LOUISIANA TRANSPORTATION RESEARCH CENTER

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Evaluation of Tack Coat Materials on Longitudinal Joints in Louisiana Roadways in Louisiana

INTRODUCTION

One of the advantages of asphalt pavements is that they can minimize traffic disruptions by being paved and opened to traffic quickly. Often, asphalt paving is performed while traffic is maintained in an adjacent lane. The disadvantage of this construction technique is it leads to the formation of longitudinal joints. A longitudinal joint is a construction feature that is present when two or more lanes are constructed adjacent to each other. They are formed when a previous placed mat is allowed to cool (cold lane), and at some other period of time the adjacent lane is paved (hot lane). The disadvantage of longitudinal joints are the distresses they create, such as separation, cracking and raveling, that cause a rather sound pavement structure to deteriorate sooner than expected. Multiple longitudinal joint construction techniques have been studied and are currently used in multiple states including Louisiana. Construction techniques such as echelon paving, proper rolling techniques, edge restraining devices, infrared joint heaters, cutting wheels, joint adhesives, and joint seals have been researched and implemented over the past 30 years. The overall objective of these various methods is to increase the pavement density at the joint, therefore improving durability and service life. This research project primarily focuses on tack coat materials and their influence on density, permeability, and shear strength at longitudinal joints. Tack coats are added to longitudinal joints with the aim of improving the bond between cold and hot lanes, preventing longitudinal cracking, and preventing water intrusion into the joint.

OBJECTIVE

The objective of this research is the following:

1. Evaluate the influence of tack coat material type on the resulting longitudinal joint density and permeability.
2. Ascertain the relationship between the interlay bond shear strength and the quality of the longitudinal joint as measured by density and permeability.
3. Recommend revisions to the current specifications for required tack coat type based on field performance data as measured by density, permeability, and bond shear strength.

SCOPE & METHODOLOGY

The project site selected was LA 3235 between Galliano and Golden Meadow in Lafourche Parish. Two types of emulsions are used as tack coat materials: un-modified emulsion (SS-1) and a polymer modified emulsion trackless tack (NTSS-1HM). Five test sections were established for the binder course and four sections for the wearing course. Application rates were minimum rates of undiluted asphalt emulsion and were selected based on the type of HMA lift; 0.08 gal/yd^2 for four binder course sections, 0.04 gal/yd^2 for one binder course section, and 0.03 gal/yd^2 for wearing course sections. There were 26 cores taken per section and were then measured and recorded for in-place density, permeability, and bond shear strength. AASHTO T-166 (DOTD TR 304-03), "Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens,"

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was used to determine G_{mb} of field cores obtained from each test section. The field cores were tested for permeability in accordance with ASTM PS 129-01, "Measurement of Permeability of Bituminous Paving Mixtures Using a Flexible Wall Permeameter." Measurement of interlayer (between layers) and interface (at joints) shear strengths was tested using the Superpave Shear Tester (SST).

CONCLUSIONS

Based upon the observations obtained from the field and lab test of this study, it can be concluded that trackless polymer-modified tack coat is capable of delivering improved performances on longitudinal joint densities and provide increased shear strength. The following findings and conclusions are shown based on the outcome of this study:

- Longitudinal joint density was lower than mat densities.
- The unconfined edge of the cold mat had lower density than the confined edge of the hot mat.
- The 0.08 gal/yd^2 trackless tack coat yielded overall greater densities than the 0.04 gal/yd^2 trackless tack on the longitudinal joint un-tamped sections. The density test showed a 1% increase in longitudinal density at the 0.08 gal/yd^2 application rate.
- Density comparison of SS-1 and trackless tack revealed no statistical differences for untamped sections, and minor statistical differences for tamped sections.
- The statistical analysis comparison of the density profile of the trackless tack and SS-1 indicates more uniformity across the mat with the trackless tack.
- Density standard deviation for all cores was approximately 1.8-1.9%, which closely matched previous statistical evaluations.
- Denser cores produced lower coefficients of permeability. Trackless tack tamped produced the lowest coefficient of permeability (COP) for the center lane and SS-1 un-tamped produced the lowest COP for the longitudinal joint. Both COPs were the lowest because the cores were the densest.
- Trackless tack tamped consistently produced a lower COP than trackless tack un-tamped for both the center lane and longitudinal joint.
- Although the COV (coefficient of variation) was high, shear strength data coincided with previous studies showing trackless tack tamped produced the highest average shear strength.
- The 0.08 gal/yd^2 trackless tack coat yielded a greater average shear strength than the 0.04 gal/yd^2 trackless tack on the longitudinal joint un-tamped sections.

RECOMMENDATIONS

Based on the outcome of this study, the authors recommend the use of Trackless Polymer Modified tack coat. Since this was a limited study, further research should be recommended to evaluate the performance of Trackless Tack on more projects.

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