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Pavement Preservation

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Pavement Preservation SEAUPG 2002

Information from 
Foundation for Pavement Preservation (FP2)
www.fp2.org

Pavement Preservation



- **Manage Assets**
 - Protect investment
 - Enhance cost-effectiveness of treatments
- **Preventive Maintenance (PM)**
 - Extend Pavement Life
 - Retard future deterioration
- **Enhance Pavement Performance**
 - Improve functional condition (friction, etc.)
- **Reduce User Delays**

Our Lifeline Our Road Network



\$1 trillion
investment in
US highway infrastructure

84% of all
goods shipped
travel on US road system

Just-in-time inventory:
highways = warehouses

Tommy Beatty, FHWA, "Protect Our Investment", 2001
The Road Information Project

**"It was not our wealth that
made our highways
possible; rather it was our
highways that made our
wealth possible"**

Thomas MacDonald,
former U.S. Commissioner
of Public Roads

Our highway system works, but . . .

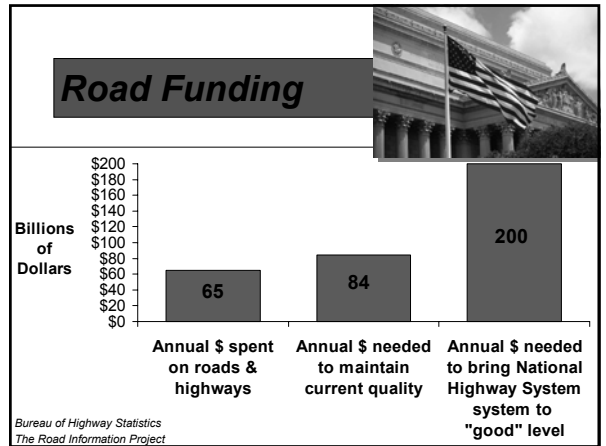
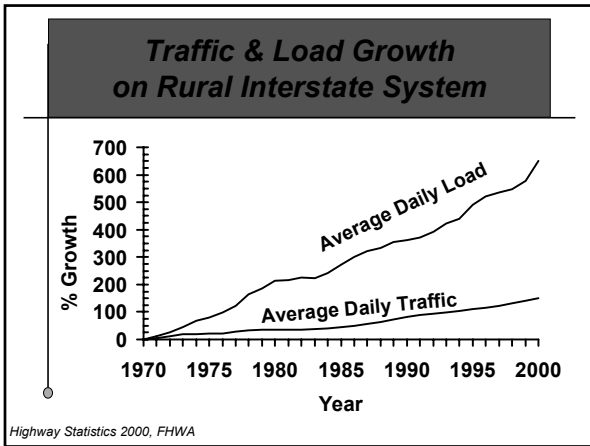
**2/3 of US roads in fair to
poor condition**

**13,000 annual traffic
fatalities due to poor
roads**



Bureau of Transportation Statistics
The Road Information Project

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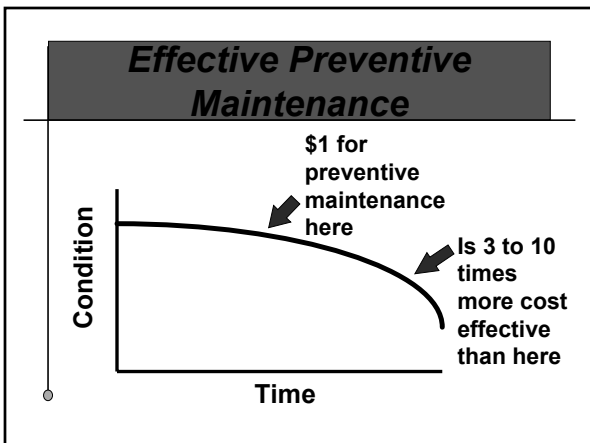


Pavement Preservation

The "right" treatment
At the "right" time
On the "right" project

What's the "Right" time?

