

Suggested Field Considerations

The following field considerations are a guide through the important aspects of performing a fog-sealing project. There are several items that should be considered in order to promote a successful job outcome. Thorough answers to these questions should be determined, as required, before, during, and after application of fog seal. The appropriate staff to do this will vary by job type and size. Some topics may need attention from several staff members. The intent is not to form a report but to bring attention to important aspects and components of the project process.

Note that some specifications described in the following content may not be the same as the specifications followed by your agency. Always check with your State agency's standards and specifications when using these guidelines.

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Preliminary Responsibilities

Project Review

- Is the project a good candidate for a fog seal?
- What is the existing surface type?

- Has an assessment been made of the surface absorption?
- How much stone has been lost?
- How much bleeding or flushing exists?
- Review project for bid/plan quantities.
- What is the relative cost?

Document Review

- Bid specifications
- Special provisions
- Emulsion specifications
- Traffic control plan (TCP)
- Material safety data sheets

Materials Checks

- Is the type and dilution rate of the emulsion selection correct?
- Is the emulsion from an approved source (if required)?
- Has the emulsion been sampled and submitted for testing (if required)?
- Is the water to be used compatible with the emulsion?
- Is sand required? Is it dry and within specification?
- Is the emulsion temperature within application temperature specification?

Pre-seal Inspection Responsibilities

Surface Preparation

- Is the surface clean and dry?
- Have all pavement distresses been repaired?
- Has the existing surface been inspected for drainage problems?

Equipment Inspection Responsibilities

Broom

- Are the bristles the proper length?
- Can the broom be adjusted vertically to avoid excess pressure on the surface?

 Distributor

- Is the spray bar at the proper height?
- Are all nozzles uniformly angled at 15 to 30 degrees from the spray bar axis?
- Are all nozzles free of clogs?
- Is the spray pattern uniform and does it properly overlap (double or triple)?
- Is the application pressure correct?
- Is the distributor properly calibrated?
- Is there a working and calibrated thermometer on site?
- Has water been added to emulsion in correct proportion and circulated?
- Is the application rate being monitored throughout the day/project?

 Sand Spreader

- Do the spreader gates function properly and are their settings correct?
- Is the sand spreader's calibration uniform across the entire head?
- Is the sand free flowing?
- Are the truck hook-up hitches in good condition?

 Trucks

- Is the truck box clean and free of debris and other materials?
- Is the truck hook-up hitch in working order?
- Is a truck box apron or extension required for loading the sand spreader?

 All Equipment

- Is all equipment free of leaks?

- Is all equipment calibrated and clean?

Site Considerations

Traffic Control

- Do the signs and devices used match the traffic control plan?
- Does the work zone comply with the agency's traffic control policies as laid out in the agency's traffic control requirements?
- Are flaggers holding the traffic for reasonable periods of time?
- Does the pilot car lead traffic slowly—25 mph or less—over fresh sand blotted fog seals? If not sanded, allow at least 2 hours before opening to traffic.
- Are unsafe conditions promptly reported to a supervisor (contractor or agency)?
- Are signs removed or covered when they no longer apply?

Weather Requirements

- Are surface and air temperatures above minimum requirements?
- Are air and surface temperatures checked at the coolest location on the project?
- Do air and surface temperatures meet agency requirements?
- Are high winds expected during application of the fog seal? High winds can create problems with the diluted emulsion application.
- Will the expected weather conditions delay the breaking of the emulsion? High temperatures, humidity, and wind will effect how long the emulsion takes to break.
- Is the application of the fog seal discontinued if rain is likely?

Binder Considerations

Binder Application

- Are the agency guidelines and requirements being followed?
- Has a check been done on the absorption ability of the surface?
- Is the surface oxidized and porous? More oil can be applied to dried-out and porous surfaces.
- Is the surface smooth, non-porous, or bleeding (asphalt rich)? Do not apply to smooth, non-porous, and asphalt-rich surfaces.
- Is the traffic volume on the road high? Less oil must be applied on roads with high traffic volumes.
- Does the emulsion soak into the surface? If not, application rate is too high.
- Is the surface texture coarse? If so, spray should be applied in both directions to avoid build up on one side of stones.
- Are manhole covers and drainage inlets covered to keep binder from entering water bodies?

Checking Application Rates

Binder – Method A (Recommended for Calibration)

- Record the weight of a 1yd² carpet, pan or, non-woven geotextile material and place on the road surface.
- Use the distributor to apply emulsion over the carpet, pan, or geotextile material.
- Record the weight of the carpet and emulsion, pan and emulsion, or geotextile material.
- Subtract the weight of the carpet, pan, or geotextile material without emulsion from the weight of the carpet, pan, or geotextile material with emulsion.
- Convert the weights applied to the area of carpet (i.e., lb/yd²) to the units of the control mechanism, which is gal/yd², through knowledge of the specific gravity of the emulsion. If the distributor is not spraying the binder at the correct application rate, adjust the controls and repeat the process described above to achieve the correct application rate. (Although this is the responsibility of the contractor, the inspector should verify that the distributor is spraying the binder at the correct application rate.)

