U.S. Department of Transportation
Federal Highway Administration

ENHANCED IN-PLACE DENSITY:

Obstacles to achieving in-place density - potential solutions

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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. A recent series of FHWA Demonstration Projects on Enhancing Durability of Asphalt Pavements Through Increased In-Place Density have identified a series of positive practices as potential solutions to overcoming these challenges.

POTENTIAL SOLUTIONS

- Understanding the factors affecting compaction, such as materials and placement challenges, can help achieve higher in-place asphalt density.
- Considering mixture placement temperature can be an important solution in achieving maximum density. Lower mixture and environmental temperatures can contribute to material and placement challenges.
- Compacting the mixture while temperature is the hottest since asphalt materials are sensitive to temperature. For warm-mix, mixture characteristics like the binder grade and aggregate size can impact the temperatures for which compaction can be achieved.
- Keeping rollers at consistent spacing, operating breakdown rollers in echelon, and keeping rollers near the paver can help achieve density more quickly and with lower standard deviations.
- Using pneumatic rollers that apply kneading compactive effort and can achieve target mat density without breaking aggregates.
- Balancing the paver speed with the speed of the compactive equipment is important. If the paver speed is too fast, it can outrun the rollers, making it harder to reach the desirable level of in-place density.
- Using the proper roller vibration amplitude for the right application is important. Higher roller vibration amplitudes can be effective for compacting stiff mixtures, but can also break down aggregates. Lower roller vibratory amplitudes typically require higher compaction temperatures.
- Optimizing the amplitude, frequency and speed can assist in achieving good density without negatively impacting smoothness.
- Maintaining consistent roller patterns is key to placing smooth pavements. This includes how frequently compactive equipment operators start and stop their operation.
- Employing the use of ongoing quality control efforts that can take into account changing project conditions as opposed to "Break Point" density control.
- Setting specification limits that allow for innovation to achieve minimum in-place density.

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