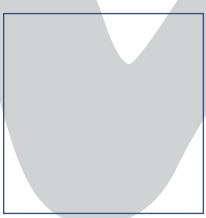
Pavement Preservation

Checklist Series

9 Partial-Depth Repair of Portland Cement Concrete Pavements



FP2

U.S. Department of Transportation

Federal Highway Administration

Partial-Depth Repair of Portland Cement Concrete Pavements Checklist

This checklist is one of a series created to guide State and local highway maintenance and inspection staff in the use of innovative pavement preventive maintenance processes. The series is provided through the joint efforts of the Pavement Preservation Program of the Federal Highway Administration (FHWA) and the Foundation for Pavement Preservation (FP^2).

FHWA uses its partnerships with FP^2, the 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 FP^2 (at www.fp2.org), and check into these Web pages:

www.fhwa.dot.gov/preservation

www.fhwa.dot.gov/infrastructure/asstmgmt/resource.htm

Partial-Depth Repair of Portland Cement Concrete Pavements Checklist

Preliminary Responsibilities

Document Review

- ❑ Bid/project specifications and design
- ❑ Special provisions
- ❑ Agency application requirements
- ❑ Traffic control plan
- ❑ Manufacturers' installation instructions
- ❑ Material safety data sheets

Project Review

- ❑ Verify that pavement conditions have not significantly changed since the project was designed and that partial-depth repair is appropriate for the pavement.
- ❑ Verify that the estimated number of partial-depth repairs agrees with the number specified in the contract.
- ❑ Agree on quantities to be placed, but allow flexibility if additional deterioration is found below the surface.

- ❑ Note that some partial-depth repairs may become full-depth repairs if deterioration extends below the top third of the slab (see Checklist No. 10, Full-Depth Repair of Portland Cement Concrete Pavements).

Materials Checks

- ❑ Verify that patch material is of the correct type and meets specifications.
- ❑ Verify that patch material is obtained from an approved source or is listed on agency Qualified Products List as required by the contract documents.
- ❑ Verify that patch material has been sampled and tested prior to installation as required by the contract documents.
- ❑ Verify that additional or extender aggregates have been properly produced and meet requirements of contract documents.
- ❑ Verify that material packaging is not damaged so as to prevent proper use (for example, packages are not leaking, torn, or pierced).
- ❑ Verify that bonding agent (if required) meets specifications.
- ❑ Verify that curing compound (if required) meets specifications.

- ❑ Verify that joint/crack re-forming material (compressible insert) meets specifications (typically polystyrene foam board, 12 mm [1/2 in.] thick).
- ❑ Verify that joint-sealant material meets specifications.
- ❑ Verify that sufficient quantities of materials are on hand for completion of the project.

Equipment Inspections

Concrete Removal Equipment

- ❑ Verify that concrete saws are of sufficient weight and horsepower to adequately cut the existing concrete pavement to the depth required along the patch boundaries as required by the contract documents.
- ❑ Verify that concrete saws and blades are in good working order.
- ❑ Verify that pavement milling machines are power-operated, self-propelled, cold-milling machines capable of removing concrete as required by the contract documents.
- ❑ Verify that milling machines used for concrete removal are equipped with a device that allows them to stop at pre-set depths to prevent removal of more than the top third of the slab and to prevent damage to embedded steel.
- ❑ Verify that the maximum rated weight of removal jackhammers is 14 kg (31 lb).

Patch Area Cleaning Equipment

- ❑ Verify that the sand-blaster unit is adjusted for correct sand rate and that it is equipped with and using properly functioning oil/moisture traps.
- ❑ Verify that air compressors have sufficient pressure and volume capabilities to clean patch area adequately in accordance with contract specifications.
- ❑ Verify that air compressors are equipped with oil and using properly functioning oil and moisture filters/traps. This can be accomplished by passing the airstream over a board, then examining the board for contaminants.
- ❑ Verify that the volume and pressure of the water-blasting equipment (if necessary) meets the specifications.

Mixing and Testing Equipment

- ❑ Verify that auger flights and paddles within auger-type mixing equipment are kept free of material buildup that can result in inefficient mixing operations.
- ❑ Ensure that volumetric mixing equipment such as mobile mixers are kept in good condition and are calibrated on a regular basis to properly proportion mixes.
- ❑ Verify that the concrete testing technician meets the requirements of the contract documents for training/certification.

