

**Pavement Preservation**  
**Checklist Series**

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**12**

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**Cold In-Place**

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**Asphalt Recycling**

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**Application Checklist**

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

# Cold 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 (FP<sup>2</sup>).

FHWA uses its partnerships with FP<sup>2</sup>, 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 FP<sup>2</sup> (at [www.fp2.org](http://www.fp2.org)), and check into these Web pages:

[www.fhwa.dot.gov/preservation](http://www.fhwa.dot.gov/preservation)

[www.fhwa.dot.gov/infrastructure/asstmgmt/resource.htm](http://www.fhwa.dot.gov/infrastructure/asstmgmt/resource.htm)

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# Cold In-Place Asphalt Recycling Application Checklist

## Preliminary Responsibilities

### Document Review

- Bid specifications
- Mix design
- Special provisions
- Construction manual
- Traffic control plan
- Agency requirements
- Additive manufacturers' instructions
- Material safety data sheets

### Project Review

- Note the types and causes of existing pavement distresses.
- Note whether rutting is present and if it is greater than 9.5 mm (3/8 in.) in depth, indicating the presence of layers of unstable mix or soft subgrade.
- Verify that previous testing has not detected the presence of weak areas underlying the pavement, confirming that pavement failures do not result from base or subgrade failure.

- ❑ 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 cold in-place recycling (CIR) treatment.
- ❑ Verify that both center and edge pavement cores have been obtained at various locations along the length of the project, and use cores to confirm the thickness of the bituminous layer.
- ❑ Verify from the cores that there is sufficient thickness of the bituminous material in place, typically, 10 cm (4 in.) minimum, to facilitate the CIR process. The upper 7.6 cm (3 in.) of bituminous material will be physically recycled, while approximately 2.5 cm (1 in.) of bituminous material shall be left in place to support the recycling equipment.
- ❑ Verify that existing appurtenant structures, e.g., guardrails, curbs, and bridge clearances, do not impose limitations on potential variations of the existing pavement geometry.
- ❑ Determine whether paving fabric is present within any of the layers to be recycled and if it can be dealt with during construction.

- Consider the impact of other issues, such as recycling shoulders or potential increases to traffic load.
- Verify that the project is a good candidate for CIR based on the project review.

## **Materials Checks**

- Cores/samples are obtained for mix design.
- Samples are identified for consistency over the length of the project.
- The asphalt/emulsion is compatible with the materials and processes.
- Other potential additives, such as lime or add-rock, are considered.

# Preapplication Inspection Responsibilities

## Preconstruction Meeting

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

## Surface Preparation

- Ensure that structural pavement distresses have been repaired.
- Ensure that premilling, if required, was performed satisfactorily.

## Equipment Inspections

### Milling Machine

- Verify that the milling drum is the correct width.
- Verify that the milling machine has sufficient weight and horsepower to cut to the depth and tolerances specified within the contract documents.
- Verify that the carbide cutting teeth are all in place and in adequate condition.
- Verify that the spray bar and nozzles are working properly and not clogged.

## Screening and Crushing Units

- Verify that the opening size of the screen deck meets the specifications of the contract documents and is in good working condition.
- Verify that all oversize material will be routed through the crusher and re-screened.
- Verify that the crushing unit is working properly.

## Additive Systems (Water, Asphalt/Emulsion, Other)

- Verify that the mixing unit is properly calibrated and is capable of accurately dispensing the required quantity of additives.
- Verify that the interior of the nurse tank is not contaminated and that the trailer is dedicated to transporting only emulsion.
- Verify that the flexible hose used to convey emulsion from the nurse trailer to the pugmill is clean and not contaminated.

## Pugmill

- Verify that all the paddles within the pugmill are present and in good condition.
- Verify that the clearance between the paddles and the wall of the pugmill does not exceed that specified in the contract documents.
- Verify that the pugmill wall is not greatly worn and does not have holes.
- Verify that the spray bars and emulsion supply lines are not clogged.

## **Paver and Pickup Machine**

- Verify that the paver and pickup machine have adequate horsepower.
- Verify that the paver hopper is adequately sized for the project to prevent material spillover.
- Verify that the automatic grade and cross-slope controls are functioning properly.

## **Rollers**

- Verify that the rollers proposed for use by the contractor are in accordance with those specified in the contract documents.  
Typically, at least one pneumatic-tired roller and one vibratory, double-steel drum roller are required.
- Verify that the rollers proposed for use by the contractor meet the size and weight requirements of the contract documents, typically a 23-T (25-t) minimum for the pneumatic-tired rollers, and a 9-T (10-t) minimum for the steel roller.
- Verify that the number of rollers used is consistent with the rate of material being processed and placed.
- Verify that the tire pressures on pneumatic-tired rollers are consistent with the tire pressures specified in the contract documents.
- Verify that working water systems are installed on all rollers as required by the contract documents.
- Verify that working scrapers are in place on all tire and drum rollers as required by the contract documents.

## **Weather Requirements**

- ❑ Verify that the ambient air temperature (in the shade) meets contract specification requirements, typically a minimum of 10 °C (50 °F) and rising when using asphalt emulsions and a minimum of 4 °C (39 °F) and rising when cement or fly ash is incorporated.
- ❑ Consider that variations in temperature, humidity, and wind conditions will all affect breaking and curing times; typically, specifications will require that fog is not present during construction operations.
- ❑ Verify that no significant precipitation is predicted during construction operations, in accordance with contract specifications.

