

MANAGING ASPHALT PAVEMENTS

CONFERENCE AND TRADE SHOW
MAY 15-17, 2023 ★ WACO, TEXAS



Maximize Your Budget

And Preserve Your Roadway Network

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Deputy Director of Engineering
Asphalt Institute

Pavement Preservation

- Pavement preservation techniques are cost-effective strategies designed to extend the life of existing pavements before they deteriorate substantially.
- Pavement preservation methods prolong pavement life, mitigating high future costs of reconstruction or rehabilitation through the expenditure of lesser amounts of money at critical points in a pavement's life.



“The right treatment on the right pavement at the right time”

- Different pavement preservation treatments
- What distress does each treatment address
- When should each treatment be used (expected performance)
- Methods to optimize roadway network



“As with changing the oil in a car, the earlier the preventative maintenance of asphalt pavements, the longer they will last without needing serious repair.”

- Tom Wood, Research Project Engineer, MNDOT Office of Materials and Road Research

Issues Causing Poor Performance

- Improper project selection - the wrong treatment for the wrong pavement
- Improper pavement preparation - dirty surfaces, insufficient treatment of open cracks
- Inattention to climatic conditions - imminent rain, pavement too cold, work too late in the season for the treatment to properly cure
- Insufficient traffic control - open to traffic too early, no pilot car, speeds too high before emulsion fully cures
- Poor construction practices - plugged distributor nozzles, improper bar height and pressure, inadequate aggregate distribution or coating
- Inadequate materials - dirty aggregate, incompatibility of emulsion and aggregate, insufficient inspection and testing leading to a lack of control during construction

“The key to preventative maintenance is timing it to occur before there is pavement distress.”



Build A Better Network

With the Optimized Approach



IMPROVE YOUR
OVERALL NETWORK
CONDITION



GET THE LOWEST
LIFE CYCLE COST
PER ROAD



MAXIMIZE
YOUR ECO
BENEFIT

requirements and increase strength and longevity.

PAVEMENT CRITERIA

PAVEMENT PHOTOS

PAVEMENT CONDITION ?

PLEASE SELECT

PRIMARY DISTRESS ?

PLEASE SELECT

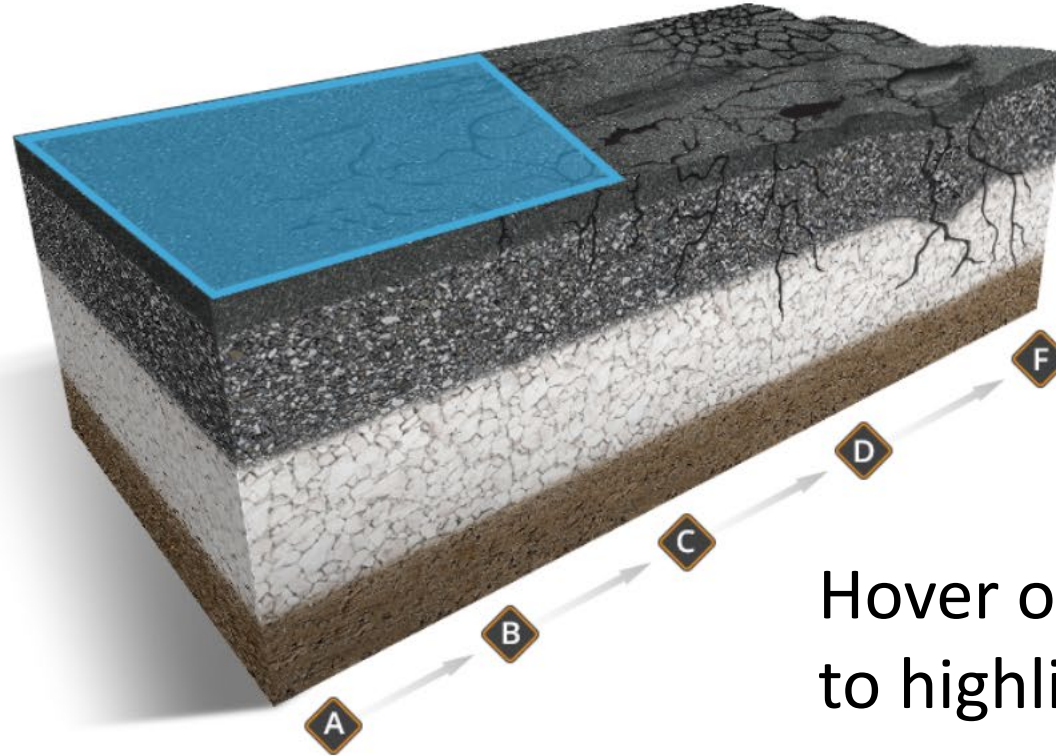
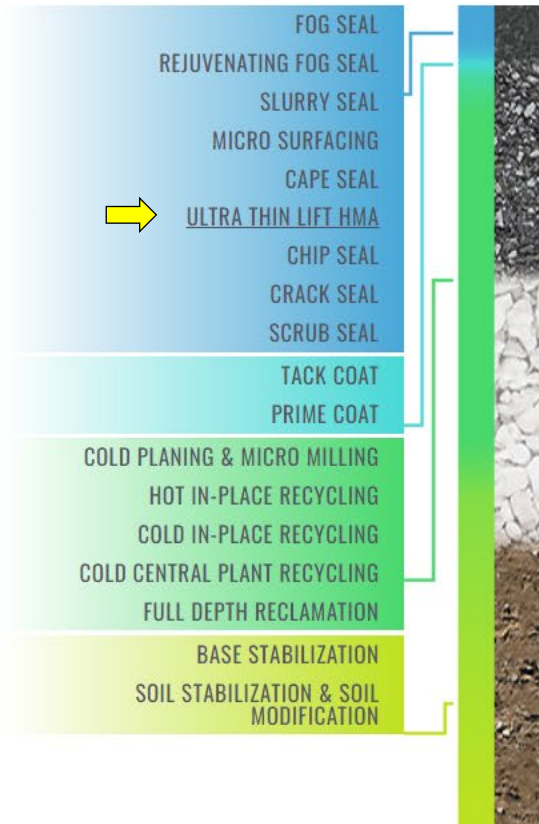
ROAD TYPE

PLEASE SELECT

SURFACE TYPE

PLEASE SELECT

OTHER FACTORS TO CONSIDER 



Hover over treatment to highlight applicable pavement condition

using innovative recycling methods to cost-effectively reengineer requirements and increase strength and longevity.