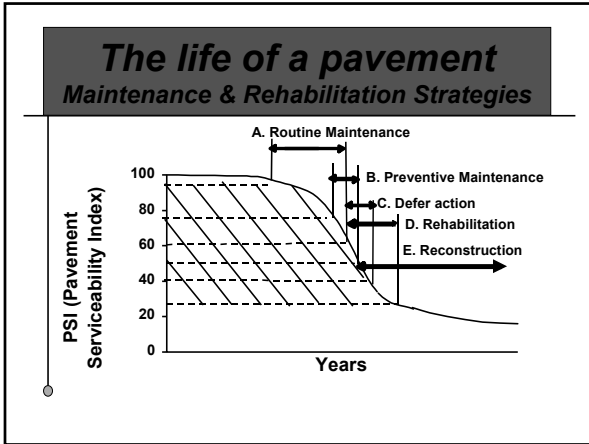
When should a pavement preservation treatment be applied?



Examples

- Michigan DOT -**
 - "For every preventive maintenance \$1 spent, we're saving \$10" Larry Galehouse, "Protecting our Pavements, Preventive Maintenance"
- Rhode Island -**
 - "I-295 will cost \$30 million to fix; costs for preventive maintenance would have been \$6-7 million over the years" William Ankner, to House Transportation & Infrastructure Committee

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Types of Pavement Maintenance

- **Preventive (Proactive)**
 - Arrest light deterioration
 - Retard progressive failures
 - Reduce need for corrective maintenance
 - "Right" treatment at the "right" time!
- **Corrective (Reactive)**
 - After deficiency occurs
 - More expensive

When Do We Have to Fix Our Pavements?

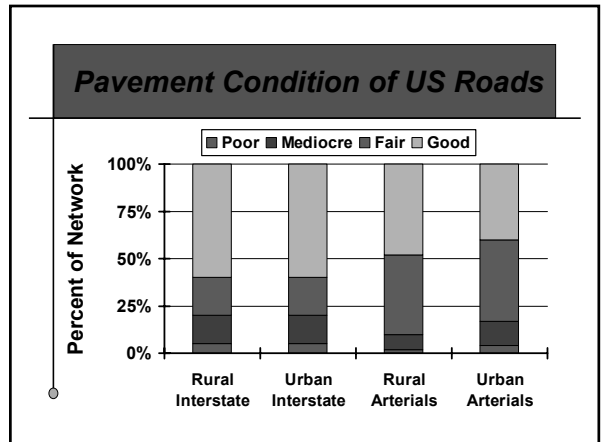
- **Pavement Preservation**
 - preserves good condition pavement
- **Corrective maintenance**
 - when the pavement loses:
 - Load carrying ability (excessive deflection)
 - Waterproofing (cracks)
 - Surface slope (rutting)
 - Surface roughness (too slick)
 - Ride quality (bumps)

What's the "Right" project?

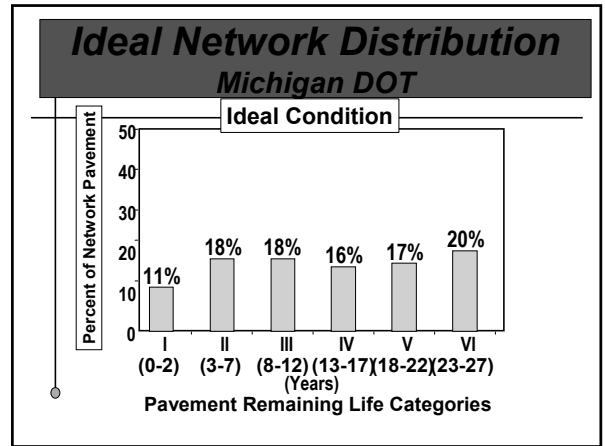
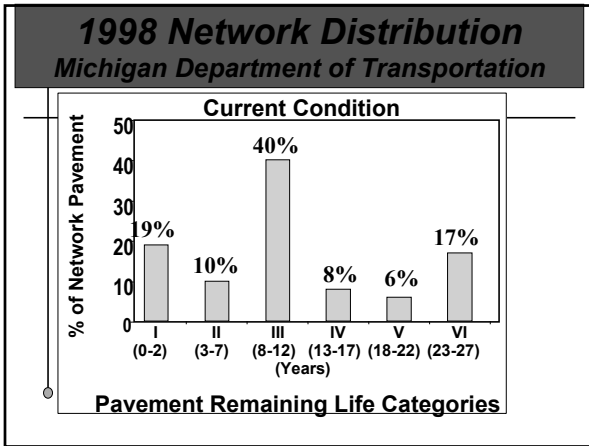
Start by looking at overall road network . . .

