



Transportation Consortium of South Central States

Key Points

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18PLSU13

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Principal Investigator(s):

Qian Zhang

University of Louisiana at
Lafayette

qian.zhang@louisiana.edu

Mohammad Jamal Khattak

University of Louisiana at
Lafayette

khattak@louisiana.edu

Lead Institution:

University of Louisiana at
Lafayette

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\$44,874

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Tran-SET

University of Louisiana at
Lafayette

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\$89,748

Mitigating Pavement Reflective Cracking using a Ductile Concrete Interlayer

Brief Project Description

A ductile high-performance fiber reinforced concrete (HPFRC) interlayer is proposed in this study to mitigate the reflective cracking problem in pavement overlays. HPFRC mixtures will be selected for the proposed interlayer application and their mechanical properties will be characterized. The HPFRC interlayer system will be designed and tested under static and fatigue loadings to evaluate their performance and effectiveness in suppressing reflective cracking. The outcome of this study will include design recommendations and guidelines for HPFRC interlayer systems. Also, various workforce development, outreach and educational programs will be implemented to further broaden the impact of the research findings.

Problem Statement

Overlays are constructed over existing pavement structures as a repair measure. When an overlay is placed on an existing pavement, under thermal, shrinkage or traffic induced loadings, cracking of the overlay often takes place at locations where there are joints or cracks in the underlying pavement due to stress concentration. This phenomenon is referred to as reflective cracking. Reflective cracking in the overlay allows water to penetrate the pavement structure and contributes to many forms of pavement deterioration, including increased roughness, spalling and decreased fatigue life. Therefore, to achieve an effective and durable pavement repair using overlay system, reflective cracking needs to be suppressed.

A ductile high-performance fiber reinforced concrete (HPFRC) interlayer is proposed in this study to mitigate the reflective cracking problem in pavement overlays. It is hypothesized that by adding a thin layer of highly ductile HPFRC material between the existing pavement and overlay, reflective cracking can be arrested by the ductile interlayer.

Objectives

The overall objective of the study is to design and evaluate the behavior and fatigue performance of a novel interlayer system made of ductile HPFRC. The specific objectives are to:



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- Review the current practice of pavement interlayer systems
- Experimentally study the performance of the proposed HPFRC interlayer system
- Make design recommendations of the HPFRC interlayer system
- Disseminate the research findings through various educational and outreach programs

Intended Implementation of Research

Workforce Development

One graduate student will work on this study and gain extensive research experience in material development, material characterization and pavement engineering. Two undergraduate students from the University of Louisiana at Lafayette (ULL) College of Engineering Research Apprenticeship program will also participate in the study and get trained on research and experimental skills.

Education

The research findings will be compiled into a lecture series which will be incorporated into a graduate course at ULL. Also, the research team will present the research findings at the graduate and undergraduate seminar class at the Louis Stokes-Louisiana Alliance for Minority Participation (LS-LAMP) program – to expose a greater number of graduate and undergraduate students across ULL to the research.

Outreach

Presentations and lab demos of the innovative interlayer system will be made to high school students through participation in the Engineering & Technology Expo activities hosted at ULL. The research team will also participate in the Speaking of Science (SoS) program held by LA EPSCoR and present the research findings of the proposed project. The target audience of the SoS program include K-16 students, educators, and general audience.

Anticipated Impacts/Benefits of Implementation

This study will evaluate the performance of an innovative interlayer system that can be potentially implemented to repair both concrete and asphalt pavement. The new repair system will have much higher structural and durability performance than that of the currently used overlay and interlayer system. The study aims at extending the life of existing transportation infrastructure through the application of emerging technologies and developing cost-effective solutions for the construction and maintenance of the transportation infrastructure.

Weblinks:

<http://transet.lsu.edu/research/research-in-progress/>

<https://trid.trb.org/View/1505414>