❑ Checking Application Rates

Binder – Method B (Recommended for Random Checks)

- Park the distributor on level ground and measure the number of gallons of emulsion.
- Measure off a known distance for a test section.
- Have the distributor apply diluted emulsion to the test section.
- Park the distributor on level ground and re-measure the number of gallons of emulsion remaining.
- Make necessary adjustments to volume based on temperature corrections per agency procedures.
- Subtract the number gallons after application from the original number of gallons to obtain the number of gallons applied.
- Divide the number of gallons applied by the number of square yards covered by emulsion to give the application rate in gal/yd².
- If the distributor is not spraying the binder at the correct application rate, make adjustments to the controls and repeat the process described above until the correct application rate is achieved. (Although this is the responsibility of the contractor, the inspector should verify that the distributor is spraying the binder at the correct application rate throughout the project.)

Binder Considerations: Example

❑ Example – Checking Fog Seal Application Rate (Method A)

Given:

- Applying a fog seal with a 1:1 diluted emulsion
- Tight surface texture
- Recommended application rate of 0.03–0.11 gal/yd²
- Specific gravity of emulsion (GE) = 1.010
- Unit weight of water (γ_W) = 62.4 lb/ft³
- Conversion factor (Cf1) = 7.5 gal/ft³

❑ Find the actual application rate (W_A).

- Measure the weight of a 1 yd² carpet (WC).
- (WC) = 4.0 lb
- Measure the weight of 1 yd² carpet and applied emulsion (WC+E).
- (WC+E) = 4.8 lb
- Calculate the weight of emulsion covering the 1 yd² carpet (WE).
- (WE) = (WC+E - WC)
- (WE) = 4.8 lb - 4.0 lb
- (WE) = 0.8 lb
- The application rate is the weight of emulsion applied per unit area (W_A).

$$(W_A) = \left(\frac{W_E}{1 \text{ yd}^2} \right)$$

$$(W_A) = \left(\frac{0.8 \text{ lb}}{1 \text{ yd}^2} \right)$$

$$(W_A) = 0.8 \frac{\text{lb}}{\text{yd}^2}$$

❑ Convert this application rate to gal/yd².

- Calculate the unit weight of the emulsion (γ_E) by multiplying the specific gravity of the emulsion (G_E) by the unit weight of water (γ_W).

$$(\gamma_E) = (G_E \times \gamma_W)$$

$$(\gamma_E) = \left(1.010 \times 62.4 \frac{lb}{ft^3} \right)$$

$$(\gamma_E) = 63.024 \frac{lb}{ft^3}$$

— Convert the unit weight of the emulsion (γ_E) to lb/gal (γ_{Ekg}) by dividing (γ_E) by ($Cf1$).

$$(\gamma_{Ekg}) = \left(\frac{\gamma_E}{Cf1} \right)$$

$$(\gamma_{Ekg}) = \left(\frac{63.024 \frac{lb}{ft^3}}{7.5 \frac{gal}{ft^3}} \right)$$

$$(\gamma_{Ekg}) = 8.4 \frac{lb}{gal}$$

— Convert (W_A) in lb/yd² to (W_A') in gal/yd² by dividing (W_A) by (γ_{Ekg}).

$$(W_A) = \left(\frac{W_E}{\gamma_{Ekg}} \right)$$

$$(W_A) = \left(\frac{0.8 \frac{lb}{yd^2}}{8.4 \frac{lb}{gal}} \right)$$

$$(W_A) = 0.095 \frac{gal}{yd^2}$$

- Check this value against the recommended application rates given in Table 1. For the given surface condition and dilution rate this application rate is acceptable.
- To convert:
 - l/m^2 to gal/yd^2 , multiply by 0.2209
 - g/cm^3 to lb/ft^3 , multiply by 62.428
 - kg/m^3 to lb/ft^3 , multiply by 0.0624
 - l/m^3 to gal/ft^3 , multiply by 0.0075

Project Inspection Responsibilities

Binder Application

- Is building paper used to start and stop emulsion application for straight edges?
- Is the emulsion temperature within the required application range?
- Does the application look uniform?
- Are any nozzles plugged?
- Is there streaking on the applied emulsion?
- Are application rates randomly checked?
- Is the speed of the distributor adjusted to match that of the sand spreader (if used) and to avoid start-and-stop operations?
- Is the distributor stopped if any problems are observed?

Truck Operation

- Are the trucks staggered across the fresh fog seal coat to avoid driving over the same area?
- Do the trucks travel slowly on the fresh seal?
- Are stops and turns made gradually?
- Do truck operators avoid driving over exposed oil?

Opening a Fog Seal to Traffic

- Are results from ASTM E 274 at least 0.30?

- Does traffic travel slowly 25 mph or less over the fresh seal until seal is broomed and opened to normal traffic? If not sanded, allow 2 hours before opening to traffic.
- Are reduced speed limit signs used when pilot cars are not used?
- Are pavement markings placed after brooming and before opening to normal traffic?
- Are all construction-related signs removed when opening to normal traffic?

Clean Up

- Is all loose (excess) sand from brooming operation removed from travel way?
- Are binder spills cleaned up?

Removal of Excess Binder from Surface

Sand Application

- Are enough aggregate trucks on hand to maintain a steady supply of sand to the spreader?
- Is clean, dry sand being used?
- Does the sand application appear uniform?
- Is sand used only once?

Brooming

- Does brooming begin as soon as possible after sand is applied?
- Is initial brooming done lightly with a rotary broom to distribute and set sand in surface?
- Is secondary brooming done to remove loose sand coated with excess binder?
- Is the brooming process repeated until results from ASTM E 274 are least 0.30?