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

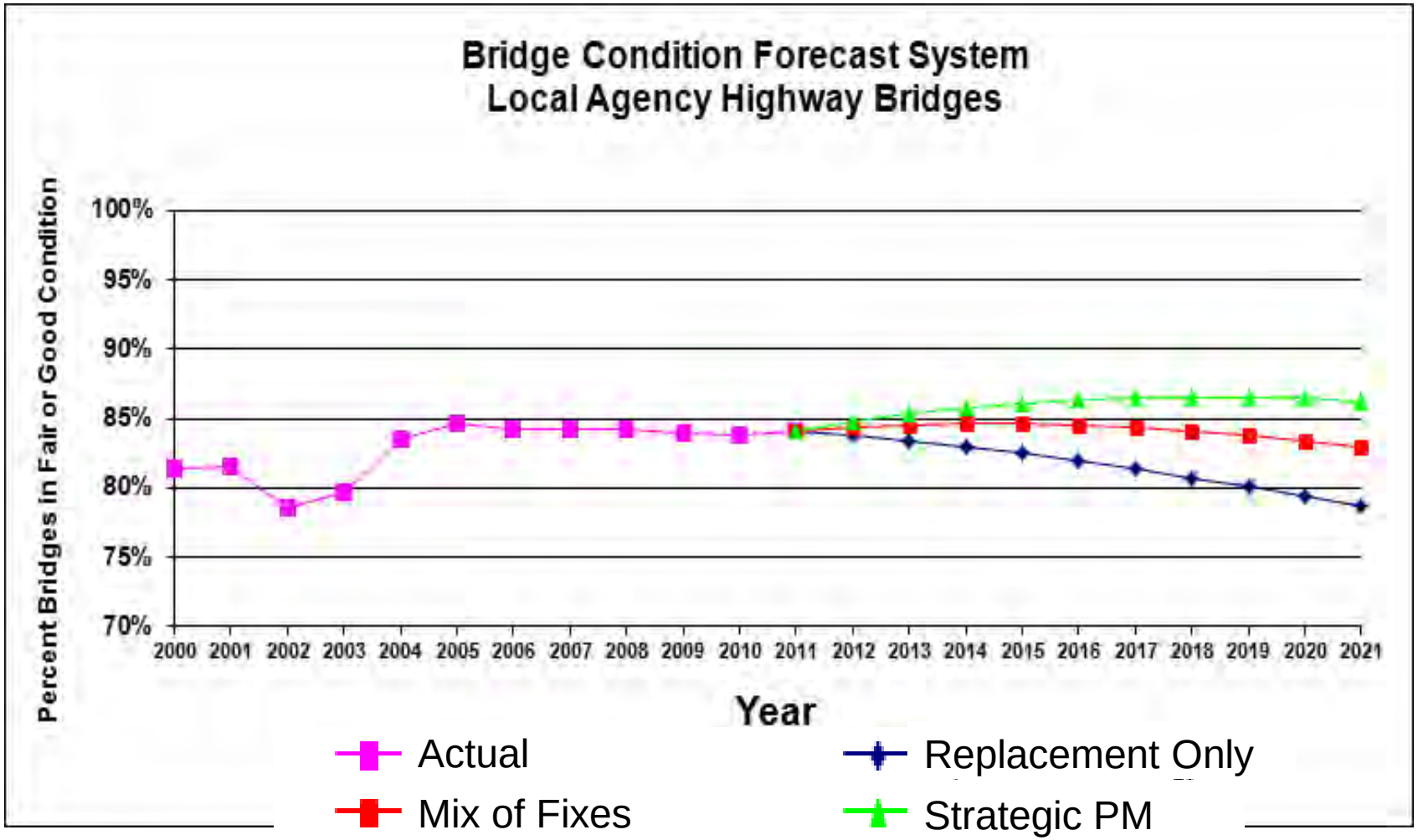
Regular oil changes will dramatically prolong the life of your car

