9th International Conference on MANAGING PAVEMENT ASSETS (ICMPA9)

Pavement Preservation Process at the Maryland State Highway Administration

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AASHTO THE VOICE OF TRANSPORTATION

VirginiaTech Transportation Institute

TRB

U.S. Department of Transportation Federal Highway Administration

WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE 1909-2009

VDOT Virginia Department of Transportation

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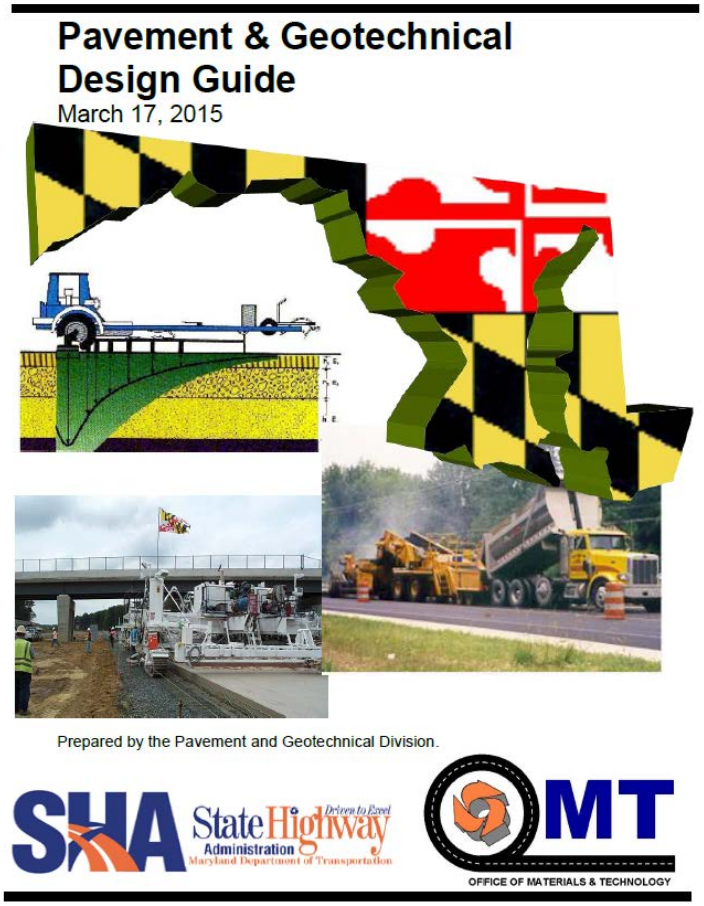
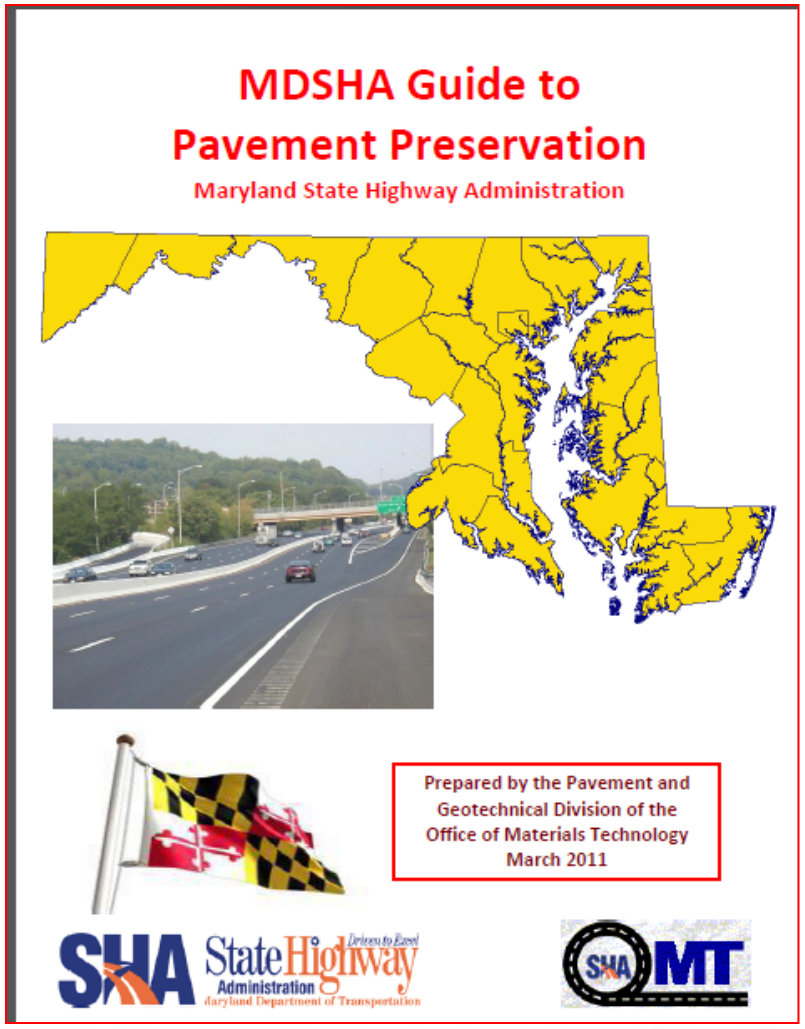
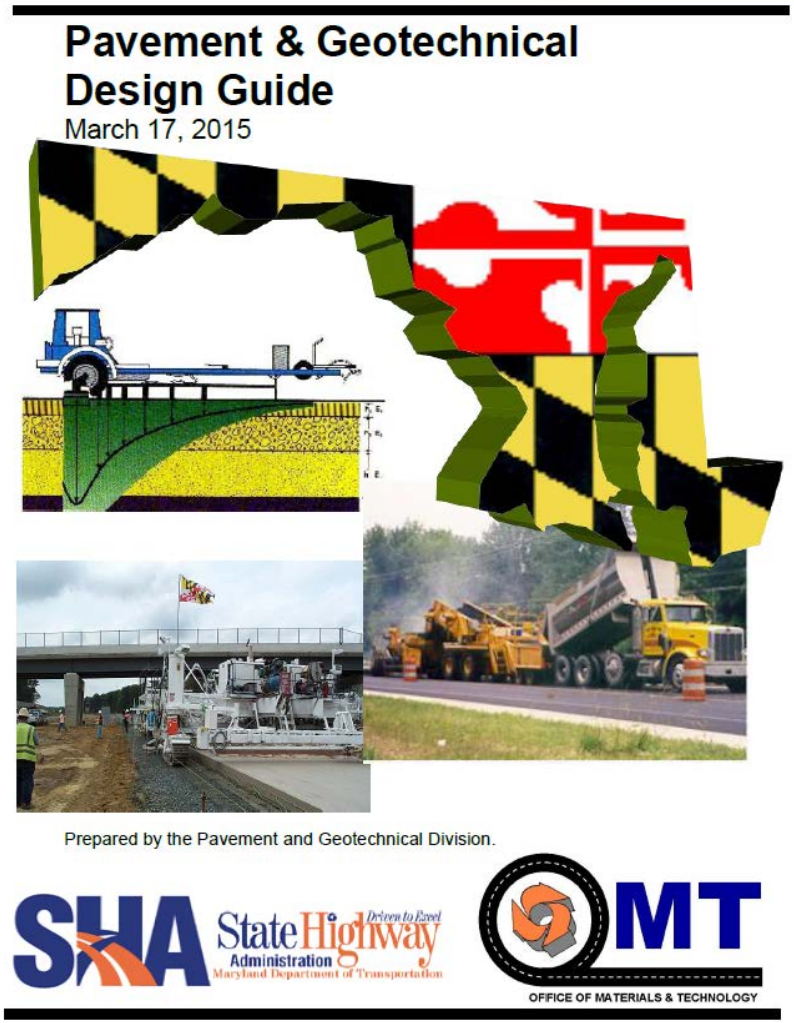
Presentation Outline