- ❑ Ensure that material test equipment required by the specifications are all available on-site and in proper working condition (equipment typically includes slump cone, pressure-type air meter, cylinder molds and lids, rod, mallet, ruler, and 3 m [10 ft] straightedge).

Placing and Finishing Equipment

- ❑ Verify that a sufficient number of concrete vibrators 25 mm (1 in.) in diameter or less are available on-site and in proper working condition.
- ❑ Verify that all floats and screeds are straight, free of defects, and capable of producing the desired finish.

Other Equipment

- ❑ Ensure that a steel chain, rod, or hammer is available on-site to check for unsound concrete around the patch area.
- ❑ Verify that grout-application brushes (if necessary) are available.

Weather Requirements

- ❑ Review manufacturers' installation instructions for requirements specific to the patch material being used.
- ❑ Ensure that air and surface temperature meet manufacturer and contract requirements (typically 4 °C [40 °F] and rising) for concrete placement.
- ❑ Ensure that patching does not proceed if rain is imminent.

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Traffic Control

- ❑ Verify that signs and devices match the traffic control plan presented in the contract documents.
- ❑ Verify that the set-up complies with the Federal *Manual on Uniform Traffic Control Devices* or local agency traffic control procedures.
- ❑ Ensure that traffic control personnel are trained/qualified in accordance with contract documents/agency requirements.
- ❑ Ensure that the repaired pavement is not opened to traffic until the patch material meets strength requirements presented in the contract documents.
- ❑ Verify that signs are removed or covered when they are no longer needed.
- ❑ *Ensure that any unsafe conditions are reported to a supervisor (contractor or agency).*

Project Inspection Responsibilities

Patch Removal and Cleaning

- ❑ Ensure that the area surrounding the patch is checked for delamination and unsound concrete using a steel chain, rod, or hammer.
- ❑ Ensure that the boundaries of unsound concrete area(s) are marked at least 50 mm (2 in.) beyond the area of deterioration.

- ❑ Verify that concrete is removed by either (a) sawcutting the boundaries and jackhammering the interior concrete or (b) using a cold-milling machine.
- ❑ Verify that concrete removal extends at least 50 mm (2 in.) in depth and does not extend below one-third of the slab depth, and that load transfer devices are not exposed.
- ❑ Verify that, after concrete removal, the patch area is prepared by sandblasting or waterblasting.
- ❑ Verify that the patch area is cleaned by airblasting. A second airblasting may be required immediately before placement of patch material if patches are left exposed for a period of time.

Patch Preparation

- ❑ Ensure that compressible joint inserts (joint/crack re-formers) are inserted into existing cracks/joints in accordance with contract documents. Joint inserts are typically required to extend below and outside the patch area by 12 mm (1/2 in.).
- ❑ When a patch abuts a bituminous shoulder, ensure that a wooden form is used to prevent patch material from entering the shoulder joint.

- ❑ Ensure that bonding agent (epoxy- or cement-based) is placed on clean, prepared surface of existing concrete immediately prior to placement of patch material as required by the contract documents. If bonding agent shows any sign of drying before patch material is placed, it must be removed by sandblasting, cleaned with compressed air, and re-applied.
- ❑ Verify that cement-based bonding agents are applied using a wire brush; epoxy-based bonding agents are applied using a soft brush.

Placing, Finishing, and Curing Patch Material

- ❑ Verify that quantities of patch material being mixed are relatively small to prevent material from setting prematurely.
- ❑ Verify that the fresh concrete is properly consolidated using several vertical penetrations of the surface with a hand-held vibrator.
- ❑ Verify that the surface of the concrete patch is level with the adjacent slab using a straightedge in accordance with contract documents. Note: To prevent pulling material away from the patch boundaries, work material from the center of the patch outward toward the boundary.
- ❑ Verify that the surface of the fresh patch material is finished and textured to match the adjacent surface.

