

3

Thin Hot Mix Asphalt Overlay



Thin Hot Mix Asphalt (HMA) Overlay 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

Notice

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange under DTFH61-13-D-00009, Task Order 0001. The U.S. Government assumes no liability for the use of the information contained in this document. The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document. They are included for informational purposes only and are not intended to reflect a preference, approval, or endorsement of any one product or entity.

Quality Assurance Statement

The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

This page left intentionally blank

Preliminary Responsibilities

Document Review

- Project specifications
- Construction sequence
- Traffic control plan
- Construction manual
- Verify that all equipment is properly maintained in accordance to the manufacturer's recommendation
- Mix design(s)
- 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 thin HMA overlay.
 - Check the existing pavement cross-section and limit existing rutting to less than $\frac{3}{8}$ in. in depth.
 - The pavement must be structurally sound with no fatigue (alligator) cracking or potholes.
 - Investigate whether cracking is present, and if so, determine the type, amount, and severity of existing cracks. Crack seal any crack greater than $\frac{1}{4}$ in.
 - Determine whether other pavement distresses exist such as raveling, polished aggregate, and bleeding or flushing.
- Verify that any drainage deficiencies have been corrected.
- Review the average daily traffic and percentage of commercial vehicles and the traffic control plan.
- Review project plans, specifications, and estimated quantities.
- Based on the existing pavement condition, determine whether the treatment is cost-effective.

Materials Checks

- Verify that materials including asphalt binder, aggregate(s), and tack coat are from approved sources.
- Asphalt binder is performance graded consistent with environmental and traffic factors.
- The lift thickness should be described in the specification for the mix gradation specified.
- Aggregate(s) meet required skid resistance value.
- Mix is produced by an approved hot-mix plant.
- The mix design meets specifications.
- The mixture has been tested for moisture susceptibility.
- Asphalt content, air voids, and gradation are within the job mix formula (JMF) tolerances.

Pre-Application Inspection Responsibilities

Pavement Surface Preparation

- Pavement distress and existing drainage issues from stormwater have been corrected.
 - Cracks greater than $\frac{1}{4}$ in. have been sealed flush or within $\frac{1}{8}$ in. below the existing surface.
 - Pavement sections displaying moderate or severe alligator cracking and potholes have been removed and patched.

- Existing surface courses exhibiting major rutting caused by mixture deficiencies have been removed by milling and where rutting is more than $\frac{3}{8}$ in. due to wear or post-construction consolidation a scratch course or milling has been performed prior to the thin HMA overlay.
- Raised pavement markers and thermoplastic markings have been removed.
- Grades and cross-slopes have been established with special attention to sections with super-elevation.
- Manholes, catch basins, and other utility castings have been raised to the level of the new overlay.
- The existing surface has been swept clean and is free of dirt, silt, and vegetation.

Equipment Inspections

Cold Feed

- Aggregate stockpiles are clearly marked, separated, and free of contamination.
- Aggregate cold feeds have been calibrated.
- All cold feed gates and belts are in working order.

Asphalt Storage Tank

- The asphalt storage tank is capable of keeping the asphalt temperature within the required specification range.

Hot-Mix Plant

- The plant is properly calibrated and the scales have been checked.
- The plant has been certified by the agency.
- The plant meets all environmental requirements.
- Production rates have been determined versus various aggregate moistures to provide a mix free of moisture.
- Temperature gauges and asphalt flow meter have been checked for accuracy.
- Mixing times have been established to assure the aggregate will be thoroughly coated with the asphalt binder.
- The plant is capable of providing the completed mix at the proper gradation, asphalt content, and temperature and within the required timeframe.

Surge/Storage Silo (If Applicable)

- The maximum mix storage time has been established.

Lime and Filler Silo (If Applicable)

- The feeder system has been calibrated.

Trucks

- Truck beds and bodies are clean and free of any deleterious material.
- Trucks are equipped (if required) with tarpaulins that meet state or local regulations.

Tack Coat Distributor

- The distributor is properly calibrated.
- The nozzles are unplugged and are able to apply a uniform tack coat at the specified rate.
- Spray bar at proper height to provide triple overlap coverage from spray nozzles.

