A Pocket Guide To Asphalt Pavement Preservation

FP-2

U.S. Department of Transportation

Federal Highway Administration

What is Pavement Preservation?

Pavement Preservation is a planned system of treating pavements to maximize their useful life.

All pavements require some form of maintenance due to the effects of traffic and the environment on the exposed pavement materials. Many times, the only treatment a pavement receives is crack-filling or patching, while surface distresses are ignored. Applying a surface treatment to a pavement with light to moderate distress can greatly increase the life of a pavement.

Pavement Preservation takes the maintenance process one step further by carefully choosing and timing pavement maintenance applications to extend the life of a pavement.

The right treatment on the right pavement at the right TIME

What Are the Benefits Of Pavement Preservation?

The most obvious benefit of Pavement Preservation is the extension of the life of the pavement. Other benefits of a Pavement Preservation program are:

- **Lower costs over time** - Studies show every additional dollar spent on preventive maintenance treatments saves up to $10 in future rehabilitation costs.
- **More predictable costs** - If you schedule your treatments and keep your pavements maintained, you should be better able to predict and plan future costs.
- **Fewer premature pavement failures** - Many premature pavement failures are caused by pavement damage that goes untreated, such as water seeping into cracks.
- **Better condition pavements** - Scheduled monitoring and pavement treatments keep pavements in better overall condition than random or insufficient maintenance.
- **Reduced user delays and user costs** - The more extensive damage a pavement has, the longer drivers will be delayed due to construction. Pavements that are in good condition are also easier on a vehicle's daily wear and tear.
- **Better utilization of resources** - Regularly scheduling treatments allows better use of available resources, and planning for those you may need (such as contractors, equipment, etc.).
- **A happier driving public** - Drivers will get to their destinations on time over safe, well-maintained roads.

How Do I Start A Pavement Preservation Program?

1. **INVENTORY your road system and components** - This will give you a starting point. You might also want to consider gathering Average Daily Traffic (ADT) or ESAL counts on those roads that seem to have heavier traffic, have a lot of growth nearby, or that have not been surveyed in a while.

2. **FIELD SURVEYS determine your pavements' conditions** - We've provided a Pavement Rating Form for you to use. The field surveys will give you information on how to prioritize your treatment strategy.

3. **ANALYZE field surveys and reports to determine maintenance strategy** - Pavements that are severely distressed aren't the best candidates for a surface treatment because you may have to reconstruct them fairly soon. Instead, it may be better to apply a surface treatment to a pavement with light or moderate distress.

4. **PLAN STRATEGY using analysis from PMS as a tool (if available)** - A Pavement Management System (PMS) makes your decisions easier, especially if you have many pavements that need attention in the near future.

5. **IMPLEMENT, execute, and document costs and work performed for future use** - Keeping track of the work performed and related costs can help determine the life of a treatment and the true costs over time.

Pavement Rating Form for Field Surveys

Surveyors: _____

Photos, Video or Both with Survey (P, V, B) _____

Pavement temperature - before, ____°C; after, ____°C _____

Location: Route, Road, mile marker, etc. _____

State assigned ID _____

Date ____/____/____

Distress Type	Severity Level		
	Low	Moderate	High
Cracking			
1. Fatigue Cracking (sq meters)			
2. Block Cracking (sq meters)			
3. Edge Cracking (meters)			
4. Longitudinal Cracking			
4a. Wheel Path - length sealed, (meters)			
4b. Non-Wheel Path - length sealed (meters)			
5. Reflection Cracking at Joints			
# of transverse cracks			
Transverse Cracking (meters) Length sealed (meters)			
Longitudinal Cracking (meters) Length sealed (meters)			
6. Transverse Cracking			
# of cracks			
Length (meters) Length sealed (meters)			

Distress Type	Severity Level		
	Low	Moderate	High
Patching and Potholes			
7. Patch/Patch Deterioration			
(Number)			
(Square meters)			
8. Potholes			
(Number)			
(Square meters)			
Surface Deformation			
9. Rutting	See Below		
10. Shoving			
(Number)			
(Square meters)			
Surface Defects			
11. Bleeding (square meters)			
12. Polished aggregate (square meters)			
13. Raveling (square meters)			
Miscellaneous Distresses			
14. Lane-to-shoulder dropoff	See Below		
15. Water bleeding & pumping (number) Length of affected pavement (meters)			

9. Rutting

Inner Wheel Path			Outer Wheel Path		
Point No.	Point Distance (Meters)	Rut Depth (mm)	Point No.	Point Distance (Meters)	Rut Depth (mm)
1.	0.00		1.	0.00	
2.	15.25		2.	15.25	
3.	30.50		3.	30.50	
4.	45.75		4.	45.75	
5.	61.00		5.	61.00	
6.	76.25		6.	76.25	
7.	91.50		7.	91.50	
8.	106.75		8.	106.75	
9.	122.00		9.	122.00	
10.	137.25		10.	137.25	
11.	152.50		11.	152.50	

14. Lane-to-Shoulder Dropoff (mm)

Point No.	Point Distance (Meters)	Lane-to Shoulder Dropoff (mm)
1.	0.00	
2.	15.25	
3.	30.50	
4.	45.75	
5.	61.00	
6.	76.25	
7.	91.50	
8.	106.75	
9.	122.00	
10.	137.25	
11.	152.50	

Other (describe)

[1] "Point Distance" is the distance in meters from the start of the test section to the point where the measurement was made.

