

Project Capsule

26-3P



August 2026

Investigating Longitudinal Cracking in Louisiana's Concrete Pavements

PROBLEM

Portland cement concrete slabs are prone to cracking when tensile stresses exceed the tensile strength of the slab. To manage these stresses and promote controlled cracking along desired planes of weakness, transverse and longitudinal saw cuts are typically made at likely crack initiation points. However, in Louisiana, concrete pavements increasingly exhibit longitudinal cracks in unexpected locations, away from the intended saw cuts. Field observations have highlighted the sudden appearance of these cracks, raising concerns about their causes and implications.

Various studies conducted by state highway agencies across the U.S. have investigated the causes of longitudinal cracking in jointed plain concrete pavements (JPCPs) and explored preventive strategies. These studies indicate that longitudinal cracking arises from a combination of interrelated factors, including temperature fluctuations, moisture gradients within the slab, jointing practices, and the properties of base/subbase materials. Important jointing practices influencing longitudinal cracking include the timing, depth, and quality of saw cuts, joint spacing, and dowel alignment. Despite these findings, the prevailing belief is that longitudinal cracking primarily results from poor construction practices and other non-load-related causes.

In Louisiana, field observations by DOTD pavement design engineers and LTRC research teams reveal that longitudinal cracking is not only prevalent in JPCPs but, in some cases, is more severe than transverse cracking. This distress significantly impacts the performance and service life of concrete pavements. Given the frequency and severity of longitudinal cracking in Louisiana, an investigative study is essential to uncover the specific causes and contributing factors unique to the state's conditions.

OBJECTIVE

The objectives of this study are to:

- Conduct field investigations to document longitudinal cracking in concrete pavements in Louisiana;
- Identify the root causes of longitudinal cracking in JPCPs specific to Louisiana; and
- Develop actionable recommendations for JPCP design features and construction practices to mitigate longitudinal cracking.

Start Date

July 1, 2026

Duration

24 months

Funding

SPR: TT-Fed/TT-Reg - 5

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METHODOLOGY

The work plan for the project has been divided into the following seven (7) tasks:

Task 1: Conduct Literature Review

An extensive search of traditional and electronic sources will be conducted to review the existing literature on longitudinal cracking of concrete pavements. The search will begin with the TRID (Transportation Research International Documentation) database and continue with Compendex/Engineering Village, Scopus, ScienceDirect, NTIS, Web of Science, and Google Scholar.

Task 2: Site Selection and Categorization

The research team will identify a diverse set of concrete pavement sections across Louisiana to ensure the findings are representative statewide. Special attention will be given to sections subjected to frequent overloading from sugar cane truck traffic.

- **Selection Criteria:** Sections will be paired where possible; a cracked section and an adjacent uncracked section with similar age and traffic will be selected to isolate variables.
- **Categorization:** Sites will be grouped by traffic level, base type (e.g., soil cement, stone, or asphalt-treated), and subgrade soil plasticity index (PI).

Task 3: Historical Review and Data Mining

- **Construction Records:** Reviews of “as-built” plans will be conducted to check for deviations in slab thickness or saw-cut timing logs.
- **PMS Analysis:** Louisiana DOTD’s Pavement Management System (PMS) will be utilized to review historical high-definition video logs. This helps determine when the cracks first appeared in the pavement’s lifecycle, as well as the patterns of the cracks.

Task 4: Comprehensive Field and Laboratory Investigation

This task will provide the empirical data required for the root cause analysis.

- **Falling Weight Deflectometer (FWD):** Load transfer efficiency (LTE) will be measured.

- **Ground Penetrating Radar (GPR):** GPR will be used to identify “moisture pockets” or voids beneath the slab that lead to loss of support.
- **Coring:** Cores will be taken to examine crack propagation.
- **Dynamic Cone Penetrometer (DCP):** This measurement will be conducted to measure the in-situ strength (CBR) of the base and subgrade.
- **Geometric Assessment:** Precise measurements of slab width-to-length ratios, joint space, slab width, nearby lane, shoulder, and pavement drainage features will be conducted.
- **Presence of Large Trees:** The presence and proximity of trees at selected sites will also be documented and evaluated.

Task 5: Pavement Mechanical Analysis

The research team will utilize Finite Element (FE) Analysis to run a sensitivity analysis. By varying parameters such as slab width, tie-bar spacing, and base stiffness in the software, they will identify which factors correlate most strongly with longitudinal crack formation under Louisiana-specific conditions.

Task 6: Root Cause Identification and Data Synthesis

Using data from Tasks 1-4, a statistical correlation analysis will be performed to determine whether cracking correlates more strongly with construction techniques, soil type, environmental factors, or design features.

Task 7: Final Report and Implementation Plan

A final report will be compiled to document the project’s findings.

IMPLEMENTATION POTENTIAL

The findings of this study can be directly translated into practical guidance for DOTD and industry practitioners, including design refinements, construction best practices, and quality control measures to minimize longitudinal cracking. These recommendations can be incorporated into existing specifications, training programs, and project workflows, enabling contractors and engineers to improve pavement quality, reduce maintenance needs, and achieve greater long-term efficiency across concrete pavement projects.