PAVEMENT CRITERIA

PAVEMENT PHOTOS

PAVEMENT CONDITION ?

PLEASE SELECT

PRIMARY DISTRESS ?

PLEASE SELECT

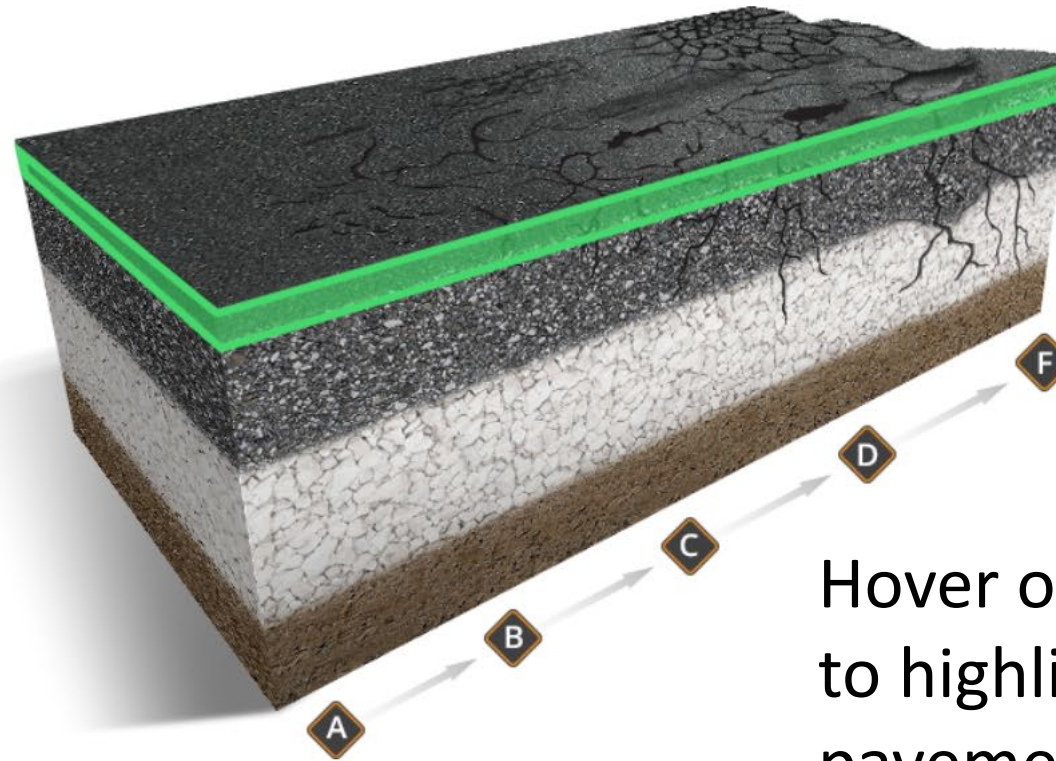
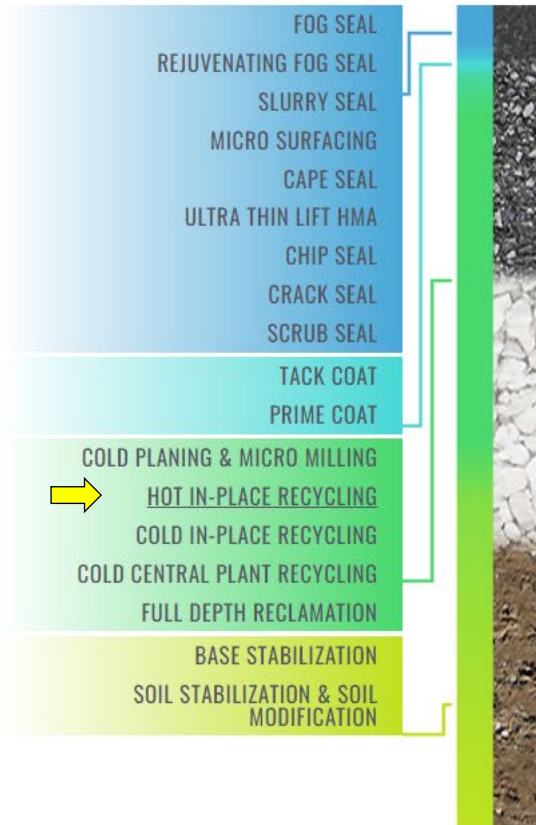
ROAD TYPE