- **Background**
  - Why we created the guide
- **Pavement Preservation Guide**
  - Contents
  - Example Project



Background


MDSHA Guide to
Pavement Preservation
Maryland State Highway Administration
Prepared by the Pavement and Geotechnical Division of the Office of Materials Technology March 2011
SHA State Highway Administration
OMT


Pavement & Geotechnical Design Guide
March 17, 2015
Prepared by the Pavement and Geotechnical Division.
SHA State Highway Administration
OMT
OFFICE OF MATERIALS & TECHNOLOGY

Background

- **Pavement Management/Project Selection/ System Preservation assessment in 2007**

- **Several useful recommendations provided**

Background

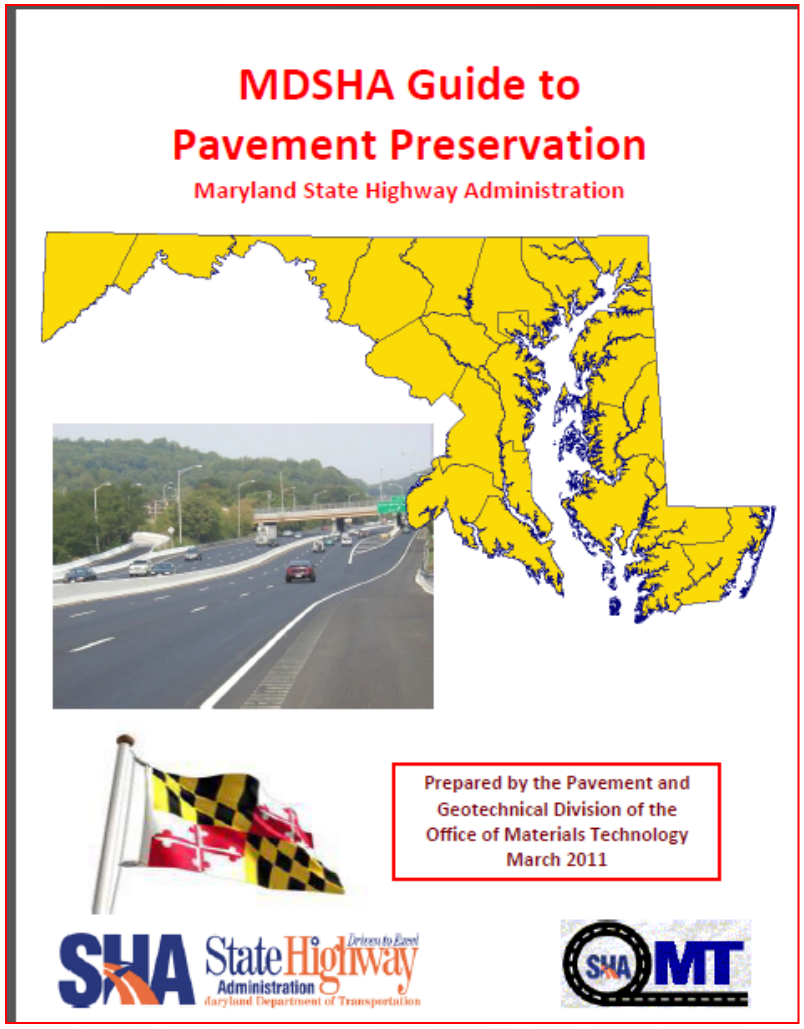
- ***Continue to move toward a more proactive philosophy, avoiding reactive approaches, particularly "worst first"***

