Bridge Preventative Maintenance......
....Act now before this happens to you!

Keith Cooper, P.E.
Local Bridge Program Manager
Local Bridge Program

• Asset Management for Local Bridges
  • 2008 started approving Rehabilitation Projects
  • 2010 started approving PM Projects
  • Greater emphasis on Asset Management
  • Optimize a “Mix of Fixes” to preserve Local Bridge Inventory
Local Bridge Program

• FY 2018 Call for Projects
  • Project Applications
    • 34 Rehabilitations
    • 140 PM’s
  • ½ of project applications are Rehab/PM
• $258 million Total ($74 million Rehab/PM’s)
• $46 million Local Bridge Program Budget
Local Bridge Program

- FY 2018 Selected Projects
  - Rehabilitation – 6 - $8.3 million
  - PM – 54 - $7.9 million

- Approx. 20% of all applications selected
- Higher number of Rehab/PM’s applied for and selected each year.

- Asset Management – Right Fix - Right Time
Introduction to Bridge Asset Management in Michigan
Asset Management Definition

Asset Management according to PA 499:

“An ongoing process of maintaining, upgrading, and operating physical assets cost effectively, based on a continuous physical inventory and condition assessment”
Oil Change Example

Regular oil changes will dramatically prolong the life of your car
No Oil Change Example

Without regular maintenance, your car will be fine…

…for a while
Bridge Condition Forecast

![Bridge Condition Forecast System](chart.png)

- Actual
- Replacement Only
- Mix of Fixes
- Strategic PM
Time to “Poor”
Types of Bridge Improvements

Preventive Maintenance vs. Rehabilitation vs. Replacement

(Sections 5.1.1 and 5.1.2)
Preventive Maintenance

Routine Scheduled Maintenance (RSM): regularly scheduled activity that maintains serviceability and reduces the rate of deterioration of structural elements. Sometimes called “Cyclic Maintenance”.

Capital Preventive Maintenance (CPM): Work activity driven by distresses in an element. The work restores element integrity and supports serviceability. Sometimes called “Condition Based Maintenance”.

(Section 5.1.2)
Routine Schedule Maintenance (RSM) Examples

- Concrete sealing
- Superstructure washing
- Joint Sealing / Cleaning
- Vegetation control
- Drainage System Cleaning

(Section 5.1.2)
Capital Preventive Maintenance (CPM) Examples

- Painting only (full, zone or spot painting)
- Pin and hanger replacement
- Drainage repair
- Expansion or construction joint repair / replacement
- Minor concrete patching/repair
- Concrete crack sealing
- Approach pavement relief joints
- Slope paving repair
- Bridge drainage system
- Scour countermeasures

- HMA overlay (with or without membrane)
- Deep or shallow deck overlay
- Epoxy overlay
- Guardrail beam retrofit

(Section 5.1.2)
Rehabilitation

- Restores the structural integrity of a bridge and corrects major safety defects
- Intended to improve ratings from “poor” to “fair” or “good”
Rehabilitation Examples

- Full deck replacement (with or without painting steel beams)
- Superstructure replacement
- Structure widening
- Demolition of existing bridge
- Superstructure repairs
- Bridge barrier replacement
- Extensive substructure repairs
- Steel repairs
- Concrete beam end repairs
- Geometric upgrades

(Section 5.1.1)
Replacement

• Replacement of the entire bridge – substructure, superstructure, deck, and associated approach work

• Intended to improve the condition for the total bridge (deck, superstructure, and/or substructure) elements from “poor” to “good”
Types of Bridge Improvements

Preventive Maintenance vs. Rehabilitation vs. Replacement

(Section 5.1.1)
Concrete Sealing
Superstructure Washing
Vegetation Control
Drainage System Cleanout and Repair
Painting

Spot painting repairs isolated areas with limited damage when the majority of the surface is in good condition.

