every day counts
An Innovation Partnership with States

Pavement Preservation
(When, Where, and How)

Applying a pavement preservation treatment at the right time (when), on the right project (where), with quality materials and construction (how) is a critical investment strategy for optimizing infrastructure performance.

Whether a highway pavement is constructed using asphalt, concrete or a composite system, traffic loads and environmental elements will contribute to its deterioration over time. Pavement preservation treatments can slow this structural decline. When the right treatment is applied at the right time with quality materials and construction, these practices offer a proven, cost-effective approach to extending the overall service life of pavements and achieving smoother, safer roads with fewer costly repairs.

Just as pavements differ, so do pavement preservation treatments. There is an array of different analyses, treatments, and construction methods that can help infrastructure owners achieve and sustain a desired state of good repair for their transportation facilities—despite tight budgets.

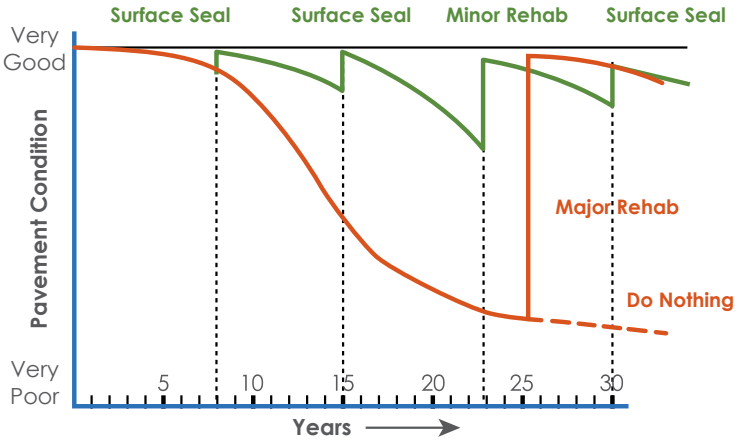
Advanced, proven preservation practices can help extend the overall service life of pavements.

The ***When and Where*** component of this innovation, as part of the fourth round of Every Day Counts (EDC-4), supports preserving highway investments by managing transportation pavements proactively. The ***How*** component promotes quality construction and materials practices, including treatment options that apply to both flexible and rigid pavements.

PAVEMENT PRESERVATION: WHEN AND WHERE

Historically, pavement preservation programs have focused on applying specific project treatments at specific locations. These projects demonstrated that the proper application of a treatment could extend the life of a pavement at a relatively low cost. However, not all projects were successful due to poor timing, inappropriate treatments, substandard materials, and inexperienced construction crews. As a result, the policy in many agencies today is to allow pavements to deteriorate until reconstruction is the only option, resulting in higher costs and more pavements in poor condition.

Pavement Management with *"Good Roads Cost Less"* Preservation Strategies



Source: Utah DOT

The mantra, "Right Road, Right Treatment, at the Right Time" was promoted from 1995–2005 to address these issues. Extensive training by the asphalt and concrete pavement industries and by the Federal Highway Administration (FHWA) at the time helped eliminate many of the construction issues and the improper uses for temporary fixes. While these practices were valuable to demonstrate the viability of preservation projects, they were project based and did not link to pavement management or other strategic processes.

This EDC-4 effort supports moving the preservation concept significantly forward. The focus today in transportation is on sustaining infrastructure through "whole-life" investments and quantifying the risks. Pavement preservation has a key role in managing pavements in these whole-life programs.

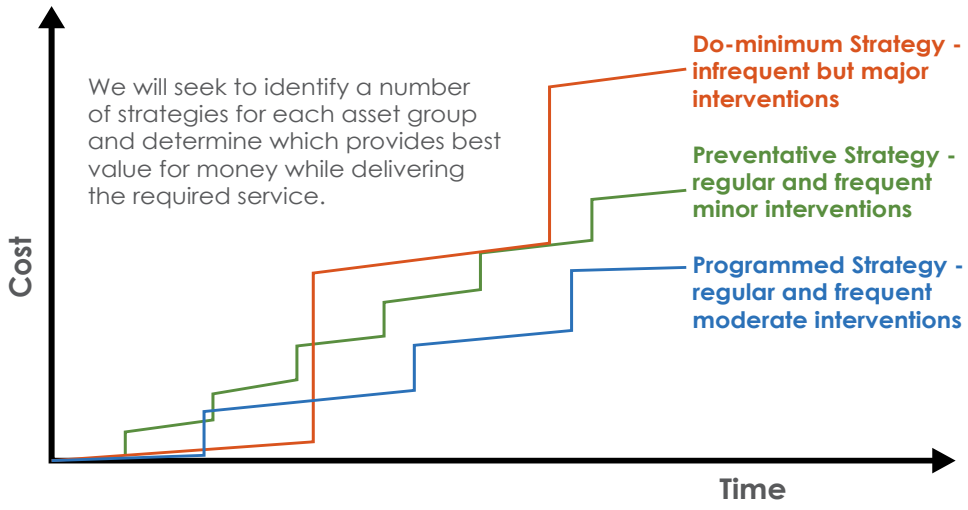
For example, a class of pavements with an expected life of 30 years will have several construct / operate / preserve / repair / restore alternatives and schedules over the expected lifecycle. Selection of a comprehensive strategy that includes preservation programs not only meets the performance expectations of the owners and users, but does so at a cost that is predictable and affordable. Making this evaluation a key part of pavement policy is an innovative approach to sustaining pavements in the future.

Under current federal statute on asset management (23 USC 119) and on performance management (23 USC 150), states are required to include consideration of pavement preservation as part of their long-term business practices that support federal funding. This consideration extends to evaluating the benefits and costs related to the lifecycle analysis for pavements. The EDC-4 pavement preservation team is focused on assisting state departments of transportation in this effort.

