



Transportation Consortium of South Central States

Key Points

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18CLSU14

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Lead Institution:
Baton Rouge Community College

Funds Requested to UTC:
\$20,000

Funding Source(s):
Tran-SET
Baton Rouge Community College
US Department of Health and
Human Services

Total Project Cost:
\$40,100

Investigation of Physical and Dynamic Properties of High Porous Concrete

Brief Project Description

This study will investigate and design samples with different grain sizes and chemical composition to optimize the mechanical, physical, and dynamic properties of the highly porous concrete for use in Louisiana's climate conditions. In addition, this research study is designed to engage Baton Rouge Community College students to develop research skills and use basic engineering principles to solve real-world problems associated with improving the durability and safety of local transportation infrastructure.

Problem Statement

Louisiana has the 11th largest highway system in the nation under state control, and a 30th national ranking in total miles of public roadways. Researchers noticed that a flooded road would experience on average approximately 15 times more damage compared with a well-drained section. Weather-Related" crashes are those that occur in the presence of adverse weather and/or slick pavement conditions. With the occurrence of inclement and hazardous weather such as floods and hurricanes, standing water is a safety concern for Louisiana drivers and pedestrians. Standing water poses hazardous conditions for drivers in other parts of the country as well. To this end, this study proposes to investigate various types of porous concrete. Highly porous concrete is a promising technology which can be applied to avoid flooding on pavements, parking lots, and highways. The concrete mixture design allows this material to be highly porous (up to 30% in air voids) and permeable that allows water to penetrate through the pavement during heavy rain periods. This would help to increase safety and reduce the number of accidents during harsh weather conditions.

Objectives

The objectives of this study are to develop a new, cost-effective porous concrete material to enhance the durability of infrastructure; and to promote education and workforce development by teaching pre-engineering students civil engineering principles to solve real-world problems associated with improving the durability and safety of local transportation infrastructure.

Intended Implementation of Research



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Education

The proposed project is an opportunity to engage two-year college students in real-world problem solving (problem-based learning) designed to positively impact their local transportation infrastructure. Students participating in the research project will have a hands-on learning experience and will be engaged in transportation engineering. The research activities used in this project will augment the course activities and concepts covered in the Introduction to Engineering course (ENGR 1052).

Workforce Development

This project will assist students in building a foundational knowledge of civil engineering principles and problem-solving skills that may be applied to their future careers. The project is an opportunity to enlighten and engage community college students, many of whom are underrepresented in STEM fields, in real-world transportation-related experiences that may lead them to choose a career in the transportation industry. In addition, the project will help students develop the soft skills needed to advance in today's technical workforce.

Undergraduate researchers (pre-engineering students) will work as in interdisciplinary teams, allowing for greater collaboration and innovation. Students will learn that the best and most creative ideas often result from group efforts. Students will learn communication skills expected of technical professionals, skills that allow them to convey ideas and plans and communicate risks as well as propose solutions.

Anticipated Impacts/Benefits of Implementation

The outcome of the project is a combination of educational and scientific findings. The project's outcomes will offer a solution against flooding pavements, highways, and roads in cases of tropical storms in Louisiana, make roads safer and less noisy, and improve the durability of road infrastructure. The educational outcomes are directed to teach pre-engineering major students to several purposes: (a) to provide a deep understanding of material properties and their capabilities; (b) to study how material properties influence the civil construction of larger and better built structures; and (c) to examine factors affecting safety and reliability of structures.

Weblinks:

- [Tran-SET's website \(http://transet.lsu.edu/research-in-progress/\)](http://transet.lsu.edu/research-in-progress/)
- [TRB's Research in Progress \(RIP\) database \(https://rip.trb.org/View/1504791\)](https://rip.trb.org/View/1504791)