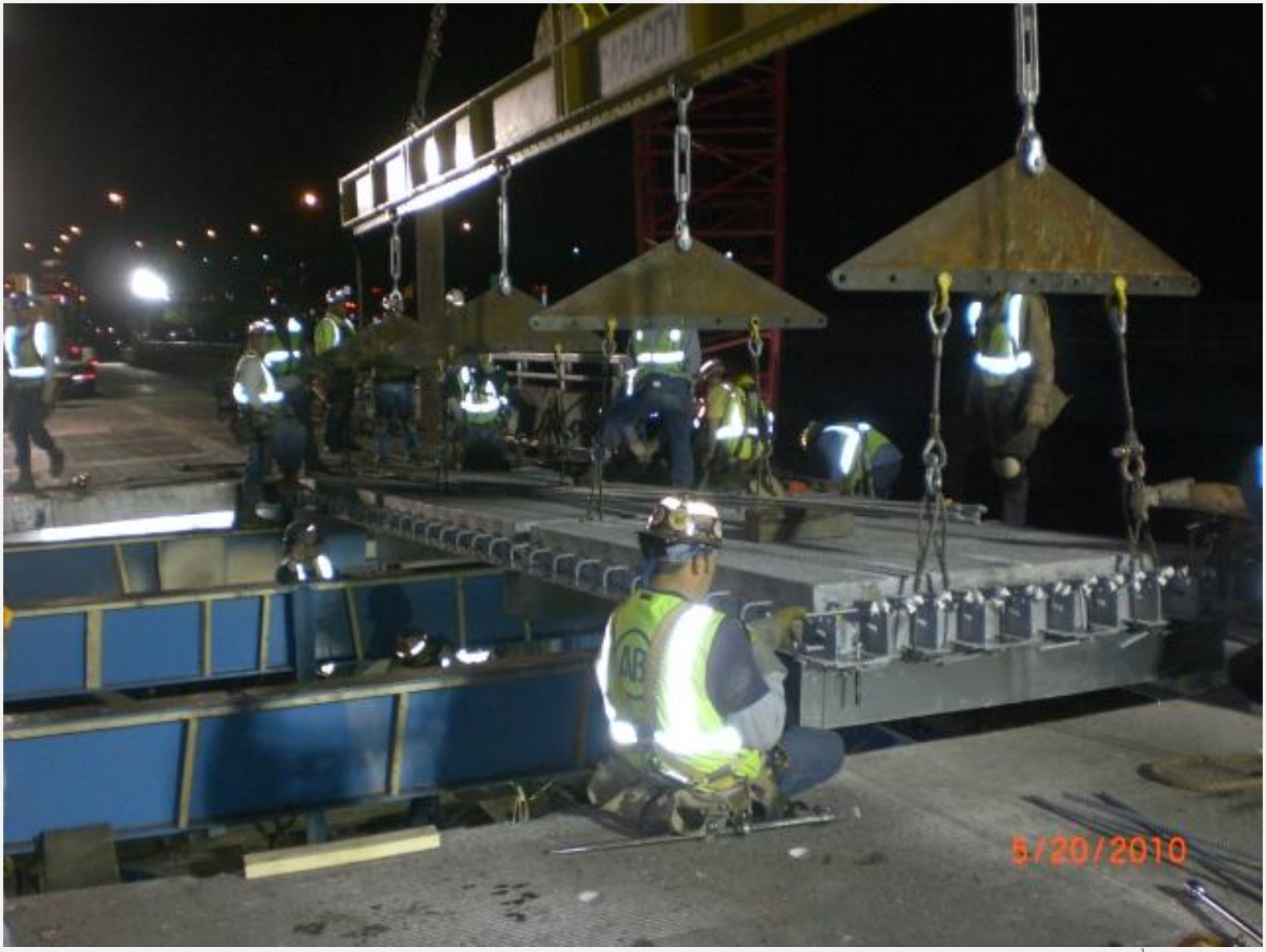
5/20/2010


CAPACITY
5/12/2010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30,000 lbs.
CAPACITY