Paver

- Verify the need for a material transfer vehicle (MTV) to allow the paver to operate continuously without stopping, which minimizes the following:
 - Truck waiting time at the paving site
 - Aggregate segregation
 - Temperature differentials
- Ensure that the paving machine is well maintained and in good working order, including the following:
 - Auger
 - Screed
 - Flow gates
 - Slat conveyor
 - Hopper wings
- Tires are properly inflated or tracks properly adjusted.

Rollers

- ❑ Determine the type(s) of rollers that will be used for breakdown, intermediate, and finish rolling.
- ❑ A sufficient number of rollers of adequate size are available to achieve the desired compaction.
- ❑ Water spray bars, wetting pads, and scraping bars are working on all rollers to avoid material buildup.
- ❑ Approved asphalt release agents are available. Note: Do NOT use diesel fuel to clean roller drums or tires.
- ❑ Steel drums are free of grooves and dents and not warped.
- ❑ Pneumatic-tired rollers comply with the manufacturer's recommendation for tire pressure.
- ❑ Pneumatic-tired roller tires do not vary more than 5 psi from the prescribed pressure.
- ❑ Vibratory plates or hand tampers are available for areas inaccessible to rollers.

Project Inspection Responsibilities

Weather Requirements

- Air and surface temperature meet agency requirements.
- Paving does not begin if rain is imminent.
- Air and pavement surface temperatures, humidity, wind and lift thickness will affect how quickly a mix cools and the time available for compaction.

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 signs are removed or covered when they are no longer needed.

Surface Preparation

- Sweeping to clean the pavement is performed consistent with applicable U.S. Environmental Protection Agency standards.
- All loose debris is removed from the pavement leaving a clean and dry surface.
- The tack coat is being applied uniformly at proper rate.
- The tack coat is cured prior to placement of overlay.

Hot-Mix Plant

- Sample aggregate stockpiles and compare gradation of each to design.
- Sample aggregate from cold feeds and compare combined gradation to design.
- Sample aggregate for moisture and make any necessary adjustments to the hot-mix plant.
- Take random samples of aggregate consistent with the approved quality control plan.
- Sample hot-bin (if applicable) aggregates and run gradation, calculating percentage required from each bin to meet the JMF.
- Check that asphalt binder is within the JMF tolerance.
- Check plant mix for uncoated aggregate.

- Random sample and test plant mix, checking for conformance with the specifications and JMF:
 - Temperature
 - Percentage asphalt
 - Gradation
 - Air voids
 - Other agency requirements

Trucks

- Sufficient trucks are available to allow the paver to keep moving at a uniform speed.
- Trucks are clean and free of solvents before the mix is loaded.
- Trucks have tarpaulins to cover mix (when required).
- Trucks are insulated (when required).
- Trucks are loaded in a manner that avoids segregation.
- Only approved release agents can be used.

Paving Machine

- Paving screed is clean of debris and preheated before starting placement.
- Mix arriving at the paving site is within the specified temperature range.
- Mix is being placed at the proper grade and cross-slope and at the specified thickness.

- Surface texture is uniform, free of segregation, tearing, or scuffing.
- Placement is providing a smooth riding surface.
- Automatic screed control is used whenever possible. (If manual controls are used, avoid frequent changes.)
- Construction joints (transverse and longitudinal) are tight with a smooth transition.
- Quantity yields or thicknesses are checked throughout the placement. Note: Inspectors should not direct thickness changes to paver operators, especially on projects with smoothness specifications.

Rollers

- A roller pattern has been established that achieves the proper in-place air voids.
- The established rolling pattern is being followed.
- Check density of the finished mat to ensure air voids within specifications.
- Vibratory, static, or rubber-tired rollers are used for breakdown and intermediate rolling.
- Static rollers or vibratory rollers in the static mode are used for finish rolling.

