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## Federal-aid Program Overview

### Concrete Pavement (PCCP) Preservation

[www.fhwa.dot.gov/federal-aidessentials](http://www.fhwa.dot.gov/federal-aidessentials)

*Preservation techniques to extend concrete pavement life.*



With shrinking budgets, increasing traffic volumes and loads, and the focus on sustainability, the need has never been greater for engineered strategies to preserve and maintain the nation's concrete pavement. Numerous national studies overwhelmingly conclude that compared to conventional overlay treatments, a long-term strategy of applying timely and appropriate preventative maintenance treatments maintains good pavement conditions for longer periods of time.



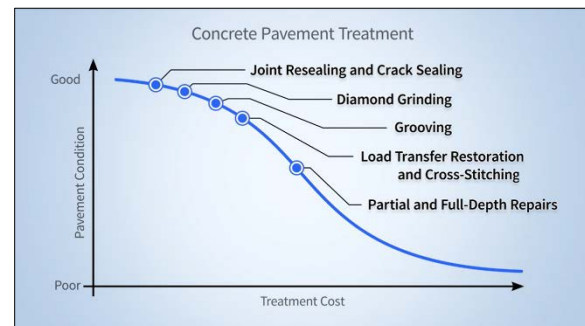
With a large part of an agency's budget going to pavement maintenance, transportation professionals must ask themselves:

- What preventative maintenance treatments can be used on concrete pavement?
- When are we applying them?
- How effective are our efforts in maintaining pavement condition as well

as minimizing costly and disruptive rehabilitation and reconstruction activities? And

- What does your agency do when it encounters cracking, joint deficiencies, surface defects, or other distresses, such as water bleeding and pumping?

While the most effective preservation treatment depends on local conditions—such as traffic, weather patterns, pavement materials, and the community's perceptions and expectations of a smooth ride—there are five commonly used concrete pavement treatments.

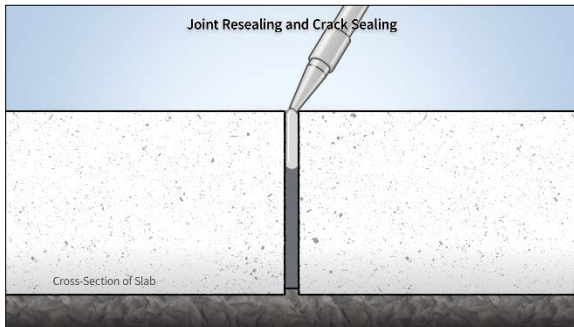


In order of worsening pavement condition and the cost of the treatment, they are:

- Joint resealing and crack sealing,
- Diamond grinding,
- Grooving,

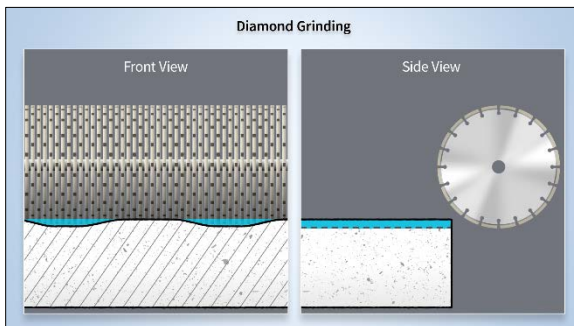
- Load-transfer restoration and cross stitching, and
- Partial and full-depth repairs

Let's review each treatment and then see how one local agency applied these treatments on a maintenance project.

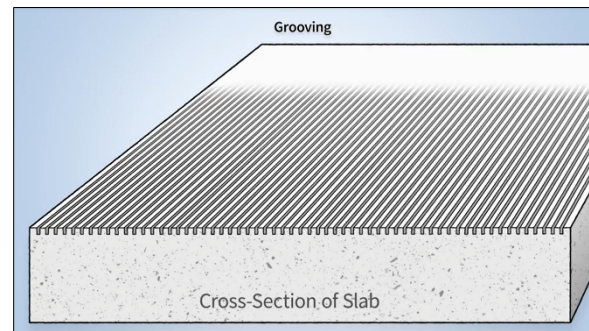


Let's begin with joint resealing and crack sealing. When water and incompressible materials enter joints and cracks that are not sealed, the joints fill with debris and can cause corner breaks, spalling, faulting, substantial slab movements, and problems for the whole pavement structure.

