DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Implementation of New Models in CalME

Improving, refining, and updating CalME for mechanistic-empirical design of flexible pavements.

Pavement

November 2025

Project Title:

Partnered Pavement Research Center (PPRC) 23: Mechanistic-Empirical Design

Task Number: 4201

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WHAT IS THE NEED?

The California Department of Transportation (Caltrans) has transitioned from an empirical pavement design method to a mechanistic-empirical (M-E) approach, which more effectively accounts for local materials, climate, and traffic conditions. Ongoing research continues to improve M-E methodologies by refining models to better represent the physical processes influencing pavement performance. Additionally, there is a growing need to replace retired desktop design programs and provide local governments with updated, consistent tools and a flexible pavement design catalog that aligns with Caltrans' adopted M-E framework.

WHAT ARE WE DOING?

This task order focuses on enhancing the models within the California Mechanistic-Empirical (CalME) software to improve prediction accuracy and reduce uncertainties in design outcomes. It involves updating existing models, adding new ones to address additional performance factors, updating climate and traffic databases as needed, and periodically recalibrating the empirical components of the M-E methodology based on the latest performance data. Subtasks include:

- Improving CalME's user interface and functionality
- Updating models and databases within CalME
- Updating the calibration of CalME performance models
- Developing a flexible pavement design catalog for local governments

WHAT IS OUR GOAL?

The primary goal is to advance the CalME program by

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enhancing its functionality, refining the accuracy of its models, and expanding its design capabilities. The task also aims to support local governments by providing a new, web-based design catalog and user-friendly tools consistent with CalME, ensuring a seamless transition from retired software.

WHAT IS THE BENEFIT?

Enhancing the CalME program will improve the efficiency and accuracy of pavement design workflows at Caltrans. Refined models will better reflect actual pavement performance under local conditions, reducing uncertainty in predicted outcomes. This enables designers to optimize pavement structures without relying on overly conservative assumptions, resulting in more cost-effective, reliable designs.

Local governments will also benefit from new, consistent design tools aligned with Caltrans' mechanistic-empirical methodology, ensuring smoother project delivery and greater statewide consistency in pavement design practices.

WHAT IS THE PROGRESS TO DATE?

The research team has made the following progress:

- Continued development of software components that can be used in CalME and other applications.
- Continued work on the first application of RealCost for Life Cycle Cost Analysis (LCCA) that will share many components and programming architecture as updated version of CalME.
- Continued development of aging model that accounts for aging effect on stiffness, fatigue and age-related cracking of asphalt pavements.
- Organized and refined the surface temperature database from the recent performance grading map study.