

Pavement Preservation
Checklist Series

11

Hot In-Place

Asphalt Recycling

Application Checklist



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

Hot In-Place Asphalt Recycling 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.

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www.fhwa.dot.gov/preservation

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

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Hot In-Place Asphalt Recycling Application Checklist

This checklist encompasses the three main hot in-place asphalt recycling (HIR) processes:

- ♦ Surface recycling,
- ♦ Remixing, and
- ♦ Repaving.

Some of the issues addressed in this checklist may not apply to all three of the processes.

Preliminary Responsibilities

Document Review

- Bid specifications
- As-built plans, if available
- Mix design
- Special provisions
- Construction manual
- Traffic control plan
- Agency requirements
- Additive manufacturers' instructions
- Material safety data sheets

Project Review

- Note the types of distresses that exist, and consider the cause and severity of each.
- Consider whether distresses are primarily limited to one of the following: aging, raveling, potholes, bleeding, friction number, rutting (<1.3 cm [$<1/2$ in.]), corrugations, shoving, light cracking, or ride quality due to minor to moderate distresses in the upper 5 cm (2 in.) of the pavement section.
- Consider whether existing materials are of sufficient quality to be recycled, or if particle gradation will need to be improved (via the addition of various portions of the particle gradation) during the rehabilitation process.
- Determine whether cutback asphalts or heavy crack sealants have been used as surface treatments in the past. The presence of flammable solvents or asphaltic materials may preclude the use of HIR methods.
- Consider whether any pavement failures are the result of base or subgrade failure. Has other testing confirmed the presence of a weak underlying layer?
- Visually examine the current surface and subsurface drainage conditions, and confirm they are sufficient to prevent surface deterioration and softening of the subgrade and will enable long-term performance of the pavement after HIR treatment.

- ❑ Determine whether pavement section cores used to confirm the thickness of the bituminous layer have been obtained at the center and along the edges at various locations along the pavement.
- ❑ Determine whether the existing pavement can support the expected number of equivalent single-axle loads (ESALs) during the design life without additional strengthening.
- ❑ If strengthening is required, determine the thickness of hot mix asphalt overlay that is required to support the anticipated traffic load.
- ❑ Determine whether any geometric corrections, e.g., alignment and width, are required during the design period.
- ❑ Determine whether any fabric is present in the layers to be recycled.
- ❑ Ensure that the environmental impact of the project on the surrounding area has been completed.

Materials Checks

- ❑ Determine whether cores and samples were obtained as part of a subsurface investigation.
- ❑ Examine samples for consistency over the length of the project.
- ❑ Note the presence of any surface treatments, fabrics, or exotic mixes.
- ❑ Select the appropriate HIR process to correct deficiencies found in the field investigation.

Preapplication Inspection Responsibilities

Preconstruction Meeting

- Ensure that the contractor, the material suppliers, and all necessary personnel from the agency attend the preconstruction meeting.

Pavement Preparation

- Ensure that any areas with drainage problems and isolated areas of base failure are repaired in accordance with the contract documents prior to starting HIR-related construction.
- Ensure that the pavement surface profile is restored to something similar to the end product presented in the contract documents by cold planing or preliminary leveling of localized areas of “excessive deformation,” i.e., 2.5-cm (1-in.) rutting or abrupt vertical change such as an overlay at a concrete joint.
- Ensure the pavement surface is clean and free of deleterious materials.

Equipment Inspections

Preheaters

- Verify that a minimum of one preheater is used immediately preceding the main heater on the recycling unit and that three or more preheater units are used as needed, depending on weather and wind conditions.

- ❑ Verify that an adequate number of preheaters are used to obtain the required pavement surface temperature of 11 °C to 149 °C (230 °F to 300 °F).
- ❑ Verify that the number of preheaters is adequate to heat the underlying pavement mass to a temperature that will facilitate scarification to the depth specified in the contract documents.
- ❑ Verify that each preheater unit is equipped with an enclosed or shielded thermal containment hood capable of heating the pavement surface to the temperature required.
- ❑ Verify that the preheater hood is a minimum of 10 cm (4 in.) wider than the scarification on either side of the machine.

