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Chip

Seal

Application



U.S. Department
of Transportation
**Federal Highway
Administration**

Chip Seal Application 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 (FP²).

FHWA uses its partnerships with FP², 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 FP² (at www.fp2.org), and check into these FHWA Web pages:

www.fhwa.dot.gov/preservation

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

Chip Seal Application Checklist

Preliminary Responsibilities

Project Review

- Is the project a good candidate for a chip seal?
- How much rutting is present?
- How much and what type of cracking exists?
- Is crack sealing needed?
- How much bleeding or flushing exists?
- Review project for bid/plan quantities.

Document Review

- Bid specifications
- Special provisions
- Construction manual
- Traffic control plan
- Agency requirements
- Manufacturer s instructions
- Material safety data sheets

Materials Checks

- The type of asphalt emulsions to be used is compatible with the aggregate.
- The asphalt is from an approved source (if required).
- The asphalt is sampled and submitted for testing (if required).
- All aggregate chips are close to the same size.
- The aggregate is clean and free of excess fines.
- The asphalt application temperature range is specified.

Preapplication Inspection Responsibilities

Surface Preparation

- The surface is clean and dry.
- All pavement distresses have been repaired.
- The existing surface has been inspected for drainage problems.

Equipment Inspections

Distributor

- The spray bar is at the proper height.
- All nozzles are uniformly angled 15° to 30° from the spray bar.
- All nozzles are free of clogs.
- The spray pattern has been checked for uniformity and proper overlap (double or triple).
- The application pressure has been checked.
- The distributor's application calibration has been checked.

Chip Spreader

- Each gate control and setting has been checked.
- The scalping screen is in good condition.
- The chip spreader's calibration across the entire chipper head has been checked.
- The truck hookup hitches have been checked.

Haul Trucks

- The truck box is clean and free of debris and other materials.
- The truck hookup hitch is in working order.
- If required, a truck box apron or extension for loading the chip spreader is in place.

Rollers

- The type of roller to be used has been selected (pneumatic-tired roller recommended).
- The roller tire size, rating, and pressure comply with the manufacturer's recommendations.
- The tire pressure is the same on all tires.
- All tires have a smooth surface.

Broom

- The bristles are the proper length.
- The broom can be adjusted vertically to avoid excess pressure.

All Equipment

- All equipment is free of leaks.
- All equipment is calibrated and clean.

Weather Requirements

- The agency has a range of dates when chip sealing can be done.
- Air and surface temperatures have been checked at the coolest location on the project.
- Air and surface temperatures meet agency requirements.
- Application of asphalt does not begin if rain is likely.
- High winds can create problems with asphalt application.
- High temperatures, humidity, and wind will affect how long the asphalt/emulsion takes to break.

Determining Application Rates

- Agency guidelines and requirements are followed.
- A chip seal design has been done.
- More asphalt is applied to dried-out and porous surfaces.
- More asphalt is applied on roads with low traffic volumes.
- Less asphalt is applied to smooth, nonporous, and asphalt-rich surfaces.
- Less asphalt is applied on roads with high traffic volumes.
- There is a salt and pepper appearance after the aggregate has been applied.

Checking Application Rates

Asphalt - Method A

(RECOMMENDED FOR CALIBRATION)

- Record the weight of a .84 m² (1 yd²) pan or nonwoven geotextile material.
- Place the pan or geotextile on the road surface.
- Have the distributor apply asphalt over the pan or geotextile.
- Record the weight of the pan and asphalt or the geotextile and asphalt.
- Subtract the two weights to obtain the weight of the applied asphalt.

Asphalt – Method B

(RECOMMENDED FOR RANDOM CHECKS)

- Park the distributor on level ground, measure the asphalt, and recover the number of L (gal) area of asphalt (note: not a conversion).
- Measure off a known area for a test section.
- Have the distributor apply asphalt to the test section.
- Park the distributor on level ground and remeasure and record the L (gal) of asphalt.
- Subtract the two numbers to obtain the L (gal) of asphalt applied.
- Divide the L (gal) applied by the area covered by asphalt. The result equals the application rate: L/m² (gal/yd²). (If using feet, length x width/9 = yd².)

