Preserving a Precast Box Beam Bridge

Waterport Road Bridge over Oak Orchard Creek
Orleans County, New York

2014 Statewide Conference on Local Bridges
Syracuse, New York

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John Papponetti, PE

Vice President | Bridge Project Manager

Over 16 years of design and project management experience in bridge replacement, preservation and asset management.
BRIDGE HISTORY

County Acquisition of Bridge

- Original Owner – NYSDOT
- Transferred to County by Official Order
- Year Acquired – 1987

Bridge Characteristics

- Precast, Prestressed Adjacent Box Beam Superstructure
- Two Course Wearing Surface (4” Concrete & 2” Asphalt)
- Two-Rail Brush Curb Railing System
- Concrete Hammerhead Piers and Cantilever Abutments
- 9-Span, 610-feet in Total Length (Max. Span = 85-feet)
- Superstructure Replacement in 1967
- Construction Cost = $490,000
PROJECT BACKGROUND & GOALS
PROJECT BACKGROUND

- 610-foot 9-Span Precast Prestressed Adjacent Concrete Box Beam Bridge (Built 1967)
- Condition Rating = 4.074 & Sufficiency Rating = 71.3
- AADT = 270 vpd
- Spans Oak Orchard Creek (aka: Lake Alice, Waterport Pond)
- Water Surface Level Approximately 10-feet Below Low Chord with Water Depths in Excess of 80-feet
- Over 120-feet of ROW Width
- Vertical Curve Across Bridge
- Drainage Accommodated through Pockets in Brush Curb
- Limited Public and Emergency Service Across the Creek (Fire Station Around Corner)
- Popular Fishing Spot - Boat Launch Adjacent to Bridge
PROJECT GOALS

- Eliminate all Structural Deficiencies
- Raise Condition Rating of all Bridge Related Elements to a 6 or Higher
- Incorporate New Low Maintenance Details and Materials
- Extend the Service Life of the Bridge by 25 – 30 Years
- Maintain Traffic during Construction (Primarily for Emergency Services)
EXISTING CONDITIONS
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Bridge Railing System

- 100% Section Loss
- Coating System Failure
EXISTING CONDITIONS

Wearing Surface (Asphalt)

- Transverse Cracking at Joints
- Longitudinal Cracking
- Alligator Cracking
- Potholes
EXISTING CONDITIONS

Wearing Surface (Concrete)

- 5.1% - Delamination
- 1.9% - Scaling
- 0.1% - Both Delamination & Scaling
- 92.9% - Sound Concrete

Concentration of delaminations near deck joint locations
EXISTING CONDITIONS

Wearing Surface

- Cored Good & Bad Locations
- Core Condition Consistent with GPR
- Material Depth Fairly Consistent with Record Drawings
**EXISTING CONDITIONS**

**Precast Box Beams**

- Fascia Beams Poor Condition
- Beams Ends – Severe Deterioration
- Leakage Between Beams
- Underside Spalling
- Failed Transverse Tendons
EXISTING CONDITIONS

Hammerhead Piers

- Structural Deck – Rated 5
- Primary Members – Rated 3
- Secondary Members – Rated 6
- Scuppers – Rated 5

Recommendation – 4
EXISTING CONDITIONS

Bridge Joints

- Overlayed with Asphalt
- Multi-Cell Joint Seal Damaged by Plows
- 1” Nominal Joint Opening
EXISTING CONDITIONS

Fishing

- Salmon
- Trout
- Steelhead
REPAIR CONSIDERATIONS
INITIAL SCOPE OF WORK

- Replace Railing System
- Mill and Replace Asphalt Wearing Surface
- Repair Concrete Deck Overlay
- Replace Joint Seals
- Shotcrete Repairs to Precast Prestressed Box Beams
- Class D Concrete | Shotcrete Repairs to Piers and Abutments
- Miscellaneous Approach Improvements
- Maintain Traffic during Construction
PRESERVATION DETAILS

- Curbless vs. Brush Curb Railing System
- Galvanized vs. Painted Railing System
- High-Strength Woven Polyester Reinforcing Waterproofing Membrane
- Modified Asphalitic Plug Joint System
MODIFIED SCOPE OF WORK

- Replace Railing System
- Mill and Replace Asphalt Wearing Surface
- Repair Concrete Deck Overlay
- Replace Concrete Deck Overlay
- Replace Joint Seals
- Shotcrete Repairs to Precast Prestressed Box Beams (Interior Only)
- Replace Precast Prestressed Concrete Fascia Beams (All 9 Spans)
- Class D Concrete | Shotcrete Repairs to Piers and Abutments
- Miscellaneous Approach Improvements
- Bridge Closed during Construction (Approx. 6 Months)
OVERHANG DETAIL

- Better Quality Control
- Reduce Labor Intensive Field Work
- Reduce Cost
- Reduce Impact to Project Schedule
CONSTRUCTION
CONSTRUCTION PHOTOS
CONSTRUCTION PHOTOS
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Video
CONSTRUCTION PHOTOS
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PDH QUESTIONS
<table>
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<tr>
<th>PDH QUESTIONS</th>
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<tr>
<td><strong>1.</strong> How much of the concrete deck wearing surface was not deteriorated?</td>
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<td>92.9%</td>
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<td><strong>2.</strong> What machine did the contractor use to remove and install fascia beams?</td>
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<td>Pipe Laying Crane</td>
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<td><strong>3.</strong> Why did we decide to precast the overhangs onto the new fascia beams?</td>
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<td>1. Better Quality Control</td>
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THANK YOU FOR YOUR TIME