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SURFACE TYPE

PLEASE SELECT

OTHER FACTORS TO CONSIDER 



Hover over treatment to highlight applicable pavement condition

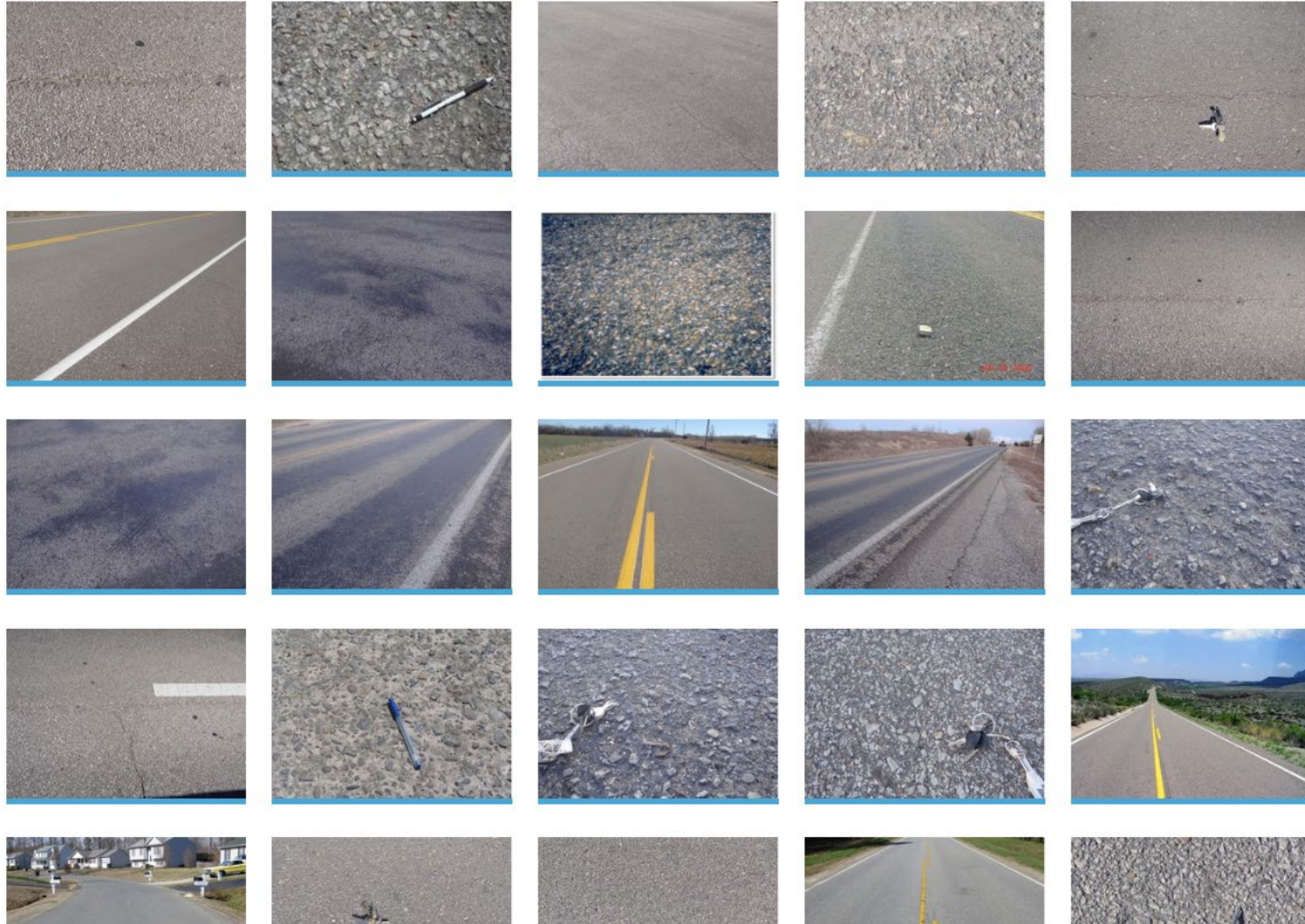
www.roadresource.org

PRIMARY DISTRESS ?

PAVEMENT CRITERIA

PAVEMENT PHOTOS

SHOW ALL



Helps users select the Pavement Condition Index (PCI) with photographs.

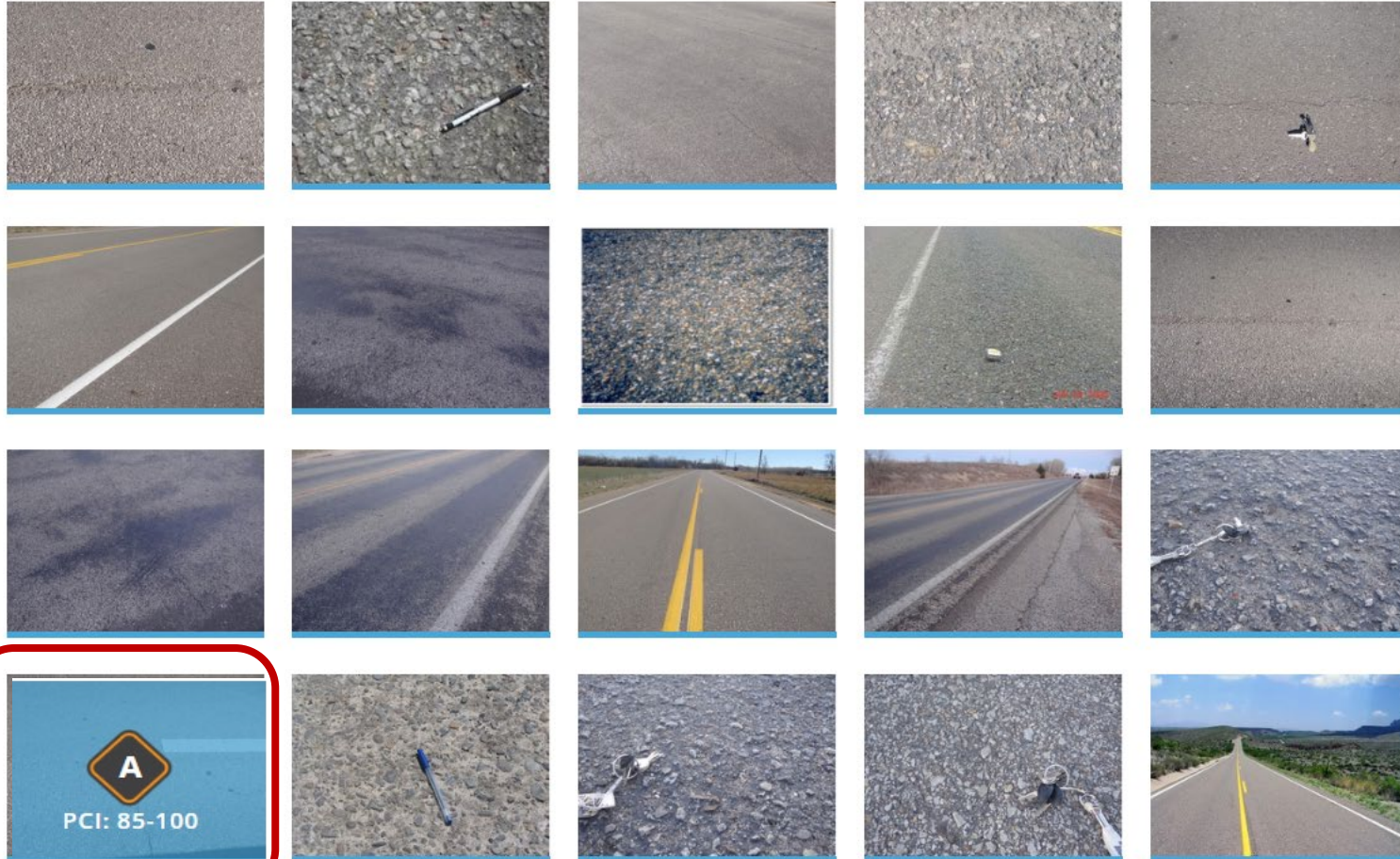
User hovers cursor over photo, pop-up shows PCI range

PRIMARY DISTRESS ⓘ

PAVEMENT CRITERIA

PAVEMENT PHOTOS

SHOW ALL



Helps users select the Pavement Condition Index (PCI) with photographs.

