



SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

Save Lives

Save Money

Save Time

Project R26 Update

October 2014
Moscow, Idaho

U.S. Department of Transportation
Federal Highway Administration

American Association of State Highway and Transportation Officials
AASHTO
The Voice of Transportation

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Overview

Program:

- **9 – year research program**
  - Research 90% complete.
  - $130 M for Implementing 60+ products
- **Renewal Focus Area**
  - Implementation Lead is FHWA Office of Infrastructure
  - Focus on minimum disruption to highway users
  - 28 Products
- **Implementation Assistance**
  - Application process
  - 135 projects in 38 States

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Renewal Products

R26: Preservation of High-Traffic-Volume Roadways.

Product Focus:

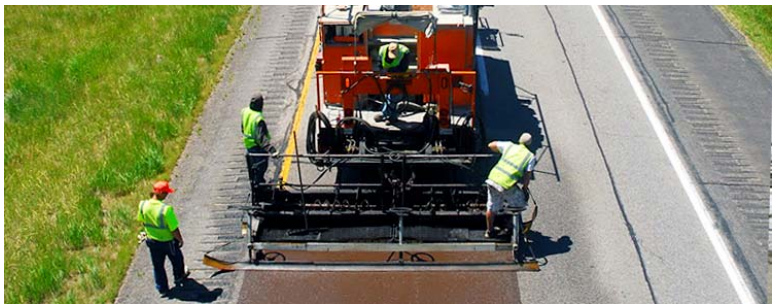
- Extend service life of high-traffic-volume highways
- Identify techniques and methods

Implementation:

- 14 States participating in projects
- Toolkit being developed
- Technology Workshops, Showcases and Peer Exchanges

Project Manager:

- Thomas Van



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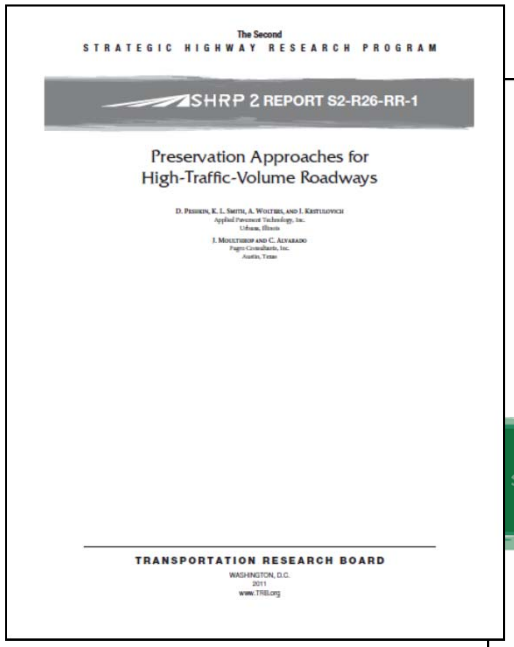
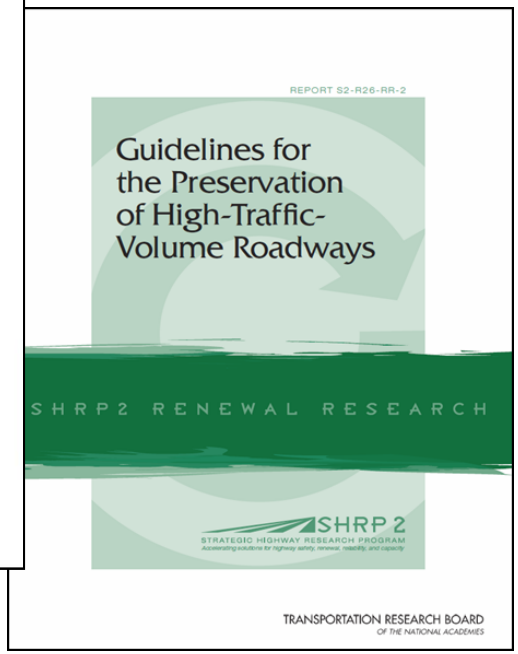
Renewal Products

R26: Preservation of High-Traffic-Volume Roadways

Products:

- Study
- Guidelines





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R26 Selection Tool – Project

Evaluate Current and Historical Pavement Performance Data
(from field surveys and testing and/or agency PMS database)

- Overall Condition Indicator (PCI, PSR, etc.)
- Individual Distress Types, Severities, and Extents
- Smoothness (IRI, PI, etc.)
- Surface and Subsurface Drainage Characteristics
- Safety Characteristics
  - friction/texture (FN, MPD/MTD, IFI, etc.)
  - crashes
- Pavement–Tire Noise

Review Historical Design, Construction, and Maintenance and Rehabilitation (M&R) Data

- Pavement Type and Cross-Sectional Design
- Materials and As-Built Construction
- M&R Treatments (materials, thicknesses, etc.)