No Oil Change Example

Without regular maintenance, your car will be fine…

…for a while

Bridge Condition Forecast



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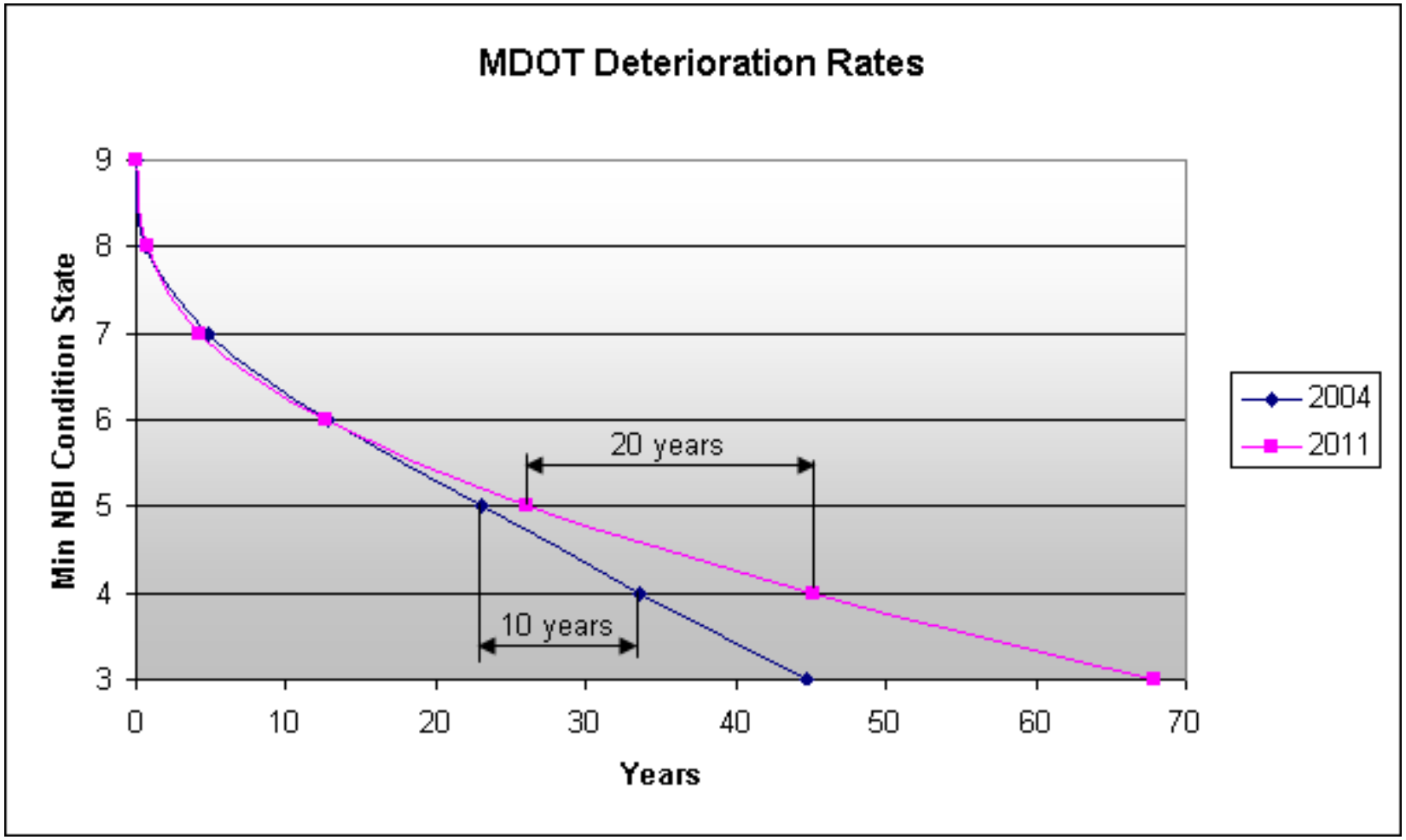
Time to "Poor"



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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”

(Section 5.1.1)