User hovers cursor over photo, pop-up shows PCI range

Click on photo to receive further guidance.

The highlighted photo shows a low cracking pavement, PCI 85 - 100

PRIMARY DISTRESS ⓘ

PAVEMENT CRITERIA PAVEMENT PHOTOS

SHOW ALL

PAVEMENT CONDITION **A** (PCI 85-100)


PRIMARY DISTRESS:
LONGITUDINAL & TRANSVERSE CRACKING - LOW
(≤ 1/4' WIDTH)

POSSIBLE SOLUTIONS:
Consider treatments that address this pavement's primary distress:

- CRACK SEAL
- CAPE SEAL
- FOG SEAL
- SLURRY SEAL
- HOT IN-PLACE RECYCLING
- MICRO SURFACING
- CHIP SEAL
- ULTRA THIN LIFT HMA
- COLD PLANING & MICRO MILLING

SECONDARY DISTRESS:
This photo also demonstrates signs of:

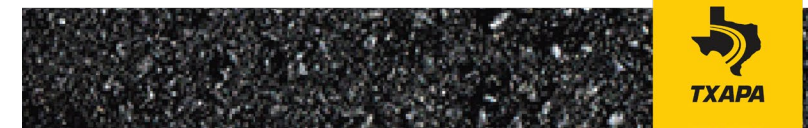
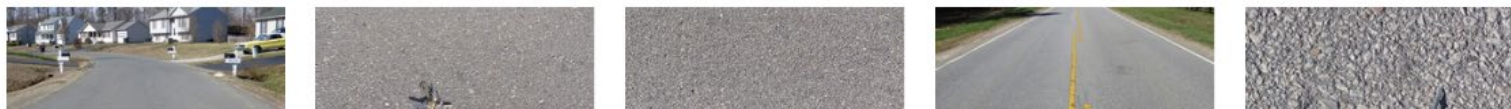
- Fatigue Cracking - Low
- Oxidation and Raveling - Low (≥ 25% to < 50% agg loss)

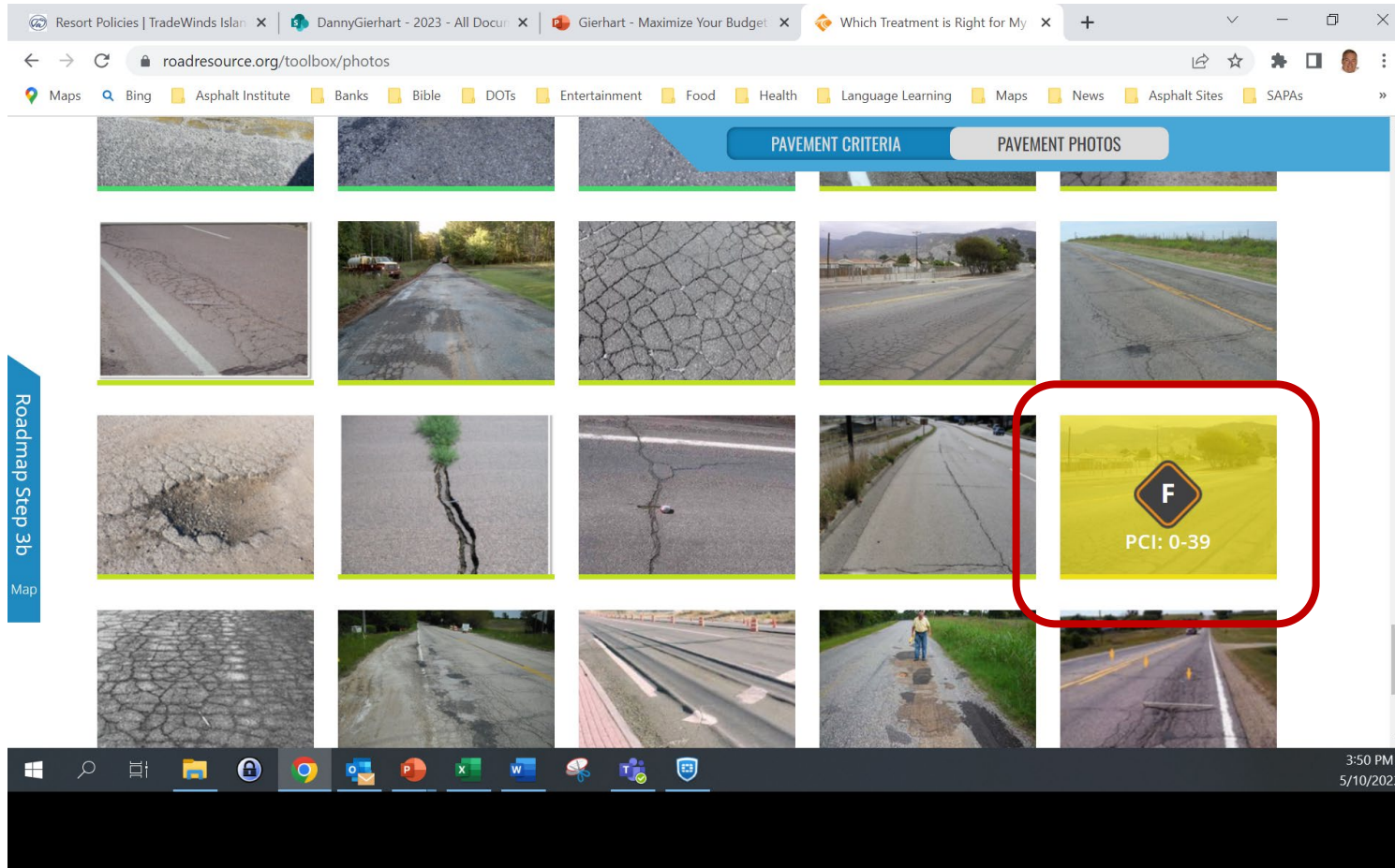


Helps users select the Pavement Condition Index (PCI) with photographs.

User hovers cursor over photo, pop-up shows PCI range

Click on photo to receive further guidance.





This photo features a high fatigue-cracked pavement with a very low PCI, 0 – 39.