Objective

Keep pavement condition such that corrective maintenance isn't needed

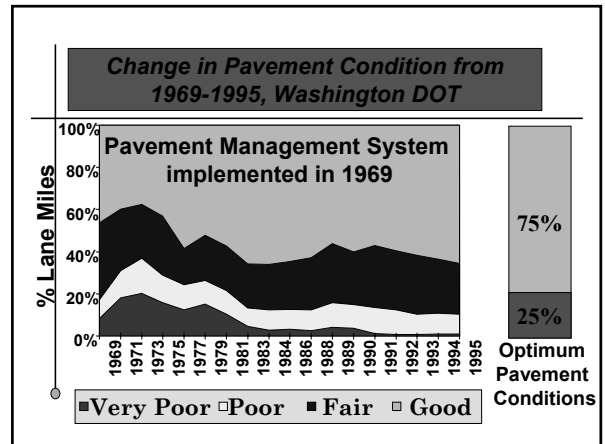


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How do we get to the ideal distribution?

One State's Experience
Washington instituted a pavement management system including preventive maintenance in 1969



Problem

Public perception

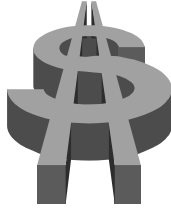
- “fixing good roads”
- and not “fixing bad roads”



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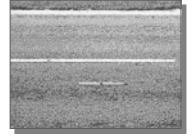
"Right" Treatment depends upon . . .

- Existing pavement
- Environment
- Life Cycle Costs
- Available Treatments
- Customers' Needs



"Right" Treatment depends upon . . .

- Existing pavement
 - type
 - structure
 - roughness, rideability
 - skid
 - distresses
 - drainage
 - etc.



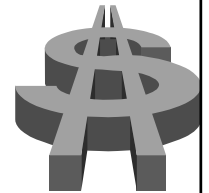
"Right" Treatment depends on . . .

- Environment
 - climate
 - past & future traffic
 - noise
 - etc.



"Right" Treatment depends on . . .

- Life Cycle Costs
 - construction
 - maintenance
 - rehabilitation
 - user-delay costs



"Right" Treatment depends on . . .

- Available Treatments
 - Construction requirements
 - Performance
 - Costs
 - Capabilities of local agencies and contractors



Pavement Preservation Techniques for Flexible Pavements

Fog Seal



Chip Seal



Crack Seal



Slurry Seal



Micro-Surfacing



Thin & Ultrathin HMA overlays



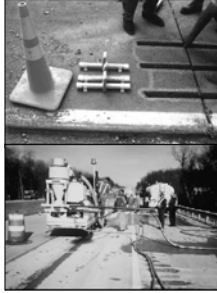
Macro-Surfacing



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Pavement Preservation Techniques for PCC

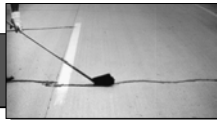
- Joint sealing
- Dowel-bar retrofit
- Full- & partial-depth repair
- Milling & grinding
- HMA treatments
- Asphalt surface treatments



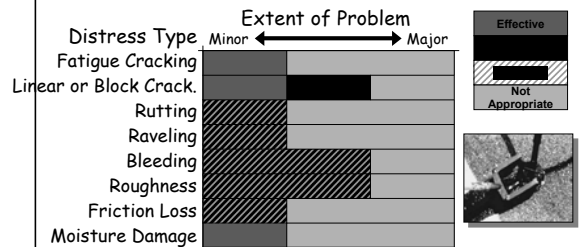
Pavement Preservation Techniques for Flexible Pavements

Crack Sealing

- Routine maintenance
- Cleaning & sealing
- Prevents intrusion of water and incompressible materials
 - Retards deterioration
 - Retards cupping deformation
 - May extend life by 4 years



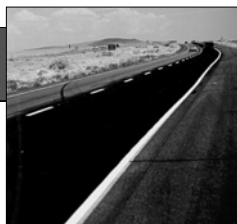
Crack Sealing Allowable Pavement Condition



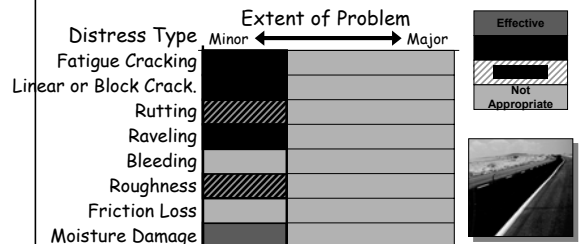
Fog Seal

Light application of diluted, slow-setting asphalt emulsion without aggregate cover