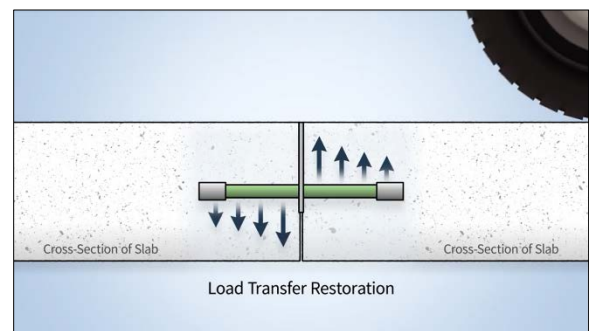
When a sealant, typically made from either modified asphalt or a silicone compound, is placed in joints and cracks, it prevents water and debris from entering. Limiting water infiltration protects the underlying pavement layers and reduces the detrimental effects of cycles of freeze and thaw and subgrade softening. The greatest benefit of joint sealing is realized when the pavement is not severely deteriorated.



Rough road surfaces from slab faulting or wheel path rutting increase vehicle operating costs, diminishes safety, and may lead to expensive slab repairs in the future — especially where water is present. Diamond grinding can address these conditions. Diamond grinding removes a thin layer of concrete—typically a quarter inch—to restore smoothness and enhance tire to surface friction.

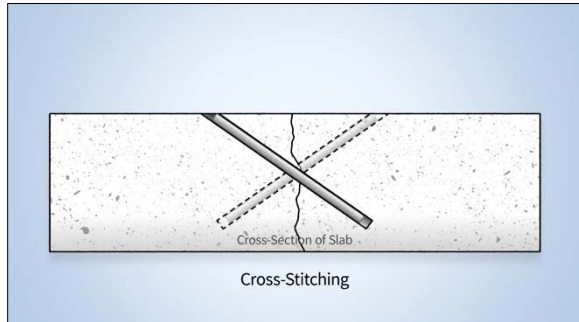


Poor friction characteristics increases hydroplaning and related accidents. To improve friction characteristics, grooving creates narrow, discrete grooves in the pavement surface to remove water from the contact surface.



Repeated heavy loads on roads can cause a reduction of load-transfer efficiency between pavement slabs, resulting in spalling, faulting, and slab cracking. Load transfer restoration and cross stitching are two treatments proven to delay further deterioration of the concrete. Load transfer restoration reinforces joints or cracks with a dowel bar or other load-transfer device; whereas cross stitching prevents crack

movement by locking two pieces of pavement together. Load-transfer restoration and cross stitching is most cost effective for larger projects with numerous cracks since this is highly specialized work.

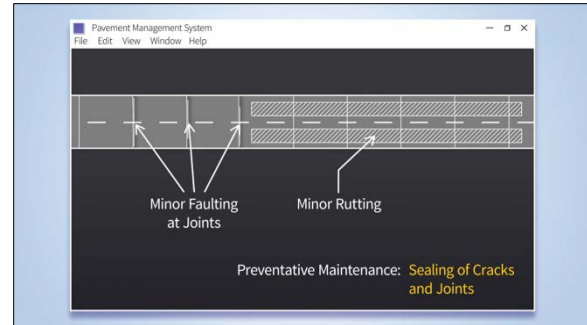


Where existing load-transfer devices are still functional but spalling and surface deterioration exist in the upper third of the slab, partial-depth repairs may be used. When applying this treatment, look for repair and bonding material based on overall effectiveness, cost, and the speed in which the materials cure so traffic can resume as quickly as possible.



In cases where deterioration exists below the upper third of the slab, agencies may elect to perform a full-depth repair or slab replacement. While the timely and appropriate application of this treatment can extend pavement performance beyond ten years, it is costly.