Decision

Develop Preliminary Set of Feasible Preservation Treatments

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R26 Selection Tool – Treatment(s)

Develop Preliminary Set of Feasible Preservation Treatments

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Assess Specific Needs and Constraints of Project

Performance Needs

- Treatment Life
  - ➢ traffic effects (functional class and/or traffic level)
  - ➢ climate/environment effects
- Risk
  - ➢ Availability of qualified contractors
  - ➢ Availability of quality materials

Construction Constraints

- Funding
- Time (of year) of construction
- Geometrics
- Work duration (facility downtime)
- Traffic accommodation

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Develop Final Set of Feasible Preservation Treatments

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Select the Preferred Preservation Treatment

- Conduct Cost-Effectiveness Analysis
  - ➢ Benefit-Cost Analysis
  - ➢ Life-Cycle Cost Analysis (LCCA)
- Evaluate Economic and Non-Economic Factors

Feasible Treatments – Bituminous-Surfaced

Preservation Treatment	Window Of Opportunity		Distress Types and Severity Levels (L=Low Severity, M=Medium Severity, H=High Severity)															Surface Characteristics Issues		
			Surface Distress					Cracking Distress					Deformation Distress							
	PCI/ PCR	Age, yrs	Ravel/ Weather	Bleed/ Flush	Polish	Segre-gation	Water Bleed/ Pump*	Fatigue/ Long WP/ Slippage	Block	Trans Therm	Joint Reflect	Long/ Edge	Wear/ Stable Rutting *	Corrug/ Shove *	Bumps/ Sags	Patches	Ride Quality	Friction	Noise
			L M H	—	—	L M H	—	L M H	L M H	L M H	L M H	L M H	L M H	L M H	L M H	L M H	—	—	—
Crack Fill	75-90	3-6 *						×××	◉○×	○××	○××	●◉○							
Crack Seal	80-95	2-5 *						×××	◉○×	●◉○	●◉○	○××							
Slurry Seal (Type III)	70-85	5-8	◉●◉	×	◉	◉○×	◉	◉○×	●◉○	◉○×	◉○×	◉○×	○××	×××	×××	◉○×	×	◉	◉
Microsurfacing-Single	70-85	5-8	◉●◉	×	◉	●◉○	◉	◉○×	●◉○	◉○×	◉○×	◉○×	◉○×	○××	○××	◉○×	○	●	◉
Microsurfacing-Double	70-85	5-8	◉●◉	×	◉	●◉○	○	◉○×	●◉○	●◉○	●◉○	●◉○	●◉○	○○×	○○×	●◉○	◉	●	◉
Chip Seal-Single Conventional Polymer-modified	70-85 70-85	5-8 5-8	◉●◉ ○◉◉	○ ×	● ●	●◉○ ◉◉○	◉ ○	◉×× ◉○×	●◉○ ●◉◉	●◉○ ●◉◉	●◉○ ●◉◉	◉◉○ ◉○×	◉○× ◉○×	○○× ○○×	○○× ○○×	◉◉○ ◉◉○	○ ○	● ●	× ×
Chip Seal-Double Conventional Polymer-modified	70-85 70-85	5-8 5-8	○◉◉ ○○◉	× ×	◉ ◉	◉◉○ ○◉○	× ×	◉○× ●◉○	●◉◉ ●●◉	●◉◉ ●●◉	●◉◉ ●●◉	●◉◉ ●◉◉	●◉○ ●◉○	◉○× ◉○×	◉○× ◉○×	●◉◉ ●◉◉	◉ ◉	◉ ◉	○ ○
Ultra-Thin Bonded Wearing Course	65-85	5-10	◉●◉	×	●	◉◉○	○	◉○×	◉◉○	◉◉○	◉◉○	◉◉○	◉○×	◉○×	◉○×	◉◉○	◉	●	◉
Ultra-Thin HMAOL	65-85	5-10	◉●◉	×	●	◉◉○	○	◉○×	◉◉○	◉◉×	◉◉×	◉◉×	◉○×	◉○×	◉○×	◉◉○	◉	●	●
Thin HMAOL	60-80	6-12	◉●◉	○	●	◉◉○	○	●◉○	●●◉	◉●◉	◉●◉	◉◉●	◉●◉	●◉○	●◉○	●●◉	●	●	●
Cold Milling and Thin HMAOL	60-75	7-12	○◉●	○	○	◉●◉	×	◉◉○	○◉◉	◉◉●	◉◉●	○◉●	◉●◉	●◉◉	●◉○	●●◉	●	◉	○
Hot In-place Recycling Surf Recycle/HMAOL Remixing/HMAOL Repaving	70-85 60-75 60-75	5-8 7-12 7-12	○◉● ×○○ ×○○	○ ○ ○	○ ◉ ◉	◉●◉ ×○◉ ×○◉	○ × ×	◉◉○ ◉●◉ ◉●◉	●◉○ ◉●◉ ◉●◉	○◉● ◉●◉ ◉●◉	○◉● ◉●◉ ◉●◉	◉◉○ ◉●◉ ◉●◉	◉●◉ ◉●◉ ◉●◉	◉◉○ ◉●◉ ◉●◉	◉◉○ ○◉● ○◉●	◉◉○ ○◉◉ ○◉◉	◉ ● ●	◉ ◉ ◉	○ ○ ○
Cold In-place Recycling and HMAOL	60-75	7-12	××○	○	○	×○◉	×	◉●◉	◉●◉	◉●◉	◉●◉	◉●◉	◉●●	◉●●	○◉●	○◉◉	●	◉	○
Profile Milling	80-90	3-6	○◉◉	◉	○	×○○	×	×××	×××	×××	×××	×××	●◉○	○××	◉◉○*	◉◉○*	◉	○	×
Ultra-Thin Whitetopping	60-80	6-12	××○	○	◉	×○◉	×	○◉◉	○◉◉	○◉◉	○◉◉	○◉●	○◉◉	○◉◉	×○○	○◉◉	◉	○	×

