

# Pavement Preservation in the United States

## Survey by the Lead States Team on Pavement Preservation American Association of State Highway and Transportation Officials

The **Lead States Team on Pavement Preservation** works to promote the philosophy of pavement preservation among State departments of transportation and other related agencies.

The Team assembles and shares data on pavement preservation activities and experience among the States.

The American Association of State Highway and Transportation Officials (AASHTO) Lead States Team on Pavement Preservation surveyed transportation agencies in the 50 States, the District of Columbia, Puerto Rico, and 6 Canadian Provinces on the nature of their pavement preventive maintenance (PPM) programs and practices. (Data collected from the Provinces are not included here.)

Information from the survey serves three primary purposes:

- to assess the current status of pavement preservation activities and programs in North America
- to estimate growth in PPM programs since a survey conducted 3 years earlier
- to allow transportation agencies to compare their preventive maintenance practices with those of other agencies

The survey asked each agency whether it has a PPM program, how long the program has existed, whether it is integrated with a pavement management system, what level of annual funding is provided, and if the program's administration is centralized, decentralized, or some combination of both.

The questionnaire also asked about PPM practices: which of 19 PPM treatments are used, whether PPM guidelines have been developed, whether test sections are used, and at what condition levels pavements are being treated with preservation techniques. (The survey questions appear at the end of this article.)

This report summarizes survey data on PPM practices and programs in the 40 responding States and Puerto Rico (PR) in two sections: findings about State programs; and findings regarding which PPM technologies are used and how decisions about preservation are guided.

## Pavement Preventive Maintenance Programs

Of the 41 agencies that responded to the 1999 survey, 36 (85 percent) have established PPM programs; 2 others are in the process of developing a program, and all 41 are using a variety of preventive treatments.

In the 1996 survey, only 26 percent of 43 reporting agencies said they had extensive preventive maintenance programs, 56 percent had moderate programs, and 19 percent had very little PPM.

The 1999 findings cover the state of pavement preservation practice across the country, but they do not allow comparisons between agencies that have programs and those that do not. Survey responses show that some respondents interpreted “program” narrowly—as a fully dedicated, organizationally discrete program—while others read it more broadly, as performing regular PPM treatment. A few agencies that reported they do not have programs responded to questions about programs; others did not. These comments sample PPM program development nationwide.

- When we first began placing emphasis on preventive maintenance treatments, not all of the maintenance field engineers were in favor of the change. As more of the treatments are placed and the engineers see the results, we are seeing more support from our field engineers.
- To really start, it seems the system must be in such a condition to not require reactionary maintenance. This can be done in stages, and by doing pavement preventive maintenance you can generate dollars to use on other sections.
- PPM is included within some parts of the Pavement Preservation Program and Maintenance Program. There is not a dedicated PPM program.
- Routine preventive maintenance but not as a formal program.
- Current program is voluntary in each maintenance area. A formal program is being developed.
- The “basic” program is being expanded at this time.
- Annual Federal and State resurfacing programs. Various maintenance treatments varying from 1" to 3/8".
- Very active program for flexible pavement but slow program for rigid pavements.
- We have an Interstate preventive maintenance program.
- Typically left to individual districts.
- Not a formal program. Began with crack sealing in 1998, progressed to micro-surfacing 1" rubberized chip seals in 1999. Will try NovaChip in 2000.
- We perform prevention maintenance, but do not have a defined Statewide program. Districts establish their programs.
- Asphalt projects - Route & seal (cracks) after 2 years, chip seal on the 3rd year.
- Currently under development.
- We do a lot of preventive maintenance, but it is not a specific, stand-alone program.
- We have developed a new program that identifies funding Statewide for preventive maintenance activities. Placement of actual activities is decided at the district level.
- Recommended seal coat in predetermined interval (6–8 years).
- The pavement preventive maintenance program is based on historical experience and engineering judgment and predicated on available funding.