- Seal pavement
- Inhibit raveling
- Enrich hardened/oxidized asphalt
- Provide delineation with shoulder



Fog Seal Allowable Pavement Condition



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Surface Treatments

Typically used to:

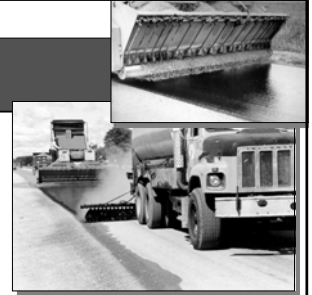
- Seal cracks
- Waterproof surface
- Improve friction
- Improve rideability
- Rejuvenate surface



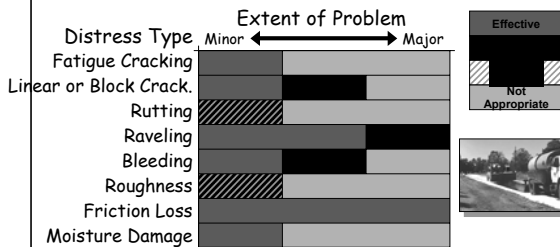
Chip Seal

Application of asphalt and aggregate chips rolled onto the pavement

- Seal pavement
- Enrich hardened/oxidized asphalt
- Retard reflection cracking on HMA overlays
- Improve surface friction



Chip Seal Allowable Pavement Condition



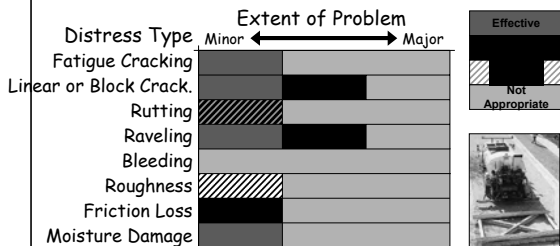
Scrub Seal

Application of sand or small-sized aggregate on broomed layer of polymer-modified asphalt

- Fill and seal small cracks and voids
- Enrich hardened/oxidized asphalt



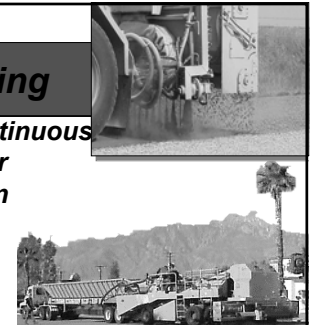
Scrub Seal Allowable Pavement Condition



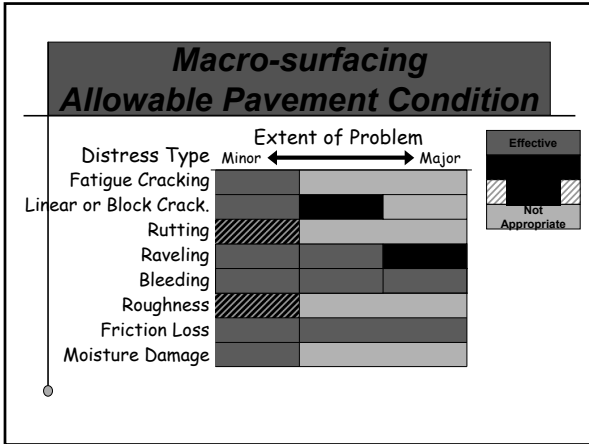
Macro-surfacing

Synchronized continuous ultrafast polymer asphalt emulsion & single sized, durable aggregate


- Seal pavement
- Improve surface friction
- For high traffic volume pavements



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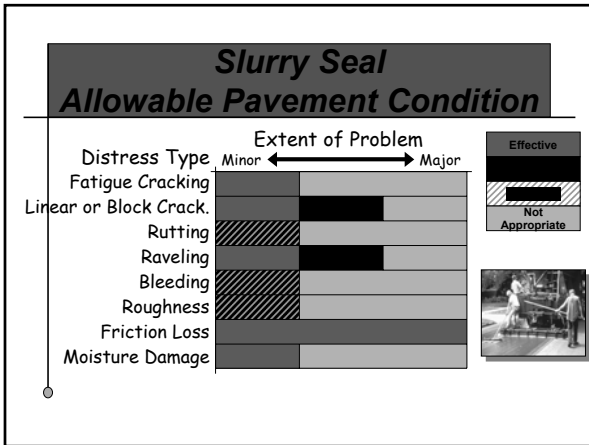


