Pavement Preservation
Checklist Series

6 Joint Sealing Portland Cement Concrete Pavements

FP2

U.S. Department of Transportation
Federal Highway Administration

Joint Sealing Portland Cement Concrete Pavements

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.

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www.fhwa.dot.gov/preservation

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

Joint Sealing Portland Cement Concrete Pavements Checklist

Preliminary Responsibilities

Document Review

- ❑ Bid/Project specifications and design
- ❑ Special provisions
- ❑ Traffic control plan
- ❑ Manufacturer's sealant installation instructions
- ❑ Agency application requirements
- ❑ Sealant material safety data sheet

Project Review

- ❑ Review joint condition to verify that the specified joint size is appropriate.
- ❑ Verify that pavement conditions have not significantly changed since the project was designed and that joint sealing is appropriate for the pavement.
- ❑ Joint design and sealant type are appropriate for the project climate and conditions.
- ❑ Joint cutting and cleaning methods are appropriate.
- ❑ Methods to remove old sealant materials are appropriate.

Materials Checks

- ❑ Correct sealant to meet specification requirements.
- ❑ Sealant is from an approved source or listed on agency qualified products list (if required).
- ❑ Sealant has been sampled and tested prior to installation (if required).
- ❑ Sealant packaging is not damaged in a way that will prevent proper use (boxes leaking, pail or drums dented or pierced).
- ❑ Primer, if used, meets specification requirements.
- ❑ Backer rod is of the proper size and type for hot- or cold-applied sealants.
- ❑ Chemically curing sealants are within shelf life.
- ❑ Sufficient quantities of all materials are available for completion of the project.

Equipment Inspections

Hot-Applied Sealant Melters

- ❑ For hot-applied sealants, an indirectly heated double boiler type melter with effective agitation is being used.
- ❑ Melters are in good working order with all heating, agitation, pumping systems, valves, thermostats, etc., functioning.
- ❑ Melter heating system is thermostatically controlled.
- ❑ Temperature gauges have been calibrated and checked for accuracy.
- ❑ Proper size wand tips for desired application are available.
- ❑ Melter is of sufficient size for the project.

Cold-Applied Sealant Pumps (Single- and Two-Component Materials)

- ❑ The pump is in proper working order.
- ❑ The follower plate(s) are in good shape and lubricated.
- ❑ Verify that two-component pump is delivering material at the correct ratio (per manufacturer's recommendations).
- ❑ Hoses are not plugged.
- ❑ For two-component pumps, an appropriate mixing head meeting manufacturer's requirements is available.

Joint Cleaning Equipment

- ❑ Abrasive cleaning unit is adjusted for correct abrasive feed rate and has oil and moisture trap.
- ❑ Abrasive cleaning uses environmentally acceptable abrasive media.
- ❑ Abrasive cleaning operators use appropriate air purification systems as required.
- ❑ Air compressors have sufficient pressure and volume to clean joints adequately and meet agency requirements.
- ❑ Air compressors are equipped with oil and moisture filters/traps that are properly functioning. Check the airstream for water or oil prior to use by passing the stream over a board and examining for contaminants.
- ❑ Joint plows (if used) are of correct size and configuration to remove required amount of old sealant without spalling joint edges.

- ❑ Concrete saws/blades are of sufficient size to adequately cut the required joint width and depth, and the saw is in good working order.
- ❑ Waterblasting equipment can supply the water volume and pressure required by specifications.
- ❑ Wire brush cleaners have brushes in good condition and are functioning properly.

Other Equipment

- ❑ Backer rod insertion tool is adjusted for correct installation depth and does not have sharp or jagged edges that could cut or abrade backer material.
- ❑ Brushes or sprayers for primer application (if used) are available.
- ❑ Tooling/Leveling devices for finishing the sealant to the required dimensions are available.
- ❑ Preformed sealant insertion devices function properly and insert seal strips without excessive stretching and to the correct recess.

Weather Requirements

- ❑ Review manufacturer installation instructions for requirements specific to sealant used.
- ❑ Air and/or surface temperature shall meet manufacturer and all agency requirements (typically 4 °C (40 °F) and rising) for sawing and sealing.
- ❑ Sealing shall not proceed if rain is imminent.
- ❑ Application does not begin if there is any sign of moisture on the surface or in the joint.

