Project Summary

Texas Department of Transportation

0-6357: Monitoring of Experimental Sections Using a Pavement Database

Background

TxDOT has developed several databases for very different purposes. However, there is no database that collects and stores important experiences that are gained from field application of technologies or methods developed through the research program. TxDOT often requests that data collected from these projects be submitted in database format at the conclusion of the project. A database that can hold information from research projects provides TxDOT personnel, practitioners, and researchers with a tool to reference information from past studies and avoid duplication. A database of this type is useful not only for tracking the performance of different types of materials, construction techniques, and new technologies, but also as a warehouse to archive case studies. This is fundamental for ensuring that the experience and knowledge gained through the years by developing and implementing technologies is preserved, that the benefits of the research program are capitalized, and that mistakes from the past are not repeated.

The availability of *wiki* tools allowed for the development of an online database system that can house all of the required information and can be easily accessed and modified by all users to accommodate changing requirements and needs. Wiki-based technology consists of a collection of web pages designed to enable anyone with internet access to contribute or modify content, using a simplified markup language.

What the Researchers Did

The goal of this project was to develop a database of experimental pavement sections constructed in Texas. It provided for collection of performance data of these sections to determine the types of experiments that have been successful (or not!). Our goal was to establish whether the research products were effective and, if so, whether they were efficient. To achieve this goal, the following objectives were established: 1) selection of experimental sections, 2) development of a data collection plan, 3) data collection, 4) a process for analyzing the data, and 5) a plan for the maintenance and management of the database. A web-based wiki was developed as a frontend to serve content developed as part of the study.

What They Found

The specific research findings can be summarized as follows:

1) **Recycled Asphalt Pavement (RAP)**. The use of RAP has the most significant effect on reducing the rutting progression of the pavement. The use of RAP, however, accelerates the time of crack initiation. In sections where the cracking process has started, milling prior to overlaying results in a lower number of transverse cracks, while adding RAP to the Hot Mix Asphalt (HMA) mix increases the number of transverse cracks. The use of RAP is a sustainable technology that should be embraced.

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RAP is an effective material for delaying and reducing rutting but it is neither effective nor efficient in preventing cracking. RAP is not always the most economical option.

2) **Long Term Performance of Compost**. The type of compost additive used did not have a significantly different effect in the performance of the sections. In the short term, however, the type of compost does make a difference. The width of soil that is treated has a significant effect on the performance of the shoulder and, possibly, of the pavement structure. Sections with 5 ft treatment did not differ significantly in performance from the control sections. Sections where the compost additive was applied to widths of 10 ft did show improved resistance to cracking and lower roughness. The depth of the treatment was also found to be significant in minimizing deterioration. The use of compost to minimize the effect of moisture variation on the performance of the adjacent pavement has been an effective and successful experiment.
3) **Warm-Mix Asphalt (WMA) Technologies**. The research findings are based on only two years of performance and are inconclusive. The performance of the sections built in Lufkin may be affected by the variability of the thickness of the overlay and the conditions of the pavement before the overlay. Validation of the early findings requires further monitoring.
4) **Perpetual Pavements**. The deterioration rates for the perpetual pavement structure are significantly lower than those of the conventional HMA structure. Perpetual pavement showed low deflections, indicating higher structural capacity. Negligible distress (cracking and rutting) was observed in the evaluated sections and lower roughness. Pavement Management Information System (PMIS) data indicate that the perpetual pavement structures have better distress, condition, and ride scores as compared to the conventional sections. Typically, the yearly maintenance investment on the perpetual pavement sections was considerably lower than that of the conventional counterpart. Therefore, the application of perpetual pavement technology has been another very successful story. The final chapter of this story will be written when the long-term performance of these sections is determined through continued monitoring of these sections.
5) **Performance of Crack Attenuating Mixtures (CAM)**. The evaluation of the CAM sections indicated that the use of CAM mixes as surface layers can result in considerable rutting. CAMs should not be used as a surface layer but actually as a rich bottom layer (RBL) to help reduce reflective cracking. It should be emphasized that CAMs were originally developed as a RBL mixture; however, the necessity in Texas for a crack-resistant mixture for relatively thin overlays over severely cracked pavements has created the need for a CAM-type mix for surfaces.

What This Means

As a result of the project, the researchers have delivered organized data and analysis from experimental sections identified as having the potential to result in reliable and economical pavement designs. The findings from these experiments, once implemented, can be used by TxDOT's districts and divisions and could realize significant savings by affecting design and construction methods and current specifications.

The research team recommends that the enhancement, maintenance, and updating of this database be a continued effort. Many valuable lessons remain out there that can be captured at a low cost and consequently, any investment in gathering these lessons will have a high benefit/cost ratio.

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