There are few options with a pavement like this that has been allowed to deteriorate so much.

Resort Policies | TradeWinds Isla... | DannyGierhart - 2023 - All Docu... | Gierhart - Maximize Your Budget... | Which Treatment is Right for My... | +

roadresource.org/toolbox/photos

PAVEMENT CONDITION **F** (PCI 0-39)

PRIMARY DISTRESS:
FATIGUE CRACKING - HIGH

POSSIBLE SOLUTIONS:
Consider treatments that address this pavement's primary distress:

FULL DEPTH RECLAMATION

SECONDARY DISTRESS:
This photo also demonstrates signs of:
• Rutting - Moderate (1/2' to 3/4')

5/10/2023

Any overlay attempted here would very quickly fail.

The only solution to incorporate the existing pavement here is full depth reclamation (FDR).

Click on the orange “Full Depth Reclamation” box for a large amount of information about FDR.

Treatment Resource Center

Apply Treatments With Confidence & Success

This resource is a combined effort from experts across the industry. It includes the most current guidelines, process information, research, success stories, and in-depth quality assurance recommendations to equip you with the tools you need to ensure treatment success.

The PPRA Treatment Resource Center is an index of common treatments under various progressive pavement management disciplines. For specific questions contact a [contractor or supplier](#) in your region.

SURFACE TREATMENTS

Fog Seal
Rejuvenating Fog Seal
Slurry Seal
Micro Surfacing
Ultra Thin Lift HMA
Cape Seal
Chip Seal
Crack Seal
Scrub Seal

PRE-TREATMENTS

Tack Coat
Prime Coat

RECYCLING & RECLAMATION

Cold Planing & Micro Milling
Hot In-Place Recycling
Cold In-Place Recycling
Cold Central Plant Recycling
Full Depth Reclamation

BASE TREATMENTS

Base Stabilization
Soil Stabilization & Soil Modification

Gives information regarding various treatments traditionally considered “pavement preservation”

OVERVIEW

ABOUT

PROCESS & VARIATIONS

EXPECTATIONS

COST

HISTORY

BEST PRACTICES

PRE-CONSTRUCTION

SITE SELECTION

MATERIAL SELECTION

MIX DESIGN

SPECIFICATION REVIEW

CONSTRUCTION

PREPARATION

WEATHER REQUIREMENTS

EQUIPMENT

CALIBRATION

TRAFFIC CONTROL

APPLICATION

QUALITY ASSURANCE

INSPECTION

TESTING PROTOCOL

TROUBLESHOOTING

ACCEPTANCE

RESEARCH & PERFORMANCE

SUCCESS STORIES

PHOTO GALLERY

FOR PAVEMENT CONDITION

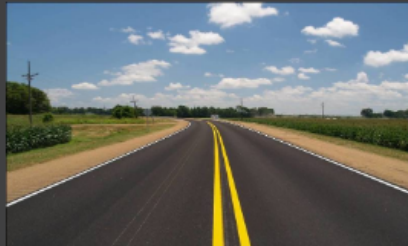
A

B

C

(PCI between 60 and 90)

A cape seal is a roadway surface treatment designed to extend the life of pavements in fair to good condition, consisting of a chip seal treatment, which is then covered by a slurry seal or micro surfacing treatment. Cape seals provide the benefits of both the chip seal and the slurry seal or micro surfacing treatment, namely sealing moderate cracks, providing skid resistance, sealing the pavement against moisture intrusion, protecting the structure from further oxidation and raveling, and restoring a uniform black appearance.



Picture of Finished Cape Seal Project

The chip seal can be polymer modified as well to improve aggregate retention and provide for a quicker return to traffic. Cape seals boast quick construction times and reasonable disruption to the traveling public. This treatment excels in urban areas where a stand alone chip seals are not be welcomed but the need for sealing cracks is warranted.



Reduces life cycle costs by 25% when compared to HMA overlay



Reduces greenhouse gases by 30% and energy use by 15% when compared to HMA overlay



Return to traffic in 1 - 4 hours per treatment and each treatment will need additional cure time before application of 2nd treatment



Adds 8-10 years (when applied for optimum preservation performance)

Issues Addressed

- Moderate cracking
- Loss of friction
- Oxidation
- Raveling
- Lack of uniform color for restriping

Attributes

- Seals moderate cracks
- Increases skid resistance
- Improves color contrast between pavement and striping
- Restores surface characteristics
- Protects the structure from moisture intrusion
- Protects the structure from oxidation
- Maintains drainage patterns and curb reveal

Common Combinations

Chip Seal + Slurry Seal or Micro surfacing or Thin Lift Asphalt

Scrub Seal + Slurry Seal or Micro surfacing or Thin Lift Asphalt

Note: Cape seal refers strictly to the combination of a chip seal plus a slurry seal.

Overview

About

Process & Variations

Expectations

Cost

History

Best Practices

Pre-Construction Site Selection

Material Selection

Mix Design

Specification Review

Construction

Preparation

Weather Requirements

Equipment

Calibration

Traffic Control

Application

Quality Assurance

Inspection

Testing Protocol

Troubleshooting

Acceptance

Research & Performance, Photo Gallery

Three Principles of Network Improvement

Proactively
keep good
roads in good
shape.

Recycle and
reuse assets
you've already
paid for.

Plan for the
entire
lifecycle of a
road.

GOAL: USE EVERY DOLLAR TO ITS FULLEST EXTENT.

Network Optimization – Making it Work

“What gets managed gets measured,
and what gets measured gets done”

- Assess your network
- Methods available to optimize your treatment plan
 - Equivalent Annualized Cost (EAC)
 - Remaining Service Life (RSL)
 - Cost-Benefit Value (CBV)
- Measure your progress



<https://roadresource.org/>

Equivalent Annualized Cost (EAC)

- Compares the true cost of various treatments over time, by dividing the treatment cost over the life extension that treatment provides.
- *“apples-to-apples comparison”*

Condition	GOOD - Pavement Condition Index: 70-84		
Type of roadway	Rural – Local Road		
Existing Surface	Dense Graded HMA		
Treatment	Cost/SY	Life Extension	EAC \$/SY/YR
Micro Surfacing	2.77	9.0	0.31
Cape Seal	5.20	10.0	0.52
Chip Seal	2.06	8.0	0.26



Equivalent Annualized Cost (EAC)

- It is important to note that as the condition of the existing pavement worsens, the life extension of the treatment gets shorter.

