



Performance Measures for Bridge Preservation

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Council Bluffs Iowa

MAP-21

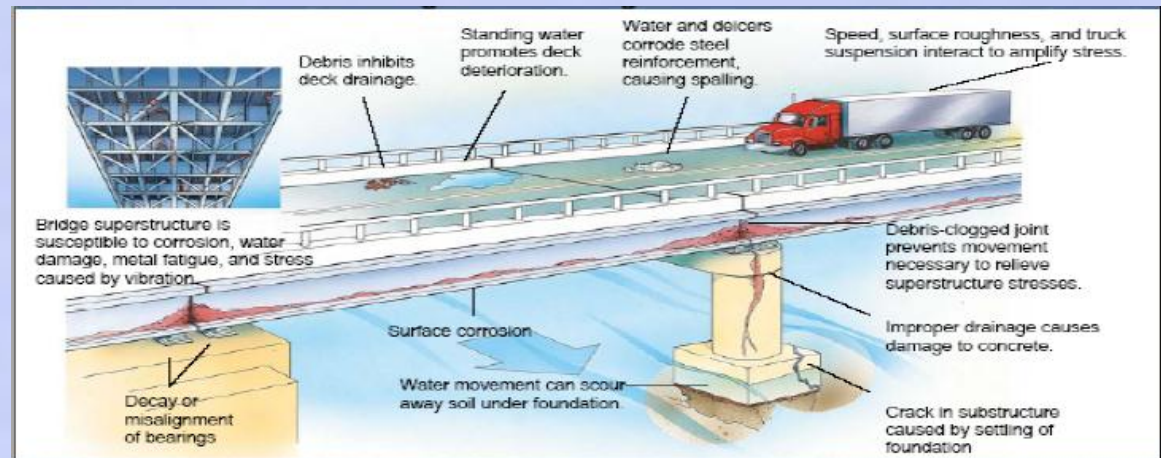
- Sets National Goals for NHS
 - Less than 10% SD by Deck Area
- Eliminated the Federal Highway Bridge Program
 - Funding for NHS Bridges - National Highway Performance Program (NHPP)
 - Non NHS Bridges – Surface Transportation Program (STP)
- Requires Element Level Inspection on the NHS
- Requires Risk Based Asset Management
 - National Task Force Reviewing Options for Performance Measures

