LTRC RESEARCH PROJECT CAPSULE

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TECHNOLOGY TRANSFER PROGRAM

JUST THE FACTS

Cost Effective Prevention of Reflective Cracking of Composite Pavement

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June 15, 2008

Duration:
24 months

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June 14, 2010

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State

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PROBLEM

Reflection cracks are caused by discontinuities (cracks or joints) in underlying layers, which propagate through a hot-mix asphalt (HMA) overlay due to continuous movement at the crack prompted by thermal and traffic loading. If the new overlay is bonded to the distressed layer, cracks in the existing pavement usually propagate to the surface within one to five years and even as early as few months have been reported. Excessive seasonal temperature variations and movements of a cement-treated base layer may also result in shrinkage cracking, which extends to the pavement surface to cause reflection block cracks. Reflection cracking leads to premature failure of overlays by allowing water infiltration through the cracks, which cause stripping in HMA layers and weakening and deterioration of the base and/or subgrade.

Since the early 1930s, considerable resources and efforts have been spent to find new and relatively inexpensive techniques to delay reflection cracking. Different methods, including the use of interlayer systems (e.g., glassgrid, stress absorbing membranes, paving fabrics, etc.) and rubblization, have been suggested for enhancing pavement resistance to reflective cracking. Experimental investigations of these crack control treatments indicate that their performances have been mixed and cannot be considered conclusive.

Louisiana has experience with various techniques and treatments to control reflection cracking since the 1970s; however, the cost-effectiveness and performance of these methods have not been reliably evaluated. In addition, scientific evaluation and testing of these treatment methods was not performed on many projects. To ensure successful control of this distress and effective allocation of maintenance funds, there is a critical need to assess the performance of pavement sections across the state built with various treatment methods and to determine the most cost-effective techniques to delay or to prevent reflection cracking in composite pavements.

Figure 1
Reflective cracking in Louisiana from a concrete layer and a cement-treated base

SPECIAL POINTS OF INTEREST:

- Problem Addressed
- Objectives of Research
- Methodology Used
- Implementation Potential

OBJECTIVES

The objectives of this project are to evaluate and compare different reflection cracking control treatments by evaluating the performance, constructability, and cost-effectiveness of pavements built with these methods across the state. Based on this evaluation, a standard state-wide policy will be established for control of this distress in composite pavements and for pavement preservation.

METHODOLOGY

To achieve the aforementioned objective, the following research tasks are proposed:

Task 1:
Conduct a comprehensive literature review to identify and document existing reflective crack control treatment methodologies that are being used or evaluated nationally to delay and mitigate reflection cracking in rehabilitated pavements.

Task 2:
Conduct a comprehensive survey of current practices in the state that are used or that had been tested to delay and mitigate reflection cracking on various pavement structures.

Task 3:
Identify and locate pavement sections in which reflective crack control treatment methods were used.

Task 4:
Select pavement sections across the state that will be used to assess the cost-effectiveness and performance of crack control treatment methods. For the selected pavement sections, collect field and performance data from Louisiana Department of Transportation & Development (LADOTD) Pavement Management Systems (PMS) database, district engineers, and from the test sites to assess the effectiveness of the reflective crack control treatments.

Task 5:
Determine the effectiveness of reflective crack control treatment methods based on performance, economic worthiness, constructability, and long-term benefits.

Task 6:
Develop a standard state-wide policy for reflection cracking control and mitigation as well as pavement preservation.

Task 7:
Prepare a final report that documents the research effort in this study, establishes a detailed strategy to control reflection cracking for various pavement structures, and provides a standard guideline that LADOTD design and construction staff can use to prevent the premature appearance of reflection cracking in rehabilitated pavements.

IMPLEMENTATION POTENTIAL

Different crack treatment methods, including the use of interlayer systems, have been suggested for enhancing pavement resistance to reflective cracking. Unfortunately, several of the proposed treatment methods have been introduced by the industry and are not supported by adequate field performance and cost-effectiveness data. The proposed research will accomplish two major objectives. First, all roadways where crack treatment methods have been used will be identified serving this research and future projects in this area. In addition, the field performance and cost-effectiveness of these treatment methods will be quantified for conditions pertinent to Louisiana. This will enable the research team to draw rational and objective conclusions about the field and cost-effectiveness of these treatment methods. Second, this research project will develop a rational, objective, and systematic policy for controlling longitudinal and transverse reflective cracking on projects involving resurfacing of distressed rigid and flexible pavements. This will ensure that ineffective crack treatment methodologies as shown by district surveys will not be re-evaluated in the state under the same conditions and, therefore, save a significant amount of financial resources to the Department.

The research results from this project can also be used by the state of Louisiana to update current specifications to provide a concise approach to control reflective cracking in rehabilitated pavements.

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