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

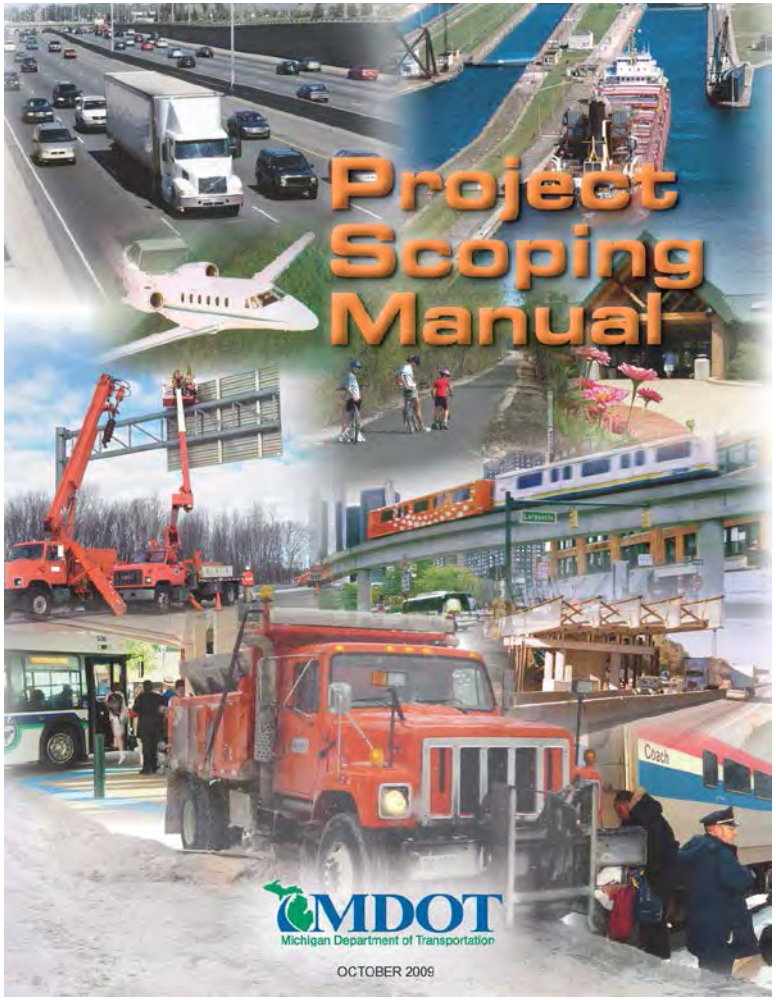
(Section 5.1.1)

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”

(Section 5.1.1)

MDOT Scoping Manual



Types of Bridge Improvements

Preventive Maintenance

vs.

Rehabilitation

vs.

Replacement

(Section 5.1.1)

