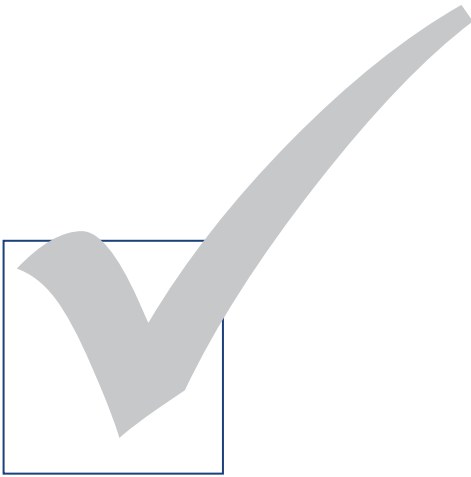
Pavement Preservation
Checklist Series

5 Microsurfacing



U.S. Department of Transportation
Federal Highway Administration

Microsurfacing 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 plans and specifications
- ☐ Project special provisions
- ☐ Traffic control plan
- ☐ Mix design information, including the following:
  1. Aggregate source with pit or quarry location
  2. Asphalt emulsion manufacturer with terminal source location
- ☐ International Slurry Surfacing Association (ISSA) *Inspector's Manual*
- ☐ Equipment manufacturer's calibration instructions
- ☐ 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 microsurfacing.
  - Determine the type, severity, extent of pavement cracks, if present. Determine whether a crack treatment is needed.
  - A structurally sound and well drained pavement is required for microsurfacing.
- ☐ Investigate whether any rutting exists on the pavement. Measure the depth and extent of the rutting and determine the cause of the rutting, if present.
- ☐ Determine the severity and extent of bleeding or flushing, if present.
- ☐ Investigate whether the pavement is raveling.
- ☐ Verify the traffic volume of the road.
- ☐ Based on the existing pavement condition, determine whether the treatment is cost-effective.

Materials Checks

- ☐ A full mix design has been done by an accredited laboratory.
- ☐ The polymer-modified asphalt emulsion is from an approved supplier.
- ☐ The polymer-modified asphalt emulsion is sampled and submitted for testing (if required).
- ☐ The aggregate is from an approved supplier.
- ☐ The aggregate is clean and free of deleterious materials.
- ☐ Verify the aggregate stockpile site is well drained and that stockpiles are not segregated.
- ☐ The aggregate stockpile is regularly sampled throughout the project, and the samples are submitted for testing.
- ☐ The aggregate is not overly wet. (The moisture content is typically between 2% and 5%.)
- ☐ The asphalt emulsion temperature is consistent throughout the job. Large variations in temperature may adversely impact the mixing and set time.
- ☐ Mineral filler is the same material as identified in the mix design.
- ☐ Water must be potable and free of reactive minerals (e.g., iron, soluble salts).
- ☐ Additives used to accelerate or retard the break must be included in the mix design.

Pre-Application Inspection Responsibilities

Pavement Surface Preparation

- ☐ Pavement repairs, including patching and crack treatments, were completed and have sufficiently cured.
- ☐ Grass and weeds have been destroyed by chemical herbicide and removed from the pavement prior to microsurfacing. Chemical herbicides need approximately one to two weeks to kill the vegetation.
- ☐ Extensive grease spots or oil saturated surfaces have been removed by washing or lightly grinding the pavement.
- ☐ Thermoplastic markings must be removed, leaving a textured surface.
- ☐ Raised pavement markers and paint markings with substantial paint buildup should be removed.
- ☐ Review the existing surface for possible overspray by lawn or field irrigation systems during construction. Inspect the pavement for existing drainage issues from stormwater.
- ☐ Check for low hanging tree limbs that may interfere with passage of the microsurface paver. Tree trimming may be necessary to ensure access of the application equipment.