Zone painting protects beam ends and pin and hangers from de-icing salt water intrusion at joints.
Concrete Crack Sealing
Joint Sealing
Expansion or Construction Joint Repair/Replacement
Approach Pavement Relief Joints
Thermal Stress Without Relief Joint
Pin and Hanger Replacement

Brand new hardware and stainless steel pins
Epoxy Overlay
Thin Epoxy Overlay/Healer Sealer

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Thin Epoxy Overlay/Healer Sealer
Treatments on Bridge Decks

November 2011
HMA Overlay
Deep/Shallow Overlays
# Bridge Deck Preservation Matrix

## BRIDGE DECK PRESERVATION MATRIX

<table>
<thead>
<tr>
<th>DECK CONDITION STATE</th>
<th>REPAIR OPTIONS</th>
<th>POTENTIAL RESULT TO DECK BSIR</th>
<th>NEXT ANTICIPATED EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top Surface</strong></td>
<td><strong>Bottom Surface</strong></td>
<td><strong>Top Surface BSIR #63a</strong></td>
<td><strong>Bottom Surface BSIR #63b</strong></td>
</tr>
<tr>
<td>BSIR #58a</td>
<td>Deficiencies % (a)</td>
<td>BSIR #58b</td>
<td>Deficiencies % (b)</td>
</tr>
<tr>
<td>≥5</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>≤5%</td>
<td>&gt; 5</td>
<td>≤ 2%</td>
<td>Epoxy Overlay</td>
</tr>
<tr>
<td>≤ 10%</td>
<td>≥ 4</td>
<td>≤ 25%</td>
<td>Deck Patch (e)</td>
</tr>
<tr>
<td>4 or 5</td>
<td>10% to 25%</td>
<td>5 or 6</td>
<td>≤ 10%</td>
</tr>
<tr>
<td>≥ 4</td>
<td>10% to 25%</td>
<td>4</td>
<td>Shallow Concrete Overlay (h, i)</td>
</tr>
<tr>
<td>2 or 3</td>
<td>&gt; 25%</td>
<td>HMA Overlay with waterproofing membrane (f, h, i)</td>
<td>8, 9</td>
</tr>
<tr>
<td>≤ 3</td>
<td>&gt; 25%</td>
<td>Deep Concrete Overlay (h)</td>
<td>8, 9</td>
</tr>
<tr>
<td>&gt; 5</td>
<td>≤ 2%</td>
<td>Shallow Concrete Overlay (h, i)</td>
<td>8, 9</td>
</tr>
<tr>
<td>4 or 3</td>
<td>2% to 25%</td>
<td>HMA Overlay with waterproofing membrane (f, h, i)</td>
<td>8, 9</td>
</tr>
<tr>
<td>2 or 3</td>
<td>&gt; 25%</td>
<td>HMA Cap (g, h, i)</td>
<td>8, 9</td>
</tr>
<tr>
<td>Replace Deck</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

(a) Percent of deck surface area that is spalled, delaminated, or patched with temporary patch material.
(b) Percent of deck underside area that is spalled, delaminated or map cracked.
(c) The “hold” option implies that there is an ongoing maintenance of fill joints with cold patch and sealing of incipient spalls.
(d) Seal cracks when cracks are easily visible and minimal map cracking. Apply healer sealer where crack density is too great to seal individually by hand. Sustains the current condition longer.
(e) Crack sealing can also be used to seal the perimeter of deck patches.
(f) Hot Mix Asphalt overlay with waterproofing membrane. Deck patching required prior to placement of waterproofing membrane.
(g) Hot Mix Asphalt cap without waterproofing membrane for ride quality improvement. Deck should be scheduled for replacement in the 5 year plan.
(h) If bridge crosses over traveled lanes and the deck contains slip aggregates, do deck replacement.
(i) When deck bottom surface is rusted poor (or worse) and may have loose or delaminated concrete over traveled lanes, an in-depth inspection should be scheduled. Any loose or delaminated concrete should be sealed off and false decking should be placed over traveled lanes where there is potential for additional concrete to become loose.

Bridge Deck Preservation Matrix: March 12, 2008 Rev. Bridge Design Manual Appendix D, 09.02

Michigan Transportation Asset Management Council
Types of Bridge Improvements

Preventive Maintenance vs. Rehabilitation vs. Replacement

(Section 5.1.1)
Beam End Repair
Beam End Repair, cont.
Steel Section Loss
Minor Concrete Patching and Repair
Major Concrete Patching and Repair
Substructure Patching and Repair
Replacement
Examples of Local PM
Examples of Local PM
Examples of Local PM
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Examples of Local PM
Examples of Local PM
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Key Points

Bridge Asset Management

- Evaluate Bridge Network Condition
- Available Maintenance Options. The Right Fix at the Right Time.
- Estimate Costs
- Develop/Optimize Bridge Preservation Plan
Key Points

Bridge Preventative Maintenance

-Greatest Concern: Keeping water and chlorides off the bridge elements.

Leaking joints and open bridge railings

HMA overlays without Waterproof Membrane

Deck Drains without extensions

Debris/Vegetation trapping water

These are Critical Items that need Immediate Attention.
Thank You!