



Transportation Consortium of South Central States

Key Points

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17CNMS01

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Principal Investigator(s):
Dr. Craig Newtonson
New Mexico State University
Email: newtson@nmsu.edu

Dr. Brad Weldon
New Mexico State University
Email: bweldon@nmsu.edu

Lead Institution:
New Mexico State University

Funds Requested to UTC:
\$90,000

Funding Source(s):
Tran-SET
New Mexico State University

Total Project Cost:
\$180,000

Bridge Deck Overlays Using Ultra-High-Performance Concrete

Brief Project Description

This project will develop the technology and/or procedures that will allow ultra-high-performance concrete (UHPC) produced with local materials to be used as an overlay material for existing concrete bridge decks.

Problem Statement

Overlays are placed on existing concrete bridge decks for numerous reasons, some of which include: (a) increasing cover for the deck reinforcing steel, (b) to improve rideability, and (c) to improve skid resistance. Over the past several decades, several materials have been used to overlay existing concrete bridge decks. Some notable materials that have been commonly used include asphalt concrete, latex-modified concrete, low-slump dense concrete, and polyester polymer concrete (or polyester modified concrete). Under current practices, most transportation agencies in the US avoid the use of asphalt concrete overlays because they obstruct inspection of the concrete deck.

During the 1990s, polyester polymer concrete became a popular overlay material for transportation agencies because it is nearly impermeable, can be used at thickness as small as 0.75 inches (19 mm), and can be opened to traffic in as little as two to four hours. In New Mexico, polyester polymer concrete is being used for all bridge deck overlays less than 3 inches (75 mm) thick. However, discussions with personnel from the Bridge Design Bureau of the New Mexico Department of Transportation (NMDOT) have indicated that polyester polymer concrete overlays have two distinct drawbacks. First, the materials costs for polyester polymer concrete overlays are high in comparison to portland cement concrete overlays. Secondly, the NMDOT personnel estimate that rehabilitation of the polyester polymer concrete overlay is necessary after about eight years on average. Therefore, there is a need to develop overlay technologies that can increase the service life of the overlay and reduce maintenance costs during that service life. It is proposed to investigate the possibility of using ultra-high performance concrete (UHPC) produced with local materials to overlay existing concrete bridge decks. UHPC is promising as an overlay material because it has been shown to have exceptional durability and strength properties.



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Objective

The goal of this proposed project is to develop overlay technologies with UHPC using local materials to increase the service life of the overlay and reduce maintenance costs during that service life.

Intended Implementation of Research

Technology Transfer

The goal of the research team is to ensure that results of this project are published in archival form to provide lasting impact on the transportation industry. NMSU's research team intends disseminate the research results to the research community, state DOTs, and other transportation related organizations by:

- Presenting the findings at national conferences, such as TRB, and publication in archival journals to provide the most lasting impact of the research.
- Presenting the findings at regional conferences that might be co-hosted by Tran-SET or institutions affiliated with Tran-SET.
- Development and dissemination of a powerpoint presentation that can be used for education or workforce development activities. This presentation will be submitted to Tran-SET for archival purposes.
- Incorporating the research results into regular course offerings at NMSU (such as capstone design courses taught by Dr. Newtonson) to ensure that our graduates have state of the art knowledge in their field.

Education, Workforce Development, and Outreach

In addition to the technical aspects of the research, efforts should be made to address education, outreach, and workforce development. To address these issues, the following tasks will also be performed as part of this project:

- Development of a powerpoint presentation containing educational content that can be used in the education and recruitment of high school and community college students that are considering transportation engineering careers, interested in construction related careers, or are interested in pursuing careers in the concrete industry.
- Presentation of the research findings at conferences, meetings, and workshops associated with Tran-SET and the transportation engineering community to provide workforce development and continuing education opportunities for people considering transportation related careers and transportation professionals.

Anticipated Impacts/Benefits of Implementation

- Developing new technology for installation of UHPC overlays produced with local materials applied to existing concrete bridge decks. This technology has the potential to increase durability of bridge deck overlays and reduce lifetime costs for bridges.
- Improving sustainability of bridge deck overlay practices. Since the durability of UHPC is known to be substantially greater than the durability of traditional concrete, UHPC holds the potential to protect substrate concrete and substantially increase service life for the overlay.



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Weblinks:

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

<https://rip.trb.org/view/1467203>