- ☐ Utility structures and castings such as manhole covers and valve boxes have been covered with heavy (kraft) paper, plastic, or roofing felt. Bridge approach slabs and decks must be protected.
- ☐ The surface is dry and has been swept clean immediately prior to microsurfacing.
- ☐ A tack coat may be necessary when the pavement surface is dry, raveling, or is concrete.

Equipment Inspections

All Equipment

- ☐ All equipment is in good working order and functions as intended by the manufacturer.
- ☐ All equipment is free of any fluid leaks.
- ☐ All equipment is clean and free of unwanted materials and debris.

Sweepers

- ☐ Sweepers shall meet applicable U.S. Environmental Protection Agency standards.
- ☐ The bristles are the proper length.
- ☐ The sweeper can be adjusted vertically to exert the proper downforce on the bristles.
- ☐ The sweeper bristles should be made of nylon, fiber, or plastic (no metal).

Microsurfacing Paver

- ☐ The paver is fully functional and can accurately proportion and deliver materials through a pugmill.
- ☐ All paddles in the dual shaft pugmill are intact.
- ☐ The paver has been calibrated using the materials specified in the project mix design.

Spreader Box and Rut Box

- ☐ Microsurfacing full-width applications requires either an adjustable width spreader box or variable width spreader box. Rut filling operations require a specialized rut box.
- ☐ The spreader box and rut box are clean of excess accumulations of the asphalt mixture and the augers are in working order.
- ☐ The auger height must be adjustable to maintain the proper clearance to the road surface.
- ☐ Spreader box and rut box controls are in working order.
- ☐ Spreader box seals and strike-offs are clean and not worn.

Mobile Support Units for Continuous Run Pavers

- ☐ Mobile support units or feeder truck units are clean and functional.
- ☐ There are enough mobile support units to allow continuous running of microsurfacing paver.

Screening Equipment (Recommended)

- ☐ The screen mesh is properly sized to remove oversized aggregate.

Rollers (If Used)

- ☐ A 5 to 8 ton pneumatic-tired roller is recommended.
- ☐ The roller tire size, rating, and pressures comply with manufacturer's recommendations.
- ☐ Tire pressure is the same on all tires.
- ☐ All tires have a smooth surface.

Weather Requirements

- ☐ Follow the range of dates established by the agency when microsurfacing can be performed.
- ☐ Air and surface temperatures have been checked at the coolest location on the project.
- ☐ Verify that the air and surface temperatures are a minimum of 50°F and rising unless warranted by agency requirements.
- ☐ High temperatures, humidity, and wind could affect how quickly the microsurfacing breaks.
- ☐ Ensure that application of microsurfacing does not begin if rain is likely.
- ☐ Application does not begin if temperatures could be freezing within 48 hours.

Determining Application Rates

- ☐ The application rate and number of courses are to be specified by the agency.
- ☐ The application rates for rut filling and scratch courses should be calculated or estimated separately.

Calibration of Microsurfacing Paver

- ☐ Each paver machine has been calibrated using the aggregate and asphalt emulsion sources specified in the mix design.
- ☐ Calibrate the microsurfacing paver according to the manufacturer's instruction procedures.
- ☐ Calibration worksheets are to be completed during the calibration procedure and saved as essential documentation.
- ☐ Calibration of the asphalt emulsion pumps, the fines delivery system, and aggregate are always tied to the head pulley count. Each material is always calibrated separately.
- ☐ Ensure the aggregate moisture content is tested and accounted for in the calibration calculations.
- ☐ Document the name(s) of the person(s) conducting the equipment calibration.

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 situations are reported to a supervisor.
- ☐ Ensure that flaggers keep traffic off freshly placed microsurfacing.
- ☐ Long work zones on two-lane roads should have two-way communication between flaggers.
- ☐ Signs are removed or covered when they are no longer needed.

Project Inspection Responsibilities

Microsurfacing Application

- ☐ If required, ensure that a test strip of satisfactory quality has been placed before starting work.
- ☐ Verify material testing is being performed in accordance with the contractor's quality control plan.
- ☐ Confirm the field tests to be performed by the agency are consistent with the contract specifications.