Condition	FAIR - Pavement Condition Index: 55-69		
Type of roadway	Rural – Local Road		
Existing Surface	Dense Graded HMA		
Treatment	Cost/SY	Life Extension	EAC \$/SY/YR
Micro Surfacing	2.77	5.0	0.55
Cape Seal	5.20	7.0	0.74
Chip Seal	2.06	3.0	0.69

Remaining Service Life (RSL)

- Every lane mile segment in a roadway network is rated by the number of years remaining until the end of life (terminal value)
- If no improvements are made for 1 year, the number of years remaining until the end of life will decrease by 1 year for each road segment
- Every year, every mile of your network loses 1 mile-year of life. To avoid losing ground, the roadway owner must design a treatment plan that adds mile-years of life equal to or greater than the number of lane miles in your network

Remaining Service Life (RSL)

Agency Highway Network = 4,356 lane-miles

Each year the network will lose

4,356 lane-mile-years

To maintain or improve the health of the network

The highway owner must develop a treatment plan that adds

4,356 lane-mile-years or more

FHWA Pub. No. FHWA-IF-07-006

Remaining Service Life (RSL)

Reconstruction Projects = 2

Project	Design Life	Lane-Miles	Lane-Mile-Years	Lane-Mile Cost	Total Cost
No.1	25 yrs	22	550	\$463,425	\$10,195,350
No. 2	30 yrs	18	540	\$556,110	\$10,009,980
Total		=	1,090		\$20,205,330

Rehabilitation Projects = 3

Project	Design Life	Lane-Miles	Lane-Mile-Years	Lane-Mile Cost	Total Cost
No.10	18 yrs	22	396	\$263,268	\$5,791,896
No. 11	15 yrs	28	420	\$219,390	\$6,142,920
No. 12	12 yrs	32	384	\$115,848	\$3,707,136
Total		=	1,200		\$15,641,952

Remaining Service Life (RSL)

Preservation Projects = 5

Project	Design Life	Lane-Miles	Lane-Mile- Years	Lane-Mile Cost	Total Cost
No.101	2 yrs	12	24	\$2,562	\$30,744
No. 102	3 yrs	22	66	\$7,743	\$170,346
No. 103	5 yrs	26	130	\$13,980	\$363,480
No. 104	7 yrs	16	112	\$29,750	\$476,000
No. 105	10 yrs	8	80	\$54,410	\$435,280
	Total	=	412		\$1,475,850

FHWA Pub. No. FHWA-IF-07-
006

Remaining Service Life (RSL)

Network Trend

Programmed Activity	Lane-Mile-Years	Total Cost
Reconstruction	1,090	\$20,205,330
Rehabilitation	1,200	\$15,641,952
Preservation	412	\$1,475,850
Total	2,702	\$37,323,132
Network needs (loss)	(-)4,356	\$60,170,083
Deficit	-1,654	\$22,846,951

FHWA Pub. No. FHWA-IF-07-006



Remaining Service Life (RSL)

Program Modification

Programmed Activity	Lane-Mile-Years	Cost Savings
Reconstruction <i>31 lane-miles</i> (40 lane-miles)	<i>820</i> (1,090)	<i>\$4,546,199</i>
Rehabilitation <i>77 lane-miles</i> (82 lane-miles)	<i>1,125</i> (1,200)	<i>\$953,778</i>
Preservation (84 lane-miles)	(412)	<i>0</i>
Total	<i>2,357</i> (2,702)	<i>\$5,499,977</i>

006

Programmed Activity	Lane-Mile-Years	Total Cost
Reconstruction (31 lane-miles)	820	\$15,659,131
Rehabilitation (77 lane-miles)	1,125	\$14,688,174
Preservation (84 lane-miles)	412	\$1,475,850
Concrete Resealing (4 yrs x 31 lane-miles)	124	\$979,600
Thin HMA Overlay (10 yrs x 16 lane-miles)	160	\$870,560
Micro Surfacing (7 yrs x 44 lane-miles)	308	\$1,243,000
Chip Seal (5 yrs x 79 lane-miles)	395	\$1,104,420
Crack Seal (2 yrs x 506 lane-miles)	1,012	\$1,268,542
Total	4,356	\$37,289,277
Network needs (loss)	(-)4,356	
Deficit	0	

Remaining Service Life (RSL)

Network Strategy

FHWA Pub. No. FHWA-IF-07-006



RSL - Results of Changing Strategies

Reconstruction: **Decreased 9 miles**
 Rehabilitation: **Decreased 5 miles**
 Pavement Preservation: **Increased 676 miles**

Original Strategy	Revised Strategy	Difference
Total Cost \$37,323,132	Total Cost \$37,289,277	Save \$33,855
Remaining Service Life Deficit = 1,654 lane-mile- years	Remaining Service Life Deficit = 0 lane-mile-years	1,654 lane-mile-years RSL Lost = RSL Gained



Cost Benefit Value (CBV)

- CBV offers roadway managers a way to prioritize projects while accounting for the variables relevant to you and the realities of traffic, cost and life extension.

$$\text{CBV} = \frac{(\text{Traffic} / \text{Constraint Factor}) \times (\text{Life Extension})}{(\text{Unit Cost}) \times (\text{PCI})}$$

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Cost Benefit Value (CBV)

Two road comparison: Which road should I treat first?