Slurry Seal




Mixture of well-graded aggregate & slow setting asphalt emulsion

- Type I: Seal surface cracks
- Type II: Correct raveling/oxidation
- Type III: Fill minor surface irregularities and restore friction

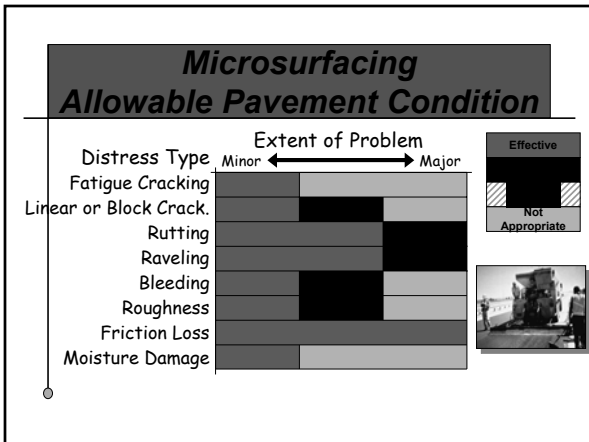


Microsurfacing




Mixture of high-quality aggregates and polymer-modified emulsion binder

- Inhibit raveling and surface oxidation
- Improve surface friction
- Fill ruts/minor surface irregularities
- Seal pavement surface




Milling with Thin HMA Overlay



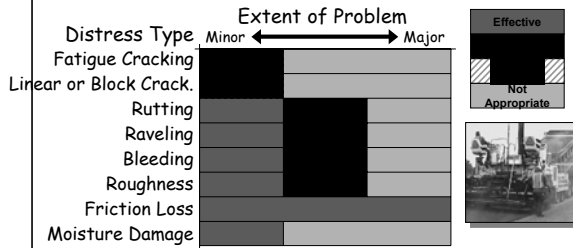
Application of a new HMA wearing course after milling of the top portion of the HMA surface

- Improve rideability and surface friction
- Reduce hydroplaning and tire splash
- Improve profile, crown, and cross-slope



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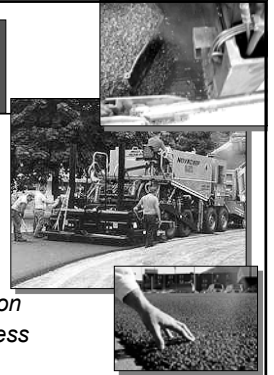
Milling with Thin HMA Overlay Allowable Pavement Condition



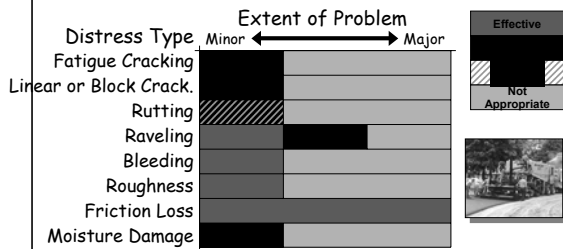
Ultrathin bonded friction course

Gap-graded, polymer-modified HMA placed on a heavy, polymer-modified emulsified asphalt tack coat

- Increase surface friction
- Address surface distress
- Reduce backspray
- Reduce noise



Ultrathin bonded wearing course Allowable Pavement Condition



Recycling Treatments

Typically used to rework AC to a depth of 25 to 100 mm (1 to 4 inches)

- Correct surface distresses
- Improve profile, crown, and slope



Recycling Treatments Types

Cold In-Place Recycling



Hot In-Place Recycling



Cold In-Place Recycling

Milling, rejuvenating, and replacement of the top portion of the HMA surface (performed without heat)

- Rework HMA to depth of 50 to 100 mm (2-4")
- Correct surface distresses
- Improve profile, crown, and cross-slope



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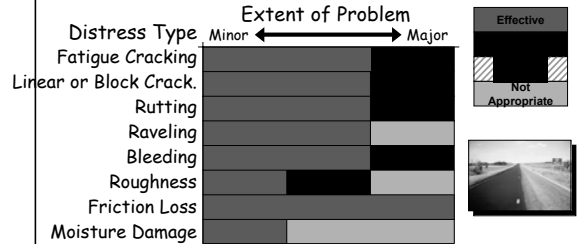
Hot In-Place Recycling

