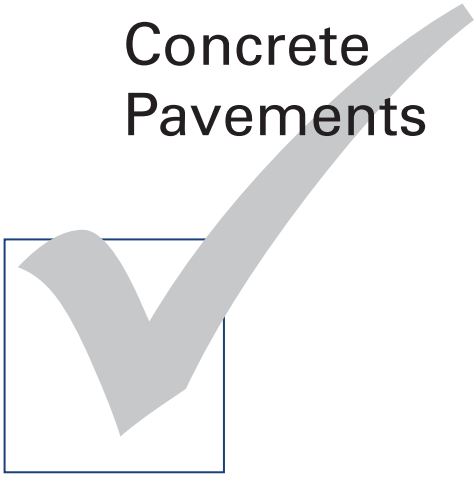
Pavement Preservation
Checklist Series

22

Cross-Stitching for Portland Cement Concrete Pavements



U.S. Department of Transportation
Federal Highway Administration

Cross-Stitching for Portland Cement Concrete Pavements Checklist

This checklist is one in a series created to guide State and local highway preservation/maintenance and inspection staff on the use of innovative pavement preservation techniques.

FHWA uses its partnerships with different pavement preservation organizations including American Association of State Highway and Transportation Officials, and State and local transportation agencies to promote pavement preservation.

To obtain other checklists or to find out more about pavement preservation, contact your local FHWA division office or check the following FHWA Web page:

www.fhwa.dot.gov/pavement/preservation/resources.cfm

Other valuable resources on pavement preservation:

- www.acpa.org
- www.cement.org
- www.cptechcenter.org
- www.igga.net

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Preliminary Responsibilities

Document Review

- ☐ Bid/project specifications and design
- ☐ Special provisions
- ☐ Agency application requirements
- ☐ Traffic control plan
- ☐ Manufacturer's installation instructions for epoxy material
- ☐ Material safety data sheets
- ☐ See resources

Project Review

- ☐ Verify that pavement conditions have not significantly changed since the project was designed.
- ☐ Check estimated quantities for cross-stitching.
- ☐ Verify actual pavement thickness and compare plans layout against industry recommendations.

Materials Checks

- ☐ Verify that repair materials meet specification requirements.
- ☐ Verify repair materials are being obtained from an approved source or listed on the agency Qualified Products List (if required).
- ☐ Verify that repair material components have been sampled, tested, and approved prior to installation as required by contract documents (if required).
- ☐ Verify that material packaging is not damaged (e.g., packages leaking, torn, or pierced), preventing proper use.
- ☐ Verify that tie bars meet specification requirements: size, strength, and coating (typically, ¾ in. diameter).
- ☐ Verify that tie bars are properly coated with epoxy (or other approved material) and free of any minor surface damage in accordance with contract documents.
- ☐ Verify that all required materials are on-hand in sufficient quantities to complete the project.
- ☐ Ensure that all material certifications required by contract documents have been provided to the agency prior to construction.
- ☐ Ensure epoxy materials for tie bar insertion have not exceeded their shelf life.

Equipment Inspections

Drilling Equipment for Tie Bar Installation

- ☐ Verify that vacuum equipment, if used in conjunction with drilling operations to remove dust, is functioning properly. Ensure Occupational Safety and Health Administration (OSHA) requirements are being met for worker safety during drilling operations.
- ☐ Verify that an appropriate fixture or system is in place to correctly align the drill holes at the designated angle, size, and depth.
- ☐ Ensure proper drill bit size is used to allow tie bar and epoxy placement (typically, maximum of ⅜ in. greater than tie bar size, with ¼ in. greater more common).
- ☐ Correctly set up hydraulic drills should be used to minimize damage to the pavement.

Equipment for Cleaning Drill Holes

- ☐ Verify that air compressors have sufficient pressure and volume to adequately remove all dust and debris from drill holes.
- ☐ Verify the airstream contains no water or oil prior to use by passing the stream over a board and examining for contaminants.

Epoxy Installation

- ☐ Ensure epoxy injection equipment is in proper working order and has sufficient capacity to provide the required volume of material.

Weather Requirements

- ☐ Review manufacturer's installation instructions for requirements specific to the epoxy injection material.
- ☐ Ensure air and surface temperature meet agency requirements (typically 40°F and rising).

Traffic Control

- ☐ Verify that signs and devices conform to the traffic control plan presented in the contract documents.
- ☐ Verify that the setup complies with the *Manual on Uniform Traffic Control Devices (*MUTCD).
- ☐ Verify that flaggers are trained/qualified according to contract documents and agency requirements.
- ☐ Verify that unsafe conditions, if any, are reported to a supervisor.
- ☐ Ensure that traffic is not opened to the repaired pavement until the epoxy injection material has attained the specified strength or curing time as required by contract documents.
- ☐ Verify that signs are removed or covered when they are no longer needed.