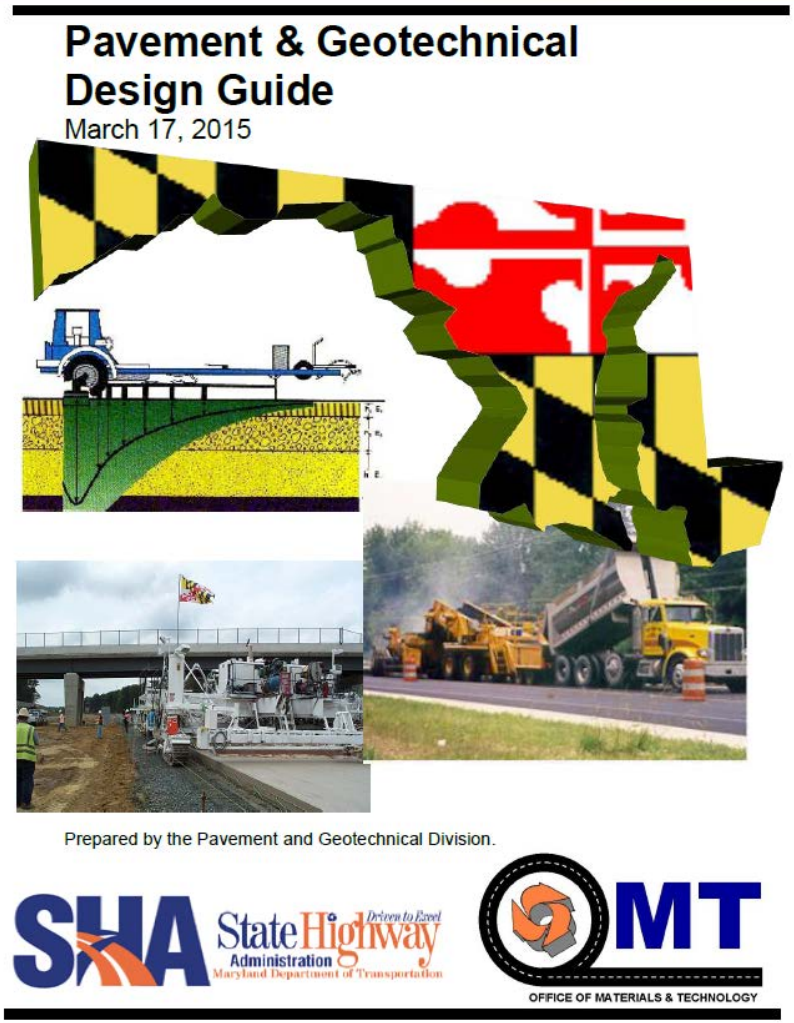
Target: Balanced Selection of roads in all condition states

Background

- ***Currently, each district has own ideas as to what constitutes appropriate treatment***
- ***Develop guidelines for use on statewide basis***
- ***Guidelines should have expected life extensions of treatments***

Pavement Preservation Guide – Contents





Pavement Preservation Guide

- **Three Main Sections**

1. Treatment Tables and Matrices
2. Definitions of Treatments
3. Supplemental Treatment Information

Pavement Preservation Guide

Treatment Tables

Group	Number	Treatment	Spec Status	Contract Type
A. Crack/Joint Seals	A-1	Crack Fill & Crack Seal (Asphalt)	Needs Work	Crack and Joint Seals
	A-2	Crack Seal (PCC Surface)	Needs Work	
	A-3	Joint Sealing (and Resealing)	Needs Work	
	A-4	Saw and Seal	None	
B. Asphalt Sealers / Rejuvenators	B-1	Fog Seal	Needs Work	Asphalt Emulsion Seals
	B-2	Rejuvenators	Pilot Phase	
C. Aggregate Seals	C-1	Cape Seal	NA	Asphalt Emulsion Seals
	C-2	Chip Seal (Modified)	Needs Work	
	C-3	High Friction Surface	Up to Date	High Friction Surf
	C-4	Sand Seal	None	Asphalt Emulsion Seals
	C-5	Sandwich Seal	None	
	C-6	Scrub Seal	None	
	C-7	Slurry Seal	Up to Date	
	C-8	Micro-surfacing	Up to Date	

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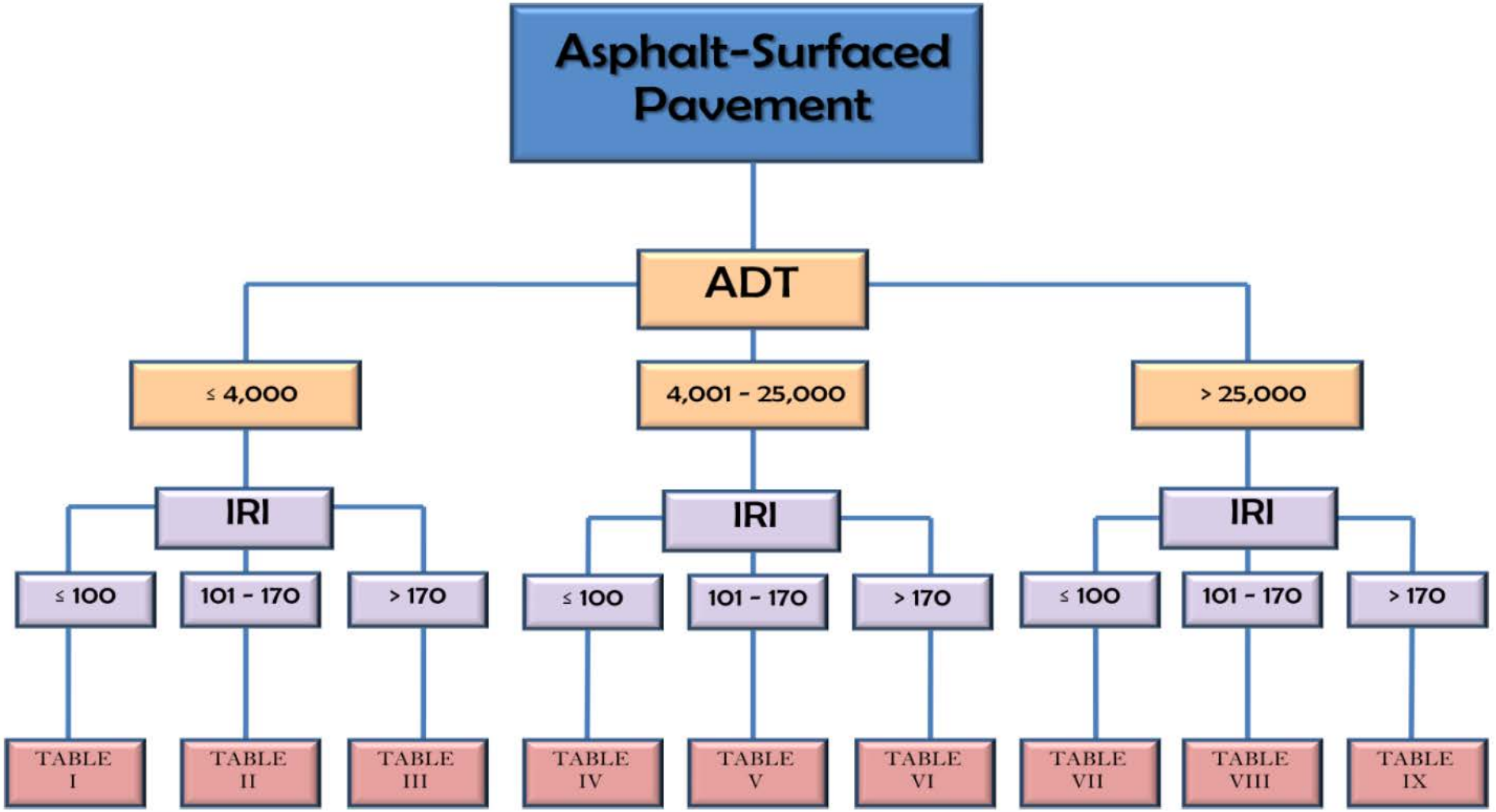
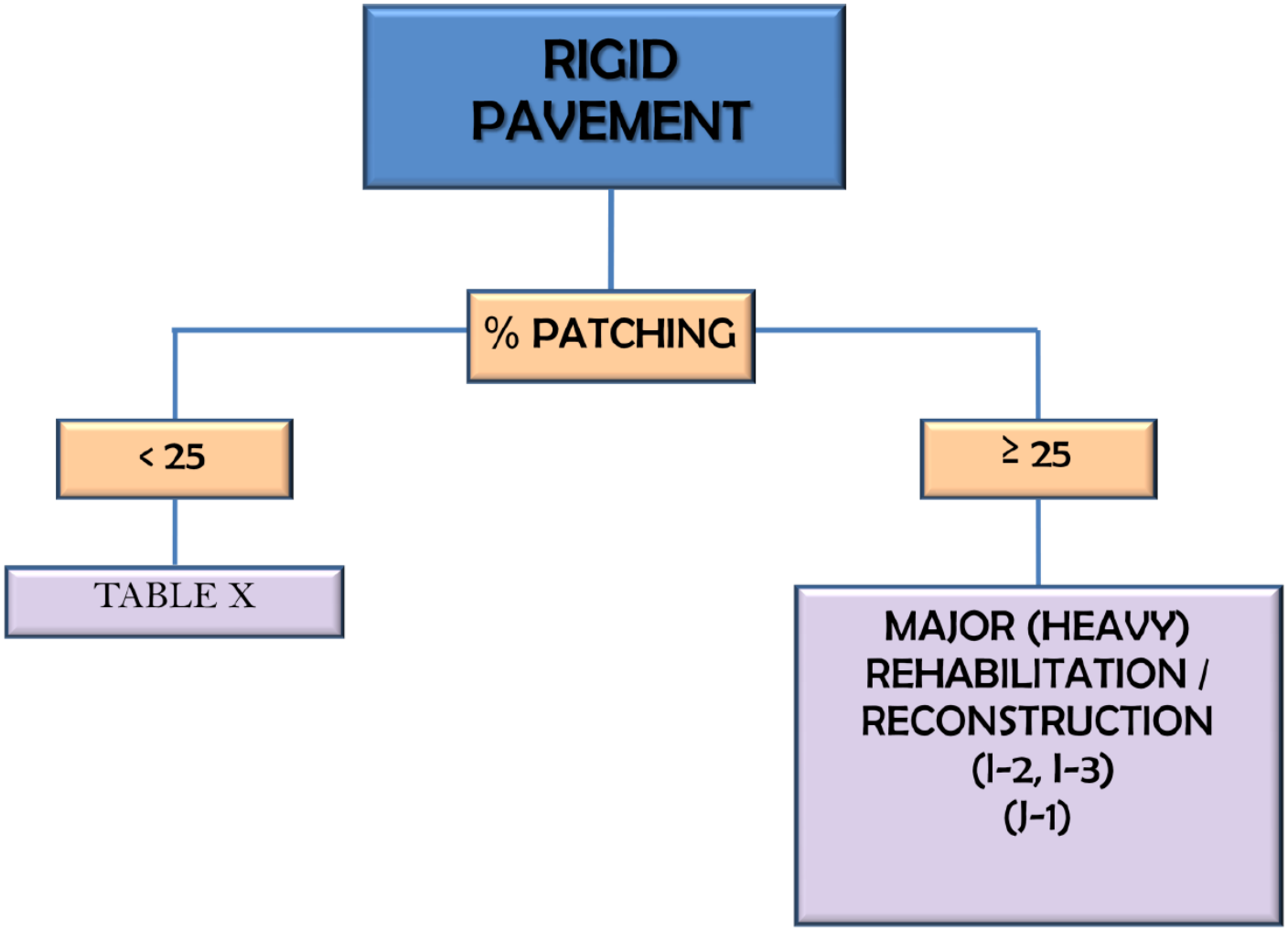
Decision Tree: Asphalt-Surfaced Pavements