Milling/Scarifying Units

- ❑ Verify that the milling/scarifying units are capable of scarifying the existing pavement surface to a minimum depth of 2.5 cm (1 in.).
- ❑ Verify that the milling/scarifying units are equipped with height controls to facilitate clearance of manholes and other obstructions in the pavement surface.

Additive and Admixture System

- ❑ Verify that the discharge rate of the additive and/or admixture is calibrated relative to the forward speed of the recycling unit so that the quantity of material added is consistent with the contract documents.

- Verify that the recycling unit is equipped with meters that show continuous readout for monitoring of quantities required in the contract documents.

Mixing System

- Verify that the mixing system is capable of thoroughly mixing the scarified material with emulsion and/or admixture in accordance with the contract documents.

Spreaders

- Verify that the equipment includes a form of spreader box and screed capable of spreading and leveling the blended material uniformly over the width of the pavement being processed, in accordance with contract documents.

Paver (Repaving)

- Verify that the paving machine is capable of automatically matching a longitudinal joint in accordance with contract documents.
- Verify that the screed pulled by the paving unit is equipped with slope and grade controls capable of automatic screed leveling, to construct the pavement to the line and grade specified in the contract documents.
- Verify that sufficient heat is maintained on the screed to prevent scraping, scuffing, or gouging of the newly completed surface.

Rollers

- Verify that the rollers onsite are of the type, width, and weight specified in the contract documents.

- ❑ Verify that the number of rollers is sufficient to keep up with the process in accordance with contract documents.
- ❑ Verify that water systems are installed and working on all rollers as required by the contract documents.
- ❑ Verify that working scrapers are in place on all rollers as required by the contract documents.

Weather Requirements

- ❑ Verify that the ambient air temperature meets contract specifications, typically a minimum of 7 °C (45 °F) in the shade.
- ❑ Verify that no significant precipitation is predicted within construction operations, in accordance with contract documents.
- ❑ Consider that variations in temperature, humidity, and wind conditions will affect breaking and curing times; specifications will typically require that fog is not present during construction operations.
- ❑ Consider that at high altitudes (1980 m [6500 ft]) the effects of temperature on mix quality need to be taken into account.

Mix Design

- ❑ Verify that a mix design has been performed and that the resulting mixture characteristics meet the specifications required by the contract documents.

- Verify that any special instructions included with the mix design are incorporated into the contractor's preparation for construction operations.

Traffic Control

- Verify that the traffic control plan complies with the contract documents and the *Federal Manual on Uniform Traffic Control Devices*.
- Verify that the signs and devices erected on the roadway match the traffic control plan contained in the contract documents.
- Determine whether conditions warrant use of a pilot vehicle.
- Ensure that flaggers do not hold the traffic for extended periods of time.
- Ensure that flaggers do not hold traffic over freshly placed material.
- Ensure that signs are removed or covered when they no longer apply.
- Ensure that an appropriate action plan is developed and implemented for emergency vehicles passing through the project.
- Ensure that any unsafe conditions are reported to a supervisor or the proper law enforcement officials.*

Project Inspection Responsibilities

Preheaters

- Verify that the surface and internal areas of the pavement are dry to decrease energy demand during the HIR process.

- ❑ Verify that the asphalt pavement surface is being sufficiently softened (typically at temperatures of 110 °C to 130 °C [230 °F to 265 °F]) to facilitate scarification without undue aggregate degradation.
- ❑ Ensure that the asphalt pavement surface is not being burned or charred, which typically occurs at temperatures of 165 °C (330 °F) and above.
- ❑ Ensure that under no circumstances does the temperature of the surface exceed 190 °C (375 °F).
- ❑ Verify that an adequate temperature is achieved for mixing the recycling agent and admixture, typically between 110 °C and 149 °C (230 °F and 300 °F).

Milling/Scarifying Unit(s)

- ❑ Verify by visual observation that the tines are scarifying the existing pavement surface to a more-or-less uniform treatment depth.
- ❑ Verify by visual observation that the coarse aggregate is not excessively degrading or fracturing, an indication that the existing pavement surface has been heated to an insufficient temperature.

