Simple Fixes to Extend the Life of Your Bridges
The bridge is laughing at you
What is the Number One Thing That Reduces the Life of Bridges?

• Water and Salt
  – Salt first introduced in 1941/42
  – Has increased steadily until the mid 1970’s

Bridge Maintenance 101

• Water and road salt cause...
  – Freeze thaw, corrosion, chloride leaching

• Newer structures can be more susceptible to salt use
  – Better bridge designs, newer technologies
Why Should I Spend Maintenance Money on Bridges?

### Road & Bridge Costs (per 100' of 2 Lane Road)

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
<th>Lifespan (years)</th>
<th>Life Cycle Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Roadway - Rehabilitation (2' Shoulder)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seal coat</td>
<td>$500</td>
<td>5</td>
<td>$100</td>
</tr>
<tr>
<td>Overlay, 1-1/2&quot;</td>
<td>$1,600</td>
<td>7</td>
<td>$229</td>
</tr>
<tr>
<td>Overlay, 2&quot;</td>
<td>$2,100</td>
<td>7</td>
<td>$300</td>
</tr>
<tr>
<td>Crush and Shape with 2&quot; HMA</td>
<td>$2,250</td>
<td>15</td>
<td>$150</td>
</tr>
<tr>
<td><strong>Roadway - Replacement</strong></td>
<td></td>
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</tr>
<tr>
<td>4&quot; HMA, 12' Lanes, 4' Shoulders</td>
<td>$7,000</td>
<td>20</td>
<td>$350</td>
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<tr>
<td><strong>Bridge - Rehabilitation (2' Shoulder)</strong></td>
<td></td>
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<tr>
<td>HMA Crack Treatment</td>
<td>$200</td>
<td>2</td>
<td>$100</td>
</tr>
<tr>
<td>Mill/Replace HMA, Replace Membrane &amp; Joints</td>
<td>$28,800</td>
<td>15</td>
<td>$1,920</td>
</tr>
<tr>
<td>Concrete Deck Replacement</td>
<td>$256,000</td>
<td>35</td>
<td>$7,314</td>
</tr>
<tr>
<td>Deck Replacement, Blast &amp; Paint Steel Beams</td>
<td>$384,000</td>
<td>35</td>
<td>$10,971</td>
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<tr>
<td>Superstructure Replacement (Conc/Steel)</td>
<td>$544,000</td>
<td>45</td>
<td>$12,089</td>
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<tr>
<td><strong>Bridge - Replacement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Bridge Replacement, Timber, 2' Shoulder</td>
<td>$570,000</td>
<td>60</td>
<td>$9,500</td>
</tr>
<tr>
<td>Full Bridge Replacement, Timber 6' Shoulder</td>
<td>$650,000</td>
<td>60</td>
<td>$10,833</td>
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<tr>
<td>Full Bridge Replacement, Precast Conc, 2' Shoulder</td>
<td>$870,000</td>
<td>60</td>
<td>$14,500</td>
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<tr>
<td>Full Bridge Replacement, Precast Conc, 6' Shoulder</td>
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<td>60</td>
<td>$15,833</td>
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Costs to Rehabilitate/Replace

- It costs 25 to 50 times more money to replace a bridge than a road.
- It costs 1 to 80 times more money to rehabilitate a bridge than a road.
Maintenance Isn’t Necessary, We’ll Just Get Replacement Grants

3 Examples

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<tr>
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<th>Cost per 100 feet</th>
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<th>Life Cycle Cost</th>
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<tr>
<th>Prestcast Concrete Bridge with 95% Grant Money</th>
<th>Cost per 100 feet</th>
<th>Life Span</th>
<th>Life Cycle Cost to Owner</th>
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Simple Fixes – Concrete Railings & Appurtenances

- Concrete Acrylic Coatings
- Epoxy Injection of Cracks
  - Only for cracks that are stable
  - .005” to .25” crack widths
  - High compressive/tensile strengths
- Urethane Injection of Cracks
  - Can be used on cracks that are stable or moving
  - .005”+ crack width
  - Low structural strength
Costs for Simple Concrete Fixes

- **Concrete Acrylic Coating**
  - $200-$250/5 gallon bucket

- **Epoxy Injection**
  - Varies with type of crack & system. Small cracks with low-pressure injection systems can be less than $100 for a few feet of repairs.

- **Urethane**
  - $100-$150/kit covers 5-12 feet of crack
Too Late to Repair
Too Late to Repair
Crack Repair vs. Acrylic Coating

- Concrete must be sound
- Evaluate the width of the cracks
- Review history of the cracks
Good Candidate for Hydrophobic Polyurethane Repair
Good Candidate for Acrylic Coating
Coating Examples
Coating Example
Painting

• Extends the life of a steel bridge
• Fairly expensive for a full MDOT paint job
• Small repairs can be very cost effective
• Don’t throw good money after bad
  — Know which bridges to paint
  — Know when to paint
Good Candidate for Painting
Too Late to Paint
Good Candidate for Painting
Too Late to Paint
To Paint or Not to Paint?
Box Beam Bridges

- Keeping the water away from the superstructure will extend the life of your bridge
- Commonly done with a waterproof membrane and wearing course
Is Your Existing Waterproof Membrane Working?
Is Your Existing Waterproof Membrane Working?

- 20 year life expectancy
-Leaks at joints and between beams
- Stalactites forming
- Service life of the membrane may be limited by the wearing surface life
Inadequate Performance by Any Component of the System Can Result in Inadequate Performance of the System
Seal Cracks in a Timely Fashion
Crack Sealing is Continuous Maintenance
Failure to Maintain the Water Proof Membrane Leads to Load Posted Bridges
New Water Proof Membrane

- Membranes can bridge and prevent reflection of many moving cracks
- Avoid thin overlays – use 2” minimum thickness
- Continue to maintain the wearing surface after installation, repair cracks as they appear
Increased Bridge Maintenance Funding = Increased Returns

• Review bridge inspection reports and Maintenance Recommendations
• Don’t throw good money after bad
• Look at life cycle costs
• Apply for maintenance grants
Questions?

WHAT IF I TOLD YOU

ENGINEER JOKES AREN'T FUNNY