● Highly Recommended ◉ Generally Recommended ○ Provisionally Recommended × Not Recommended

*. Porous surface mix problem.

*. Rutting primarily confined to HMA surface layer and largely continuous in extent.

*. Corrugation showing primarily HMA surface layer mix problem and frequent in extent.

*. For composite AC/PCC pavements, a more probable window of opportunity is 2-4 years for crack filling and 1-3 years for crack sealing.

*. Localised application in the case of bumps.

Feasible Treatments – PCC-Surfaced

Preservation Treatment	Window Of Opportunity		Distress Types and Severity Level (L=Low Severity, M=Medium Severity, H=High Severity)														
			Surface Distress					Joint Distress		Cracking Distress		Deformation Distress		Surface Characteristics Issues		
			Polish	Map Crack/Scale (non-ASR)	D-Crack	Popouts	Water Bleed/Pump	Joint Seal Damage	Joint Spall	Corner	Long/ Trans	Faulting	Patches	Ride Quality	Friction	Noise
	PCI/ PCR	Age, yrs	—	—	L/M/H	—	—	L/M/H	L/M/H	L/M/H	L/M/H	L/M/H	L/M/H	—	—	—
Concrete Joint Resealing	75-90	5-10						○◉●	○××							
Concrete Crack Sealing	70-90	5-12								●◉○	●◉○					
Diamond Grinding	70-90	5-12	●	◉	×××	×	×	×××	×××	×××	××○*	◉●◉	◉●◉	●	◉	●
Diamond Grooving	70-90	5-12	○	×	×××	×	×	×××	×××	×××	×××	×××	×××	×	◉	●
Partial-depth Concrete Patching	65-85	6-15	×	○	×××	◉	×	×××	◉●●	×××	×○◉	×××	○◉○	×	×	×
Full-depth Concrete Patching	65-85	6-15	×	○	○◉●*	×	◉	×××	×○◉	◉●●	××○	×○◉*	○◉●	◉	×	×
Dowel Bar Retrofitting	65-85	6-15	×	×	×××	×	◉	×××	×××	×○○	×××	○◉●*	×××	×	×	×
Ultra-Thin Bonded Wearing Course	70-90	5-12	◉	●	◉○×	○	×	×××	×××	○××	○◉○	◉○×	◉●◉	●	●	◉
Thin HMA Overlay	70-90	5-12	◉	●	◉○×	○	×	×××	×××	○××	○◉○	◉○×	◉●◉	●	●	●

● Highly Recommended ◉ Generally Recommended ○ Provisionally Recommended × Not Recommended

* May be appropriate in conjunction with partial- and/or full-depth repairs to ensure smooth profile.
* Isolated incidences of D-cracking only.
* Isolated incidences of faulting only.
* Likely needed in conjunction with diamond grinding.