Levels of Performance Measures

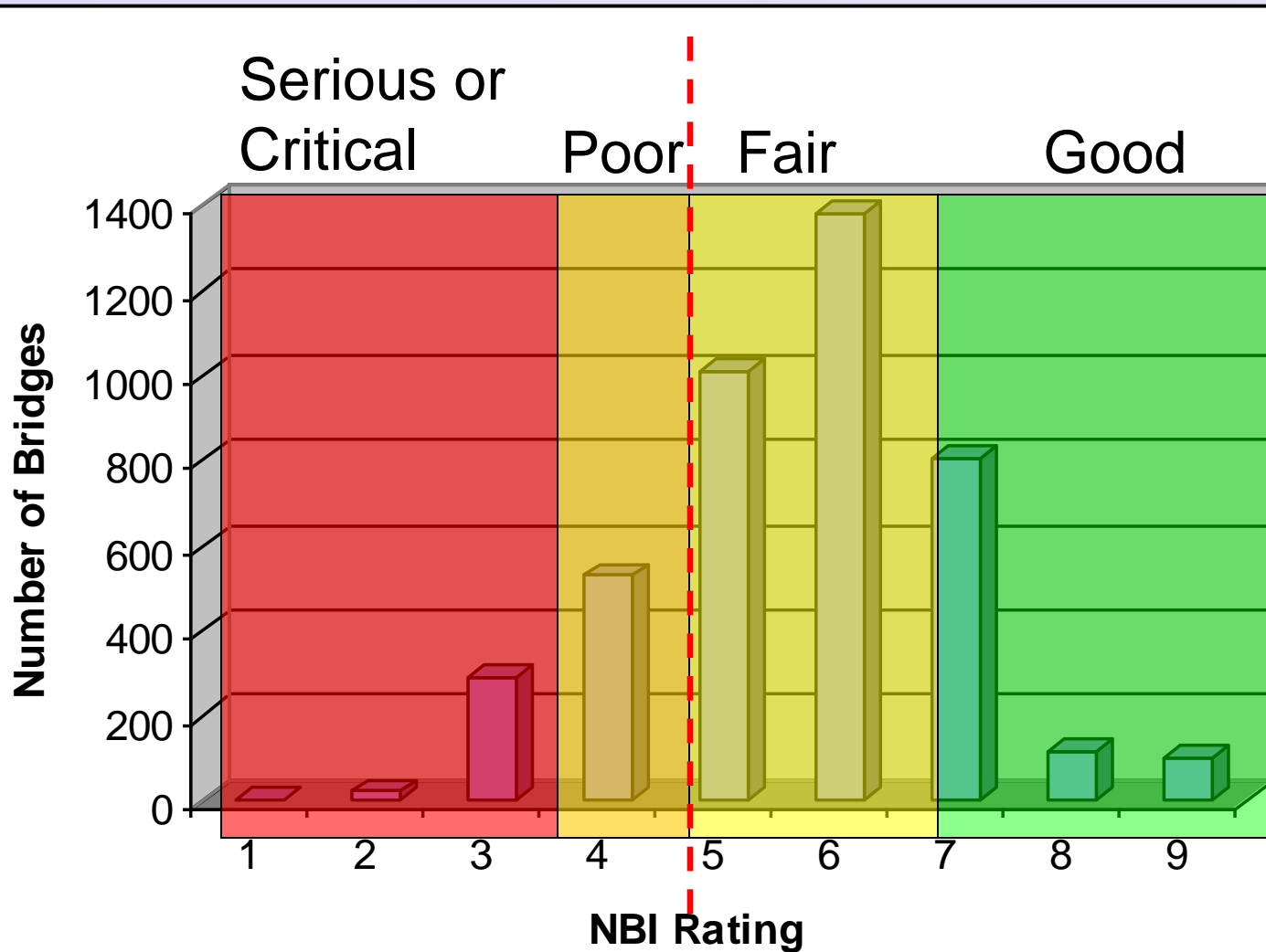
Elements → Components → Bridge

- Steel Beams
- Reinforced Concrete Deck
- Reinforced Concrete Abutment
- Pier Columns
- Pier Cap
- Paint System
- Barrier
- Elastomeric Bearings
- Strip Seal Expansion Joints
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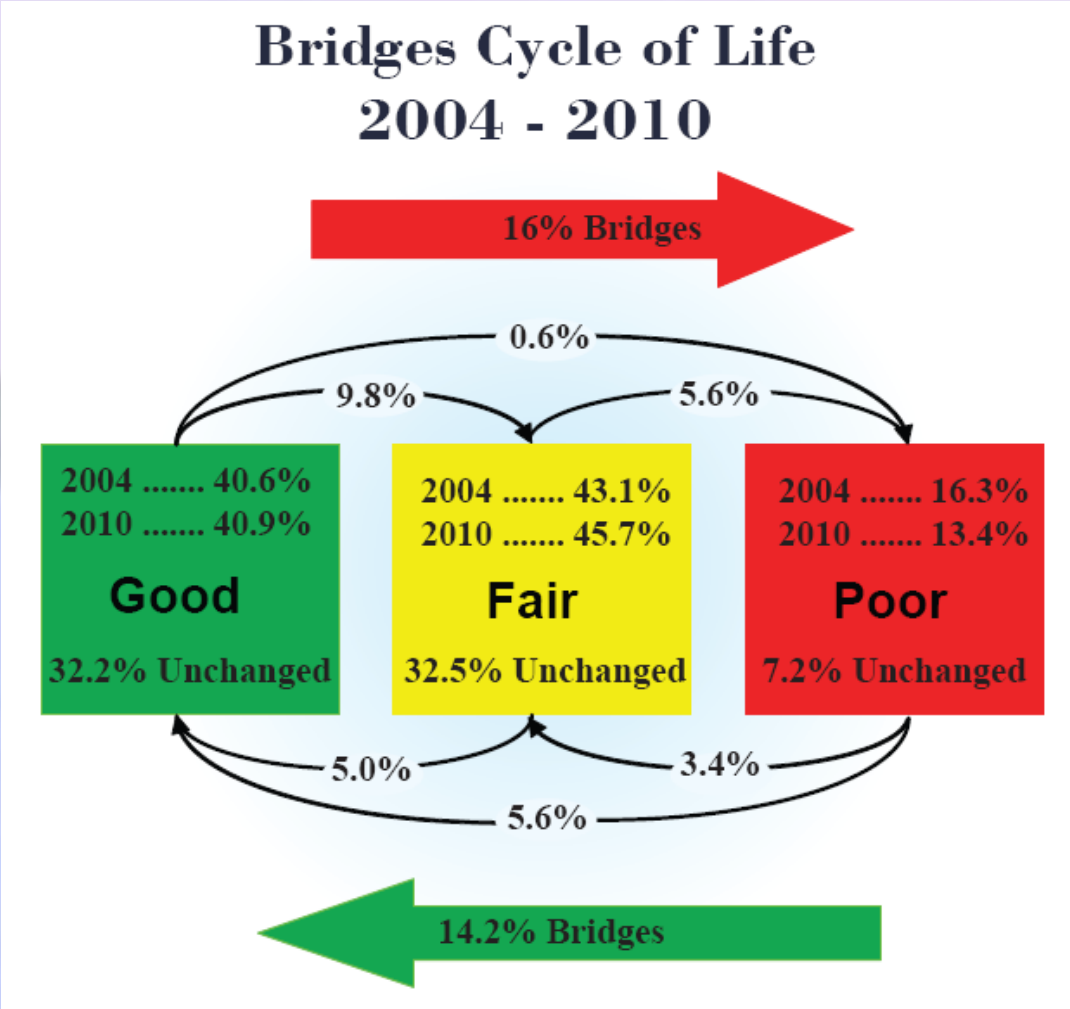
- Deck
- Superstructure
- Substructure
- Culvert