Pavement Preservation Guide

Decision Tree: Rigid Pavements



Pavement Preservation Guide

Treatment Matrices for Asphalt Surface – Groups A thru D

Table I				Pavement T ADT: 0 to ≤			
SCI	FCI	Skid	Rutting (in.)	A. Crack/ Joint Seal	B. Asphalt Rejuvenator	C. Aggregate Seals	D. HMA Overlay**
≤ 50	> 75	>40	< ½"				D-3
			½" to 1"				D-3, D-4
			>1"				D-2, D-3, D-4
		≤ 40	< ½"				D-3
			½" to 1"				D-3, D-4
			>1"				D-2, D-3, D-4
	≤ 75	>40	< ½"				D-3
			½" to 1"				D-3, D-4
			>1"				D-2, D-3, D-4
		≤ 40	< ½"				D-3
			½" to 1"				D-3, D-4
			>1"				D-2, D-3, D-4

Note: See Table C for Treatment Activities. *I-2 and I-3 apply to composite pavements only.
**D-2 shall replace D-3; and D-4, D5 and I-1 do not apply to pavements with predominant Curb & Gutter. Click to go to Initial Treatment Identification – Pavement Preservation Guide

Pavement Preservation Guide

Treatment Matrices for Asphalt Surface – Groups E thru J

Table I	ype: Asphalt Surface 4,000, IRI: 0 to ≤ 100							
SCI	FCI	Skid	Rutting (in.)	E. PCC Overlay	F. Patch	H. Surface Texturizing	I. Major Rehab**	J. Reconstruction
≤ 50	> 75	>40	< ½"				I-1, I-2*, I-3*	J-1, J-2
			½" to 1"				I-1, I-2*, I-3*	J-1, J-2
			>1"				I-1, I-2*, I-3*	J-1, J-2
		≤ 40	< ½"				I-1, I-2*, I-3*	J-1, J-2
			½" to 1"				I-1, I-2*, I-3*	J-1, J-2
			>1"				I-1, I-2*, I-3*	J-1, J-2
	≤ 75	>40	< ½"				I-1, I-2*, I-3*	J-1, J-2
			½" to 1"				I-1, I-2*, I-3*	J-1, J-2
			>1"				I-1, I-2*, I-3*	J-1, J-2
		≤ 40	< ½"				I-1, I-2*, I-3*	J-1, J-2
			½" to 1"				I-1, I-2*, I-3*	J-1, J-2
			>1"				I-1, I-2*, I-3*	J-1, J-2

Note: See Table C for Treatment Activities. *I-2 and I-3 apply to composite pavements only.
**D-2 shall replace D-3; and D-4, D5 and I-1 do not apply to pavements with predominant Curb & Gutter. Click to go to Initial Treatment Identification – Pavement Preservation Guide

Pavement Preservation Guide

Treatment Matrix for Concrete Surface

Table X	Pavement Surface: Concrete Patching < 25%			
Structural Distress	**Cracking (≥ 5% of slabs)**	**Pumping (≥ 5% of slabs)**	**Joint/Crack Deterioration (including Faulting) (≥ 8% of slabs)**	**Punchouts (≥ 5/mile)**
Punchouts (≥ 5/mile)	Crack/Joint Seal (A-2, A-3) Patch (F-3) Joint Treatments (G-1, G-2)	Patch (F-3) Joint Treatments (G-2, G-3) Drainage Improvements	Crack/Joint Seal (A-2, A-3, A-4) HMA Overlay (D-3) PCC Overlay (E-1, E-2) Patch (F-2, F-3)	Patch (F-3)
Joint/Crack Deterioration (including Faulting) (≥ 8% of slabs)	Crack/Joint Seal (A-2, A-3, A-4) HMA Overlay (D-3) PCC Overlay (E-1, E-2) Patch (F-2, F-3) Joint Treatments (G-1, G-2, G-3)	Crack/Joint Seal (A-3, A-4) HMA Overlay (D-3) PCC Overlay (E-1, E-2) Patch (F-2, F-3) Joint Treatments (G-2, G-3) Drainage Improvements	Crack/Joint Seal (A-2, A-3, A-4) HMA Overlay (D-3) PCC Overlay (E-1, E-2) Patch (F-2, F-3) Joint Treatments (G-1, G-2, G-3)	