Traffic level

The level of traffic (and especially the ESALs, or equivalent single axle loads) is one of the most important factors in the durability of a treatment. The traffic level is also an indication of user delay costs. A treatment with higher initial cost that has quicker traffic return and lasts longer may be a significantly less expensive alternative over the life of the pavement.

Rutting

Permanent deformations of the pavement (indentations) in the wheelpaths. Rutting may be caused by heavy trucks, slow, stopping & standing traffic, poor aggregate, temperature susceptible asphalt, poor construction, moisture damage and/or post-construction compaction by traffic.

Cracking

Fatigue

Also called "alligator" because the interconnected cracking pattern resembles alligator skin. It is caused by fatigue, insufficient pavement structure, or excessive deflection.

Longitudinal

Cracks that run parallel to the direction of traffic, usually caused by insufficient pavement structure, stresses applied by the sidewalls of radial tires, and/or poor construction.

Transverse

Cracks that run perpendicular to the direction of traffic, often caused by stresses applied by thermal cycling.

Surface Condition

Dry

An aging surface may not show any signs of distress, but the oxidation process and micro-damage has started. Timely surface protection will prevent future deterioration.

Flushing/Bleeding

Excess binder on the pavement surface with a shiny or glassy appearance, caused by too high an asphalt content or, sometimes, moisture damage.

Raveling

Loss of loose aggregate on the surface. It may be caused by an oxidized and aged surface, segregation during construction, or debonding of the surface course.

Potholes

Holes in the pavement surface, usually caused by inadequate structure, accumulated damage, age hardening, poor drainage and moisture intrusion.

Stripping (Moisture Damage)

The asphaltic binder is delaminated from the aggregate, caused by moisture (either water or water vapor) debonding the asphalt from the mixture. The unbound aggregate is no longer able to support the traffic load.

Deficient Drainage

The inability of surface water to drain away from the pavement. The resulting trapped moisture erodes the base structure and can cause stripping of the asphaltic binder from the aggregate.

Patching/Crack Filling

Filling potholes and filling cracks with patch mixes or bituminous fillers.

Asphalt Surface Treatment

Any application of asphalt materials to roadway with a thickness <1", including:

Fog Seal

A light application of diluted asphalt emulsion to renew surfaces and seal small cracks and surface voids.

Slurry Seal

A mixture of emulsified asphalt, fine aggregate and additives applied in a very thin layer to renew surfaces and protect against moisture and air intrusion.

Chip Seal

An application of asphalt emulsion followed by a thin layer of aggregate to renew and protect pavements and restore skid. Seal Coats may also be done in multiple applications.

Macro-Surfacing

A new surface treatment for high volume roads.

Micro-Surfacing

A mixture of emulsified, polymer modified asphalt, high quality fine aggregate, chemical and other additives to fill ruts, renew and protect pavements, restore skid, and release quickly to traffic.

Ultrathin Bonded Wearing Course

A polymer modified asphalt emulsion membrane followed within seconds by an ultra-thin lift of high performance open-graded asphalt concrete mix, and immediate release to traffic. Renews and protects pavement, restores skid, and provides a strong bond to the existing surface.

Mill & Fill

Existing surface milled and replaced with a new asphalt mixture.

Thin Overlay

A thin (up to 1 1/2") layer of hot mix is applied to the existing surface.

Open Graded Surface

An overlay of an asphalt mixture with a gap-graded aggregate and high air voids, allowing moisture to drain off of surface.

Structural Overlay

A layer of hot or cold bituminous mix that is sufficiently thick to add structural strength to the pavement.

Paver Mixed Bituminous Pavement

Engineered quick setting, flexible pavement.

Recycled Bituminous Pavement

Processed Reclaimed Asphalt Pavement (RAP)

Reclaimed Asphalt Pavement that is milled, crushed and processed into an emulsion or hot mix asphalt at a central location and then paver placed onto a roadway.

Cold In-Place Recycling

A distressed pavement that is milled several inches, sized, mixed with emulsion, repaved and compacted using a train of equipment in-place on the road.

Hot In-Place Recycling

A distressed pavement that is milled an inch or two, heated, scarified, mixed with emulsion, repaved and compacted using a train of equipment in-place on the road.

Reconstruction HMA

Removal of the existing pavement followed by fixing subgrade and drainage problems, and construction of a new pavement.