- ☐ Ensure enough trucks are on hand to keep a steady supply of material for the microsurfacing paver.
- ☐ A rut box must be used to fill ruts deeper than ½ in. The rut box must be adjusted to crown the deepest portion of the rut ¼ in. for each 1 in. of rut to allow for traffic compaction.
- ☐ Completed rut filling should be open to traffic for at least 24 hours before applying the top course of microsurfacing.
- ☐ Address ruts less than ½ in. by placing a scratch course using a steel strike-off.
- ☐ A full-width top course of microsurfacing is applied over a rut filling or scratch course.
- ☐ Spreader box strike-offs are cleaned regularly.
- ☐ The finished surface is free of excessive drag marks due to oversize aggregate or dirty strike-offs on the spreader box. Any excessive drag marks must be corrected immediately.
- ☐ Verify that the surface texture is uniform, smooth, and does not exhibit a ripple pattern. Do not leave ripples greater than ⅛ in. measured by a 10 ft straight edge.
- ☐ Verify that the paver is traveling at the proper speed (no faster than a “brisk” walking pace).
- ☐ Areas inaccessible to the spreader box require handwork. Ensure that the mixture is not overworked during handwork, which may cause segregation.

- ☐ Verify that the consistency and application of the mix is uniform and does not float fines.
- ☐ The paver is stopped as soon as any problems are detected.
- ☐ The application starts and stops on heavy (kraft) paper, roofing felt, or a plastic sheet.
- ☐ Check the percent of asphalt in the mixture at least three times per day by randomly reading the paver counter readings.
- ☐ Yield checks should be performed by randomly reading the aggregate counter at least four times per day and measuring the distance between readings.

Longitudinal Joints

- ☐ All longitudinal joints on tangent sections are straight and on curves uniformly follow a consistent radius. Along curb and gutter sections a straight joint abuts the gutter.
- ☐ Pavement sections having significant superelevation will require the first application to begin along the lower (elevation) edge of the pavement and with adjacent applications made upslope until the entire width of the pavement is covered.
- ☐ The longitudinal joint is made at the center of the road or edge of a lane. Never construct longitudinal joints in the wheel paths.

- ☐ Longitudinal joints must have less than 3 in. overlap on adjacent passes and no more than ⅜ in. overlap thickness as measured with a 10 ft straight edge.
- ☐ The spreader box runners are adjusted so that the spreader box doesn't run on fresh mat.

Transverse Joints

- ☐ Verify that all paver starts and stops have neat transverse joints. Kraft paper, roofing felt, or a plastic sheet may be used to achieve neat transverse joints. The transverse joint must be less than ⅛ in. difference in elevation across the joint as measured with a 10 ft straight edge.
- ☐ The microsurfacing texture is consistent throughout the application.
- ☐ Excess mixture materials and underlying paper, felt, or plastic are properly disposed at all starts and stops.

Rolling (If Required)

- ☐ Rolling may be necessary only in special circumstances.
- ☐ The rolling does not begin until the mat is stable and the pavement is cool.
- ☐ Rolling begins at the downslope edge and proceeds upslope, taking care to roll the joint.
- ☐ Verify that the entire surface is rolled once.
- ☐ Ensure that the rollers travel slowly, not more than 5 mph.

Sweeping (If Required)

- ☐ Sweeping after microsurfacing may be necessary only in special circumstances.
- ☐ If sweeping is needed, it should begin after the microsurfacing has cured to the point it is considered adequate to be opened to vehicle traffic.
- ☐ Sweeping should not dislodge the aggregate or remove sections of the microsurfacing mixture.

Opening to Traffic

- ☐ The road can generally be reopened to traffic when the microsurface expels clean water and has cured sufficiently to resist damage from traffic. Straight rolling traffic can typically be returned within one hour depending on conditions.
- ☐ Working hours should be adjusted when placing microsurfacing at major intersections or high-traffic areas that cannot be taken out of service for relatively short periods of time.
- ☐ Blotter sand should be placed over fresh microsurfacing in traffic areas that cannot be taken out of service.
- ☐ Temporary pavement markings are placed before opening the pavement to normal traffic.
- ☐ All construction-related signs are removed when opening the pavement to normal traffic.