Bridge Condition Ratings

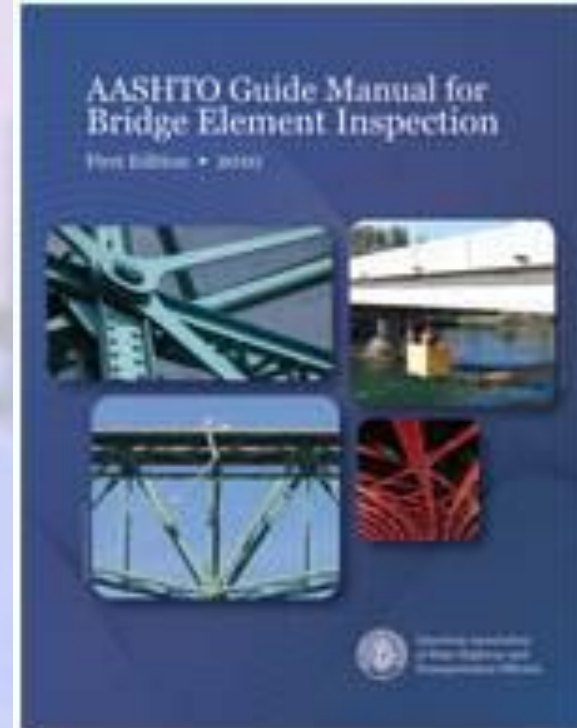


Performance Measure for Preservation Bridge Cycle of Life



AASHTO Guide Manual for Bridge Element Inspection

- Four condition states for all elements
 - Follow – Good, Fair, Poor, Severe convention
- Deck and slab units changed to square feet.
- Wearing surfaces and protective treatments separated from structural elements



AASHTO Guide Manual for Bridge Element Inspection

- National Bridge Elements
 - Primary Load Carrying Members,
 - refinement of the deck, superstructure, substructures and culvert condition ratings
 - Also bearings and bridge rails
 - National Performance Measures
 - Additional Elements Requested By The FHWA
 - **Protective Systems**
 - **Steel Coating**
 - **Concrete Coating**
 - **Wearing Surface**
 - Deck Joints