GUIDELINES FOR PAVEMENT TREATMENT SELECTION

Treatments

Pavement Conditions	Parameters	Fog Seal	Crack Seal	Sand Seal	Std. Chip Seal	Micro-Surfacing	Modified Chip Seal	Slurry Seal	Micro-Surfacing	Ultrathin Bonded Wearing Course	Recycled Bituminous Pavement: Processed RAP	Recycled Bituminous Pavement: HIR	Recycled Bituminous Pavement: CIR	Paver Mixed Bituminous Pavement	Thin Hot Mix Overlay
Traffic (ADT) (Note: % trucks should also be considered)	<1000	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	1000-4000	●	●	●	●	●	●	●	●	●	?	●	●	●	●
	>4000	?	●	?	●	●	●	●	●	●	?	●	●	?	●
Ruts	<3/8in	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	3/8 - 1 in	X	?	?	?	?	?	?	●	X	●	?	?	?	?
	>1 in	X	X	X	X	X	X	X	?	X	?	?	?	X	X
Cracking Fatigue	Low	?	●	●	●	●	●	X	●	●	●	●	●	●	●
	Moderate	X	?	?	●	●	?	X	?	?	?	●	●	●	●
	High	X	X	X	X	X	X	X	X	X	?	?	●	?	?
Cracking Longitudinal	Low	?	●	●	●	●	●	●	●	●	●	●	●	●	●
	Moderate	X	●	?	●	●	●	?	?	?	?	●	●	●	●
	High	X	?	X	X	X	X	X	X	X	X	?	●	?	?
Cracking Transverse	Low	?	●	●	●	●	●	●	●	●	●	●	●	●	●
	Moderate	X	●	?	●	●	?	?	?	?	?	●	●	●	●
	High	X	?	X	X	X	X	X	X	X	X	?	●	?	?
Surface Condition	Dry	●	X	●	●	●	●	?	●	●	●	●	●	●	●
	Flushing	X	X	?	●	●	●	X	●	●	●	●	●	●	●
	Bleeding	X	X	X	?	●	●	●	●	●	●	●	●	●	●
	Variable	?	X	?	●	●	●	●	●	●	●	●	●	●	●
	PCC	X	?	●	●	●	●	●	●	●	?	X	X	?	●
Raveling	Low	●	X	●	●	●	●	●	●	●	●	●	●	●	●
	Moderate	?	X	●	●	●	●	●	●	●	●	●	●	●	●
	High	?	X	●	●	●	●	?	●	●	●	●	●	●	●
Potholes	Low	X	●	●	●	●	●	●	●	●	●	●	●	●	●
	Moderate	X	?	?	?	?	?	?	?	X	●	?	●	●	●
	High	X	?	X	X	X	X	?	?	X	?	?	●	?	●
Stripping	Moisture Damage	X	X	X	X	X	X	X	X	X	X	?	?	X	X
Texture	Rough	X	X	?	?	?	?	●	●	●	●	●	●	●	●
Ride	Poor	X	X	X	X	X	X	●	?	●	●	●	●	●	●
Rural	Min Turning	●	●	●	●	●	●	X	●	●	●	●	●	●	●
Urban	Max Turning	●	●	?	●	●	●	●	●	●	●	●	●	●	●
Drainage	Poor	X	X	X	X	X	X	X	X	X	X	?	?	X	X
Snow Plow Use	High	●	●	●	?	●	●	●	●	●	●	●	●	●	●
Skid Resisance	Low	X	X	●	●	●	●	●	●	●	●	●	●	●	●

Initial Cost Concern	Low	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	High	●	?	●	●	●	?	?	X	X	●	?	?	●	?
Life Cost Concern	Low	●	●	●	●	●	?	●	●	?	●	●	●	●	?
	High	?	●	?	?	●	●	?	●	●	●	●	●	●	?
Local Construction Quality	Low	X	?	X	X	●	?	X	●	●	?	X	X	●	?
	High	●	●	●	●	●	●	●	●	●	●	●	●	●	●
User-Delay $	High	?	?	?	?	●	?	?	●	●	?	?	?	●	?

These are very broad assumptions; assessment of a given road should take precedence, with special attention to distress cause(s), and needed repairs before treatment.
Recommendations in top chart assume good quality design & construction. Multipliers from the bottom chart should be used. This information is meant to be fed into a decision matrix.

X = NOT RECOMMENDED ? = MAY BE RECOMMENDED ● = RECOMMENDED

Since 1992, the Foundation for Pavement Preservation in cooperation with partners, FHWA, AASHTO, industry associations and others have been providing research, education and outreach to those responsible for America's highway transportation systems. FP^2 is the unquestioned leader in continuously improving the quality and understanding of preservation technology. It is our belief that preserving the highway network while maintaining performance, safety and cost-effectiveness is essential to keep America's economy and public moving into the new century. The public deserves highways in smooth and safe condition at the lowest cost. FP^2 and its industry partners will continue to support and provide knowledge and training necessary to reach that goal. For more information, we can be reached at: www.fp2.org or by calling 703-245-8044 or contact your local FHWA division office.

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