

Viability Assessment and Cost-Effectiveness of Using High-Modulus Asphalt Concrete (HMAC) as Base Course in Asphalt Pavements in Louisiana

Analyzing if the Enrobé à Module Élevé (EME) method can be executed in Louisiana with local materials

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\$120,000

In 1987, the Strategic Highway Research Program (SHRP) drafted a new system for designing asphaltic materials. The final product of the SHRP asphalt research program was named Superior Performing Asphalt Pavements (Superpave). Superpave was meant to enhance over the existing Hveem and Marshall Procedures by adopting a new methodology for selecting and specifying asphalt binders. Early Superpave implementation mainly focused on the pavement resistance to rutting by specifying a higher grade of asphalt binder and high-quality aggregates for heavy traffic loads. Yet, most transportation agencies in the US currently report that pavement rutting has been all but eliminated. Instead, there have been growing concerns that the primary mode of failure for asphalt pavements is cracking due to (a) problems in mixture design, (b) increased use of recycled materials, (c) problems with construction quality, and (d) failure to properly address underlying pavement distresses during rehabilitation. It is now known that current mixture design practices have some faults. To this end, using emerging technologies that enhance pavement durability would be advantageous. One such promising technology is the “Enrobé à Module Élevé- (EME)” or “High-Modulus Asphalt Concrete (HMAC) Mix.” The improved pavement performance of the EME technology raises the question whether using this type of asphalt mix is beneficial for the conditions encountered in Louisiana and other states located in Region 6

Belgium, and Switzerland. This technology is now being developed worldwide. The improved pavement performance of the EME technology raises the question whether using this type of asphalt mix is beneficial for the conditions of Louisiana and other states of Region 6. Some factors like climate, traffic, available construction materials, construction methods are specific to Louisiana and thus, development of a suitable EME mix design cannot be a perfect copy of the original method. Therefore, it is necessary to evaluate this emerging mixture for Louisiana conditions while retaining the authenticity and advantages of the original technology.

Project Summary

The main goal of this project is to assess whether local virgin and recycled materials in Louisiana could be used to produce Enrobé à Module Élevé- (EME) mixtures so that it can be used as a base course in asphalt pavements. To this end, high-modulus asphalt mixtures simulating the European approach will be prepared using the Superpave specifications. These mixtures will incorporate different asphalt binder grades, polymer contents, and reclaimed asphalt pavement (RAP) percentages. The dynamic modulus and the performance of these mixes against rutting, moisture damage, and fatigue cracking will be calculated. The project results will potentially give solutions for fatigue and rutting failures in asphalt pavements in Region 6, thus increasing the durability and service life of the road infrastructure.

Intended Implementation of Research

Education and Workforce Development: This project will fund one Ph.D student at Louisiana State University. This will help prepare future leaders in the Transportation Sector. The research team will also prepare educational material on the guidelines for EME mix design to incorporate into courses at LSU and share it with other universities. The educational material will also be summarized

Problem Statement

The EME was drafted in the 1980s in France to address fatigue cracking and rutting failures in asphalt pavements. This mix is divided into two classes, EME Class 1 and EME Class 2. EME Class 2 has a high stiffness modulus (dynamic or complex modulus) together with a great resistance to fatigue and rutting while EME Class 1 is a degraded “low cost” class that has similar stiffness and rutting resistance to Class 2 but with relatively lower fatigue resistance. Normally, EME mixes can be used in new and rehabilitation pavement projects. Using EME became prevalent in many European countries such as the United Kingdom,



and disseminated to government entities and the industry. Results of this work will be also disseminated at national conferences such as TRB and ASCE.

Outreach: This research project will extend at least one summer internship to high school students within the High School Student Research (HSSR) Intern Program organized by Dr. Adam Melvin at LSU.

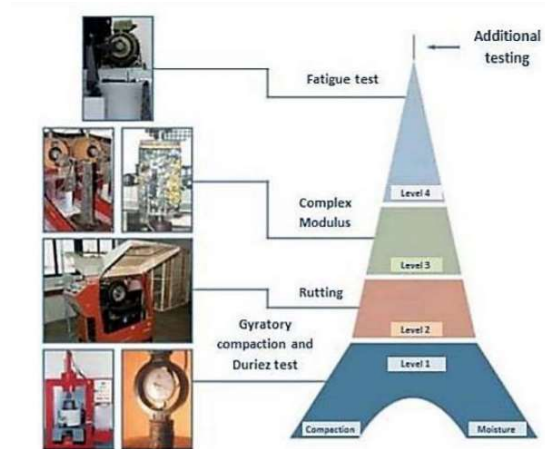


Figure 1: EME Mix Design Approach

Anticipated Impacts/Benefits of Implementation

The main deliverables from this study are: (1) a final report to be delivered at the end of the technical phase with details of the drafted protocols for the EME mix design. The final report will include developed guidelines for the EME mix design. The final report will be prepared to include a complete description of the problem, approach, methodology, findings, conclusions, and recommendations, (2) an Implementation report will be delivered at the end of the implementation phase using the Tran-SET template for implementation reports. The Implementation Report will include a full description of developed products from the education, T2, and workforce development activities that were done during the implementation phase of this project.

Web links

- Tran-SET's website
<https://transet.lsu.edu/research-in-progress>

Tran-SET

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes".

Learn More

For more information about Tran-SET, please visit [our website](#), LinkedIn, Twitter, Facebook, and YouTube pages. Also, please feel free to contact Dr. Momen Mousa (Tran-SET Program Manager) directly at transet@lsu.edu.