Traffic Control

- ❑ The signs and devices used match the traffic control plan.
- ❑ The setup complies with the Federal *Manual on Uniform Traffic Control Devices* (MUTCD) or local agency requirements.
- ❑ Flaggers do not hold traffic too long.
- ❑ Any unsafe conditions are reported to a supervisor.
- ❑ The sealed pavement is not opened to traffic until the sealant has adequately cooled or cured to not pick up on vehicle tires.
- ❑ Signs are removed or covered when they are no longer needed.

Project Inspection Responsibilities

Joint Preparation

- ❑ During cutting and cleaning operations, all safety mechanisms and guards on equipment are in place and functioning properly, and operators are using required personal protective equipment.
- ❑ Old sealant (if present) is removed from the joint.
- ❑ Concrete is allowed to cure for the specified time prior to sawing joints.
- ❑ Joint is sawn or refaced to produce a rectangular reservoir of the specified depth with cut vertical sides.
- ❑ After sawing, joints are flushed with high pressure water to remove all saw slurry and debris.
- ❑ Joint surfaces are cleaned using abrasive cleaning, waterblasting, or wire brushing.
- ❑ Abrasive cleaning is accomplished with the nozzle 25 to 50 mm (1 to 2 in) above the joint using two passes, each directed at one of the joint faces.
- ❑ Joint is blown clean with clean dry air.
- ❑ Primer, if used, is applied at the correct coverage rate and allowed to cure as required by the manufacturer.

- ❑ Inspect joints prior to sealing by rubbing your finger along the joint walls to insure that no contaminants (dust, dried saw residue, dirt, moisture, or oil) are on the joint walls. If dust or other contaminants are present, reclean joints to a satisfactory condition.
- ❑ Inspect joints for proper sealant geometry.

Backer Material Installation

- ❑ Backer material (rod) is installed after final joint cleaning and inspection for cleanliness, and just prior to sealant installation.
- ❑ Backer is inserted uniformly without stretching into the joint to the required depth to provide the specified sealant dimensions.
- ❑ Backer fits snugly in the joint with no gaps along the joint sides.
- ❑ Backer is not torn, abraded, ripped, or otherwise damaged during installation.

Sealant Installation

Hot-Applied Sealants

- ❑ Manufacturer's installation instructions are being followed.
- ❑ Melter heat transfer medium is heated to the correct temperature range.
- ❑ Sealant is heated to a minimum of the manufacturer's recommended pouring or application temperature, but the temperature shall not exceed the material's safe heating temperature.
- ❑ Sealant is continuously agitated to assure uniformity, except when adding additional material.

- ❑ Operator wears required personal protective equipment.
- ❑ If melter is equipped with a heated hose system, the hose is heated to operating temperature prior to beginning sealant application.
- ❑ If melter does not have a heated hose, verify that the hose is unplugged and clear prior to beginning application.
- ❑ If melter does not have a heated hose, sealant shall be recirculated through the hose to warm the hose prior to application. During idle periods, or if it is noted that sealant is cooling through the hose, sealant shall be recirculated through the hose back into the material vat to maintain hose temperature.
- ❑ Sealant temperature is checked periodically to assure proper temperatures.
- ❑ Melting vat should be kept at least one-third full to help maintain temperature uniformity.
- ❑ Joint is filled from the bottom up to the specified level to produce a uniform surface with no voids in the sealant.
- ❑ Detackifier or other blotter is applied to reduce tack prior to opening to traffic, if needed.
- ❑ Traffic is not allowed on project until sealant is tack-free or cooled.
- ❑ Verify adequate adhesion by pulling up several random sections of cooled sealant.

Cold-Applied Sealants (Single- and Two-Component)

- ❑ Joint is filled from the bottom up to the specified level to produce a uniform surface with no voids in the sealant.
- ❑ Verify correct ratio, mixing, and curing of two-component sealants using a test strip prior to beginning full-scale project sealing.
- ❑ Tool nonsag sealants to force the material against the sidewalls and to form a smooth surface at the specified recess from the surface.
- ❑ Sealant is permitted to cure to a tack-free condition prior to opening the pavement to traffic.
- ❑ Verify adequate adhesion by pulling up several random sections of cured sealant.