Milling, rejuvenating, and replacement of the top portion of the HMA surface (performed with heat)



- Rework HMA to depth up to 50mm (2")
- Correct surface distresses
- Improve profile, crown, and cross-slope

Cold and Hot In-Place Recycling Allowable Pavement Condition



Maintenance of Drainage Features

Description

- Any activity that will improve the drainability of a pavement section

Purpose

- Minimize time to remove infiltrated or surface water

Recommended Use

- Strongly recommended on all HMA pavements

Pavement Preservation Techniques for Rigid (PCC) Pavements

Pavement Preservation Techniques for Rigid (PCC) Pavements

- Joint /crack sealing
- Diamond grinding/grooving
- Reflective crack relief layer
- Ultrathin bonded wearing course
- Micro-surfacing
- Undersealing
- Load transfer restoration
- Maintenance of drainage features



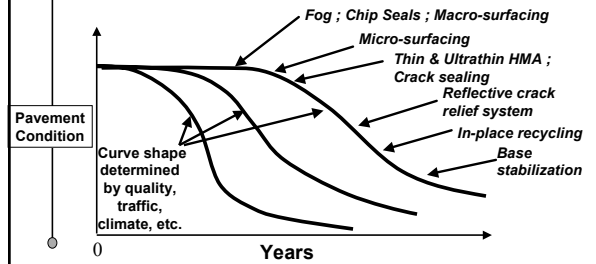
DRAINAGE!

- Any activity that will improve the drainability of a pavement section
- Keep the base dry to increase pavement structure

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Comparison of Treatments

When Should The Treatments be Applied?



Typical Cost Data

Treatment	Cost, \$/yd ²
Crack Sealing	0.30 - 0.45
Fog Seals	0.40 - 0.60
Surface Dressings (Chip Seals)	0.80 - 2.50
Slurry Seals	0.60 - 1.00
Micro-surfacing	1.10 - 1.30
Thin and Ultra Thin HMA	1.75 - 3.00

Estimated Life Extension (years)

Treatment	Good Condition (PCI=80)	Fair Condition (PCI=60)	Poor Condition (PCI=40)
Fog Seal	3 - 5	1 - 3	1 - 2
Chip Seal	7 - 10	3 - 5	1 - 3
Slurry Seal	7 - 10	3 - 5	1 - 3
Micro-surfacing	8 - 12	5 - 7	2 - 4
Thin HMA	10 - 12	5 - 7	2 - 4

SHRP Preventive Maintenance Study

- **Nationwide test sections**
 - high-volume, high-speed highways
 - good, fair, and poor pavements
- **Observations:**
 - Treated sections outperforming control sections
 - Performance related to existing pavement condition
 - Most sections are performing well


SHRP Preventive Maintenance Study

- **Conclusions:**
 - **Preventive Maintenance**
 - is cost-effective
 - should be a program over time

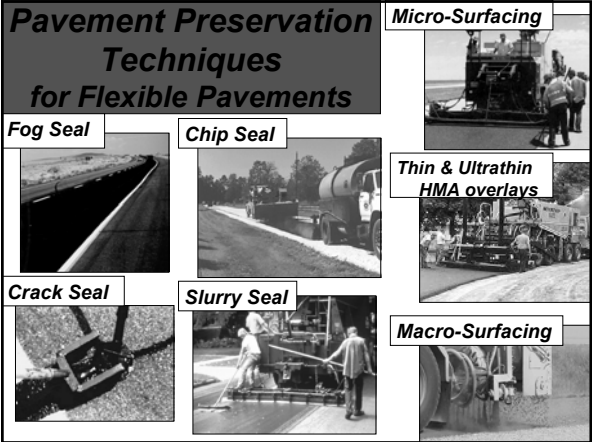
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Summary
Benefits of Pavement Preservation


- **Extended pavement life**
- **Lower life-cycle costs (cost effectiveness)**
- **Improved safety**
- **Improved budget planning**
- **Public support**




Pavement Preservation Techniques for Flexible Pavements



- Fog Seal**
- Chip Seal**
- Micro-Surfacing**
- Crack Seal**
- Slurry Seal**
- Thin & Ultrathin HMA overlays**
- Macro-Surfacing**



Pavement Preservation
The “right” treatment
At the “right” time
On the “right” project

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