ROAD 1

Worst First ⓘ
Reconstruction

AADT: 5000
PCI: 30

$$\frac{(5000_{\text{AADT}} / 7_{\text{CF}}) \times (25_{\text{YEARS}})}{(\$39_{\text{PER SY}} \times 30_{\text{PCI}})}$$

= 15 CBV

ROAD 2

**Pavement
Preservation**
Chip Seal

AADT: 5000
PCI: 75

$$\frac{(5000_{\text{AADT}} / 7_{\text{CF}}) \times (6_{\text{YEARS}})}{(\$2_{\text{PER SY}} \times 75_{\text{PCI}})}$$

= 29 CBV

www.roadresource.org

Worst First Approach

Strictly Sorted by Pavement Condition
Index (PCI)

Street Name	Condition (PCI)	Recommended Repair Type	Unit Cost (USD)	AADT	Service Life	CBV
Arthur Avenue	43	Full Depth Reclamation	\$28.54	7000	25	20.4
South Road	47	Full Depth Reclamation	\$28.54	1500	25	4.0
Canal Street	62	1.5" Mill & Overlay	\$9.80	3000	11	7.8
Beach Street	64	1.5" Mill & Overlay	\$9.80	7500	11	18.8
Williams Avenue	68	Modified Chip Seal - Double	\$3.35	3500	9	19.8
Adams Avenue	72	Micro Surfacing - Double	\$3.92	6500	8	26.3
Thorn Avenue	84	Crack Seal	\$0.48	5500	2	39.0
Midway Road	86	Crack Seal	\$0.48	8500	2	58.8

www.roadresource.org

Roads Addressed: **3**

Project Prioritization

Loosely Sorted by Cost Benefit Value (CBV)

Street Name	Condition (PCI)	Treatment	Unit Cost (USD)	AADT	Service Life	CBV
Midway Road	86	Crack Seal	\$0.48	8500	2	58.8
Arthur Avenue	43	Full Depth Reclamation	\$28.54	7000	25	20.4
Adams Street	72	Micro Surfacing - Double	\$3.92	6500	8	26.3
Beach Street	64	1.5" Mill & Overlay	\$9.80	7500	11	18.8
Thorn Avenue	84	Crack Seal	\$0.48	5500	2	39.0
Williams Avenue	68	Modified Chip Seal - Double	\$3.35	3500	9	19.8
Canal Street	62	1.5" Mill & Overlay	\$9.80	3000	11	7.8
South Road	47	Full Depth Reclamation	\$28.54	1500	25	4.0

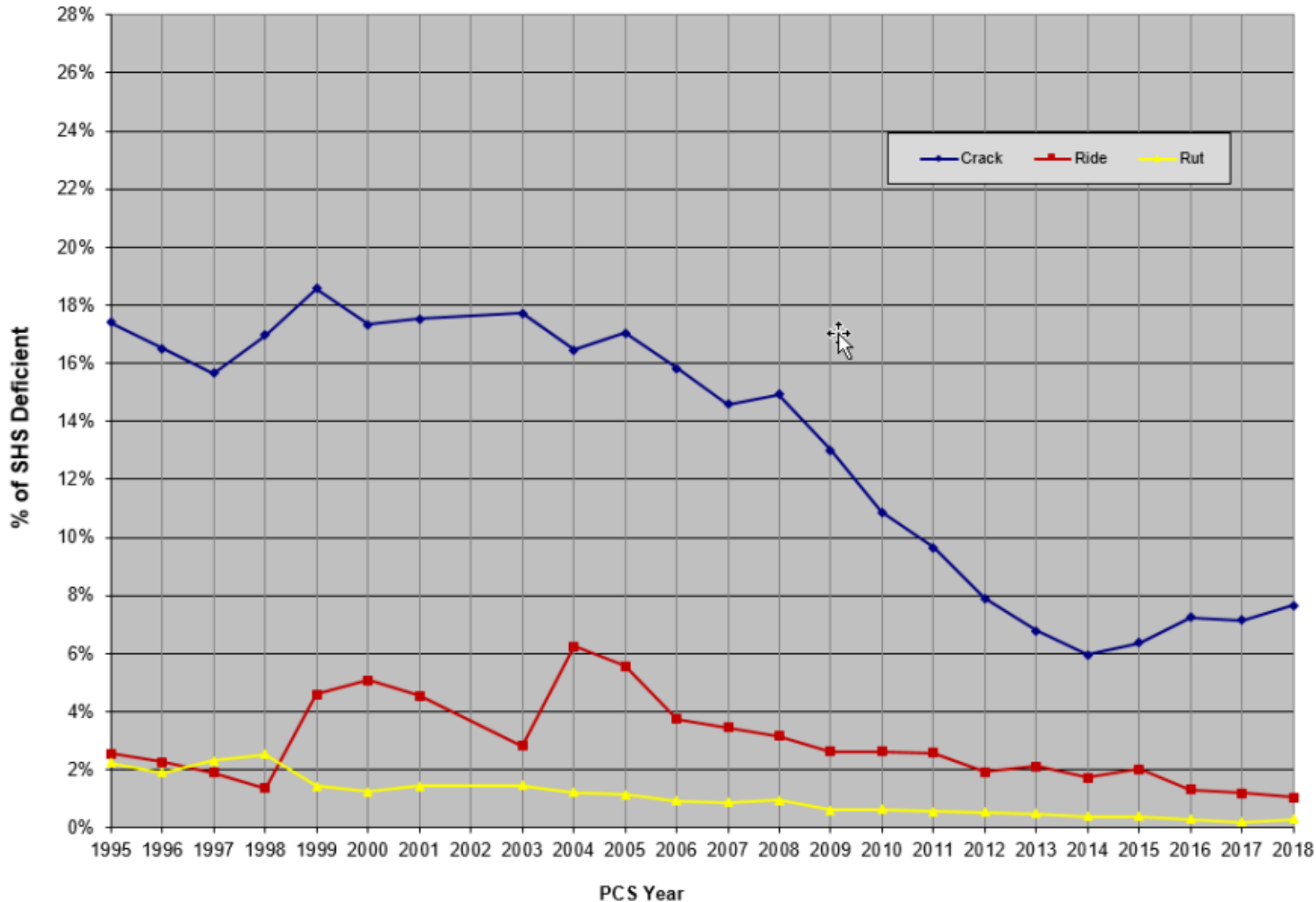
www.roadresource.org

Roads Addressed: **7**

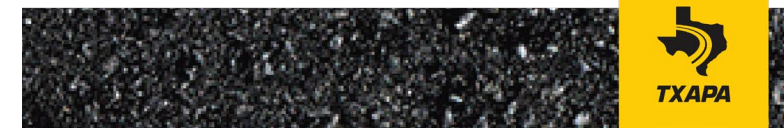


Measure Your Progress

Historical Statewide Performance



By whatever means makes the most sense to you, track your progress and adjust your network strategy accordingly



Webinar Recordings

Hosted by the Pavement Preservation & Recycling Alliance, each webinar in the "How I Built This Network" Webinar series highlights stories from high-performing agencies across North America. View recorded webinars here.

On the website, you can access 40 free webinars over a wide range of topics. Several of your peers across the country have webinars discussing how they improved their own local road network.

