U.S. Department of Transportation
Federal Highway Administration

ENHANCED IN-PLACE DENSITY:

Obstacles to achieving in-place density - placement challenges

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Although several factors can influence the performance of an asphalt pavement, one of the most important is in-place density. A small increase in density can potentially lead to a significant increase in service life of asphalt. There are a number of challenges to achieving desirable in-place density when placing asphalt mixtures. These obstacles are primarily classified into two groups: (1) material challenges and (2) challenges with field placement. The three major sources of placement challenges are discussed below.

SMOOTHNESS

The most significant influences on obtaining desired smoothness are the number of lifts and the thickness of each lift. However, compactive rolling equipment also plays a minor role in impacting smoothness (as shown by the excess roller impact marking in the image). Excessive rolling is often intended to achieve desired density, but can be improved by matching the amplitude, frequency, and speed of rollers to the paving operation. Oscillatory compactive rollers also help to create a smoother mat finish. Maintaining roller pattern techniques provide an excellent strategy to placing smooth asphalt pavements.

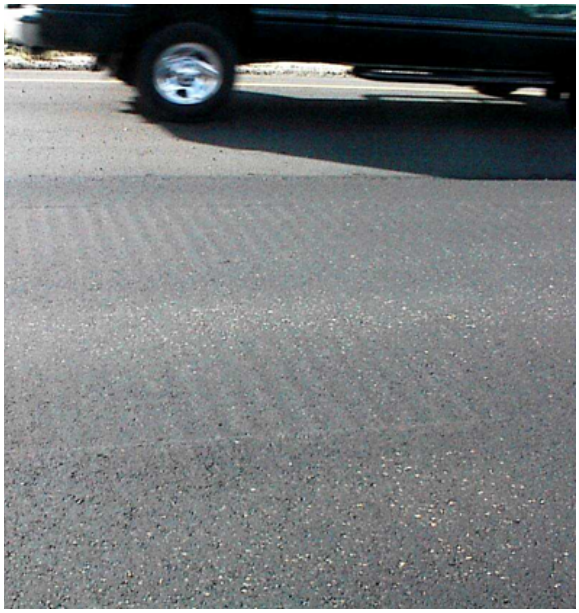

Image Credit: Adam Hand

WEAK SUBGRADE OR BASE

Oftentimes, new asphalt layers are placed on weakened sublayers or a soft foundation, which makes it challenging to obtain the optimum density in the asphalt mat. One practical approach to address this condition is to identify areas of weakened support by pre-mapping before paving. It is important to determine the cause of weakened sublayers and to employ methods of improving the strength before asphalt layer placement.

BREAK POINT DENSITY CONTROL

The "Break Point" number of passes is identified as the number of roller passes at which the density peaked on test strips performed at the beginning of the project or production day. While useful, strict adherence to this approach may not detect changing conditions and can hinder the ability to obtain maximum density. Factors that may change with time include temperature, moisture, type of roller, paving speed, and underlying layers.

Visit https://www.fhwa.dot.gov/pavement/asphalt/density/index.cfm to access the full series

For more information or technical assistance on improved density, please contact: Derek Nener-Plante, FHWA Resource Center, derek.nenerplante@dot.gov