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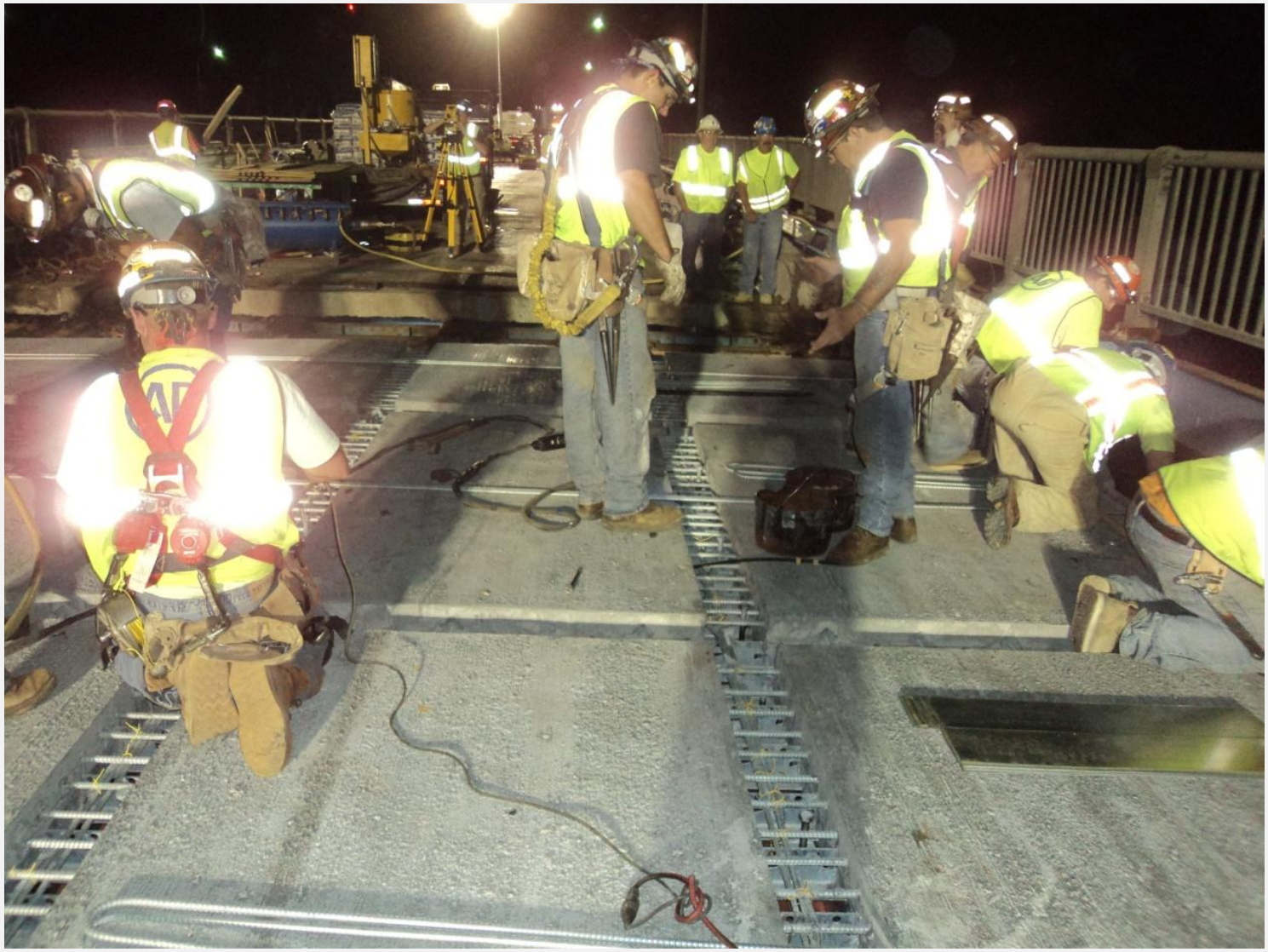


