DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Towards Implementation of Recycled Fibers from Novel and Existing Source Materials in Concrete

Identifying and evaluating recycled fiber materials for concrete pavements.

Pavement

November 2025

Project Title:
Partnered Pavement Research Center (PPRC) 23: Performance Related Specifications

Task Number: 4394

Start Date: November 27, 2023

Completion Date: June 30, 2026

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WHAT IS THE NEED?

Fiber-reinforced concrete (FRC) can extend pavement service life and reduce crack and joint repairs. Yet, specifications for FRC are limited, and recycled fibers – often matching or surpassing virgin fibers in performance – remain underused. California needs validated design parameters, supply-chain strategies, and life-cycle cost and environmental data to integrate recycled fibers into concrete paving practices.

WHAT ARE WE DOING?

Phase II of this task builds on initial work (2022–2023) and focuses on:

- Source material sampling, characterization, and fiber production to identify viable recycled fiber feedstocks in California.
- Optimization of fiber size and load through trial batching, industry collaboration, and performance testing.
- Durability evaluation using freeze-thaw and other standardized tests on selected recycled fiber-reinforced concrete (rFRC).
- Documenting Phase II research findings and refine associated guidelines based on results.
- Test track construction and testing with Heavy Vehicle Simulator loading to assess fiber contributions to fatigue life and joint load transfer.
- Mechanistic-empirical modeling to incorporate fiber benefits into PavementME design frameworks.
- Final research report and implementation proposal for

Caltrans

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inclusion in Caltrans' Rigid Design Catalog.

WHAT IS OUR GOAL?

The main goal of this task is to validate recycled fibers as effective FRC additives, quantify their environmental and economic benefits, and develop design guidelines and specification language for the California Department of Transportation (Caltrans) to adopt rFRC in concrete pavements.

WHAT IS THE BENEFIT?

Implementing recycled fibers will enhance pavement resilience, reduce reliance on virgin materials, and lower life-cycle costs and carbon emissions. Caltrans gains sustainable infrastructure solutions, cost savings, and leadership in innovative concrete practices.

WHAT IS THE PROGRESS TO DATE?

The research team has made the following progress:

- Reviewed collected fiber samples and continued contacting suppliers to obtain additional fibers.
- Developed a fiber-reinforced concrete batching and testing plan, completed fiber size and load selection through trial batches and meetings with industry, and is finalizing the technical report for submittal to Caltrans.
- Installed the freeze-thaw cabinet and conducted freeze-thaw testing of recycled fiber–reinforced concrete.
- Started test section planning.
- Completed a literature review of existing pavement design procedures with FRC.
- Submitted Phase 2 report, which was approved by Caltrans. Project meeting was held with the project technical advisory panel and start of Phase 3 was approved. Report is undergoing editorial review.