

Consideration for Preservation: FDOT District 5 Bridge Preservation Practices – *A Context Sensitive Approach*

Jonathan Jastremsky, PE Matthew Hodges, PE



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



General FDOT District 5 at a Glance

Preservation Considerations

Current Project Snapshots



IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018







NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

734088 734064 735510 730066 730006 L 73005230011730068 364057 734085 734083730940 364010 734087 734011790083 R 360065 L 360034 364056 920206 790800⁷⁹⁰¹⁹⁴ L 360037 L 360042 364012 790016794038794097 360050364090 364054 360067 790048 790801 794188

 184054
 114023
 110028
 750738 L 770091775501
 700135

 184006
 184078
 114051
 750733 R 50711754133 750012
 750015 L 704017

 184006
 184008 14054
 759007
 755808 50252 R
 754156 704100

 184019184050
 180910114091
 756200
 755912 L
 750034 04093

 180011
 180912
 14096
 750486 54161
 754123700050

 180071
 114083
 754310
 924167
 754123700050

 180014
 110002
 110036 R 925006
 924113
 924071
 700225

 180023
 920607920174
 924182
 920197
 920148 R 704189

 920207924152 L
 920940
 705909705924
 924019
 920035
 705919
 700203

 924110
 924019
 920035
 705919
 700159
 924018
 924018
 924018
 705919
 700159

 924018
 924018
 924016920028
 7001017040
 924018
 924018
 705919
 700159

 924018924016920028 700101 704035 98 4 92 700157 924090 704154 920089 920172 920146 920199 L





1055 - State Owned Bridges 656 - Local/Private Bridges 1711 Total Bridges

NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018







Marion/Sumter County



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018









NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018







NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018







Osceola County



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018







NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018











NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Preservation Considerations

Pin-pointing the Problem

Inspection/Maintenance History

Age of Structure

Environment

DT/NDT Methods



ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Preservation Considerations

A Context Sensitive Design Approach

Local Coordination

Project Scheduling

- Special Events
- Weather Seasons





Preservation Considerations

A Context Sensitive Design Approach

- Traffic Volume
- User Demographic
- Safety During Construction
- Availability of Alternate Routes



Current Project Snapshots

SR 40 Over Halifax River Pier 8 Repair

Located in Ormond Beach Volusia County





IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

- Bridge constructed between 1981- 1983 in two phases
- Substructure distress and deterioration observed shortly after construction completion





- Bridge constructed between 1981- 1983 in two phases
- Substructure distress and deterioration observed shortly after construction completion





- Pier #9 in worse condition & repaired in 1995
- Pier #8 not as severe –
 State crews carbon-wrapped the crashwall in 1995 with goal to delay in-depth repairs





- Pier #9 in worse condition & repaired in 1995
- Pier #8 not as severe –
 State crews carbon-wrapped the crashwall in 1995 with goal to delay in-depth repairs









NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Project Considerations



- Atypical Failure Mode for Intracoastal Bridges
 Investigations propose differing theories: 1994 Report – Mass Concrete Pour Failure 2014 Report – Differential Settlement
- Yearly surveys = pier is stabilized
- Carbon repair had gone past its intended service life (20+ years)



Project Considerations



- Aggressive brackish environment
- Structure built in 1983 –
 40+ year service life remaining
- Time for a <u>permanent</u> repair



Project Complexities

- Unknown condition of concrete under the carbon-fiber wrap
- Proximity of the fender system & battered piles
- Coordination with Army Corp of Engineers, Water Management District, and Coast Guard





Project Complexities

- Unknown condition of concrete under the carbon-fiber wrap
- Proximity of the fender system & battered piles
- Coordination with Army Corp of Engineers, Water Management District, and Coast Guard





Proposed Solution

- Design Consultant: AECOM
- Phased removal of existing deteriorated concrete
- Installation of new Post-Tensioning system