### **Age of Programs**

Nearly half of the country’s established PPM programs (17) have existed for more than 10 years. One agency commented that it had been practicing preventive maintenance for 75 years but not as an established program.

#### PROGRAM AGE

Years	Agencies
Less than 3	7
3–10	9
More than 10	17
Agencies reporting	33

- Informal program has long existed. A formal program is currently being introduced.
- Just completed our first year.
- Preventive maintenance occurs, but not really on a program basis.
- Crack pouring and chip seals have been used for more than 10 years. These are our two primary preventive maintenance activities.
- Not a specific program; but the concept and larger program funding has existed for over 10 years.
- We have been conducting preventive maintenance for a number of years but have only just begun a formal program.
- Maintenance management more than 10 years.
- Approximately 3½ years ago we began to specifically identify a portion of contract maintenance funds that were to be used for preventive maintenance treatments.

### **Integration with Pavement Management Systems**

In 31 agencies, pavement preservation programs are integrated with pavement management systems. Integration is still in the beginning or informal stages in 3 agencies, while in others there is collaboration on budget and project assignment issues between the PPM and pavement management systems.

- Integration is the key to the program.
- We are in the beginning stages of this integration.
- This is our ultimate goal. Pavement Management System not yet fully operational.
- PMS selects locations and suggested actions, however these may be adjusted with actual field knowledge.
- Currently an informal integration. A more formal program is under development.
- Pavement management system is in the development process.
- Integrated with preservation program, not with preventive maintenance.
- Currently the two programs work closely.
- It has been proposed.
- We are doing this to establish annual budgets and general activity assignment for the first time this year.
- Not completed. Working on now. PMS is in district offices. Specific guidelines needed.
- The pavement management system provides some assistance in project selection. We are working to increase the input from pavement management into our preservation program selection process.
- The Pavement Management System incorporates the timely application of preventive maintenance treatments, and also makes recommendations for rehabilitation treatments.

## Program Administration

Half the reporting agencies (20) characterize their PPM administration as a mixture of centralization and decentralization. Only 6 programs are centralized.

### PROGRAM ADMINISTRATION

Type	Agencies
Centralized	6
Decentralized	12
Combination	20
Agencies reporting	38

Agency comments illustrate the various ways in which central agencies share administrative functions with districts and regions in States without centralized programs.

- Districts rate all roads to determine candidates for PPM.
- Highway Maintenance Districts start process. Overseen by Highway Maintenance Headquarters staff.
- Central office and districts work together.
- The plans are for a combination-type program to be implemented.
- Regions and districts select the projects they want for the program.
- State is centralized with coordination and design/plans done in regions.
- Primarily planned by districts with assistance from central offices.
- Individual districts manage their own preventive maintenance programs, within reason.
- Each region selects projects and reviews them with the central office. This improves project selection. The regions provide project data to the central office and the central office prepares bid proposals for projects.
- Guidelines are developed by a team consisting of both central and region staff. Regions are responsible for actual administration, and are free to deviate from the guidelines. Central provides all funding for regions.

## Funding

Dedicated funding was found in more than two-thirds (28) of the reporting agencies, including 2 States without formal PPM programs.

Annual funding levels were reported by 36 agencies, both those with and those without dedicated funding or established Statewide programs.

### ANNUAL FUNDING

Millions of Dollars	Agencies
Less than 10	6
10-25	12
25-50	6
50-75	4
Over 75	8
Reporting agencies	36

- Varies by need each year.
- Maintenance is funded through annual construction budget.
- State funds are used for crack seal & surface seals; 80/20 funds are used for overlays, mill & fill.

- 100% State funds.
- Preventive maintenance is part of a larger dedicated budget.
- No. These dollars are competed with other maintenance activities but we are trying to establish dedicated funding. Currently, the program is driven by objectives that need to be met annually.
- The funding for this work comes from our annual contract maintenance program.
- Not truly dedicated, but highly prioritized.

