

**Pavement Preservation
Checklist Series**

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Fog Seal



U.S. Department of Transportation
Federal Highway Administration

Fog Seal 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.roadresource.org
- www.fp2.org
- www.tsp2pavement.pavementpreservation.org

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Preliminary Responsibilities

Document Review

- Project specifications
- Special provision
- Traffic control plan
- Agency application requirements
- Emulsion specifications
- Safety data sheets
- Applicable Occupational Safety and Health Administration (OSHA) safety requirements
- Certification requirements
- Contractor quality control (QC) plan

Project Review

- Verify that the project is a good candidate for fog sealing.
 - Assess the existing pavement surface condition and determine the surface absorption.
 - Do not place a fog seal if bleeding or flushing exists.
- Examine the pavement for aggregate loss.
- Review project plans, specifications, and estimated quantities.
- Determine whether the treatment is cost-effective.

Material Checks

- Determine if additives (e.g., rejuvenating oils, polymers) are blended in the asphalt emulsion.
- The recommended dilution rate is one part of asphalt emulsion and one part processed water. A diluted emulsion is never less than 28% residual asphalt content.
- The diluted asphalt emulsion is from an approved source.
- The diluted asphalt emulsion is sampled and submitted for testing (if required).
- The diluted asphalt emulsion temperature is within application temperature specifications.
- Asphalt emulsions should only be diluted by the manufacturer, NEVER by the contractor.
- Sand blotters, if required for a post treatment, are clean, dry, and within the gradation specification.
- Manufactured sand (a byproduct of crushed stone) should be used rather than natural sand.

Pre-Application Inspection Responsibilities

Pavement Surface Preparation

- The surface has been swept clean immediately prior to fog seal application and is free of dirt, silt, and vegetation.
- All pavement distresses have been repaired.
- Review the existing surface for possible overspray by working irrigation systems during construction. Inspect the pavement for existing drainage issues from stormwater.

Equipment Inspections

All Equipment

- All equipment meets manufacturer's standards.
- All equipment is free of any fluid leaks.
- All equipment is clean and properly calibrated.

Sweeper

- Sweepers shall meet applicable U.S. Environmental Protection Agency standards.
- Bristles are the proper length.

Distributor

- All nozzles are uniformly angled 15° to 30° from the spray bar.
- All nozzles are sized for fog seal applications and are free of clogs.
- The spray bar is at the proper height and the spray pattern has been checked for uniformity and triple overlap coverage.
- The spray bar has been checked for constant pressure along the entire length.
- The distributor's application calibration has been checked.
- The thermometer for measuring temperatures of the asphalt emulsion in the tank has been checked for accuracy.
- There is a working and calibrated thermometer on site.
- The ground speed computerized application control has been checked for providing a uniform application rate at different speeds.

Sand Spreader

- The gate(s) control and setting has been checked.
- Sand is free flowing.

Weather Requirements

- Air and surface temperatures have been checked at the coolest location on the project.
- Air and surface temperature is 59°F and rising unless warranted by agency requirements.
- High winds can create problems with the diluted emulsion application. Work should be avoided when wind speeds exceed 20 mph.
- Air and pavement surface temperatures, humidity, and wind will affect how long the emulsion takes to break.
- The fog seal application does not begin if rain is likely.

Determining Application Rates

- Agency specifications and standards are followed.
- More fog seal can be applied to dried-out and porous surfaces.
- Do not apply fog seal to smooth, nonporous, and asphalt-rich surfaces.
- Estimating an application rate is accomplished by filling a 1 quart graduated container with diluted emulsion and pouring it evenly over an approximate area of 1 yd².
 - If the diluted emulsion is not absorbed into the surface after 2–3 minutes, decrease the amount and apply to a new 1 yd² area. Repeat the trials until the approximate application rate is found.

- If the surface looks like it will absorb more diluted emulsion, increase the amount and apply over a new 1 yd² area. Repeat trials until the approximate application rate is found.
- Always establish a test section to check the application rate and absorption over a larger surface area.
- If the application rate is in question, it is best to error with a light application.

