

# FHWA: Thin HMA Overlays Preserve Pavements

This document defines thin asphalt overlays as dense graded mixtures placed less than 1½ in. in thickness. Gap-graded and open-graded mixtures may be specifically designed for thin placement but they are considered specialty mixtures and aren't discussed in this document. Thin asphalt overlays placed for pavement preservation are functional overlays to extend the service life of the pavement and are not intended to add structural capacity. The key benefits of a thin asphalt overlay are improved ride, corrected rutting, impermeability and reduced noise.

A thin asphalt overlay, as shown in the image, is a dense graded, small nominal maximum aggregate size (NMAS) asphalt mixture placed at a thickness of less than 1½ in. using conventional asphalt production and placement operations. This definition distinguishes thin asphalt overlays as being constructed with dense-graded mixtures with the nominal maximum aggregate size (NMAS) of less than ½ in., and excludes other specialty asphalt mixtures occasionally used as thin overlays, such as open-graded friction course (OGFC), stone matrix asphalt (SMA), and ultra-thin bonded wearing course (UTBWC). Dense-graded mixtures utilized for thin lift overlays are often called No. 4 or ½-in. (4.75 mm or 9.5 mm) mixtures.

Highway agencies and asphalt industry groups have different terminology for thin asphalt overlays and may use some form of the term "thin asphalt" for all such mixes. *Thinlay*™ is a term coined by the National Asphalt Pavement Association (NAPA) for plant-produced and paver-placed asphalt mixtures designed for pavement preservation. A Thinlay further defines minimum lift thickness as ¾ in., but does not include a maximum lift thickness. Thinlays include 4.75 mm and 9.5 mm NMAS asphalt mixtures used in thin overlays.

## PRESERVATION TREATMENTS

There is a variety of thin surface treatments for pavement preservation. Traditional pavement preservation treatments (PPTs) include fog seals, sand seals, slurry seals, scrub seals, chip seals, micro surfacing, combinations of seals, thin dense-graded asphalt mixtures and special asphalt surface mixtures.

PPTs that are called seals (including micro surfacing) require emulsion distributors, chip spreaders and slurry-mix trucks. Thin overlays using dense-graded asphalt mixtures and most special asphalt surface mixtures are placed using conventional asphalt mixture production and paving equipment. Each type of treatment can be a cost-effective PPT when placed at the proper time and for the proper reasons.

Collectively, studies show benefits of thin asphalt overlays vary with condition of the pavement, level of traffic and climate conditions. The quality of thin overlay materials and construction also impact performance. Some studies reported relatively low performance periods, but a deeper examination of the data reveals that one agency was using thin asphalt overlays to treat pavements with moderate to severe distress.

## BENEFITS OF THIN OVERLAYS

The life-extending benefits of placing a thin asphalt overlay PPT are summarized below, based on a condition-appropriate decision to place a PPT.

- Improve surface smoothness** to achieve a better ride. Both the traveling public and highway agencies recognize the value of a better ride. Placing a thin asphalt overlay with quality workmanship improves ride, but the level of improvement depends on the pre-treatment condition.




Core showing 1-in. thin asphalt overlay (top)

- Reduce wheel path rutting** to improve safety. A thin asphalt overlay effectively corrects rutting if the existing pavement rut depth is less than ¼ in.

- Reduce water intrusion** to maintain pavement structure. Thin asphalt mixtures are impermeable (hydraulic conductivity less than  $125 \times 10^{-5}$  cm/sec) when placed with compacted voids less than 10 percent. This effectively seals all minor and moderate surface cracks. Keeping water out of a pavement prevents loss of structural capacity due to moisture damage, which is needed to support traffic and minimizes fatigue damage. Larger working cracks, such as low-temperature transverse cracks, reflect through a thin asphalt overlay relatively soon after placement and require sealing.

- Restart surface aging process** and slow asphalt binder property changes in the existing asphalt pavement. When the thin overlay is placed early in the life of an existing pavement, aging of the existing surface is limited to the top ½ in. where exposure to heat and oxidation is extreme. The thin asphalt overlay will slow aging distress in the existing surface, but will not provide rejuvenation of existing mixture.

- Decrease pavement surface noise.** A new thin asphalt surface has low surface macrotexture. Low macrotexture reduces the level of noise generated at the tire/pavement interface.

A PPT is intended to extend service life of an existing pavement, but is generally not intended to increase structural capacity of a pavement. Generally, the structural value of a PPT is negligible, but thin asphalt overlays can achieve an incremental increase in structural capacity if placed prior to structural damage occurring. Structural damage in the pavement occurs before fatigue cracks visually appear on the surface, so a pavement evaluation should include a detailed examination of the existing pavement's current structural condition. 

*Adapted by Pavement Preservation Journal from the June 2019 FHWA TechBrief, The Use of Thin Asphalt Overlays for Pavement Preservation. For the full copy of this 13-page document, please search for FHWA-HF-19-053*