Cleanup Responsibilities

- ☐ The spreader box, seals, and strike-offs are cleaned at the end of each day or at any time the paver is shut down long enough to allow material to break. Cleaning avoids drag marks.
- ☐ All loose blotter sand is swept from the roadway each day.
- ☐ Material spills are removed from the site and disposed of in accordance with the contract documents.

Common Problems and Solutions

(Problem: Solution)

Drag Marks:

- ☐ Clean spreader box strike-offs and check aggregate supply for oversized stone.
- ☐ The application rate may be too low for the given gradation.

Flush Surface:

- ☐ Reduce water content and increase additive.
- ☐ Increase cement.
- ☐ Allow longer time before traffic.
- ☐ The application rate may be too high for the given gradation.

Uneven Surface—Washboarding:

- ☐ Assure the paver is not moving too fast.
- ☐ Spreader box is incorrectly set up and the skis are not running smoothly on the pavement.
- ☐ Viscosity of the mix is too high.
- ☐ Add extra additive or water.
- ☐ Mix is breaking too fast.
- ☐ Ambient temperature is too high.
- ☐ Use water sprays on front of spreader.
- ☐ Check strike-off material for compatibility with the application. Depending on the situation, a harder or softer strike-off may be needed.

Poor Joints:

- ☐ Too much water or not enough water at start-up.
- ☐ Runners of spreader box running on fresh microsurfacing—use water spray or let the mixture cure longer.
- ☐ Too much or not enough overlap may suggest an inexperienced line driver.

Excessive Raveling:

- ☐ Mix is breaking and curing too slowly.
- ☐ Make mix faster; add cement.
- ☐ The application rate is too low for the given gradation.
- ☐ The mixture is too dry.
- ☐ The wrong strike-off material is being used.

- ☐ Control traffic.
- ☐ Wait until cured before opening to traffic.
- ☐ Traffic or equipment speeds too high.
- ☐ Sweeping or trafficking before the emulsion is properly set.

Debonding:

- ☐ Ensure the existing pavement has been swept free of dust and debris.
- ☐ Material characteristics of the existing pavement surface is reducing or preventing bond.
- ☐ The equipment is leaking oil, hydraulic fluid, or spilling dry aggregate.
- ☐ Extensive grease spots or oil saturated surfaces has been cleaned with industrial detergents. For severe problems, acrylic seals are available for oil spot treatment.

Mixture Is Breaking Too Quickly:

- ☐ Temperature variations may require a change in the amount of additive used to control the break from the amount in the mix design.
- ☐ Keep the mixture in constant movement. The spreader box must be equipped with augers to keep the mix in motion.
- ☐ Allow the operator to control the mixture by adding additives to help slow the break.
- ☐ The aggregate has changed and is not consistent with the job mix formula.

Mixture is Breaking Too Slowly:

- ☐ Suspend operations until temperature is within the recommended application range. Never allow application outside of the recommended temperature range.
- ☐ In shaded areas, when possible, place the treatment early in the day to provide extra time to facilitate breaking and curing.
- ☐ The aggregate has changed and is not consistent with the job mix formula.

Unsatisfactory Surface Finish from Handwork:

- ☐ Try to time handwork for early in the day when cooler ambient and pavement temperatures allow extra time for the mixture to be worked before the set begins.
- ☐ Water should be sprayed on the surface first to be sure the material does not dehydrate during placement.
- ☐ When large areas require handwork, apply small amounts of material at a time and avoid segregation by not overworking the handwork area.
- ☐ Add a little more break time by using more additive. Do not add extra water in the mixture.