## **Use of Preventive Maintenance Practices and Technology**

### **Preventive Maintenance Guidelines**

Agencies in 26 States have established guidelines for PPM activities; this includes 3 agencies without established programs. Another 4 agencies are developing guidelines. Comments show that guideline development and refinement is ongoing in most States as programs become more sophisticated and widespread.

- Our pavement management data is utilized to prioritize available funds and to attempt to secure additional funds from the legislature.
- To some extent. Refining as we implement Pavement Management System.
- We use our PMS, but then apply engineering judgment.
- We have general guidelines for this work.
- The Pavement Management system includes preventive maintenance options/strategies. Also, a maintenance management system is being developed.
- We have general guidelines for maintenance activities but we are currently developing more detailed guidelines that should be ready in 2000.
- Only partial. Specific within Maintenance Management System. Working on remaining.
- We have developed some very general guidelines and are working to make them more specific.
- 1. Based on timing, but allows the Regions to choose the specific treatment. 2. Guidelines for treatment cycles are established according to pavement type, functional class, and level of traffic. All roads are included.

### **Pavement Conditions Receiving Preventive Treatment**

Although more than half (25) the reporting agencies treat roads while they are still in good condition, 22 are treating pavements in poor condition, and in at least one case “very poor.” Another State commented: “Preventative maintenance techniques are sometimes applied to poor roads when reconstruction budgets are limited.” Another: “All pavements are treated, based on the assumption that even poor pavements will receive some benefit, however small.” Most agencies, however, try to restrict treatment to pavements in good and fair condition, and decisions generally are made on a case-by-case basis using objective criteria.

## PAVEMENT CONDITIONS TREATED

Pavement Condition	Agencies with PPM Programs	All Reporting Agencies
Good	23	25
Fair	31	34
Poor	18	21
Agencies reporting	35	41

## Test Sections

Test sections are being used in more than half (23) of the reporting States, including 2 States without PPM programs.

- Evaluating several projects to ensure treatment selection guidelines are adequate.
- 1. SHRP SPS 3 1990. 2. Asphalt-rubber test sections, 1993, funded by the Waste Board.
- We budget funds for "experimental use." So far, we have tried lithium treatment on existing ASR PCC pavement, ultra-thin white topping, bonded overlays, partial depth hot-mix repair of composite pavements, polymer-mod intersection overlays, and cold-in-place.
- We have used the information from SHRP to base our decision to move in the selection of actions.
- Used for crack filling.
- Several test sections being evaluated including crack seal, seal coat, micro-surfacing, retrofit dowels, concrete joint sealing, and CPR.
- Not on a formal basis.
- Numerous projects have been done to determine effectiveness (i.e., dowel bar retrofit).
- We have developed a number of sections to evaluate crack sealing techniques, micro-surfacing, and we had an SRS-maintenance test section under the LTPP program.
- SHRP test sites on asphaltic pavements. Crack sealing test sections.
- Monitor certain sections with their overlays.
- Some SHRP SPS.
- Crack sealing effectiveness only.
- We are currently in the second phase of a research project to study performance of preventive maintenance treatments.
- Three SPS-3 sites.

## Use of Specific Preservation Strategies

Although 6 of the 41 reporting agencies have no established PPM program, all agencies use some preventive maintenance techniques.

As shown in the following tables, overlay techniques are the most frequently cited treatments, followed by single course chip seal, crack treatments, and single course micro-surfacing. Slurry seal, fog seal, paver-placed surface seal, scrub seal, and cape seal are least widely used. The numbers of agencies using specific pavement treatments are shown in the following two tables.