Aggregate – Method A

(RECOMMENDED FOR CALIBRATION)

- Weigh a .84 m² (1 yd²) tarp or geotextile material.
- Place the tarp or geotextile on the roadway.
- Have the chip spreader apply the aggregate over the tarp or geotextile.
- Weigh the tarp or the geotextile material with the aggregate.
- Subtract the two weights to obtain the weight of the aggregate.
- Divide the weight of the aggregate by .84 m² (1 yd²) to determine the application rate.

Aggregate – Method B

(RECOMMENDED FOR RANDOM CHECKS)

- Weigh a haul truck empty.
- Load the haul truck with aggregate and reweigh the truck.
- Subtract the two weights to obtain the weight of the aggregate.
- Empty all the aggregate into the chip spreader.
- Have the chip spreader apply all the aggregate from the weighed truck.
- Measure the length and width of the aggregate spread and calculate the area (if using feet, length x width/9 = yd²).
- Divide the weight of the chips by the area of spread to determine the actual application rate (kg/m² or lb/yd²).

Traffic Control

- The signs and devices used match the traffic control plan.
- The setup complies with local agency regulations or the *Federal Manual on Uniform Traffic Control Devices* (MUTCD).
- Flaggers do not hold the traffic for extended periods of time.
- The pilot car leads traffic slowly 40 kph (24 mph) or less over fresh seals.
- Signs are removed or covered when they no longer apply.
- Any unsafe conditions are reported to a supervisor.*

Project Inspection Responsibilities

Asphalt Application

- Building paper is used to start and stop asphalt application for straight edges.
- The asphalt temperature is within the required application range.
- The application looks uniform.
- A check is made for plugged nozzles.
- A check is made for drilling or streaking.
- Random checks of application rates are performed.
- The distributor speed is adjusted to match the chip spreader speed to prevent stop-start operations.
- The distributor is stopped if any problems are observed.

Aggregate Application

- Enough trucks are on hand to keep a steady supply of aggregate for the spreader.
- The application starts and stops with neat, straight edges.
- The application starts and stops on building paper.
- The chip spreader follows closely 30 m (33 yd) or less behind the distributor when an emulsion is used.
- The spreader travels slowly enough to prevent chips from rolling when they hit the surface.
- The aggregate is in a surface-damp condition.
- No asphalt is on top of the chips.
- The application is stopped as soon as any problems are detected.
- The application appears uniform.
- The aggregate has a salt and pepper appearance.
- The percentage of aggregate embedment in the asphalt is checked and the asphalt or aggregate application rate adjusted if required.
- A check is made for streaks and plug-ups.

Truck Operation

- Trucks are staggered across the fresh seal coat to avoid driving over the same area.
- Trucks travel slowly on the fresh seal coat.
- Stops and turns are made gradually.
- Truck operators avoid driving over exposed asphalt.
- Trucks stagger their wheel paths when backing into the chip spreader to help eliminate aggregate rollover and to aid in rolling.

Rolling

- The rollers follow closely behind the chip spreader.
- The rollers first pass is on the meetline.
- The rollers travel slowly speeds are kept at 8 kph (5 mph) maximum.
- Rollers must avoid driving on exposed asphalt.
- All stops, starts, and turns are made gradually.
- The entire surface is rolled twice.

Longitudinal Joints

- The meetline is only as wide as the spray from the end nozzle about 20 cm (8 in).
- The distributor lines up so that the end nozzle sprays the meetline.
- The meetlines are not made in the wheel paths.
- The meetlines are made at the center of the road, center of a lane, or edge of a lane.
- The meetlines are not left uncovered overnight.

Method A

- Leave a 15–20 cm (6–8 in) strip of asphalt exposed when applying the aggregate.
- Apply asphalt to the strip on the next distributor's pass.
- Apply aggregate to the asphalt.

Method B

- Turn the end nozzle 90°.
- Apply asphalt and aggregate the full width of the binder.
- Repeat the process on subsequent passes.

Transverse Joints

- All asphalt applications begin and end on building paper.
- All aggregate applications begin and end on building paper.
- The building paper is disposed of properly.

