RESEARCH
PROJECT CAPSULE [14-1B]
February 2015
TECHNOLOGY TRANSFER PROGRAM

Effects of Temperature Segregation on the Volumetric and Mechanistic Properties of Asphalt Mixtures

JUST THE FACTS:

Start Date:
August 5, 2014

Duration:
24 months

End Date:
August 14, 2016

Funding:
SPR:TT-Fed/TT-Reg

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POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used Implementation Potential

PROBLEM

Material segregation in asphalt mixtures is a non-uniform distribution of coarse and fine aggregates through its masses, i.e., concentration of coarse materials in some area and fine materials in others. During construction, the coarse and fine asphalt mixtures may cool at different rates, at different locations, causing temperature segregation (or temperature differentials). Excessive temperature differentials within a mat of uncompacted asphalt mixtures can cause variations in the density levels of the finished pavements due to the inconsistent compaction at different temperatures. A lack of density in the cooler areas of the pavement can cause premature deterioration of those pavement areas such as moisture damage, fatigue, cracking, rutting, raveling, pothole, etc. Therefore, it is essential to ascertain the effects of temperature segregation on the quality of asphalt mixtures as measured by their densification and mechanical properties of asphalt mixtures in Louisiana in order to improve the initial quality and the long term performance of its asphalt pavements. The pavement surface thermal profile during construction will be measured using a paver-mounted infrared (IR) bar known as PAVE-IR system commercially available from MOBA Corporation. This profile will be used to ascertain the effect of temperature segregation on the quality of asphalt mixtures as defined by measurements of density and mechanistic properties.

OBJECTIVE

The objective of this research is to determine the impact of temperature segregation on the quality of asphalt mixtures as defined by measurements of density and mechanistic properties of asphalt mixtures. Specific objectives of this study include: ascertain temperature segregation range during paving operations; measuring the density of roadway cores at uniform and non-uniform temperature zones; measuring mechanical properties (Loaded Wheel Tracking test, Semi Circular Bent test, and Indirect Tensile Dynamic Modulus test) of roadway cores at uniform and non-uniform temperature zones; and establishing an acceptable temperature segregation range during paving for specification purposes.

METHODOLOGY

Research will be conducted following the proposed tasks listed below:

Task 1: Conduct Literature Review
Task 2: Develop Experimental Design and Select Field Projects
Task 3: Install and Calibrate of Temperature Measuring Device
Task 4: Preform Thermal Profile Measurement
Task 5: Identify Project Locations with Thermal Segregation
Task 6: Perform Field Sampling and Laboratory Testing
Task 7: Perform Data Analysis
Task 8: Explain the Benefits of Implementation
Task 9: Prepare Draft Final Report

IMPLEMENTATION POTENTIAL

It is anticipated that the results of this project will identify the level of segregation detected through the infrared bar system. The color profile maps of placement temperatures and the number and duration of paver stops will be used as a tool to identify locations of defects for focused coring in order to ascertain if the density of the mixture is within specification limits. This approach has the advantages of identifying defects that may not be captured during random coring.

MOBA Pave-IR System