



Project Summary

Texas Department of Transportation

0-6080: Performance Histories of Thermally Segregated HMA

Background

Thermal segregation during asphalt mixture construction indicates a localized region of mix exists that may not meet operational tolerances. Typically, these thermally segregated zones become a low-density area in the completed mat. Since proper density significantly influences performance, this project sought to evaluate the performance of overlay projects where thermal segregation occurred during construction. Documentation of this field performance was needed to better evaluate the relevance of TxDOT's thermal profile requirements in

What the Researchers Did

The research team used a full-coverage infrared temperature bar to collect thermal profiles on construction projects around the state. Often, a complementary ground-penetrating radar (GPR) survey was also conducted at the time of construction to determine uniformity after compaction. The research team documented locations of thermal segregation during construction, and then returned to the projects to evaluate their condition after trafficking. These follow-up surveys include a visual and GPR assessment, and in some cases, focused coring. Of the 14 projects that the research group evaluated, five that were constructed and monitored did not exhibit thermal segregation, while nine actually did. The age of projects at the time of the last performance evaluation ranged from two to seven years. The research team used the field performance and core results to analyze the performance of each project.

During the course of the project, the research team also documented projects with reported cyclical pavement failures. Even though data at the time of construction were not available, these projects illustrated the types of deterioration that can occur when segregation occurs during overlay construction.

What They Found

Projects constructed without thermal segregation do not show any distress due to localized construction anomalies. However, one project seems to exhibit some distress likely due to cyclical segregation in a subsurface layer. Other state departments of transportation have reported similar observations.

Results from projects constructed with thermal segregation are mixed. Within the performance time frame, most projects did not exhibit any distress at locations of known thermal segregation; in some cases, the GPR data suggest traffic action has homogenized the density of the pavement surface.

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In other cases, the research group found evidence of thermal segregation remained, generally noted as differences in surface appearance and localized anomalies in the GPR data. One project showed evidence of cracking from segregation.

Performance testing cores after some years of service also provided mixed results. The results suggested thermal segregation did not impact Hamburg Wheel-Tracking Test results. Overlay Test results suggested the thermally segregated locations may exhibit higher susceptibility to cracking.

The review of projects with known cyclical failures illustrated that, in some cases, segregation results in rapid deterioration of the pavement condition by cracking and/or raveling. Figure 1 illustrates cyclical cracking occurring on a project within a few years after



Figure 1. Cyclical Cracking on a Roadway.

What This Means

While construction free of segregation certainly precludes defects from non-uniformity, the presence of thermal segregation at the time of construction does not guarantee failure within two to seven years. However, thermally segregated locations may remain anomalies in the mat that deteriorate due to cracking when on the surface or contribute to failures of subsequent overlays once covered. The presence of thermal segregation at the time of construction results in a higher risk of pavement deterioration within those segregated zones, even if another overlay covers the segregation.

Based on the conclusions from this project, TxDOT should continue to promote construction of asphalt-mixture layers free from significant thermal segregation. The thermal profiling requirement in TxDOT's construction specifications should continue to be used, as this requirement is designed to promote construction free of segregation. Constructing layers free of thermal segregation should be an objective for both surface and subsurface mixtures.

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