Example Using R26 Tools

Rural HMA Roadway

4-lane interstate, 8 miles long

Deep-freeze climate, flat to mildly rolling terrain

ADT=14,000, 11% trucks

Treatment performance goal: ≥ 4 yrs

Existing structure (12 years old)

8.5 inches HMA, 8 inches aggregate base, lime-treated subgrade

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Background Information on Existing Structure

Existing Pavement Condition Parameters	Condition Survey Year			Smoothness Testing Year		Friction Testing Year	
	2005	2007	2009	2007	2009	2007	2009
PCR	95	90	81				
Raveling, LS (% area)	3.0	11.2	18.4				
Raveling, MS (% area)	1.3	4.7	7.3				
Segregation, LS (% area)	0.0	0.0	0.0				
Segregation, MS (% area)	0.0	0.0	0.0				
Trans Thermal Cracking, LS (cracks/mi)	45	96	102				
Trans Thermal Cracking, MS (cracks/mi)	11	52	64				
Long Cold-Joint Cracking, LS (ft/mi)	120	967	1,798				
Long Cold-Joint Cracking, MS (ft/mi)	0	54	367				
Stable Rutting, LS (0.125 to 0.375 in) (ft/mi)	45	735	3,987				
Stable Rutting, MS (0.5 to 1.0 in) (ft/mi)	0	151	1,268				
Fatigue Cracking, LS (% wheelpath area)	0.2	1.0	2.2				
IRI (Average ± Std Dev) (in/mi)				88.5±6.2	105.7±10.3		
FN40S (Average ± Std Dev)						45.4±3.2	43.6±2.6

Key Deficiencies

Preliminary Feasibility

Several candidate treatments address INDIVIDUAL key deficiencies

Four candidate treatments address ALL key deficiencies:

Double microsurfacing

Single-course conventional chip seal

Ultrathin HMA overlay

Thin HMA overlay

Selecting Preferred Alternative

Three feasible alternatives

Double microsurfacing

Single-course conventional chip seal

Thin HMA overlay

Final selection should consider:

- **Economic analysis**
- **Materials and contractors**
- **Customer satisfaction**
- **Sustainability**
- **Other factors**

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Network-Level Tools – Pavement Background

Pavement inventory

Measures of:

Past performance

Current condition

Projections of future condition

Traffic data

These network-level tools are components of a typical pavement management system

Pavement Preservation at the Network Level

Contributions to:

Improved network conditions

Individual performance metrics

Costs of management

Safety

The practice of project-level pavement preservation will have positive impacts on network-level outcomes.

Renewal Products

R26: Preservation of High-Traffic-Volume Roadways.

Implementation Program:

- 14 States participating in projects
- Toolkit and Guides being developed
- Technology Workshops, Showcases and Peer Exchanges

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Renewal Products

R26 - Types of Preservation Projects:

- Crack Seals
- Microsurfacing
- Chip Seals
- Thin Overlays
- Rejuvenators
- Slurry Seals
- Thin Overlays
- Cold In-Place Recycling
- SAMI
- UBWC
- Bonded PCC Overlay
- Diamond Grinding

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Renewal Projects

Arizona:

I-8 Crack Seal with polymer modified asphalt rubber sealant (6.5 miles)

I-10 Crack Seal with polymer modified asphalt rubber sealant (32.3 miles)

SR 68 Microsurfacing (4.1 miles)

I-10 Microsurfacing (3.08 miles)

Renewal Projects

Massachusetts:

US 3 – 10 test sections with treatments including ultrathin bonded wearing course with modified binders, recycled rubber, rejuvenator fog seals, and polymer modified fog seals. Project includes one control section using conventional materials.

Renewal Projects

Minnesota:

MnRoad Showcase:

Preservation on I-94 and Low-Volume Road

- Next Generation Concrete Surface
- Microsurfacing
- Chip Seal
- Cold Weather Approaches
- “Mumble Strips”

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Renewal Projects

Rhode Island:

I-95 – Crack Sealing (9.4 miles)

SR 102 – Rubberized Chip Seal (2.6 miles)

SR 3 – SAMI Seal (1.2 miles)

SR 114 – Thin Overlay (0.53 miles)

Renewal Projects

Washington:

SR 24 – Chip Seal + Seal

SR 97 – Chip Seal + Seal

US 97A – Hot-applied Chip Seal (1.52 Miles)

US 155 – Chip Seal + Seal

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Contacts:

R26 Project Information:

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Opportunity!!!

SHRP2 Round 5 Project Solicitation:

- 3D Utility Location Data Repository (R01A)
  Webinar December 5, 2014; 2 PM – 3:30 PM EST
- Railroad-DOT Mitigation Strategies (R16)
  Webinar December 11, 2014; 2 PM – 3:30 PM EST
- Performance Specifications for Rapid Renewal (R07)
  Webinar December 12, 2014; 11 AM – 12:30 PM EST

You need to register for the webinars on the website!!!!

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Information:

SHRP2 Program Information or Applications:

Website:
http://www.fhwa.dot.gov/goshrp2/

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