RESEARCH
PROJECT CAPSULE [23-3B]
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TECHNOLOGY TRANSFER PROGRAM

Effect of Longitudinal Joint Construction and Density on Asphalt Pavement Performance—Phase I – State of the Practice

JUST THE FACTS:

Start Date:
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6 months

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February 21, 2023

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TT-Fed/TT-Reg-6

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used / Implementation Potential

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PROBLEM

The performance and durability of asphalt pavements are influenced by various factors, including the quality of construction techniques utilized during the installation process. One critical aspect that significantly impacts the performance of asphalt pavements is the construction of longitudinal joints and the achievement of specified density levels at the joints. Longitudinal joints are formed when two adjacent asphalt lanes are constructed during paving operation. These joints are created in situations where the width of the pavement exceeds the paving width of the equipment. Longitudinal joints are critical to the performance of asphalt pavements as they provide continuity to the laid asphalt mat. However, longitudinal joints generally have lower density than the rest of the pavement due to the formation of an unconfined edge during placement of the cold asphalt mat and the temperature difference between the freshly paved asphalt lane (hot mat) and the previously paved asphalt lane (cold mat). Higher air voids observed in longitudinal joints results in weaker pavement at the joints and facilitates water penetration into the pavement.

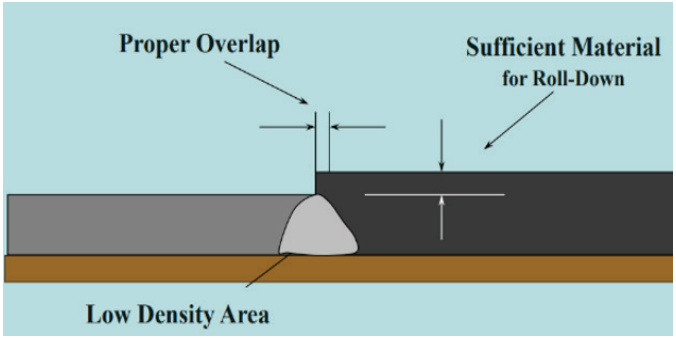

Figure 1. Longidutinal joint (a) construction and (b) deterioration (The Constructor, 2021)

The Federal Highway Administration (FHWA) has identified in-place density as a significant factor influencing the long-term durability of longitudinal joints. According to available literature, low density and water intrusion near a longitudinal joint can reduce its service life by 36%. To address the problems caused by lower longitudinal joint density, some states in the US have incorporated density specifications for longitudinal joints. These specifications aim to guide the contractor's compaction process while emphasizing the importance of measured density for acceptance. Notably, Alaska, Colorado, Illinois, Kentucky, Minnesota, Missouri, Montana, Nebraska, Pennsylvania, Utah, Vermont, and West Virginia DOTs have established specific longitudinal joint density specifications accompanied by payment schedules that offer incentives for achieving enhanced density and impose penalties for lower density levels. Current Louisiana DOTD specifications for longitudinal joint construction include recommended hot mat overlap width and height, maximum deviation in grade at joints, and minimum joint offset for multiple layer construction. Further, Louisiana DOTD recommends

that top layer joints be kept 6 in.–9 in. from the centerline of two lane highways. The state of the practice for longitudinal joint construction and density is evolving. As more research is conducted, new techniques and materials are being developed that can improve the performance of longitudinal joints. These new techniques and materials have the potential to extend the service life of asphalt pavements and reduce the cost of maintenance.

OBJECTIVE

The objective of this study is conduct a literature review regarding the current best practices for longitudinal joint construction.

METHODOLOGY

To achieve the objective of this study the research team will collect and critically review available literature regarding best practices for longitudinal joint construction and the use of various techniques and materials for improving longitudinal joint density. The research team will also assess the payment schedules for longitudinal joint density used by different states in the US. The literature search for this study will include, but is not limited to, standard sources such as Transportation Research Information Database (TRID), Computerized Engineering Index (COMPENDEX), National Technical Information Services (NTIS), standard specification documents for different states as well as consulting with various state DOT construction and specification engineers. The research will be conducted following the proposed tasks listed below:

- Task 1: Conduct a literature review
- Task 2: Prepare a draft final report

IMPLEMENTATION POTENTIAL

It is expected that the findings of this research will serve as a guide for the conduct of additional study to modify section 502 of *Louisiana DOTD Standard Specifications for Road and Bridges* for the inclusion of longitudinal joint specification with pay adjustment schedules. It is also expected that the findings of this study will lead to improved practices for longitudinal joint construction and extended pavement service life in Louisiana.