Pavement Preservation Guide

Treatment Matrix for Concrete Surface

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Pumping (≥ 5% of slabs)	Crack/Joint Seal (A-2, A-3) Patch (F-3) Joint Treatments (G-1, G-2, G-3) Drainage Improvements	Patch (F-3) Joint Treatments (G-2, G-3) Drainage Improvements		
Cracking (≥ 5% of slabs)	Crack/Joint Seal (A-2) Patch (F-2, F-3) Joint Treatments (G-1, G-2)			

Pavement Preservation Guide

Treatment Definitions

9.01.01.01 *Crack / Joint Seals:*

A-1: Crack Fill and Crack Seal (Asphalt-Surfaced pavements)

A-1a: Crack Fill is a process that consists of placing a generally bituminous material into "**non-working**" cracks to substantially reduce water infiltration and reinforce adjacent top-down cracks. Non-working cracks are cracks that have vertical or horizontal movement of less than 2.5mm (0.1"), and are typically diagonal or longitudinal cracks.

A-1b: Crack Seal is a process of placing higher-quality material into or on top of "**working**" cracks in order to reduce water infiltration into a pavement. Working cracks are cracks that have vertical or horizontal movement of at least 2.5mm (0.1"), and are typically transverse and reflective cracks.

In contrast with crack **filling**, crack **sealing** requires more crack preparation procedures and uses higher-quality sealant materials. Generally, one pound of material equates to ½" by ½" by 5' of crack filling/sealing.

Pavement Preservation Guide

Supplemental Information

Table B.1 Return to Table C		2.09.01 SUPPLEMENTAL INFORMATION F TREATMENT A-1	
		A-1a. Crack Fill (Asphalt Surface)	A-1b. Crack (Asphalt Sur
This treatment is intended to improve:	IRI		
	FCI	Yes	Yes
	SCI		
	Rut		
	Skid		
	Aging	Yes	Yes

Pavement Preservation Guide

Supplemental Information

Table B.1 Return to Table C	2.09.01 *SUPPLEMENTAL INFORMATION F* *TREATMENT A-1*	
	A-1a. Crack Fill (Asphalt Surface)	A-1b. Crack (Asphalt Su
Treatment Advantages	1. Slows/ Reduces Moisture Damage 2. Slows/Reduces Cracking and Rutting 3. Performs well in all climatic conditions 4. Performance is not significantly affected by varying ADT or truck levels 5. Prevents incompressibles from entering cracks.	1. Slows/ Reduces Moisture 2. Slows/Reduces Cracking 3. Performs well in all clima 4. Performance is not signif by varying ADT or truck lev 5. Prevents incompressible crack joints

Pavement Preservation Guide

Supplemental Information

Table B.1 Return to Table C	2.09.01 SUPPLEMENTAL INFORMATION F TREATMENT A-1	
	A-1a. Crack Fill (Asphalt Surface)	A-1b. Crack (Asphalt Su
Treatment Disadvantages	1. Adds no structural benefit. 2. Damages the aesthetic look of the pavement 3. May reduce friction if used extensively in wheel paths 4. Applicable only for non-working cracks	1. Requires more substan preparation compared to c 2. Applicable only for "wor 3. May reduce friction if us wheel paths 4. Damages the aesthetic pavement 5. Adds no structural bene

Pavement Preservation Guide

Supplemental Information

Table B.1 Return to Table C		2.09.01 SUPPLEMENTAL INFORMATION F TREATMENT A-1	
		A-1a. Crack Fill (Asphalt Surface)	A-1b. Crack (Asphalt Su
Cost Clarification	Small Quantity Cost	> $0.30 per linear feet per NHI > $2.50 per linear feet per MD Price Index	> $0.60 - $1.00 per linear f
	Medium Quantity Cost	$0.30 per linear feet per NHI $2.50 per linear feet per MD Price Index	$0.60 - $1.00 per linear fee
	High Quantity Cost	$0.30 per linear feet per NHI $2.50 per linear feet per MD Price Index	$0.60 - $1.00 per linear fee
	Items Included	Minimal crack preparation, low-quality thermoplastic sealant materials	Crack preparation procedu thermoplastc sealant mate
	Items Excluded	Marking Removal	Marking Removal

Pavement Preservation Guide

Supplemental Information

Table B.1 Return to Table C	2.09.01 *SUPPLEMENTAL INFORMATION F* *TREATMENT A-1*	
	A-1a. Crack Fill (Asphalt Surface)	A-1b. Crack (Asphalt Su
Typical Life Extension	2-4 years	2-10 years
MOT Considerations / Cure time	1. Traffic passing over a hot applied sealed or filled crack is usually not an issue. However, traffic control during the application of the treatment should be in effect long enough to allow for adequate curing of the product and prevent tracking. 2. Hot applied rubber modified sealants, especially asphalt rubber, have excellent adhesion and do not require the application of a thin sand coating prior to trafficking. Emulsions must be sand coated prior to being trafficked.	1. Traffic passing over a h or filled crack is usually nc However, traffic control du application of the treatme effect long enough to allo curing of the product and 2. Hot applied rubber moc especially asphalt rubber, adhesion and do not requ of a thin sand coating pric trafficking. Emulsions mus prior to being trafficked.

Using the Guide –
What fixes are most appropriate?