NUMBER OF AGENCIES USING PREVENTIVE MAINTENANCE TREATMENTS FOR  
FLEXIBLE AND COMPOSITE PAVEMENTS (rank ordered)

Agencies	Treatment
38	Mill and overlay
37	Bituminous (asphalt) overlay (< 40 mm or 1 1/2 inch)
34	Cold milling & bituminous overlay (< 40 mm or 1 1/2 inch)
33	Single course chip seal
30	Bituminous crack treatment (saw and seal or route and seal)
28	Single course micro-surfacing
25	Profile milling
24	Bituminous shoulder work (remove & replace shoulder)
21	Fog seal
21	Multiple course micro-surfacing
21	Cold-in-place recycling
19	Overband crack fill
18	Multiple course chip seal
14	Ultra-thin bituminous overlay (< 20 mm and 3/4 inch)
14	Hot in-place bituminous recycling (< 40 mm or 1 1/2 inch)
14	Slurry seal
12	Fog seal
11	Paver placed surface seal (NovaChip)
7	Scrub seal
2	Cape seal
	<i>Other:</i>
1	White topping
1	Crack sealing without sawing or routing
1	Full-depth cold recycling

*Additional comments:*

- We are moving away from overband crack sealing. We recommend crack sealers be squeegeed very tight to surface and keep narrow as possible.
- Plan to evaluate NovaChip. Have placed a few cold and hot in-place recycling projects. Not used routinely.
- Thin overlay and inlays are typically 50 mm (bituminous; cold milling & bituminous).
- Leveling + 2" overlay is part of maintenance program.
- Evaluating test section for Bituminous crack treatment (saw & seal or route & seal). Limited underdrain outlet repair and cleaning.
- Single and multiple course chip seal, local system. Fog seal, shoulders. Single and multiple course micro-surfacing, limited use. Slurry seal, shoulders, mainly.
- Open graded seal coat.

NUMBER OF AGENCIES USING PREVENTIVE MAINTENANCE TREATMENTS FOR  
CONCRETE PAVEMENTS (rank ordered)

Agencies	Treatment
38	Full-depth concrete pavement repair
36	Concrete joint resealing
34	Concrete joint and surface spall repair
34	Diamond grinding
33	Concrete crack sealing
29	Partial-depth concrete pavement repair
27	Shoulder/pavement longitudinal joint resealing
18	Underdrain outlet repair and cleaning
17	Dowel bar retrofit
	Other treatments:
1	Thin AC overlay of CRC pavement
1	Overlay with asphalt 2" surface course
1	Multiple course micro-surfacing for faulting
1	Demo project with paver placed surface seal (Nova chip)
	<i>Additional comments:</i>
	- Beginning to place and evaluate dowel bar retrofit.
	- Some treatments listed above are not considered pavement preventive maintenance.
	- No pro-active pavement preservation for concrete pavements. Are actively eliminating by rubbleizing and replacing with flexible pavements.
	- Concrete joint resealing and crack sealing on older pavements which were originally sealed. Newer pavements (since 1990) do not have the joints sealed during construction or in maintenance.
	- Full and partial depth concrete pavement repair is performed under resurfacing by contract project (3R). Diamond grinding will be conducted for the first time as part of a project with a 2/2/00 advertisement date.
	1 - Slab jacking/undersealing.

## Use of Multiple Preservation Strategies

Many variables outside the control of transportation agencies—including climate, funding, age and condition of roadways, State and local political climate—may influence pavement preservation practices in a given State and promote or inhibit the development of a successful PPM program. Nonetheless, the number of different preventive maintenance practices used by a State may give some indication of commitment to pavement preservation and development of a PPM program.

The tables on page 9 show how many of the pavement preservation technologies listed in the survey are used by each of the responding agencies.