Proposed Solution





Post-Tensioning system using
 2" thick steel bearing plates

 Reconstructed larger crashwall to encapsulate the PT system



IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Proposed Solution



- Phased repairs for substructure integrity
- At least two columns fully bonded to the crash wall at any one time during construction
- Temporary column bracing concept added for additional confinement & stability (think hurricane season)



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Current Status – Under Construction





ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Current Status – Under Construction

- Cofferdam is complete & dry
- Contractor currently wrapping-up Phase A (first of six phases)









IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 201

Current Project Snapshots

SR 44 Over Berrys and Connors Canals Partial Deck Replacement

Located in New Smyrna Beach Volusia County





IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018





ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Signs of Early Deck Failure

- Both bridges built in 1994 flat slab bridges with 14" decks
- Delaminations, spalls, and popouts developing at a quick rate
- Bridges serve beach access and county's busiest boat ramp (salt water)





Investigation

- Cores taken by FDOT Corrosion Research Laboratory
- Berrys Canal 3.40 lb/yd³
- Connors Canal 1.90 lb/yd³
- Chloride concentration of
 1.2 lb/yd³ considered threshold for corrosion
- Active corrosion identified on both structures







- GPR scan commissioned by D5 Structures Maintenance
- Goal to delineate damaged and undamaged areas
- Data analysis and interpretation: entire deck area needs attention

Proposed Solution

- Affected concrete must be removed corroded steel replaced
- Full-depth deck replacement likely to require falsework
- Unable to work in the water-permitting not in the design schedule



Proposed Solution



- Design Consultant: AECOM
- Partial-depth hydrodemolition
- Approximately 5" depth concrete removal
- Hydrodemolition avoids introducing microfractures

NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Project Considerations

- Maintenance of Traffic addressed throughout project design
- Residents generally more affluent and politically active
- Berry's Canal simple two-phase lane-shift (56' roadway width)





Project Considerations

- Connors Canal more difficult cannot be completed in two phases (48' roadway width)
- Temporary signal-controlled two way (single lane) MOT scheme considered
 rejected by stakeholders





Project Considerations

- Connors Canal required three phases by bifurcating traffic during one phase
- Not ideal but necessary
- Low speed corridor
- Favorable five-year crash history





Project Considerations



Top-mat exposed after hydrodemo

 limited reinforcing remaining in
 negative moment region

Pour sequence developed so that negative moment regions be placed first



Current Status – Under Construction







Current Status – Under Construction







ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018

Current Status – Under Construction





IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Current Project Snapshots

I-95 North over CR 5A – Partial Deck Replacement

Located in Brevard County





ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018









NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018









NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Project Background

2014: Irregular/brittle concrete layer found in 2 bays of Span 3 Bridge Deck section during I-95 widening project





ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Affected Section





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Affected Section





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Project Background

2015: Coring Results at the affected section indicated high chloride content and low compressive strength (avg. 2560 psi)





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Project Background

2016: Design began to replace deck in affected region. Kissinger Campo & Associates - EOR





IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Project Considerations

Public Visibility/ Traffic Impacts
MOT/Constructability
Project Scheduling



ATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



MOT Challenges





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



MOT Challenges





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



Proposed Solution



Precast Deck Panels with Ultra High Performance Concrete "UHPC" joints



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



UHPC Benefits

Rapid cure time: 14 ksi -3 days

Decreased Construction time: 6 days - demo to opening Reduced MOT time: several weeks down to several days



NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



UHPC Considerations

Cost Premium
 Coordination with Supplier for installation
 Sensitivity to High Temperatures during mixing
 Leak Proof Formwork is necessary





UHPC Joint Details





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018





Construction

4/2/18: Construction commences by Oceaneer





NATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018



All Projects Are Not Created Equal

Given States Fixing the Problem vs. Placing a Bandage

A little upfront consideration goes a long way



IATIONAL BRIDGE PRESERVATION PARTNERSHIP CONFERENCE 2018