- Vibratory rollers are operated:
 - At an amplitude and frequency as selected according to mix harshness and lift thickness. (For thin lifts, high frequency and low amplitude are usually used.) Caution should be exercised when using a vibratory roller so that the aggregate is not fractured during rolling.
 - At maximum travel speed the frequency minimum is at least 10 impacts per foot.
 - In the static mode when lift thickness is 1 in. or less.
- Rubber-tired rollers
 - Tires must be warmed to prevent mixture pickup.
 - Must be used on scratch courses.

Opening to Traffic

- Place temporary pavement markers on lane lines for delineation before opening the pavement to normal traffic.
- The pavement can be opened to traffic after the mix has been compacted and the mat has cooled to 140°F or the agency's required temperature.
- All construction-related signs are removed when opening pavement to normal traffic.

Common Problems and Solutions

(Problem: Solution)

Plant Mix Discharge Temperatures Too Low:

- Moisture in the stockpile may be higher than initially planned. Decrease the production rate.

Uncoated Aggregate in the Plant Mix:

- Moisture may be in the aggregate.
- Worn or missing flights may be in the hot-plant drum dryer.
- Mixing time may be too short (check slope of drum for drum mix plants).

Segregation in the Mix:

- Use multiple drops instead of a single drop when loading the trucks from the hot-mix plant storage silo.
- The haul truck should raise the truck bed slightly to break the load before unloading into the paver hopper.
- Paver wings should be folded on every load, or not at all. Material that builds up in the wings should be properly disposed of at the end of the day. When the paver wings are folded, do it slowly and be sure mix remains above the flow gates.

- Keep a constant head of material to the paver's auger and screed.
- Paver screed extension use should conform to paver manufacturer recommendations and agency requirements. Watch for possible segregation in areas where long extensions are used.
- Harsher or stiffer mixes will require more care when placing and compacting.

Lack of In-Place Density:

- The aggregate gradation may be outside of the target gradation.
- Asphalt content may be too low.
- Roller pattern or the frequency or amplitude of the vibratory roller may need adjusting.
- Plant mix may be below optimal rolling temperatures.
- Check the density of the underlying mat, which will influence nuclear gauge readings on thin overlays. If this is the case, a control strip can determine the maximum achievable density.
- Nominal maximum aggregate size may be too large for lift thickness. Use different mix or increase thickness.

Plant Mix Has A Lean or Dull Appearance:

- The mix may contain too little asphalt or an excess of minus No. 200 sieve.

Plant Mix Slumped in the Haul Truck:

- Properly mixed material in a haul truck will have a dome shape. If the load of mix has a flat shape, there may be excessive asphalt or moisture.

Tears in the Plant Mix after Rolling:

- Tearing of the surface occurs if the mix is too cold, too dry, has too many fines, has excess moisture, or has been over-rolled.

Poor Surface Smoothness or Rough Ride:

- Multiple stop-starts of the paver.
- Excessive paver speed.
- Improper use of manual screed controls.
- Vibratory rollers operating at excessive speed (impacts spaced too far apart).
- Poor joint construction practices.

Sources

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

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

An Overview of Surface Rehabilitation Techniques for Asphalt Pavements. Pub. No. FHWA-PD-92-008. 1992. Washington, DC: Federal Highway Administration.

Pavement Maintenance Effectiveness: Preventive Maintenance Treatments. Instructor's Guide, pp. 111–133. Pub. No. FHWA-SA-96-028. 1996. Washington, DC: Federal Highway Administration.

Pavement Maintenance Effectiveness: Preventive Maintenance Treatments. Participant's Handbook, pp. 113–132. Pub. No. FHWA-SA-96-027. 1996. Washington, DC: Federal Highway Administration.

Thin Asphalt Concrete Overlays, NCHRP Synthesis 464. 2014. Washington, DC: Transportation Research Board, National Cooperative Highway Research Program.

Thin-Surfaced Pavements, Synthesis of User Practices, NCHRP Synthesis 260. 1998. Washington, DC: Transportation Research Board, National Cooperative Highway Research Program.

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

Construction Management Team, HICP-30
Office of Preconstruction, Construction,
and Pavements
Federal Highway Administration
U.S. Department of Transportation
www.fhwa.dot.gov/pavement/preservation

July 2019

Publication No. FHWA-HIF-19-030



U.S. Department of Transportation
Federal Highway Administration