Checking Application Rates

Diluted Asphalt Emulsion—Method A (RECOMMENDED FOR CALIBRATION)

- Record the weight of a 1 yd² pan or nonwoven geotextile material.
- Place the pan or geotextile on the road surface.
- Have the distributor apply diluted emulsion over the pan or geotextile.
- Record the weight of the pan or geotextile and diluted emulsion.
- Subtract the two weights to obtain the weight of the diluted emulsion applied.
- Divide the net weight in pounds by the weight per gallon to determine the application rate per square yard.
- To check application across the bar, repeat above procedure.

Diluted Asphalt Emulsion—Method B (RECOMMENDED FOR RANDOM CHECKS)

- Park the distributor on level ground, measure the diluted asphalt emulsion, and record the number of gallons of diluted emulsion (note: conversion for temperature is not necessary).
- Measure off a known area for a test section.
- Have the distributor apply diluted emulsion to the test section.
- Park the distributor on level ground and remeasure and record the gallons of diluted emulsion.
- Subtract the two numbers to obtain the gallons of diluted emulsion applied.
- Divide the gallons applied by the area covered by diluted emulsion. The result equals the application rate in gal/yd². (If using feet, there are 9 ft² per yd².)

Traffic Control

- Verify that traffic control conforms to plans and specifications and complies with the *Manual on Uniform Traffic Control Devices* (MUTCD).
- Verify that traffic control personnel are trained and qualified in accordance with contract documents and agency requirements.
- Any unsafe conditions are reported to a supervisor.

- Ensure that flaggers do not hold the traffic for extended periods of time. Long work zones need two-way communication between flaggers.
- The pilot car leads traffic slowly, 25 mph or less, through the work zone and until the fog seal can be opened to traffic.
- Signs are removed or covered when they no longer apply.

Project Inspection Responsibilities

Diluted Emulsion Application

- Kraft paper or roof felt is used to start and stop fog seal application for straight edges.
- Diluted emulsion is within the required application temperature range (never more than 122°F).
- Application appears uniform.
- Checks are made for drilling and streaking.
- Nozzles are checked for plugging.
- Random application rate checks are performed.
- The distributor is stopped if any problems are observed.

Blotter Sand Application (If Required)

- Application appears uniform.
- Application is stopped if any problems are detected.
- Checks are made for plug-ups.

Sweeping

- Sweeping is performed prior to the fog seal application.
- Sweeping may be required after blotter sand is applied.
- Sweeping of excess blotter sand should be light and done once.

Opening to Traffic

- The road should not be opened to traffic until the surface is cured and adequate friction is restored.
- The traffic should travel slowly, 25 mph or less, over the fog seal until a proper friction value is measured.
- Reduced speed limit signs are used when pilot cars are not used.
- After sweeping, temporary 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 blotter sand is removed by sweeping the roadway.
- Excessive diluted emulsion application or spills are removed.

Common Problems and Solutions

(Problem: Solution)

Excessive Splattering of the Emulsion:

- Emulsion has been diluted too much.
- Bar is incorrectly set.
- Spray pressure is too high.

Streaking or Drill Marks Are Appearing in the Emulsion:

- Emulsion is too cold.
- Viscosity of the emulsion is too high.
- All nozzles are not the same angle.
- Spray bar is too high.
- Spray bar is too low.
- Spray bar pressure is too high.
- Nozzle is plugged.

Emulsion Bleeding or Flushing Occurs:

- Emulsion application is too high.

Slick Surface after Application:

- Road surface is wet.
- Application rate is too high.
- Temperatures are too cold.

Surface Remains Tacky:

- Road was not properly swept and is too dusty.
- Application rate is too high.
- Temperatures are too hot.

Sources

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

Asphalt Emulsion Handbook, Manual Series No. 4. 2000. Lexington, KY: The Asphalt Institute.

Basic Asphalt Emulsion Manual Fourth Edition, MS-19. 1999. Lexington, KY: The Asphalt Institute.

Fog Seal Guidelines. 2003. Sacramento, CA: State of California Department of Transportation.

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

Transportation Research Synthesis 1602 Alternatives to Seal Coats. 2016. St. Paul, MN: Minnesota Department of Transportation, Local Road Research Board.

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

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and Pavements
Federal Highway Administration
U.S. Department of Transportation
www.fhwa.dot.gov/pavement/preservation

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