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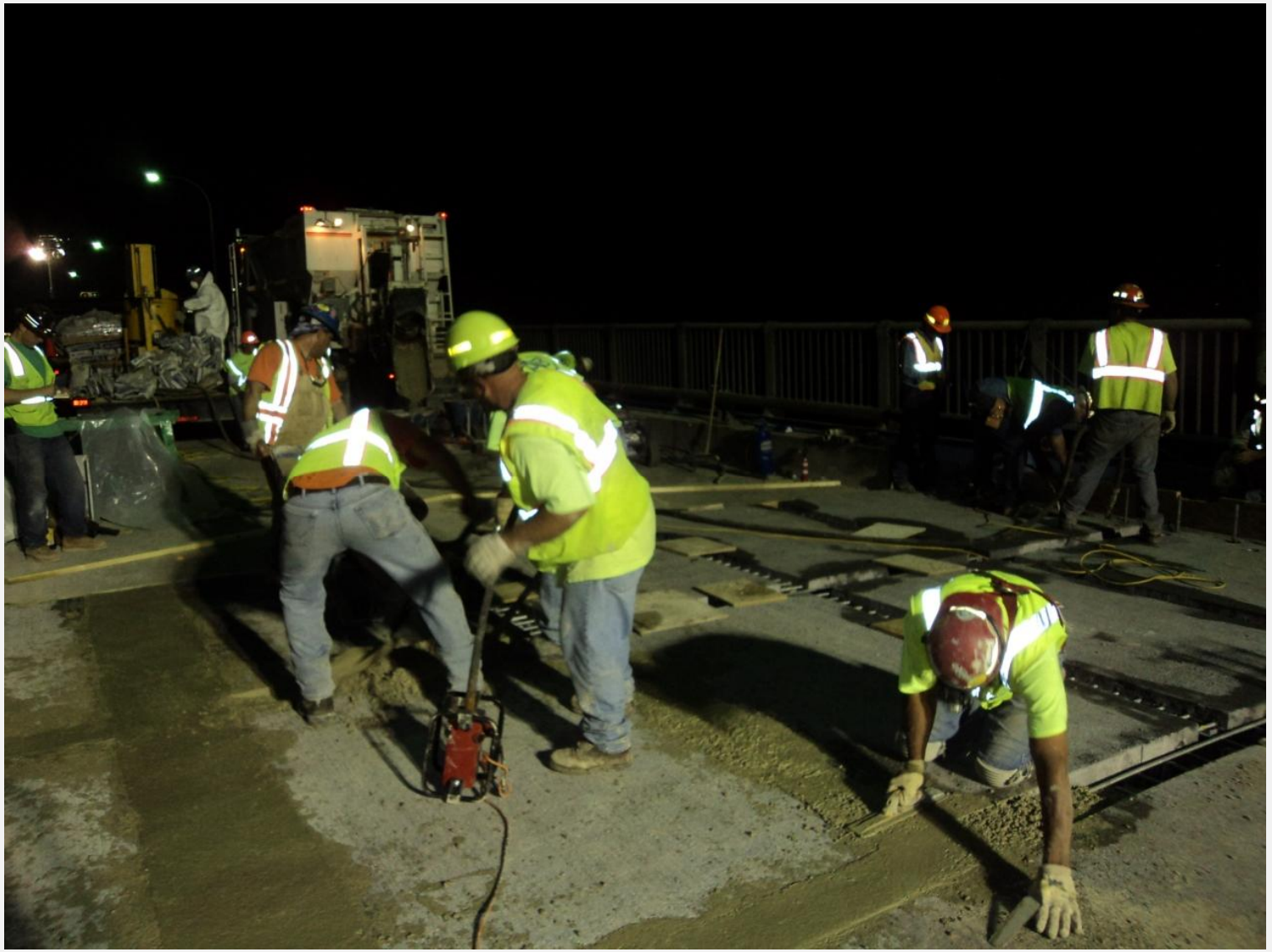


