DRISI

Caltrans Division of Research, Innovation and System Information

Research Notes

MED-E: ME Algorithms and Field Characterization

Continue Improving the M-E Design System Developed by University of California Pavement Research Center for California Pavement Design.

Pavement

JULY 2020

Project Title:
PPRC 20 Performance Related Specifications

Task Number: 3200

Start Date: July 1, 2017

Completion Date: June 30, 2020

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WHAT IS THE NEED?

To accomplish California Department of Transportation's (Caltrans') mission of providing an efficient transportation system to enhance California's economy and livability, Caltrans is transitioning from using empirical method to mechanistic-empirical (M-E) method for pavement design, so that local conditions such as material, climate and traffic can be effectively accounted for.

M-E methods involves using computer models to describe various physical processes that change pavement conditions and ultimately simulating pavement deterioration over time. M-E design method needs to be continuously improved by conducting research to better understand various physical processes affecting pavement deterioration and implementing the findings.

WHAT ARE WE DOING?

Through several previous research projects, computer models have been continuously improved to enhance critical physical processes for California pavements. This research will help Caltrans to identify critical but not yet well understood physical processes related to M-E design and critical subject areas that need further study. This research includes the following tasks:

1. Identify M-E design research needs
2. Develop critical models for flexible pavements
3. Develop critical models for composite pavements
4. Develop additional critical models not covered in Tasks 2 and 3 Implement improvements in M-E design tools

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DRISI provides solutions and knowledge that improves California's transportation system

5. Improve field characterization procedures
6. Update deflection back-calculation tool - CalBack
7. Prepare report to document the study

WHAT IS OUR GOAL?

The goal of this project is to gain more knowledge on pavement behaviors and use them to improve M-E design methods for California pavements. The ultimate goal is to increase the understanding of physical processes in pavements; and to minimize the need to use empirical factors to cover critical processes affecting pavement performance that are not well understood.

WHAT IS THE BENEFIT?

Caltrans is looking to expand the use of M-E methods for flexible pavement design and rehabilitation. Compared to empirical methods, M-E method is better at accommodating new materials and construction processes. The transition to M-E design helps Caltrans design more cost-effective pavements and accomplish the mission of providing an efficient transportation system to enhance California's economy and livability. M-E methods account for local conditions such as climate, traffic, and material, and therefore, optimize pavement designs for the specific conditions rather than having to cover the worst-case scenario.

WHAT IS THE PROGRESS TO DATE?

As of July 2020, the research team is continuing the following tasks:

- Developing a preliminary set of models for different pavement types
- Reviewing laboratory testing on binder and fine aggregate mixture rest period effects; analyzing sets of results of aging protocol for consistent performance evaluation; and performing laboratory testing for studying asphalt concrete aging
- Additional trial tests using the prototype loading frame for concrete creep stress; analyzing data collected and preparing to build an alternative CTE testing device, and conducting pilot laboratory testing
- Refining strain calculation engine for traffic induced reflective cracking model
- Implementing FDR-FA damage model in CalME
- Ongoing documentation of progress