Project Inspection Responsibilities

Drilling Holes for Tie Bars

- ☐ Verify that plans layout is appropriate for the thickness of existing pavement and traffic conditions.
- ☐ Verify that drill holes are marked out according to project plans, ensuring correct spacing and offset to crack or joint. Offsets should be at right angles to joint or crack, and typically spaced 20 to 30 in. apart.
- ☐ Ensure the drill fixture or system maintains the correct drill depth and angle, and does not punch through the bottom of the pavement. Drilling is typically accomplished at a 35° to 45° angle.
- ☐ Verify that OSHA air quality requirements are maintained during drilling operations.
- ☐ Verify that drills holes are the correct size for tie bar and epoxy placement. (Note: Design charts allow for the bar to be 1 in. from the top and bottom of the slab).
- ☐ Verify that no transverse joints or cracks are being cross-stitched. (Note: These should have dowel-bar retrofit [DBR] repairs.)

Placement of Tie Bars and Epoxy

- ☐ Verify that air blasting is utilized to clean drill holes. A second air blasting may be required immediately before placement of tie bars if holes are left open and become dirty or wet.
- ☐ Verify the correct tie bar lengths and diameter are used.
- ☐ Verify tie bars have appropriate epoxy coating thickness, and it is undamaged or satisfactorily repaired.
- ☐ Ensure correct amount of epoxy is placed in the drill holes to fill the cavity once tie bars are inserted.
- ☐ Ensure installed tie bar remains below pavement surface and epoxy is flush with surface. (Note: This may require additional epoxy at the surface.)

Optional Crack Sealing

- ☐ Use crack chasing saw to create reservoir for sealant if required by contract documents.
- ☐ Abrasive blast crack, if required, to prepare for sealant.
- ☐ Crack seal with required sealant.

Cleanup Responsibilities

- ☐ Verify that all loose debris is removed from the pavement surface and disposed of in accordance with contract documents.
- ☐ Verify that epoxy placement equipment is properly cleaned for the next use.

Common Problems and Solutions

(Problem: Solution)

Drill Hole Layout Does Not Match Plans:

- ☐ Stop work immediately and install correct layout.

Drill Hole Locations Do Not Match Contractor Layout:

- ☐ Stop work immediately and install according to layout.

Drills Wandering on Pavement Surface:

- ☐ Ensure fixture is appropriate for installation conditions.
- ☐ It may be necessary to install a starter hole vertically to provide a starting point for the fixture drill.

Drill Holes Are Not the Correct Diameter to Allow Proper Epoxy Movement and Tie Bar Embedment:

- ☐ Stop immediately and install correct size drill bit.

Drill Breaks through the Bottom of the Slab:

- ☐ Verify actual pavement thickness, check angle and depth requirements, and then adjust to prevent breaking out the bottom of the slab.

Coating on Tie Bar Is Damaged:

- ☐ Repair using manufacturer's approved coating.

Tie Bar Extends Above Pavement Surface:

- ☐ Remove immediately before epoxy sets, redrill hole to proper size, and install new tie bar.
- ☐ If epoxy has set, tie bar must be cut to shorten it. Repair surface with epoxy.

Epoxy Not Setting Properly:

- ☐ Consult manufacturer's recommendation.
- ☐ Verify shelf and pot life, and install according to requirements.

Web-Based Training

- NHI-134207D Proper Construction Techniques for Dowel Bar Retrofit and Cross-Stitching

Sources

Information in this checklist is based on or refers to the following sources:

Concrete Pavement Preservation Guide, Second Edition. Pub. No. FHWA-HIF-14-004. 2014. Ames, IA: Iowa State University, National Concrete Pavement Technology Center. Available at https://intrans.iastate.edu/app/uploads/2018/08/preservation_guide_2nd_ed_508_final.pdf.

Darter, M. 2017. *Concrete Repair Best Practices: A Series of Case Studies / Cross-Stitching Tech Brief*. Missouri Department of Transportation, Jefferson City, MO.

Manual on Uniform Traffic Control Devices. 2009, Revised May 2012. Washington, DC: Federal Highway Administration. Available at http://mutcd.fhwa.dot.gov.

Proper Construction Techniques for Dowel Bar Retrofit and Cross-Stitching, Web Based Training (WBT). NHI-134207D. Washington, DC: Federal Highway Administration, National Highway Institute.

For more information on the Pavement Preservation Checklist Series, contact:

Construction Management Team, HICP-30
Office of Preconstruction, Construction, and Pavements
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www.fhwa.dot.gov/pavement/preservation

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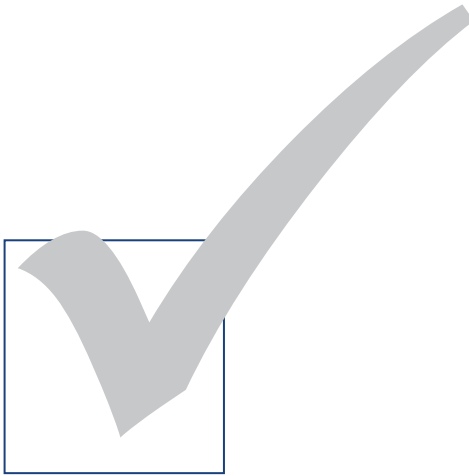

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