## **Mix Design (if required)**

- ❑ Verify that a mix design has been performed and that the resulting mixture meets the specifications in the contract documents.
- ❑ Verify that any special instructions included with the mix design are incorporated into the contractor's preparations for construction operations.
- ❑ Verify that the contractor has submitted the final mix design to the owner agency for review and acceptance prior to initiation of 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.
- Ensure that flaggers do not hold the traffic for extended periods of time.
- Ensure that flaggers do not hold traffic stopped on freshly treated 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 appropriate law enforcement officials.*

# Project Inspection Responsibilities

## Milling, Crushing, and Mixing

- Ensure that all grass and soil are removed from the pavement surface, especially along the edges of the pavement.
- Ensure that the depth and width being milled are in accordance with contract documents.
- Verify that the width of milling overlaps with the previous pass by a margin of at least 15 cm (6 in.).
- Verify that the maximum size of the coarse aggregate passing through the screen is less than or equal to the maximum permitted by the mix design, typically, 3.0 to 3.8 cm (1.25 to 1.5 in.) maximum for crushed coarse particles.
- Verify that the maximum area of 90 percent of the fabric pieces milled is 12 cm<sup>2</sup> (5 in.<sup>2</sup>) and that the maximum length of any individual piece is 10 cm (4 in.).
- Ensure that the pugmill is emptied each time the train stops.

## **Additives and Mixture**

- Verify that emulsion/asphalt, water, and additives are added at the rates specified by the mix design in accordance with contract documents.
- Visually inspect the mixture for uniformity and homogeneity as it is discharged, whether onto the pavement and windrowed, directly into the paver hopper, or into a truck bed.
- Obtain samples of the mixture and component additives in accordance with the requirements of the contract documents.
- Verify that the mixture and component additives comply with the requirements of the contract documents.

## **Pickup Machine and Paver**

- When processed material is being windrowed, ensure that the pickup machine is the correct distance behind the pugmill. (Note: Contract documents may specify a maximum separation, either in units of distance or time.)
- Ensure the screed on the paver is not heated unless otherwise directed by the contract documents.
- Ensure that the paving machine places processed material to grade and slope or crown in accordance with contract documents.
- Ensure that both the transverse and longitudinal joints are constructed in accordance with contract documents.

- ❑ Ensure that a continuous flow of material is deposited into the paver hopper. Material should not overflow the hopper and spill over the sidewalls, nor should the hopper be underfilled such that the drag slats in the bottom of the hopper are exposed.

## **Rolling Procedure**

- ❑ Ensure that the rollers are the correct distance behind the paver in accordance with the requirements of the emulsion manufacturer.
- ❑ Develop a rolling pattern at the beginning of construction so that the number of passes required using the specified rollers will result in the maximum achievable density (using a nuclear density gauge) in accordance with contract documents.
- ❑ Ensure that rollers are not operating at more 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 compaction tests are performed routinely and that the test results meet the requirements of the contract documents.
- ❑ Ensure that stops, starts, and turns are gradual.
- ❑ Ensure that finish rolling is completed within the time 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 the material in the recently completed mat meets the requirements for compaction density and length of cure time as presented in the contract documents. (Note: CIR mixtures stabilized only with emulsions lose internal moisture and typically require 30 to 45 days to acquire maximum unconfined compressive strength. CIR mixtures incorporating cement or fly ash cure in significantly less time and often require the placement of a fog seal to act as an impermeable membrane that seals in moisture.)
- ❑ Ensure that the temporary pavement markings required by the contract documents are in place prior to opening the surface to traffic.

## **Brooming and Fog Seal**

- Ensure that any excess aggregate particles are broomed from the surface of the completed mat.
- Apply a fog seal if traffic causes raveling.

## **Seal or Overlay**

- After curing, protect the surface of the CIR-treated material by either a surface wearing course, such as a seal or overlay of hot mix asphalt.
- Verify that, after curing, the moisture content of the CIR is 2 percent or less of the total material weight.

## Common Problems and Solutions

### (Problem: Solution)

#### ❑ **Aggregate in the CIR:**

1. Inspect milling depth.
2. Ensure sufficient bituminous layer thickness.

#### ❑ **Oversize material or chunks:**

1. Check the screen deck for correct size or holes.
2. Check for chunks in the pugmill: ensure paddle clearance; remove chunks before compaction.

#### ❑ **Nonhomogeneous mixture:**

1. Check for sufficient moisture content.
2. Check for sufficient emulsion/asphalt.
3. Check emulsion/asphalt temperature for extremes.
4. Check correct operation of the pugmill.

#### ❑ **Segregation:**

1. Inspect the top size versus the depth being placed.
2. If the wings of the hopper are being used, make sure segregated material is not being introduced in this way.
3. Identify systematic segregation areas and make corrections, such as around a gear box.
4. If the screed is extended, look for segregation in the extensions.

- ❑ **Drag marks in uncompacted mixture:**
  1. Ensure that the screed is clean.
  2. Ensure that the screed is unheated if necessary.
- ❑ **Insufficient compaction:**
  1. Ensure rolling is started at the correct time.
  2. Ensure roller patterns have been adequately established, are understood, and are being followed.
  3. Ensure the correct type, number, and size of the rollers.
  4. Ensure the rollers are not moving too fast.
- ❑ **Rain:**
  1. Stop the milling process.
  2. Pick up windrow and pave as fast as possible.
  3. Roll with a steel roller first as fast as possible.
- ❑ **Loose material:**
  1. Ensure the water system is working on the rollers.
  2. Check if traffic may be on the compacted CIR too soon.
  3. Check for sufficient emulsion/asphalt content.
  4. Ensure ambient conditions are not too cool.
- ❑ **Flushing:**
  1. Ensure there is not too much pre-wet water or emulsion being added (total fluids).

## 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](http://www.arra.org).

*Manual on Uniform Traffic Control Devices*. 2003. Washington, DC: Federal Highway Administration. Available at <http://mutcd.fhwa.dot.gov>.

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