Brooming

- Brooming begins as soon as possible.
- Brooming does not dislodge the aggregate.
- Brooming does not begin until a sufficient bond is formed between the aggregate and the asphalt. Check the asphalt manufacturer's recommendation or refer to agency requirements.
- Consider using a flush truck to place water on the surface before brooming to reduce dust problems.

Opening the Chip Seal to Traffic

- The traffic travels slowly 40 kph (25 mph) or less over the fresh seal coat until it is broomed and opened for normal traffic.
- Reduced speed limit signs are used when pilot cars are not used.
- After brooming, pavement markings are placed before opening pavement to normal traffic.
- All construction-related signs are removed when opening pavement to normal traffic.

Cleanup Responsibilities

- All loose aggregate from brooming is removed from the travelway.
- Excessive asphalt application and spills are removed.

Common Problems and Solutions

(Problem: Solution)

- ❑ **Aggregate embedment over 80 percent:** Consider lowering the asphalt application rate.
- ❑ **Aggregate embedment less than 50 percent:** Consider raising the asphalt application rate.
- ❑ **Lots of chips with small amounts of asphalt on them:** Consider lowering the aggregate application rate.
- ❑ **Excessive asphalt splattering:** The spray pressure is too high.
- ❑ **Streaking or drill marks in asphalt:**
 1. Asphalt is too cold.
 2. Viscosity of the asphalt is too high.
 3. All the nozzles are not at the same angle.
 4. Spray bar is too high.
 5. Spray bar is too low.
 6. Spray bar pressure is too high.
 7. Nozzle is plugged.
- ❑ **Exposed aggregate remains after aggregate application:** Chip spreader gate may be clogged or malfunctioning.
- ❑ **Excessive aggregate:** Spreader gate may be malfunctioning or chipper head may be overloaded.

- ❑ **Uneven aggregate application:** Recalibrate the chip spreader; gates may not all be set the same.
- ❑ **Asphalt on top of the aggregate:**
 1. Chip spreader may be operating too fast.
 2. Truck, roller, or pilot car may be operating incorrectly.
- ❑ **Chips being dislodged:**
 1. Asphalt application rate is too low.
 2. Aggregate is dirty or dusty.
 3. Traffic or equipment speeds are too high.
 4. Brooming has been started before the asphalt is properly set.
- ❑ **Asphalt bleeding or flushing:** Asphalt application rate is too high.
- ❑ **Loss of aggregate at meetlines after brooming:** Check meetline procedures.

Sources

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

Manual on Uniform Traffic Control Devices, Millennium Edition. 2000. Washington, DC: Federal Highway Administration.

An Overview of Surface Rehabilitation Techniques for Asphalt Pavements. Pub. No. FHWA-PD-92-008. 1992. Washington, DC: Federal Highway Administration.

Thin-Surfaced Pavements, Synthesis of User Practices, NCHRP Synthesis 260. 1998. Washington, DC: Transportation Research Board, National Cooperative Highway Research Program.

For more information about pavement preservation, visit these Web sites:

www.fhwa.dot.gov/preservation

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

www.fp2.org

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

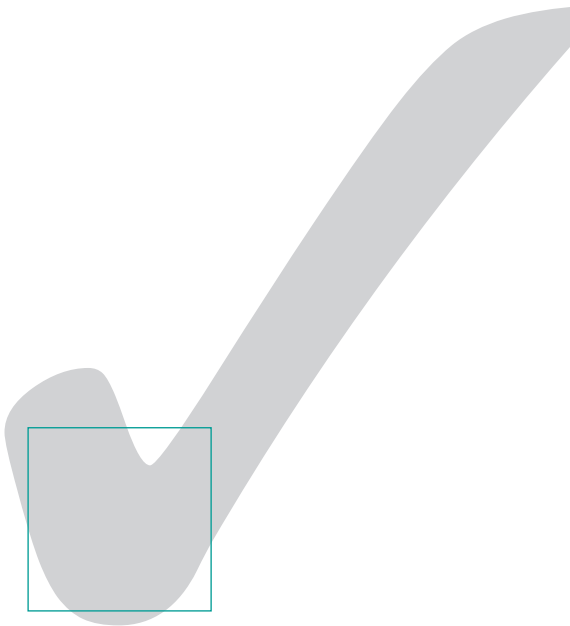
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