



# *Project Summary*

*Texas Department of Transportation*

## 0-5566: Strategies to Improve and Preserve Flexible Pavement at Intersections

### *Background*

Rural intersections originally constructed with thin untreated flexible base and hot mix or a two-course surface treatment tend to experience severe pushing, shoving and rutting. In most cases, pavements constructed with the same materials at cross-sections adjacent to the intersection perform adequately. These distresses cause an extremely rough surface that can cause damage to small vehicles and potentially cause motorists to lose control of their vehicles. Moreover, these distresses almost always result in complete failure of the pavement in the intersection that must be repaired several times during the life of the roadway.

### *What the Researchers Did*

Researchers developed an online expert system and an accompanying guide. An expert system is a knowledge-based system whose performance is intended to rival that of human experts. It can be used to record and distribute expert knowledge to ensure the quality of problem solving, and to train inexperienced personnel. The guide can be used either online or in the field to assess the type and severity of distresses, to identify the layer(s) that contribute to the distress, and the nature of each remediation strategy.

The expert system in this case serves as a step-by-step advisory tool for determining the optimum solution based on the expertise of experienced engineers and experts from around the world. This translates into uniformity in the decision making process that would promote more consistency across TxDOT.

Two sets of questionnaires allowed the researchers to customize the experiences documented by other highway agencies around the world to TxDOT needs. The two questionnaires documented the extent of distress such as excessive permanent deformation at intersections in the districts and current solutions typically used to remedy those problems. The questionnaires were followed by face-to-face interviews with several districts' design, maintenance and construction personnel. In addition, forensic investigations at several sites in different districts provided valuable information that was used in the development of the expert system.

### *Research Performed by:*

The University of Texas at El Paso (UTEP)

#### **Research Supervisor:**

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## What They Found

The feedback from the literature search, the questionnaires, and district interviews provided a good foundation for the treatment needs and common distresses at intersections, as well as the mechanisms and decisions utilized by the districts based on their funding limitations. Several appropriate remediation strategies for common distresses found at intersections were selected from different state and national agencies and summarized into a table. The table allows the user to map the appropriateness of remediation alternatives to the most common intersection distresses in Texas. In most cases, the distresses are separated into three levels: low, moderate, and high. This expertise composed the main component of the knowledge base or brain of the expert system.

## What This Means

Two products, the expert system and guideline, developed under this project would be useful to TxDOT personnel. Inexperienced engineers can utilize the expert knowledge and opinions embedded in the expert system to assist them in decision making. Field personnel can also use the guideline to help in identifying distress and severity levels.

The expert system can be used to evaluate intersections in various districts across Texas after having identified the source of the problem for the selection of a remediation strategy. The economic aspects of the selected alternatives are also provided based on a life cycle cost analysis for short term and long term solutions.

An online guideline provides detailed information to TxDOT personnel in the field. The information is separated into four components: a) common distresses, b) common remediation strategies, c) protocol for data collection, and d) structural remediation strategies.

More effectively, the guideline can be used for identifying the types and severity of the distress and locate the layer(s) that contribute to distress. This information is used as input in the expert system to assist in estimating the three most predominant distresses.

The expert system and guideline can be securely accessed through the following link:

[http://ctis.utep.edu/training\\_s/main/login\\_form.php](http://ctis.utep.edu/training_s/main/login_form.php)

### *For More Information:*

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### *Technical reports when published are available at:*

<http://library.ctr.utexas.edu/index.html>

**[www.txdot.gov](http://www.txdot.gov)**

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