BENEFITS

- **Economy.** Whole-life planning for pavements defines expectations and risks for the long term and provides more stability to the cost of operating and maintaining highway pavements.
- **Performance.** Identifying preservation policies and strategies at the network level provides a cost-effective alternative for extending the performance period for pavements and reducing the need for frequent or unplanned reconstruction.
- **Sustainability.** A well-defined pavement strategy that includes preservation will aid in setting achievable performance targets.

Comparison of lifecycle cost for three alternative maintenance strategies



Source: Transport Scotland

PAVEMENT PRESERVATION: HOW

Pavements deteriorate as a result of many different forces, but the predominant factors affecting pavement performance are the vehicle loads and environmental elements they are exposed to over their lifetime. Today, most highway agencies accept that an effective pavement preservation program will slow down the rate of pavement deterioration, while also providing a safer, smoother ride to the traveling public. Pavement preservation programs based on the 3Rs—right treatment, right pavement, and right time—have been proven to extend pavement life while saving money.

One obstacle to successful pavement preservation is the impact that treatment failures can have on an entire program. Whether it is a failed patch, stone flying off a chip seal, or a microsurfacing that peels off because it did not set, even a single failure and the associated damages can set back an agency's program for many years. However, most early failures can be attributed to a breakdown in some part of the construction process, such as the materials, site preparation, or placement practices, and as such are avoidable.

What is Preservation?

Pavement Preservation includes work that is planned and performed to improve or sustain the condition of the transportation facility in a state of good repair. Preservation activities generally do not add capacity or structural value, but do restore the transportation facility's overall condition.

EDC-4 is promoting quality construction and materials practices that apply to both flexible and rigid pavements. For flexible pavements these include using improved specifications for thin asphalt surfacings such as chip seals, scrub seals, slurry seals, microsurfacing, and ultrathin bonded wearing courses; following improved construction practices; and using the right equipment to place these treatments. Rigid pavement strategies include the rapid retrofitting of dowel bars to reduce future faulting; the use of new, fast-setting partial- and full-depth patching materials to create a long-lasting

surface; advanced pavement removal techniques to accelerate patching construction times; and advancements in diamond grinding that contribute to smoother and quieter pavement surfaces with enhanced friction.

Far too often, the past response to a construction failure has been to introduce bans or moratoriums on using treatments that have otherwise been proven effective. By following the best practices for materials selection and construction practices, pavement preservation will be less disruptive and safer while also eliminating much of the "fix-the-fix" problems endemic to many conventional pavement repair and rehabilitation techniques. Improved construction practices and the associated reduction in construction-related failures allow agencies to continue to use treatments that are proven to be effective, enabling them to realize the benefits of these techniques.

STATE OF THE PRACTICE

The past 20 years have seen significant advancements in the quality of the materials used in preservation, as well as technological advancements in equipment and construction methods, but early failures persist, and they are often attributed to poor construction practices.

A focus on improved construction of pavement preservation highlights innovations in treatment materials, construction practices, improved specifications, better equipment, and a greater

emphasis on construction quality, all of which lead to longer lasting preservation treatments. Properly constructed pavement preservation projects on flexible pavements using chip seals, microsurfacing and slurry seals, and ultrathin bonded wearing courses have allowed agencies to cover more miles of pavements more rapidly and with greater assurance of success. Similarly, successful preservation projects on rigid pavements, using techniques such as dowel bar retrofits, patching, and diamond grinding, have been demonstrated to add years of service life to pavements.

Highway agencies, industry and the FHWA have partnered in deploying the materials and methods needed to advance the *how* aspect of pavement preservation. They have identified effective approaches that are implementation-ready and have been used in all regions of the United States. Some of these include:

- the North Carolina Department of Transportation's chip seal specifications and construction practices
- the Kentucky Transportation Cabinet's slurry and microsurfacing specifications and construction practices
- the Clinton County, Iowa, portland cement concrete full panel replacement specifications and construction practices

BENEFITS

- **Safety.** The treatments are typically installed in shorter work zones and during off-peak hours, reducing the likelihood of work zone incidents. Improved skid resistance is a key functional benefit of preservation.
- **Performance.** Successful construction practices contribute to improved pavement performance, providing smoother and safer roads and delaying the need for time-consuming and costly rehabilitation.
- **Flexibility.** Retaining a mix of successful treatments in the preservation toolbox provides agencies greater flexibility in placing the right treatment on the right pavement at the right time.
- **Savings.** Improved performance and fewer failures keep a pavement network in a state of good repair at a lower cost.

RESOURCES

EDC-4 Pavement Preservation (When, Where, and How): https://www.fhwa.dot. gov/innovation/everydaycounts/edc_4/pavement.cfm

EDC-4 Pavement Preservation (When and Where): http://www.fhwa.dot.gov/asset/

EDC-4 Pavement Preservation (How): https://www.fhwa.dot.gov/preservation/

For additional information, please contact:

Pavement Preservation: When and Where

Thomas Van
FHWA Office of Infrastructure
202-366-1341
Thomas.Van@dot.gov

Steve Gaj
FHWA Office of Infrastructure
202-366-1336
Stephen.Gaj@dot.gov

Pavement Preservation: How

Bryan Cawley
FHWA Office of Infrastructure
202-366-1333
Bryan.Cawley@dot.gov

James Gray
FHWA Office of Infrastructure
517-702-1834
James.Gray@dot.gov

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts (EDC), a State-based initiative of FHWA's *Center for Accelerating Innovation*, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery.