PROJECT SUMMARY REPORT

5-6839-01: Pavement Rehabilitation and Design Strategy for Heavy Loads in the Energy Development Areas

Background

In recent years, rapid energy development in Texas has caused significant damage to many farm-to-market (FM) roads, which traditionally have a thin asphalt surface layer plus a stabilized base directly over the subgrade. These FM roads performed well under normal traffic loads but failed dramatically under the energy-sector truck loads. There is an urgent need to repair many of these badly damaged roadways with new pavement rehabilitation and design strategy in all energy development areas.

What the Researchers Did

Researchers analyzed all the traffic data collected by both permanent and portable weigh-in-motion stations around Texas and developed default load spectrum inputs for interstate highways, state highways, FM roads, and energy development areas. The researchers then presented the six-step pavement rehabilitation and design strategy and applied it to assist pavement designs using the Texas Flexible Pavement Design System (FPS21) combined with the latest Texas Mechanistic-Empirical Pavement Design for Flexible Pavements (TxME), as shown in Figure 1. The pavement designs of five field projects in four different districts were developed using both FPS21 and TxME and considering both field performance and initial construction cost. Furthermore, the researchers surveyed the field performance of five existing test sections with full-depth reclamation (FDR).

What They Found

Researchers found that the energy development areas had much heavier trucks than the non-energy development areas. The researchers concluded that overloading traffic caused much damage to the pavements through comparison with regular equivalent single-axle load (ESAL) and further identified that the truck factor used to transfer annual average daily traffic to ESAL for pavement designs should be increased.

The field survey indicated that most FDR test sections performed well. However, some of the FDR test sections had early failures as well. Therefore, adequate pavement designs with accurate traffic loading as inputs are critical.

The combination of the FPS21 and TxME check is a useful tool for pavement engineers to design satisfactory roads in the energy development areas to carry such heavy loads.

What This Means

The total ESAL for a design period calculated from the traditional method (i.e., using the equation based on average daily traffic) is much lower than from the TxME-load spectra, which means the total ESAL is significantly

Research Performed by:
Texas A&M Transportation Institute

Research Supervisor:
Fujie Zhou, TTI

Researchers:
Tom Scullion, TTI

Project Completed:
8-31-2022

underestimated when using the traditional methodology. This is specifically true for FM roads in the energy development areas. Although new truck factors could be developed for different highways, load spectrum data should be directly used for pavement designs.

The six-step pavement rehabilitation and pavement design strategy and associated nondestructive testing tools should be used for rehabilitating the severely damaged roads in the energy development areas.

The pavement design with the FPS21 and TxME check can provide Texas Department of Transportation pavement engineers with adequate pavement designs to support overloaded heavy traffic in the energy development areas.

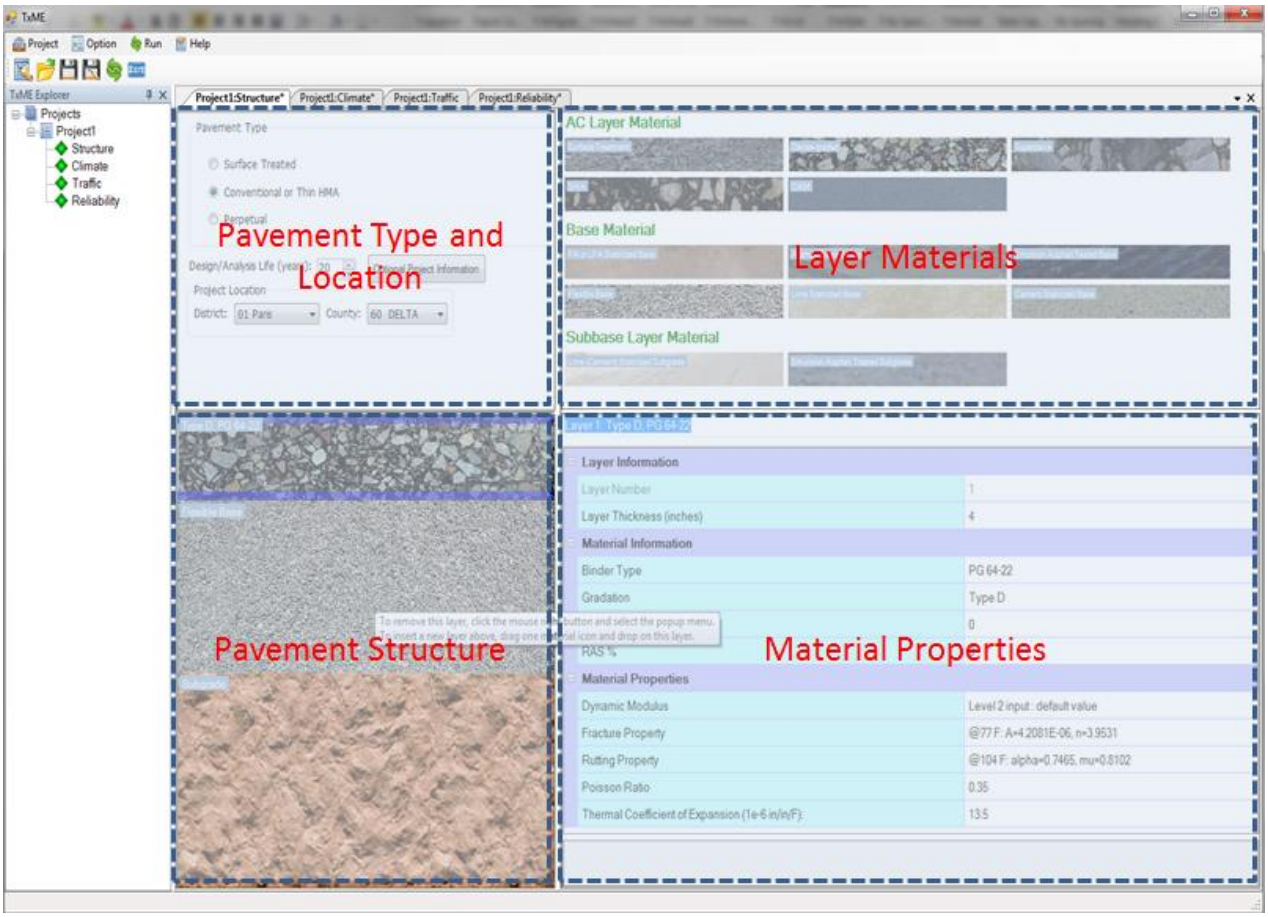

Figure 1. Texas Mechanistic-Empirical Pavement Design for Flexible Pavements.

For More Information

Project Manager:
Martin Dassi, TxDOT, (512) 416-4738

Research Supervisor:
Fujie Zhou, TTI, (979) 317-2325

Project Monitoring Committee Members:
Miguel Arellano, Ruben Carrasco, Roberto Trevino Flores, Andres Gonzalez, Andy Naranjo, and Tony Reyna Jr.

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov
Keyword: Research

Technical reports when published are available at **http://library.ctr.utexas.edu**.

This research was sponsored by the Texas Department of Transportation and the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented here. The contents do not necessarily reflect the official view or policies of FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and not for product endorsement.