- ❑ Verify that the perimeter of the patch and saw-cut runouts (if saws are used) are sealed using grout material. Alternatively, saw-cut runouts can be sealed using joint-sealant material.
- ❑ Verify that adequate curing compound is applied to the surface of the finished and textured, fresh patch material in accordance with contract documents.
- ❑ Ensure that insulation blankets are used when ambient temperatures are expected to fall below 4 °C (40 °F). Maintain blanket cover until concrete attains the strength required in the contract documents.

Resealing Joints and Cracks

- ❑ Verify that the compressible inserts are sawed out to the dimensions specified in the contract documents when the patch material has attained sufficient strength to support concrete saws.
- ❑ Verify that joints are cleaned and resealed according to contract documents.

Cleanup Responsibilities

- ❑ Verify that all concrete pieces and loose debris are removed from the pavement surface and disposed of in accordance with contract documents.
- ❑ Verify that mixing, placement, and finishing equipment is properly cleaned for the next use.

Common Problems and Solutions

(Problem: Solution)

- **More deterioration below surface than is evident above:**
  1. Extend limits of repair area into sound concrete.
  2. If deterioration extends below one-third of the depth, do a full-depth repair.
- **Dowel bar or reinforcing steel is exposed during concrete removal:**
  1. If steel is in the upper third of slab, remove the steel to the edges of the patch and continue.
  2. If removal extends to mid-depth of the slab, do a full-depth repair.
- **Patch material flows into joint or crack:**
  1. Ensure joint insert extends far enough into the adjacent joint/crack and below the patch.
  2. Ensure insert is correctly sized for joint/crack width.

- **Patch cracking or unbonding:**
  1. Check that joint insert is being used properly.
  2. Ensure that the insert is correctly sized for the joint/crack width and that it has been inserted correctly.
  3. Check that patch area was cleaned immediately prior to grouting/concrete placement.
  4. Check that grout material has not dried out before concrete placement.
  5. Ensure that curing compound has been applied adequately.
  6. Check that patch material is not susceptible to shrinkage.

Sources

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

- ❑ "Guidelines for Partial-Depth Spall Repair," *Concrete Paving Technology.* 1998. Pub. No. TB003P. Skokie, IL: American Concrete Pavement Association. Available at www.pavement.com.
- ❑ *Innovative Materials and Equipment for Pavement Surface Repairs, Volume I: Summary of Material Performance and Experimental Plans.* 1991. Pub. No. SHRP-91-504. Washington, DC: Strategic Highway Research Program, National Research Council.
- ❑ *Manual on Uniform Traffic Control Devices.* 2003. Washington, DC: Federal Highway Administration. Available at http://mutcd.fhwa.dot.gov.
- ❑ *Materials and Procedures for Rapid Repair of Partial-Depth Spalls in Concrete Pavements, Manual of Practice.* 1999. Pub. No. FHWA-RD-99-152. Washington, DC: Federal Highway Administration. Available at www.fhwa.dot.gov/pavement/ltpp or www.tfhrc.gov/pavement/ltpp/pdf/99152a.pdf and 99152b.pdf.
- ❑ *Portland Cement Concrete (PCC) Partial-Depth Spall Repair, Tech Brief.* 1999. Pub. No. FHWA-RD-99-177. Washington, DC: Federal Highway Administration. Available at www.fhwa.dot.gov/pavement/ltpp/tbriefs.cfm.

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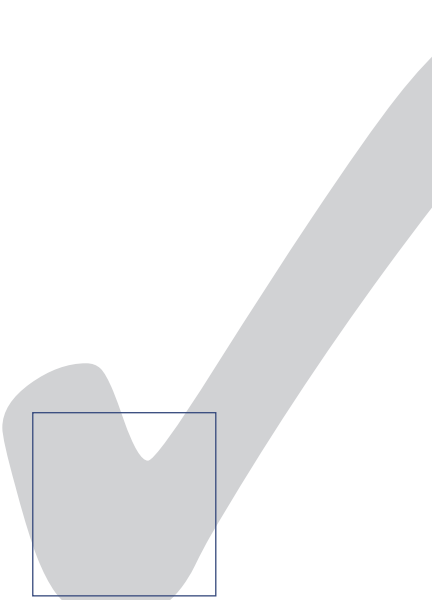

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