Depressions in the Wheel Path Shortly after Rut-Filling:

- ☐ If rutting appears before the top microsurfacing layer is applied, there may be too much asphalt in the mixture.
- ☐ Rutting that is irregular or less than ½ in. deep should use a full-width scratch coat. The maximum thickness of a scratch coat is 1 in.
- ☐ Wheel path ruts greater than ½ in. should be filled with a rut box. The rut box must crown the deepest portion of the rut ¼ in. for each 1 in. of rut to allow for traffic compaction. Ruts in excess of 1 in. require multiple placement passes with the rut box.

Tire Marks and Surface Abrasions (Scuffing):

- ☐ Roll the microsurfacing with a rubber-tired roller.
- ☐ Place the microsurface during the cooler weather.
- ☐ Broadcast sand on the new surface to break the bond. Avoid using light colored sand, which may discolor the microsurfacing.

Adhesion to Crack Sealants and Fillers:

- ☐ Before placing crack treatment, obtain crack treatment manufacturer's information about suitability as a microsurfacing pretreatment.
- ☐ Avoid overfilling cracks with sealant.
- ☐ Allow crack treatment sufficient time to cure prior to placing the microsurfacing. Sealant cure time can range from several weeks to several months.

Unexpected Rain:

- ☐ Always check weather radar to guard against unexpected rain.
- ☐ In the event that light rain has fallen on fresh microsurfacing a road closure is required until the pavement surface is dry and can be reopened to traffic.
- ☐ A heavy rain may wash the microsurfacing emulsion off the top of the aggregate. A road closure is required and the microsurfacing emulsion must be allowed to dry and set. Once set, sweep all loose aggregate off the pavement surface and reopen to traffic. A new microsurfacing can be placed over the remaining material.

False Break or False Slurry:

- ☐ Wet the surface with water to help keep pavement temperatures down. In severe cases, it may be necessary to work earlier in the day before the temperature elevates.
- ☐ Heavy applications of microsurfacing during hot weather may skim over causing water to be sealed inside the mat. Check the break time.
- ☐ Check calibration of placement machine and compliance of materials with the mix design and the job mix formula.
- ☐ Keep traffic off the surface.

Grade Flow:

- ☐ Partially compensate by diverting mixture to the higher part of the spreader box. This should only be attempted by an experienced operator.
- ☐ For an uphill application use a more fluid microsurfacing mixture. For a downhill application use a stiffer microsurfacing mixture.
- ☐ Check the spreader box auger clearance over the pavement to properly distribute the mixture.

Non-Uniform Appearance of the Finished Surface:

- ☐ Ensure that the placement machine has been properly calibrated.
- ☐ All materials are consistent with the job mix formula.
- ☐ Assure the strike-offs are tight and cleaned frequently.
- ☐ The mixture consistency is uniform throughout the application.
- ☐ A constant application rate is being applied.

Web-Based Training

International Slurry Surfacing Association Web-Based Training. Retrieved from www.slurry.org.

Sources

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

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NCHRP Synthesis 411- Microsurfacing. 2010. Douglas D. Gransberg. Washington, DC: Transportation Research Board, National Cooperative Highway Research Program.

Recommended Performance Guidelines for Micro Surfacing, A143. Revised February 2010. Annapolis, MD: International Slurry Surfacing Association.

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

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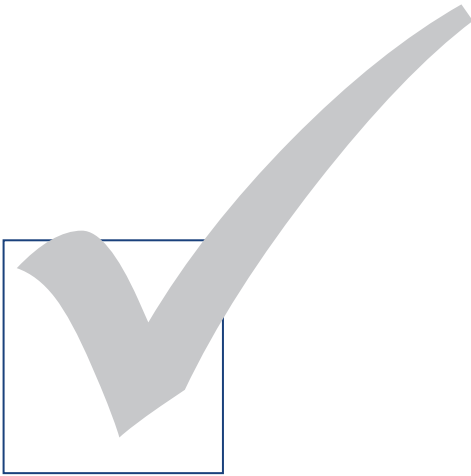

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