- **Two Steps:**

1. Using network-level data, go through the appropriate matrix to identify viable treatments
2. Then use project-level data, treatment advantages/disadvantages, cost/benefit to select final treatment choice

Historically…

- **Very few options in toolbox of fixes**
- **Even fewer that are non-HMA-overlay**

  “pavement preservation”

Example Project – Historically

Flexible Pavement
15 years old
ADT = 22,000
IRI < 100
SCI and FCI > 75
Friction < 35

What is a good fix?

How we used to do it –
What fixes are available?

Circa 2007…

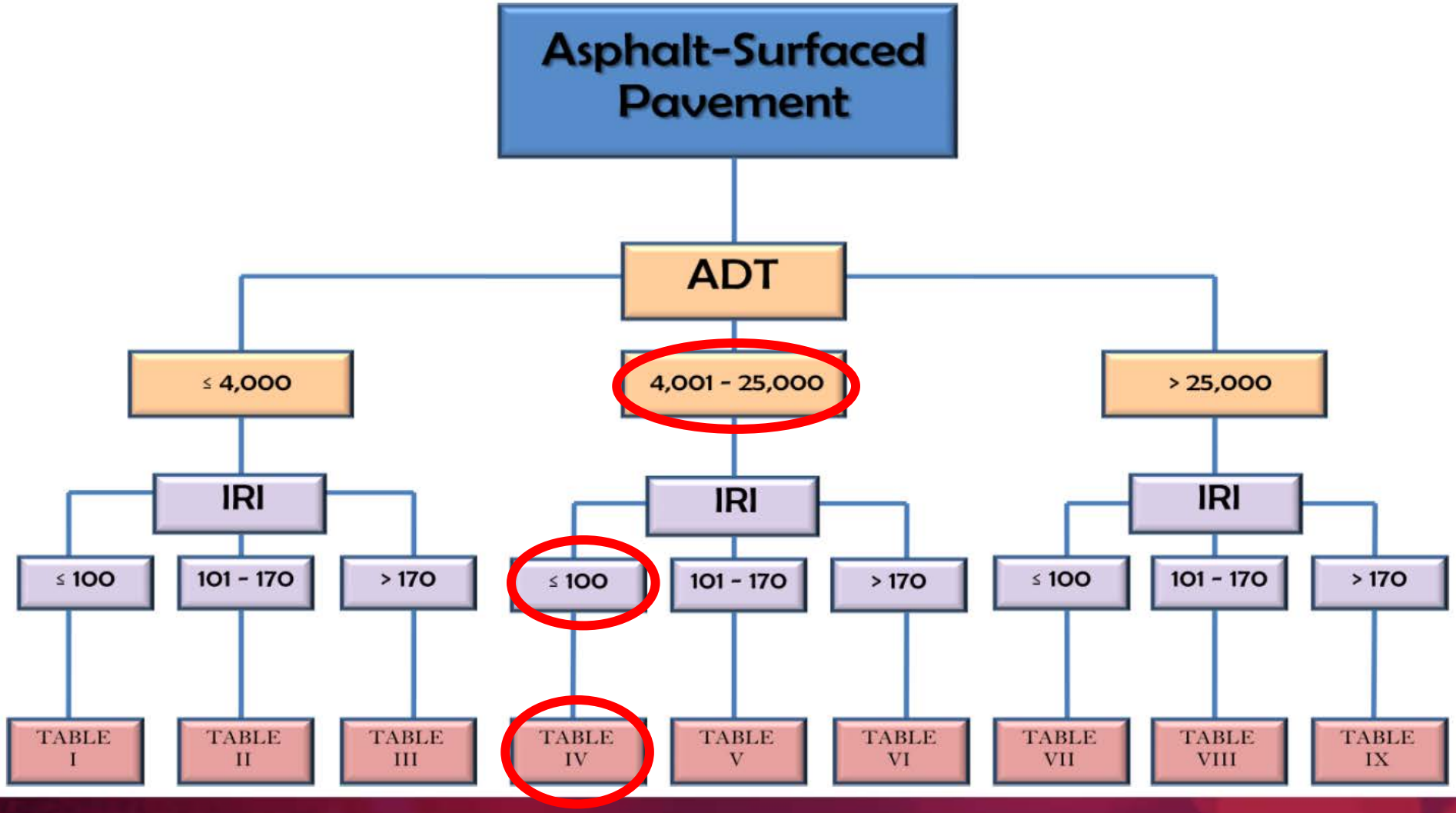
- **Option 1:** Thin HMA OL
- **Option 2:** Thick HMA OL
- **Option 3:** Wait until next year

Example Project – Historically

Flexible Pavement
15 years old
ADT = 22,000
IRI < 100
SCI and FCI > 75
Friction < 35

What is a good fix?

Right Fix: Step #1



Right Fix: Step #1

Table IV

Pavement
ADT:
IF

SCI	FCI	Skid	Rutting (in.)	A. Crack/ Joint Seal	B. Asphalt Rejuvenator	C. Aggregate Seals	D. HMA Overlay**
> 75	> 75	>40	< ½"	A-1	B-1, B-2	C-1, C-8	D1, D-3
			½" to 1"	A-1	B-1, B-2	C-8	D-3, D-4
			>1"	A-1	B-1, B-2		D-2, D-3, D-4
		≤ 40	< ½"	A-1		C-1, C-3, C-8	D1, D-3
			½" to 1"	A-1		C-8	D-3, D-4
			>1"	A-1			D-2, D-3, D-4
	≤ 75	>40	< ½"	A-1	B-1, B-2	C-1, C-8	D1, D-3
			½" to 1"	A-1	B-1, B-2	C-8	D-3, D-4
			>1"	A-1	B-1, B-2		D-2, D-3, D-4
		≤ 40	< ½"	A-1		C-1, C-3, C-8	D1, D-3
			½" to 1"	A-1		C-8	D-3, D-4
			>1"	A-1			D-2, D-3, D-4