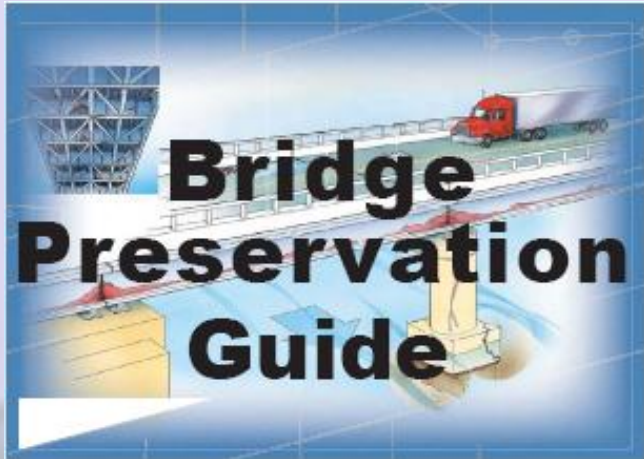
AASHTO Guide Manual for Bridge Element Inspection

- Bridge Management Elements
 - Define secondary elements and protective systems to support advanced bridge management.
 - Flexibility allowed so states can develop need indicators to meet their BMS needs

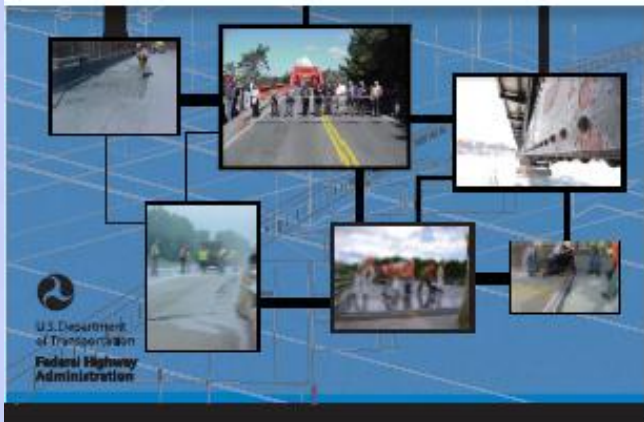
Condition State Definitions:				
Defect	CS 1 - Good	CS 2 - Fair	CS 3 - Poor	CS 4 - Severe
Scour	None	Arrestment or countermeasures exist, or both	Minor	The condition is beyond the limits established in condition state three (3), warrants a structural review to determine the strength or serviceability of the element or bridge, or both.
Settlement	None	Arrestment or countermeasures exist, or both	Minor	
Load Capacity	No Reduction	No Reduction	No Reduction	

Figure 24 - Recommend adding scour and settlement for applicable concrete substructure elements

What is Preservation?

