Bridge Preservation Strategies

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Bridge Division
2007 Bridge/Design Conference
Condition of Texas’ Bridges - 2006
(49,829 Bridges)

Good or Better: 77%

23%

Source: 2006 Report on Texas Bridges
On-System (32,674) 86%

Off-System (17,155) 60%

Source: 2006 Report on Texas Bridges
On-System Structurally Deficient Bridges

Source: 2006 Report on Texas Bridges
Age of On-system Bridges

Source: 2006 Report on Texas Bridges
Bridge PREVENTATIVE Maintenance Program

- Established in 2005
- Goal is to keep bridges from getting worse
- Designed to supplement other funding sources
- “Bridge the gap” between Bridge Rehabilitation funds and maintenance funding
- Using un-utilized funds from previous FY
Bridge Preservation Strategies

- Keep joints maintained, cleaned and sealed
- Open up concrete pavement joints
- Deck Crack Sealing
- Concrete Structure Repair
- Spot Painting
- Overlays
- Control Drainage
- Count the cost?
Keep Joints Clean & Sealed

Item 438
Consequences of Debris in Joints
Joint Cleaning and Sealing Issues

• Plan the Work for Cooler Months
  – Joints are wider, easier to clean
  – Joints are wider, pourable sealants work better
  – Bats less likely to be present

• Inspect Sealing Operations
  – Backer Rod Placement Critical
  – Thickness of Sealant – 1/2” – Not More or Less

• Seal Up Into Curb or Rail
  – May need to use Class 4 (Non-Sag) Sealant
Improper Surface Prep/
Improper Backer Rod Placement
Proper Backer Rod Placement

½ inch

Slab

½ inch

Slab
Header Type Joint Issues

- Asphalt thickness typically exceeds the 2” specified on the plans
- Header bid prices are escalated to take advantage of this possible error
  - Price of Header Material – $350/CF or $9,450/CY
- Go to the Linear Foot?
  - $77/LF
  - Contractors are requesting change order
- FY 07 Over $4,000,000 on Header Joints
- Pursuing Warranty Specification
Changing Past Recommendations

Past Recommendations

Min. Width \((W) = 2 \times t\)
(typical \(w = 6\) inch min.)

New Recommendations

Min. Width \((W) = 1.5 \times t\)
(Start with \(w = 5\) inch min.)
Measure Asphalt Thickness?

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<th>Bent</th>
<th>Left Shoulder</th>
<th>Center</th>
<th>Right Shoulder</th>
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<td>1</td>
<td>2 ½”</td>
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Alternative to Header Joint
Alternative to Header Joint

Short Spans (Pan Girder, T-Girders, & Slab Spans)

Saw Cut & Class 3 Hot Pour Rubber Seal
Concrete Pavement Growth

Concrete Pavement Continuous/Jointed

Bridge Slab

Concrete Pavement Continuous/Jointed

As Built Condition

Concrete Pavement Continuous/Jointed

Bridge Slab

Concrete Pavement Continuous/Jointed

Condition At a Later Date
Distress to Bridge Backwall
Un-armored Joint

Latex Concrete Overlay

Concrete Pavement Overlay

US Highway Traffic
Painting Costs

Guidance

- Previous - $5-$9/SF
- Current - $15-$25/SF
Think Spot Painting
Bridge Deck Cracking

Thankfully – Not in Texas
Bridge Deck Cracking

Special Specification #4100 – Gravity Feed Crack Repair for Concrete
Estimated Cost - $3/SF, Can also be bid per linear feet
Corrosion of Reinforcing Steel
Crack Sealing
Flood Deck
Can Look Slippery
Spread Aggregate on Top
Concrete Structure Repair

Item 429 – Concrete Structure Repair
FY 2007 – 24,650 SF @ $90/SF = $2,218,500
Patch Material Cracking
Rapid Setting-High Strength
Keys to Success

• Surface preparation - chip behind the steel
• Square-up edges - sawcut 1/2”
• Quality Repair Material
  – Shrinkage Compensated, Not High Strength
• Anchor Patches with Additional Steel
  – Especially at Bearing Locations
• Waterproof (Seal Joints, Drains, Silane…)
• Corrosion mitigation (Galvanic Anodes?)
• Over-estimate the repair quantity
Innovative Repair Material

Replace Water with Latex Admixture and add Steel Fibers
Proper Patch Detail

Excavate Around Bars – Especially when Chlorides are Present

Saw Cut Perimeter
No Feather Edges
Galvanic Anodes

Under Evaluation – Not Currently Pushing Their Use
Bridge Deck Overlays

• Concrete Overlay (Item 439) ($50-$100/SY)
  – Standard Concrete Overlays
  – Dense Concrete Overlays (Discontinue Use)
  – Latex Concrete Overlays
• Multi-layer Polymer Overlay (SS) ($50/SY)
• Asphalt Overlays ($5/SY)
  – Try to avoid
  – Always include 2 course surface treatment
  – Cost of joints can be more than overlay
Surface Preparation

Surface Prepared by Hydro-demolition

Surface Prepared by Shot-Blasting

ICRI Surface Roughness Standard
Overlays

Latex Concrete Overlay

Epoxy Overlay
Which One?

• Concrete Overlay
  – Need a minimum of 150 psi bond strength
  – 1 1/2” min thickness
  – 20 to 30 year life
• Multi-layer Polymer Overlay (SS) ($50/SY)
  – Need a minimum of 250 psi bond strength
  – < ½” thickness
  – Not sure on life expectancy (20 years maybe?)
• Asphalt Overlay
  – Surface bond minimal
  – Thickness varies (Seal coat to 2”+)
  – 10 year life expectancy
  – Joint Cost High
Control Drainage
CS 1 – Marine Structure Rehab

- 720’ – 18 Span Pan Girder – 43,380 TSF
  - Conc Str Rep $30,528 $0.70/TSF
    - Galvanic Anodes added $67/SF to Conc Str Rep
  - Cathodic Prot $563,662 $13.00/TSF
    - Zinc Jackets ($775/LF), Str Jackets ($900/LF)
  - Rail Retrofit $187,200 $4.32/TSF
  - ACP Surface $45,273 $1.04/TSF
    - ACP ($0.48/TSF), Joints ($0.56/TSF)

- Total Contract Cost to Rehab Bridge
  - $1,634,367 $37.68/TSF
CS 2 – Deicing Chemical Induced Structure Rehab

- 250’ – 4 Span Steel I-beam – 20,000 TSF
  - Bridge is Over RR tracks
  - Remove and Replace Slab (Make Composite)
  - Replace steel shoes with elastomeric pads
  - Concrete Structure Repair
  - Clean and Paint Steel I-beams
CS 2 – Deicing Chemical Induced Structure Rehab

- 250’ x 2 – 4 Span Stl I-beam – 20,000 TSF
  - Conc Str Rep $63,322 $3.17/TSF
  - Replace Bearings $376,835 $18.84/TSF
    - Raising (182,260) - $18,226/Bent
    - Brg Seat & Elast Brg ($3,240/EA)
  - Deck Work $733,107 $36.66/TSF
  - Misc $231,072 $11.55/TSF
  - Painting $357,082 $17.85/TSF
    - $12/SF (Protection System 2)

- Total Rehab Cost for Both Bridges (No Mob)
  - $1,761,400 $88.07/TSF
Technical Assistance
Bridge Construction & Maintenance Branch

- 6 Professional Engineers, 1 EIT
- 4 Structural Steel Field Inspectors
- Serve as in-house consultant to districts, divisions, and consultants on bridge construction and maintenance issues
Thank You

Questions?