Right Fix: Step #1

Table IV — ype: Asphalt Surface 4,000, IRI: 0 to ≤ 100

SCI	FCI	Skid	Rutting (in.)	E. PCC Overlay	F. Patch	H. Surface Texturizing	I. Major Rehab**	J. Reconstruction
> 75	> 75	>40	< ½"		F-1			
			½" to 1"		F-1	H-1		
			>1"		F-1	H-1		
		≤ 40	< ½"		F-1	H-5		
			½" to 1"		F-1	H-1		
			>1"		F-1	H-1		
	≤ 75	>40	< ½"					
			½" to 1"			H-1		
			>1"			H-1		
		≤ 40	< ½"			H-5		
			½" to 1"			H-1		
			>1"			H-1		

Note: See Table C for Treatment Activities. *I-2 and I-3 apply to composite pavements only.
**D-2 shall replace D-3; and D-4, D5 and I-1 do not apply to pavements with predominant Curb & Gutter. Click to go to Initial Treatment Identification – Pavement Preservation Guide

Treatment Tables

Treatment Group	Treatment Number	Treatment
A. Crack/Joint Seals	A-1	Crack Filling
	A-2	Crack Sealing
	A-3	Joint Sealing (and Resealing)
	A-4	Saw and Seal
B. Asphalt Sealers / Rejuvenators	B-1	Asphalt Sealers
	B-2	Fog Seals / Rejuvenators
C. Aggregate Seals	C-1	Cape Seal
	C-2	Chip Seal (Modified)
	C-3	High Friction Surface
	C-4	Sand Seal
	C-5	Sandwich Seal
	C-6	Scrub Seal
	C-7	Slurry Seal
	C-8	Microsurfacing
D. Ultrathin HMA	D-1	Ultrathin Bonded Wearing Course (As

Right Fix: Step #1

Viable Treatments:

- **Crack Fill/Seal**
- **Asphalt Sealer**
- **Fog Seal/ Rejuvenator**
- **High Friction Surf.**
- **Slurry Seal**
- **Micro-surface**
- **Ultrathin Bonded Wearing Course**
- **Hot-in-place recycling**
- **HMA Overlay**
- **Bonded PCC Overlay**
- **Grind only**

Right Fix: Step #1

11 viable treatments were identified.

How do we identify which one should be the final choice???

Right Fix: Step #2

Investigate project-level details:

- Project-level conditions,
- Geometrics,
- MOT restrictions,
- Contract/contractor considerations,
- Etc.

Right Fix: Step #2

Consider treatments:

- Advantages and disadvantages,
- Time until open to traffic,
- Expected cost,
- Expected life extension
  - These items available as Supplemental Information

Right Fix: Step #2

Viable Treatments:	Consider Further?
• **Crack Fill/Seal**	• **No - Doesn't help friction**
• **Asphalt Sealer**	• **No - Doesn't help friction**
• **Fog Seal/ Rejuvenator**	• **No - Doesn't help friction**
• **High Friction Surf.**	• **No – for spot locations**
• **Slurry Seal**	• **Yes**
• **Micro-surface**	• **Yes**

Right Fix: Step #2

Viable Treatments:	Consider Further?
• **Ultrathin Bonded Wearing Course**	• **Yes**
• **Hot-in-place recycling**	• **Yes**
• **HMA Overlay**	• **Yes**

Right Fix: Step #2

Viable Treatments:

- **Bonded PCC Overlay**
- **Patch only**
- **Grind only**

Consider Further?

- **No – Rutting not bad enough**
- **No - Doesn’t help friction**
- **No – For short areas only**

Right Fix: Step #3

Now down to **5** Viable Treatments:

- **Slurry Seal**
- **Micro-surface**
- **Ultrathin Bonded Wearing Course**
- **Hot In-place Recycling**
- **HMA Overlay**

Time for Benefit/ Cost Analysis!

Right Fix: Cost

Treatments:	Cost ($/LM):
Slurry Seal	**$14k ✓**
Micro-surface	$20k
Ultrathin Bonded Wearing Course	$80k
Hot-in-place recycling	$30k
1.5” HMA Overlay	$50k

Right Fix: Benefit

Treatments:	Benefit:
Slurry Seal	4 Years
Micro-surface	8 Years
Ultrathin Bonded Wearing Course	10 Years
Hot-in-place recycling	8 Years
1.5” HMA Overlay	**12 Years ✓**

Right Fix: Cost/Benefit

Treatments:	Benefit/Cost ($/LMY):
Slurry Seal	$3.5k
Micro-surface	**$2.5k ✓**
Ultrathin Bonded Wearing Course	$8k
Hot-in-place recycling	$3.75k
1.5” HMA Overlay	$4.2k

ADA Triggers

- Districts also consider if a given treatment is an ADA Trigger
- If yes, it is considered an “alteration” that requires ADA work

U.S Department of Justice/Department of Transportation directive: http://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm

Final Decision

- Made by District, with input/support from Pavement Engineer.
- Pavement Engineer determines what treatment life will be.

Summary

There are **several** fixes (besides HMA overlay) that can work.

This Guide provide the tools to find the:

Right Fix

for the **Right Road**

at the **Right Time**

THANK YOU!