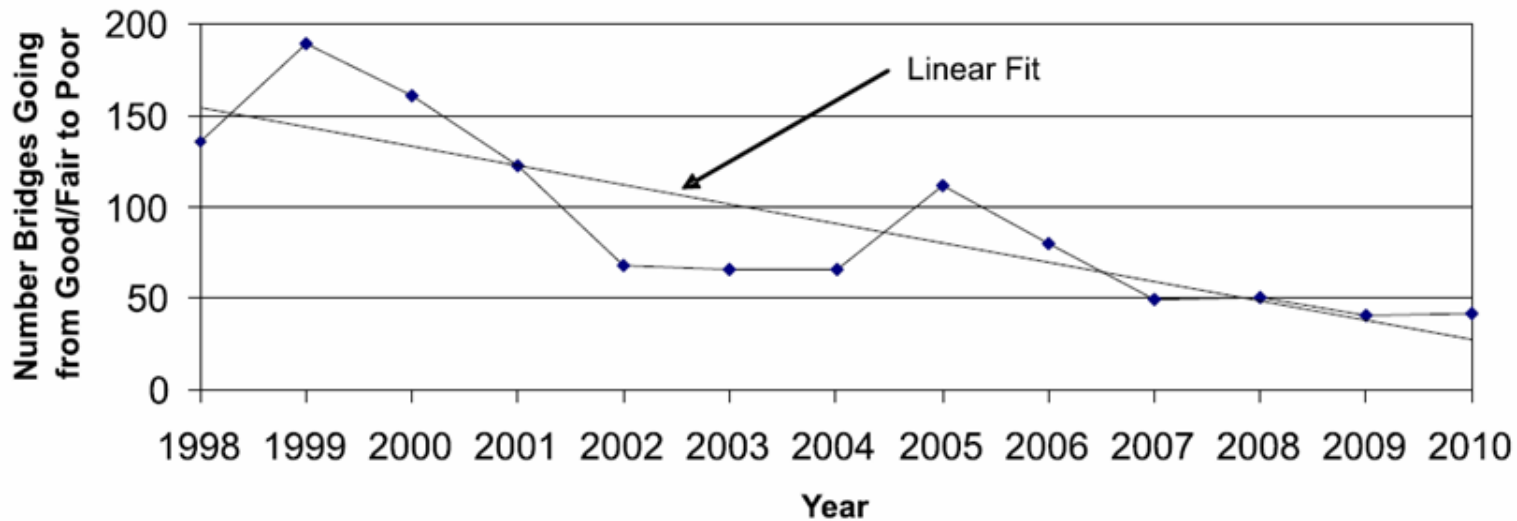


**Maintaining a State of Good Repair Using
Cost Effective Investment Strategies**



Performance Measure for Preservation Monitor Bridges Dropping to Poor (Structurally Deficient)

DETERIORATION RATE STATEWIDE TRUNKLINE BRIDGES



Performance Measures For Preservation

Counting number of bridge projects per year and what type of projects.

- MDOT 2005 Construction Program
 - Replacement
 - 59 Projects
 - Rehabilitation
 - 133 Projects
 - Preventive Maint.
 - 206 Projects



Preventive Maintenance Projects

- Joint Replacements
- Pin & Hanger Replacements
- Complete Painting
- Zone Painting
- Epoxy Overlays
- Deck Patching
- (many more)...



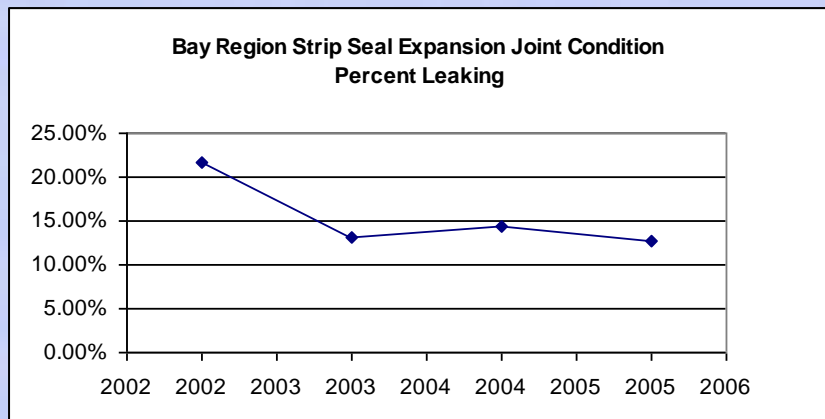
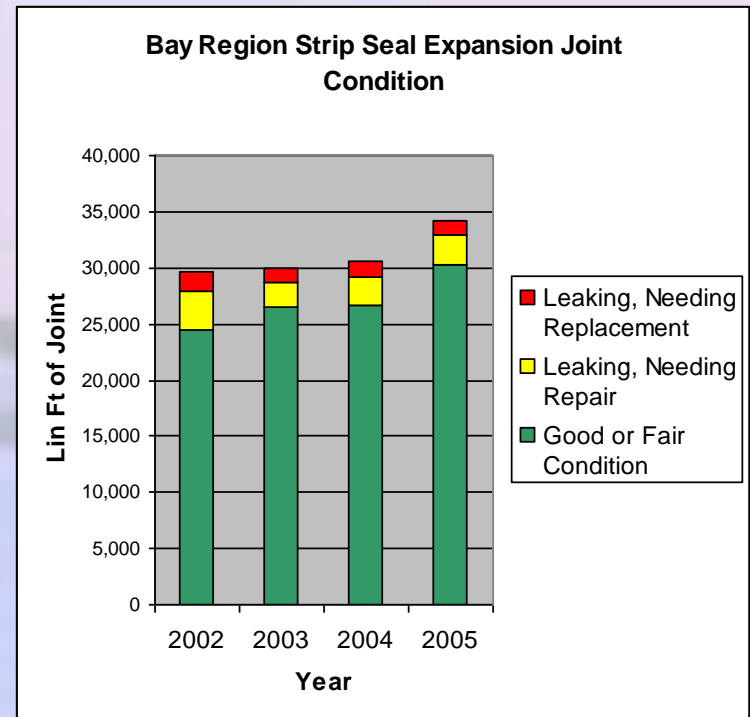
Scope (Detailed Inspections) May Be Need to determine right “fix”