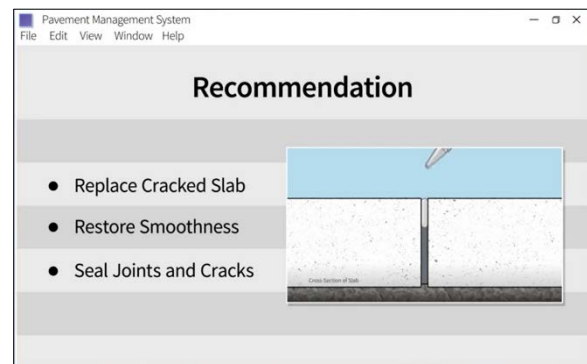
Now let's see how one county applied some of these concrete pavement treatments to three miles of a distressed concrete arterial roadway.



At the start of the project, the project engineer reviewed the road data compiled over the past several years in the County's pavement management system.

On one mile of pavement, he discovered the county had not applied any preventative treatments over the last 40 years, and 5 percent of the segments had extensive cracking and had minor faulting.

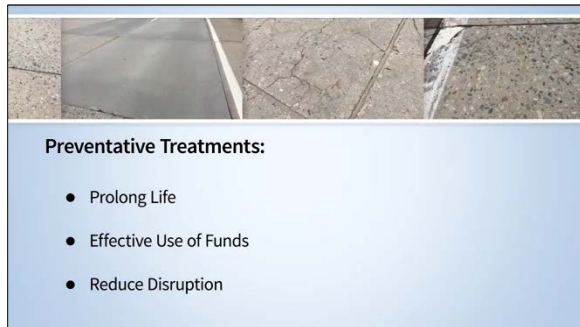
The remaining two miles were newer, and the county had sealed cracks and joints regularly. That section was in good shape structurally but had minor slab faulting and rutting of the surface.



The engineer evaluated preservation treatment options using the observed distresses and the available budget. He concluded that the life of the pavement could be extended for 7 to 10 years without substantial maintenance if:

- The slabs identified with extensive cracking were removed and replaced.

- Diamond grinding was used to restore smoothness, and
- All joints and cracks were sealed



As the example illustrates, treatments do not have to be mutually exclusive and are often combined in a preservation project. Such preventative treatments can

- Prolong the life of concrete pavement,
- Make effective use of available funding, and
- Reduce the frequency of costly and disruptive rehabilitation and reconstruction projects.



Agencies must make cost-effective decisions and spend limited budgets wisely. An effective preservation program helps achieve that goal but relies on the agency selecting the right treatment at the right time for the specific pavement condition. If some of the techniques highlighted here—crack and joint sealing, diamond grinding and grooving, load transfer and cross stitching, and partial and full-depth repairs—are not in your agency’s tool box, look for additional information on how those treatments have helped other agencies effectively manage their pavement network.

### Additional Resources

- FHWA Policy Guidance Center page has technical information and guidance materials for Pavement Preservation.  
<https://www.fhwa.dot.gov/pgc/index.cfm?ddisc=52&dsub=1014>
- The FHWA published PCCP Preservation Guide book published in September 2014.  
<https://www.fhwa.dot.gov/pavement/concrete/pubs/hif14004.pdf>
- A report with case studies of PCCP repair techniques compiled by the Missouri DOT in 2017 showing examples of application of multiple preservation methods for PCC Pavements.  
<https://library.modot.mo.gov/RDT/reports/TR201618/cmr17-013.pdf>
- See this FHWA Center for Accelerating Innovation (CAI) webpage for details of preservation techniques.  
[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_4/pavement.cfm](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/pavement.cfm)
- This pavement management guidance document provides the necessary tools, procedures and practices for network-level pavement condition data collection.  
[https://www.fhwa.dot.gov/pavement/management/qm/data\\_qm\\_guide.pdf](https://www.fhwa.dot.gov/pavement/management/qm/data_qm_guide.pdf)
- This website of the Foundation for Pavement Preservation provides a toolbox with links to research reports and details for the wide variety of preservation techniques.  
<http://fp2.org/preservation-toolbox/>
- Promotional brochure from FHWA effort to clarify when, where, and how of pavement preservation that can be distributed to stakeholders and management.  
[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_4/factsheet/pavement\\_preservation.pdf](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/factsheet/pavement_preservation.pdf)

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This Companion Resource is the script content for the video production of the same name.