FLEXIBLE AND COMPOSITE PAVEMENT  
PRESERVATION ACTIVITIES

Agency	Number Used
Michigan	16
Utah	15
Idaho	14
Minnesota	14
Texas	14
Georgia	14
Maryland	14
Arizona	13
Arkansas	13
North Carolina	13
Wisconsin	13
California	12
Illinois	12
Missouri	12
Montana	12
Delaware	11
Kansas	11
Ohio	11
South Dakota	11
Washington	11
Nevada	11
Connecticut	10
Indiana	10
Nebraska	10
Iowa	9
Mississippi	9
New Hampshire	9
New York	9
Oklahoma	9
Virginia	9
Wyoming	9
Massachusetts	7
New Jersey	6
North Dakota	6
Rhode Island	6
South Carolina	6
Oregon	5
West Virginia	5
Kentucky	4
Puerto Rico	4
Hawaii	3

CONCRETE PAVEMENT PRESERVATION  
ACTIVITIES

Agency	Number Used
Michigan	9
Wisconsin	9
Kansas	9
South Dakota	9
New York	9
Minnesota	8
Georgia	8
Maryland	8
Arkansas	8
California	8
Illinois	8
Nevada	8
Wyoming	8
North Dakota	8
West Virginia	8
Puerto Rico	8
Idaho	7
North Carolina	7
Montana	7
Delaware	7
Connecticut	7
Indiana	7
Nebraska	7
Oklahoma	7
Utah	6
Texas	6
Washington	6
Iowa	6
Mississippi	6
Virginia	6
New Jersey	6
South Carolina	6
Kentucky	6
Arizona	5
Ohio	5
Missouri	4
Oregon	4
Hawaii	3
Rhode Island	2
New Hampshire	0
Massachusetts	0

**AASHTO LEAD STATES TEAM ON PAVEMENT PRESERVATION SURVEY**  
(Circulated October 1999)

1. Check all of the following preservation activities used in your state:

*For flexible and composite pavements:*

Bituminous (asphalt) overlay (< 40 mm or 1 1/2 inch)  
Cold milling & bituminous overlay (< 40 mm or 1 1/2 inch)  
Ultra-thin bituminous overlay (< 20 mm and 3/4 inch)  
Bituminous shoulder work (remove & replace shoulder)  
Hot in-place bituminous recycling (<40 mm or 1 1/2 inch)  
Bituminous crack treatment (saw and seal or route and seal)  
Overband crack fill  
Single course chip seal  
Multiple course chip seal  
Cape seal  
Fog seal  
Single course micro-surfacing  
Multiple course micro-surfacing  
Slurry seal  
Paver placed surface seal (Nova Chip)  
Profile milling  
Cold-in-place recycling  
Mill and overlay  
Scrub seal  
Other

*For concrete pavements:*

Full-depth concrete pavement repair  
Partial-depth concrete pavement repair  
Concrete joint resealing  
Concrete crack sealing  
Concrete joint and surface spall repair  
Dowel bar retrofit  
Diamond grinding  
Underdrain outlet repair and cleaning  
Shoulder/pavement longitudinal joint resealing  
Other

2. Does your state/province currently have a preventive maintenance program? ☐Yes ☐No Comments
3. Does your state/province have a dedicated budget for pavement preventive maintenance? ☐Yes ☐No Comments
4. What level of annual funding is dedicated to your pavement preventive maintenance program?  
☐Less than \$10 million ☐\$10 - \$25 million ☐\$25 - \$50 million ☐\$50 - \$75 million ☐Greater than \$75 million Comments
5. Has your state/province developed specific guidelines for pavement preventive maintenance? ☐Yes ☐No Comments
6. How would you characterize the administration of your state's/province's pavement preventive maintenance program?  
☐Centralized ☐Decentralized ☐Combination ☐Other Comments
7. Does your state/province integrate a pavement management system with the pavement preservation program? ☐Yes ☐No Comments
8. Pavement preventive maintenance activities are directed to the following pavement condition levels in your state/province (check all that apply):  
☐Good ☐Fair ☐Poor ☐Other Comments
9. Has your state/province established any pavement preventive maintenance test sections to help determine optimum pavement performance?  
☐Yes ☐No Comments
10. Approximately how long has your state's/province's pavement preventive maintenance program existed? ☐Less than 3 years ☐3 to 10 years  
☐More than 10 years ☐Does not exist Comments
11. Additional comments, if any.