- The routine (visual) bridge inspection may not be enough to determine actual bridge project needs.
- Chain drag bridge deck
- Sound concrete surfaces
- Measure section loss of corroded beams
- Compare costs of different fixes (sometimes using life cycle cost analysis)



Performance Measures and Need Indicators for Preventive Maintenance

- Expansion joints leaking
 - Measured using Pontis data.
 - MDOT categorizes seven different types of joints



Pontis Reports

- Possible projects with estimate of cost (unlimited budget)
- Future Poor Bridges (predicts what year a bridge will become poor (2012 – 2031))

Facility	Feature Int	Future Predicted Conditions			
		Year To Turn Poor	Deck	Super	Subst
M-50	TUPPER RIVER	2012	0	6	6
M-66	GRAND RIVER	2030	4	5	5
HASTINGS RD	I-96	2030	4	6	5
NASH HWY	I-96	2012	4	6	6
MORRISON LAKE RD	I-96	2012	3	5	6
JORDAN LAKE RD	I-96	2018	4	5	6
I-96 EB	GRAND RIVER & MARKET	2012	4	4	6
I-96 WB	GRAND RIVER & MARKET	2020	4	6	6
I-96 EB	CSX RR (ABN)	2020	4	5	5
I-96 WB	CSX RR (ABN)	2020	4	5	5
M-66 NB	I-96	2012	4	6	6
M-66 SB	I-96	2028	4	6	5
SUNFIELD RD	I-96	2030	4	6	5
I-96 EB	PORTLAND RD	2012	4	6	6
I-96 WB	PORTLAND RD	2020	4	6	6

Facility	Feature	Action	Element	Item Cost	Proj Cost	Proj Type
M-32	BEAN CREEK	Paint	Pnted Stl Girder /Bm	42,641	42,641	CPM
US-23	THUNDER BAY RIVER	Rehab Elem	Misc Bridge Railing	6,865	7,189	CPM
		Rehab Elem	Sidewalk	324		
US-23	LONG LAKE CREEK	Repl Elem	Reinf Conc Girder/Bm	10,104	12,290	Replace
		Min Repair	Reinf Conc Girder/Bm	1,379		
		Rehab Elem	Reinf Conc Culvert	807		
M-68	PIGEON RIVER	Paint	Pnted Stl Girder /Bm	47,366	47,366	CPM
US-23	LITTLE BLACK RIVER	Rehab Elem	Misc Bridge Railing	6,862	6,862	CPM
I-75 NB	D&M RR (ABN)	Epoxy Ovly	Conc Dk Thn Epoxy Ov	39,123	42,290	CPM
		Rehab Elem	Fixed Bearing	3,167		

Performance Measures for Preventive Maintenance

- Paint condition
 - Measured using Michigan Specific NBI rating and Pontis data.
 - Full painting
 - Zone painting
 - Spot painting



Full Painting Candidates when greater than 15% paint failure.

Develop Paint Preservation Guidance

- Lead based and zinc based paint systems handled differently
 - Only do spot and zone painting on Zinc based paint systems
- Take into account effectiveness of paint contractors and full containment requirements.
- Have had limited effectiveness because of reduced surface preparation.



Bridge Decks

- Number one overarching need Indicator
 - The condition of bridge decks most often drive bridge projects.



Performance Measures are Deck Top and Bottom Surface Condition

- Top Surface
 - 2 to 5% - deck patch, epoxy overlay
 - 5% to 15% - deck patch
 - > 15% - rigid overlays, HMA overlays
- Bottom Surface
 - < 10% - deep overlay
 - 10% to 30% shallow overlay
 - > 30% replace deck.



For more information see MDOT Bridge Deck Preservation Matrix

Need Indicator for Crack Sealing and Epoxy Overlays

Pontis Smart Flag – Deck Cracking



Epoxy Overlay



Crack Sealing



Differentiate spalls from delaminations



We often have bridge decks having rigid overlays (concrete, latex modified, or silica-fume) having very small percentage of spalls (< 2%) but having large percentage of delaminations (30% plus).

Question – How long will it take delaminated area to spall?

Review Your Bridge Management Data (Bridge Management Elements) with Your Practitioners



Thank You

- Our work is not done
- We must continue to develop and enhance our performance measures for preventive maintenance