DISA
GOFF
ROADABRATOR

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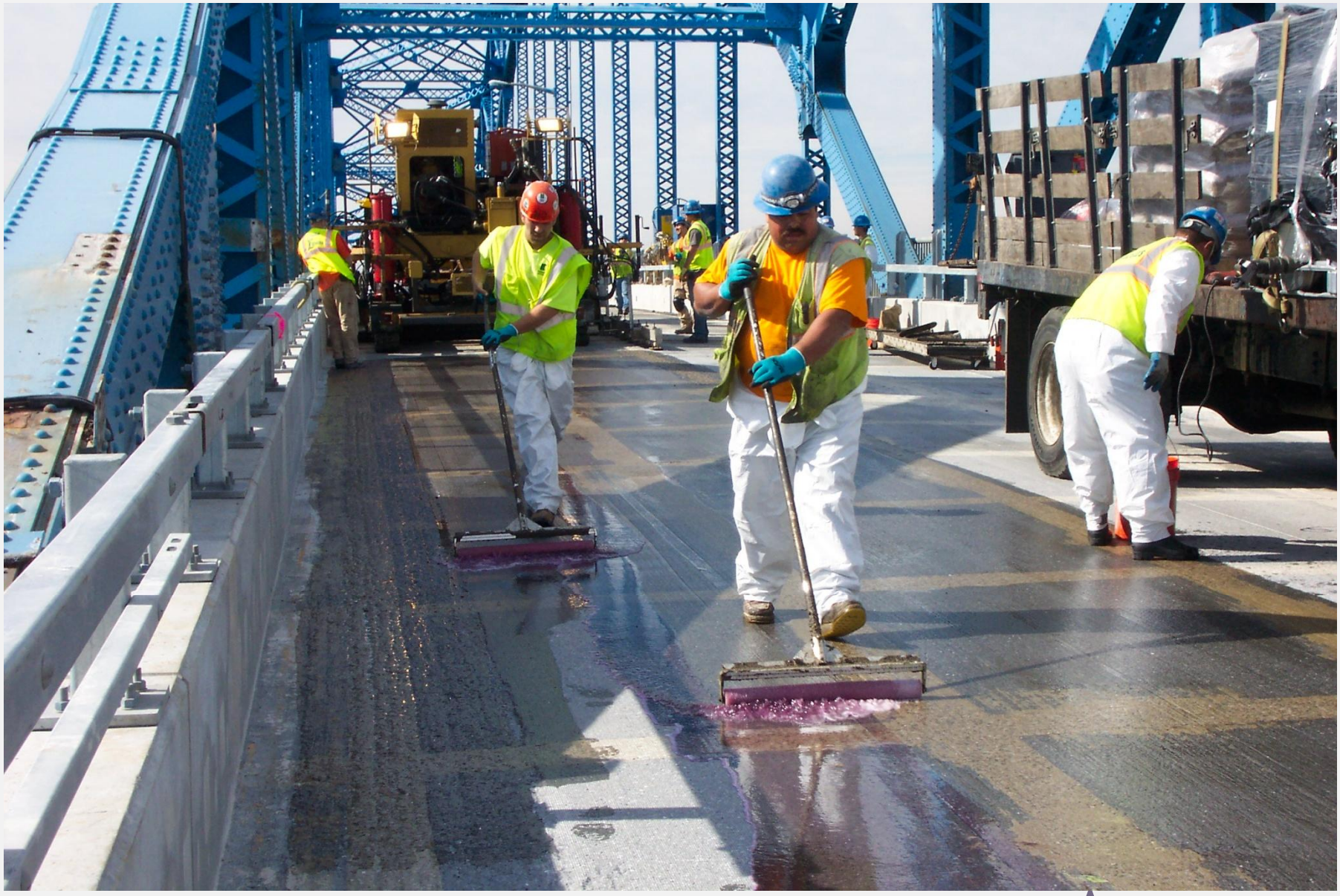

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Summary

- **Cost:** **$ 48.2 Million**
- **Duration:** **2 Construction Seasons**
- **Owner:** **New York State Thruway Authority**
- **Engineer:** **Bergmann Associates**
- **Contractor:** **American Bridge**

Questions?