Recorded Webinars

Showing all 40 available webinars



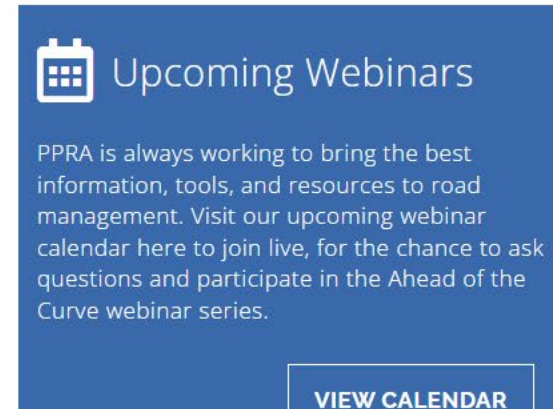
The thumbnail for the RSL Webinar features the AEMA logo in the top left corner. The main text reads "RSL Webinar" followed by a subtitle: "How can network managers inject more life into their networks?". A large red play button icon is centered over the text. At the bottom right, the PPRA logo and the URL "RoadResource.org" are visible.

IS YOUR NETWORK GAINING OR LOSING LIFE?
Remaining Service Life



The thumbnail for the Life Cycle Cost Webinar features the AEMA logo in the top left corner. The main text reads "Life Cycle Cost Webinar" followed by a subtitle: "Traffic Material Quality Maintenance Support Elements". A large red play button icon is centered over the text. At the bottom right, the PPRA logo and the URL "RoadResource.org" are visible.

HOW MUCH DOES A ROAD REALLY COST?
Life Cycle Cost & Predictive Spending



The "Upcoming Webinars" section features a calendar icon in the top left corner. The main text reads "Upcoming Webinars" followed by a paragraph: "PPRA is always working to bring the best information, tools, and resources to road management. Visit our upcoming webinar calendar here to join live, for the chance to ask questions and participate in the Ahead of the Curve webinar series." A "VIEW CALENDAR" button is located at the bottom right.



PPRA - Pavement Preservation & Recycling Alliance

November 11, 2022 · 🌐

Congratulations to the Fall 2022 class of Roadvocates! This talented group just spent 3 days learning the ins and outs of managing their networks, expanding their toolboxes, and stretching taxpayer dollars further. Recognize anyone? Tag 'em!

Look for the next training in 2023.
#roadvocate #expandyourtoolbox
#manageyournetworks



Write a comment...



Twice yearly, PPRA offers a 3-day “Roadvocate” class online. Topics include how to determine the best solutions for your network budget, how to evaluate the effectiveness of your annual treatment plans, and how to prioritize projects using optimization tools.



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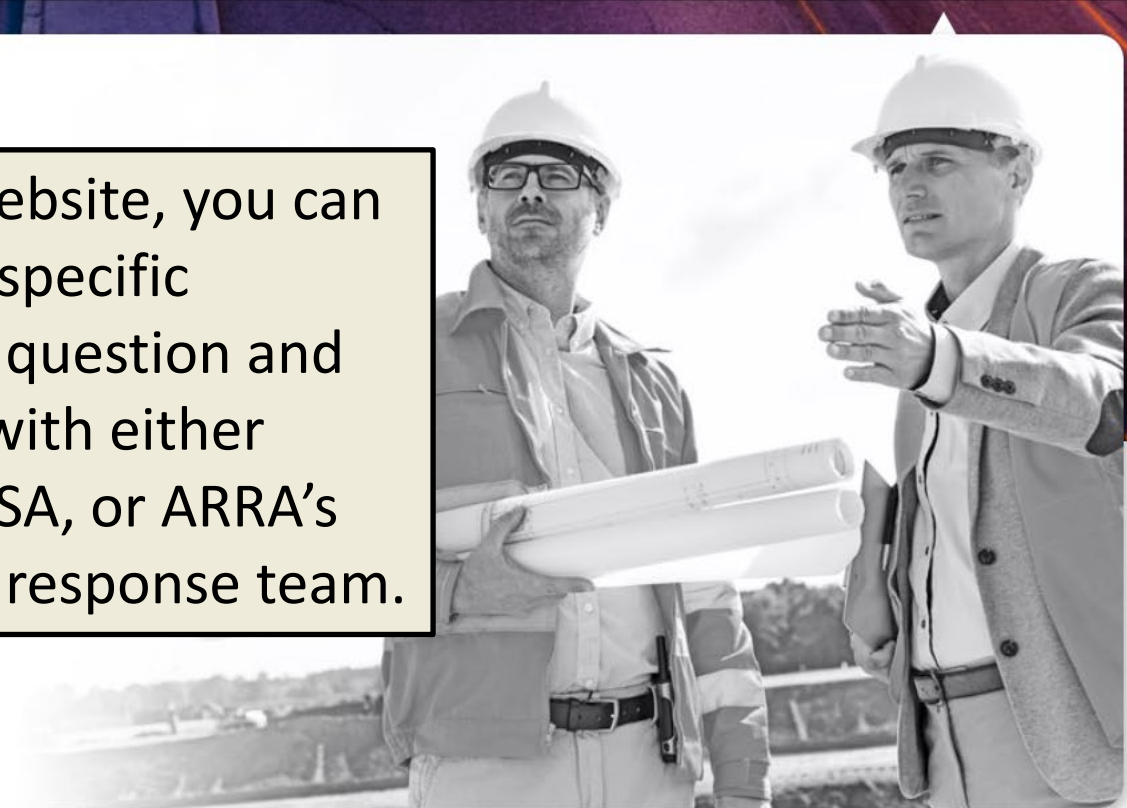
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On the website, you can submit a specific technical question and connect with either AEMA, ISSA, or ARRA's technical response team.



Get free downloadable resources to communicate with taxpayers and the media. With proactive communication, you can protect the plan

QUESTIONS?

- **Course Outline**

- Module 1: Inspector's Authority and Responsibility
- Module 2: Materials
- Module 3: Mixtures and Mix Design
- Module 4: Plants & Production
- Module 5: Transportation, Delivery, & Preparation
- Module 6: Placement
- Module 7: Compaction
- Module 8: Acceptance and Testing

- **Each module roughly 90-120 mins**

- **Modules consist of ppt slides with audio, exam**

<http://www.asphaltinstitute.org/training/seminars/paving-inspector-certification-pic/>