Additive or Admixture System

- ❑ Verify that the application rate of the additive and/or admixture is consistent with the mix design and the contract documents by keeping track of the quantity of material used to treat a given volume of the pavement surface.

- ❑ Take into account that the quantity of admixture can be influenced by surface irregularities such as rutting and can vary from section to section of road.

Mixing Unit/Spreader

- ❑ Verify by visual observation that a uniform, consistent product is being produced.

Paver (Repaving)

- ❑ Verify by visual observation that the product is uniform and consistent and not segregated by an abundance of coarse aggregate or flushed with an excess of fine material.
- ❑ Verify that longitudinal joints are uniformly straight and overlap the previously treated area by a minimum of 5 cm (2 in.).

Rolling

- ❑ Verify that the temperature is adequate for compaction of HIR mixtures, typically a minimum of 79 °C (175 °F).
- ❑ Ensure that a rolling pattern is developed at the beginning of construction to determine the number of passes required using the specified rollers.
- ❑ Ensure that the rollers are not operating faster than 6.4 km/h (4 mi/h).
- ❑ Ensure that there is no damage from potential overrolling.
- ❑ Communicate daily with the roller operators to review the developed rolling pattern.
- ❑ Ensure that stops, starts, and turns are gradual.

- ❑ Ensure that finish rolling is completed at or above the minimum required temperature specified in the contract documents.
- ❑ Ensure that water (or an approved wetting agent, such as dishwashing detergent, if permitted by the contract documents) is lightly sprayed onto the roller drums and tires to prevent pickup. Under no circumstances should diesel or other solvents be used to prevent pickup.

Opening to Traffic

- ❑ Ensure that, prior to opening the roadway to traffic, the surface temperature of the HIR-treated pavement is 66 °C (150 °F) or less as required by the contract documents.
- ❑ Ensure that the temporary pavement markings required by the contract documents are in place on the pavement surface prior to opening the surface to traffic.

Common Problems and Solutions

(Problem: Solution)

- ❑ **Oversize material or chunks:**
 1. Slow down to allow material to heat properly.
- ❑ **Nonhomogeneous mixture:**
 1. Slow down to allow enough mixing time.
- ❑ **Segregation:**
 1. Pavement may not be heated sufficiently.
 2. Kickback on the screed is not working.

- ❑ **Drag marks in uncompacted mixture:**
 1. Check for cool material and possibly increase the heat.
 2. Slow down.
 3. Look for crack sealant or other foreign material.
- ❑ **Insufficient compaction:**
 1. Check the roller pattern and roller type, or add rollers.
 2. Increase the heat.
- ❑ **Rain:**
 1. Stop the process.
 2. Ensure the roadway is dry before restarting.
- ❑ **Loose material:**
 1. Check for improper compaction.
 2. Increase emulsion.
- ❑ **Flushing:**
 1. Decrease emulsion.
 2. Check for improper mixing.

Sources

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

- ❑ *Basic Asphalt Recycling Manual*. 2004. Annapolis, MD: Asphalt Recycling and Reclaiming Association. Available at www.arra.org.
- ❑ *Manual on Uniform Traffic Control Devices*. 2003. Washington, DC: Federal Highway Administration. Available at <http://mutcd.fhwa.dot.gov>.

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

Construction and System Preservation Team
Office of Asset Management
Federal Highway Administration, HIAM-20
U.S. Department of Transportation
400 Seventh Street, SW, Room 3211
Washington, DC 20590
E-mail: preservation@fhwa.dot.gov
Telephone: 202-366-1557

National Center for Pavement Preservation
Michigan State University
2857 Jolly Road
Okemos, MI 48864
E-mail: galehou3@msu.edu
Telephone: 517-432-8220
www.pavementpreservation.org

Foundation for Pavement Preservation
8613 Cross Park Drive
Austin, TX 78754
E-mail: fppexdir@aol.com
Telephone: 866-862-4587 (toll free)
www.fp2.org

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