MICHIGAN TRANSPORTATION ASSET MANAGEMENT COUNCIL

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

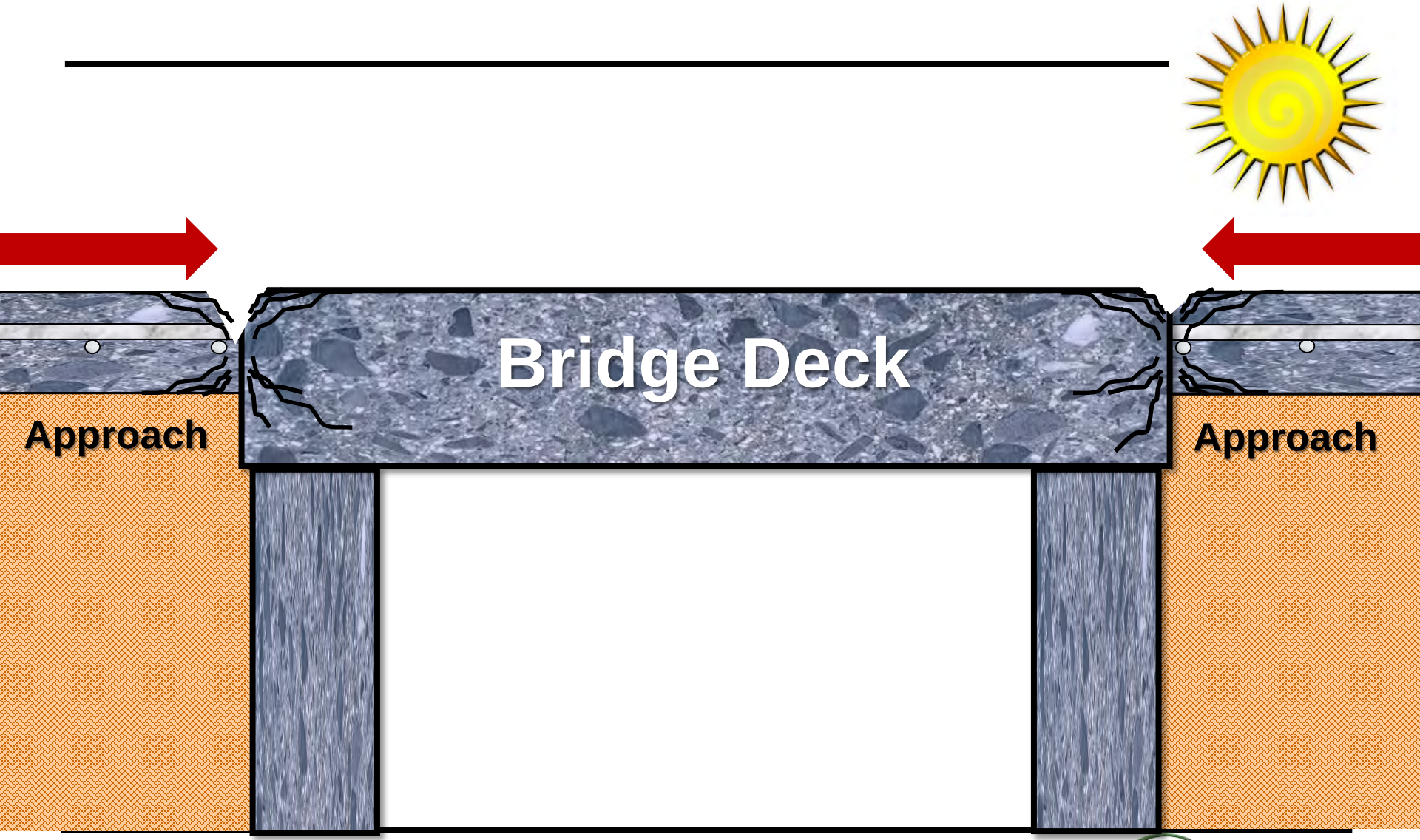
Concrete Crack Sealing

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

Region Bridge Support Unit
Bridge Field Services

MDOT Division of Operations
6333 Old Lansing Rd.
Lansing, MI 48917

Corey E. Rogers, P.E.
Engineer Manager

Andrew Bouvy, P.E.
Structures Engineer

Paul Schiefer
Structures Engineer

Thin Epoxy Overlay/Healer Sealer Treatments on Bridge Decks

November 2011

HMA Overlay

Deep/Shallow Overlays

Bridge Deck Preservation Matrix

BRIDGE DECK PRESERVATION MATRIX

DECK CONDITION STATE				REPAIR OPTIONS	POTENTIAL RESULT TO DECK BSIR		NEXT ANTICIPATED EVALUATION
Top Surface		Bottom Surface			Top Surface BSIR #58a	Bottom Surface BSIR #58b	
BSIR #58a	Deficiencies % (a)	BSIR #58b	Deficiencies % (b)				
≥ 5	N/A	N/A	N/A	Hold (c) Seal Cracks/Healer Sealer (d)	No Change	No Change	1 to 8 years
	≤ 5%	> 5	≤ 2%	Epoxy Overlay	8, 9	No Change	10 to 15 years
	≤ 10%	≥ 4	≤ 25%	Deck Patch (e)	Up by 1 pt	No Change	3 to 10 years
4 or 5	10% to 25%	5 or 6	≤ 10%	Deep Concrete Overlay (h)	8, 9	No Change	25 to 30 years
		4	10% to 25%	Shallow Concrete Overlay (h, i)	8, 9	No Change	10 to 15 years
				HMA Overlay with water-proofing membrane (f, h, i)	8, 9	No Change	8 to 10 years
		2 or 3	> 25%	HMA Cap (g, h, i)	8, 9	No Change	2 to 4 years
≤ 3	>25%	> 5	< 2%	Deep Concrete Overlay (h)	8, 9	No Change	20 to 25 years
		4 or 5	2% to 25%	Shallow Concrete Overlay (h, i)	8, 9	No Change	10 years
				HMA Overlay with water-proofing membrane (f, h, i)	8, 9	No Change	5 to 7 years
		2 or 3	>25%	HMA Cap (g, h, i)	8, 9	No Change	1 to 3 years
				Replace Deck	9	9	40+ years

(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 on-going maintenance of filling potholes with cold patch and scaling of incipient spalls.
(d) Seal cracks when cracks are easily visible and minimal map cracking. Apply healer sealer when 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 slag aggregate, do deck replacement.
(i) When deck bottom surface is rated 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 scaled 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 12.09.02

Types of Bridge Improvements

Preventive Maintenance

vs.

Rehabilitation

vs.

Replacement

(Section 5.1.1)

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Beam End Repair

Beam End Repair, cont.

Steel Section Loss

Minor Concrete Patching and Repair

Major Concrete Patching and Repair

Substructure Patching and Repair

Types of Bridge Improvements

Preventive Maintenance

vs.

Rehabilitation

vs.

Replacement

(Section 5.1.1)

Replacement

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

Examples of Local PM

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!