Preformed Sealants

- ❑ Manufacturer's installation instructions are being followed.
- ❑ Lubricant/Adhesive is installed as specified.
- ❑ Sealant size used is appropriate for the size of the finished joints.
- ❑ Sealant is installed in a manner that does not stretch the seal beyond specified requirements.
- ❑ Seal is installed to the required recess below surface level.

Cleanup Responsibilities

- ❑ Any excess sealant application or spills are removed.
- ❑ All loose debris from cleaning is removed from the pavement surface.
- ❑ Sealant containers or other miscellaneous debris are removed and disposed of properly.
- ❑ Melters and other application equipment are properly cleaned for the next use.

Opening the Pavement to Traffic

- ❑ The sealed pavement is not opened to traffic until the sealant has adequately cooled or cured to not pick up on vehicle tires.
- ❑ All construction-related signs are removed when opening pavement to normal traffic.

Common Problems and Solutions

(Problem: Solution)

- **Sealant not adhering to joint:**
  1. Joint not clean enough—reclean.
  2. Wet joint surfaces—allow to dry.
  3. Low sealant application temperature (hot applied sealants)—heat to correct temperature or verify temperature gauges.
  4. Cold ambient temperature—allow temperature to rise.
  5. Insufficient recess for cold-applied sealants, traffic, pulling sealant out—use correct recess for joint width.
  6. Concrete not cured sufficiently—allow concrete to further cure.
  7. Applying sealant at temperatures below the dew point—apply sealant when temperature warms to above the dew point.
- **Sealant pick-up or pull-out when opened to traffic:**
  1. Opened to traffic too soon after application—delay opening.
  2. High ambient temperature—seal in cooler temperatures.
  3. Excessive sealant application—apply flush with surface or with specified recess.

4. Sealant too soft for climate—use stiffer sealant.
5. Use a detackifier or blotter to reduce initial tack.
6. Overheated or underheated sealant—install at correct temperature. Verify temperature gauges on melter.
7. Sealant contaminated with solvent or heat transfer oil from tank leak.
8. Joint faces contaminated with old, incompatible sealant. May also cause bleeding—reclean joint to remove old sealant.
9. Preformed sealant installed too high in joint—use required recess.

❑ **Sealant gelling in melter:**

1. Overheated sealant—check melter temperature gauges.
2. Sealant reheated too many times—use fresh sealant.
3. Using sealant with short pot life—use sealant with longer pot life.

❑ **Sealant cracking or debonding in winter:**

1. Sealant too stiff—use sealant that is more extensible at low temperatures.
2. Poor cleaning during installation—improve cleaning.
3. Sealing during extreme hot summer temperatures when joints are at their narrowest—avoid sealing during extremely hot temperatures.
4. Joint too narrow for the movement experienced—use wider joints.

5. Joint spacing too long—use closer joint spacing.
6. Incorrect joint configuration, sealant installed too thick or too thin—use correct depth-to-width ratio.

- **Voids or bubbles in cured sealant:**
  1. High pavement temperature and moisture content when sealed—seal during cooler periods and allow Portland cement concrete to further dry or cure, or use nonsag type sealant to resist void formation.
  2. Outgassing of backer material—backer may be melting with hot applied sealants; use heat-resistant backer material and check for proper sealant temperature.
  3. Backer may be punctured during installation—install backer without damaging.
  4. Top-down sealing, which can trap air—apply sealant from bottom up.
  5. Air entering the sealant pumping lines—tighten all connections, or bleed off entrapped air.
  6. Moisture buildup on backer material due to being installed night before—replace backer material.
  7. Primer not properly cured prior to sealant application.

- **Sink holes in sealants:**
  1. Sealant flowing past gaps in backer material—use larger backer material, reapply (top off) sealant to correct level, or use nonsag sealant.
  2. Backer melting when using hot-applied sealants—use heat-resistant backer.
- **Cold-applied sealants not setting up:**
  1. Sealant has exceeded its shelf life—use fresh sealant.
  2. Incorrect proportioning or mixing of two-component sealant—use correct mix ratios and mixing systems.

Sources

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

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www.fhwa.dot.gov/preservation

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www.fp2.org

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