ENERGY-SECTOR BRIEF

Maintenance Division, Roadway Asset Management

16-03 PROJECT LEVEL PAVEMENT EVALUATION GUIDELINES

A significant number of roadways in Texas have been damaged by traffic associated with energy development and production. The repair of these roadways requires both routine maintenance and pavement rehabilitation. Routine maintenance operations used by the Texas Department of Transportation (TxDOT) to repair damaged roads in the energy sector are defined in this project as Shallow Patching, Deep Patching, Level Up Patching, Surface Treatments, and Pavement Strengthening. All documents are available on the TxDOT Maintenance Division (MNT) SharePoint at https://txdot.sharepoint.com/sites/division-mnt/SitePages/Home.aspx

When more extensive pavement rehabilitation operations are used, it is often necessary to perform a more detailed pavement evaluation of the damaged roadway. In addition, premature pavement distress has been evident on some energy sector repaired roadways. Traffic volumes have exceeded expectations and some selected repair alternatives have not performed as well as others. For example, relatively thin hot mix asphalt surfaces placed on flexible base materials and subjected to heavy traffic have experienced premature distress. The process used to evaluate roadways to determine rehabilitation alternatives can also be used to collect information for forensic analysis that are conducted on roadways exhibiting premature distress.

BACKGROUND

This Energy Sector Brief summarizes methods that have been used by the Texas A&M Transportation Institute (TTI) and TxDOT to evaluate the condition of existing pavements, provide recommendations for the selection of rehabilitation alternatives including mixture design for the various pavement layers and for the conduct of forensic analysis.

This basic approach has been used for corridor analyses for roadway sections in many districts and eight roadways have been evaluated for the Maintenance Division and Districts associated with energy sector repair projects. Table 1 shows these roadways and their associated Technical Memorandum which document the activities associated with each project. Technical Memorandum shown below are available on TxDOT Maintenance Division (MNT) SharePoint site. These Technical Memorandum document case histories associated with the selection of rehabilitation alternatives as well as the conduct of forensic analysis for specific project in four districts.

Table 1. Roadways Studied and Associated Tech Memos.

Roadway	County/District	Project Limits	Technical Memorandum No.
FM 99	Live Oak/ Corpus Christi	US 281A to McMullen Co. Line	TM-14-01
FM 443	Gonzales/Yoakum	Curve at CR 368 (north of FM 533)	TM-14-02
FM 468	La Salle/Laredo	Cotulla	TM-14-03
SH 97	Gonzales/Yoakum	US 80 to US 183	TM-14-04
SH 349	Martin/Odessa	SH 176 to Dawson Co. Line	TM-14-05
SH 72	Karnes/ Corpus Christi	SH 239 to FM 792	TM-14-06
US 87	Gonzales/Yoakum	Wilson to Dewitt Co. Line	TM-14-07
FM 624	LaSalle/Laredo	SH 16 to McMullen/ LaSalle Co. Line	TM-15-01

LEVEL OF DETAIL REQUIRED

The amount of detailed information collected as part of the pavement evaluation process will vary depending on a number of factors including; size of project, amount of funding available, likely repair strategy, risk reduction and workforce and equipment availability. Typically the more engineering information that is available the more likely a quality rehabilitation/repair alternative will be selected. This reduces the risk of making an incorrect decision. Figure 1 illustrates this concept.

Larger projects with relatively large budgets require more extensive investigation. Three levels of pavement condition evaluation are recommended.

For routine maintenance operations that involve strengthening the pavement, it is recommended that the project historic records (what and when maintenance and rehabilitation activities have been performed on the roadway), a visual condition survey and perhaps Ground Penetration Radar (GPR) information be collected. When preventive maintenance alternatives such as seal coats (chip seals), slurry seals, micro-surfaces and thin overlays) are likely to be selected for repair; historic records, visual condition surveys, GPR and Falling Weight Deflectometer (FWD) information is recommended. Dynamic Cone Penetrometer (DCP) may also be of interest. When more extensive rehabilitation alternatives are being considered

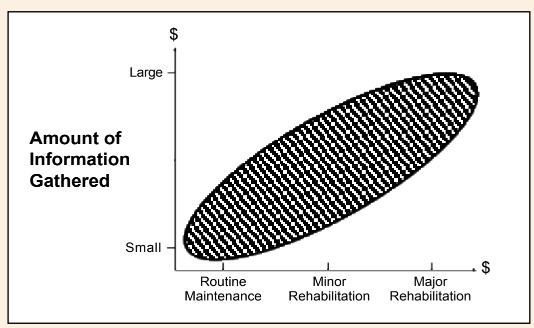

Figure 1. More Information Lessens Risk of Incorrect Decisions.

(pulverization, widening, full depth recycling, additional of flexible base course material, think overlay of hot mix asphalt for example) historic records, visual condition surveys, GPR, FWD, DCP and field sampling and testing are recommended.

KEY STEPS IN PROCESS

Typical steps in the process used to evaluation a pavements condition for either selection of a repair strategy or for the conduct of a forensic analysis are briefly outlined below.

- Obtain and review historic records
- Determine the condition of the existing pavement
- Verify pavement structure (type and thicknesses of layers)
- Obtain samples of materials
- Mixture design
- Pavement thickness design

Historic records are available in District or Area offices. Historic records should provide information on the types and thickness of the pavement layers. In addition, maintenance and rehabilitation activities performed on the pavement section can be identified.

The condition of the existing pavement should first be determined by a visual condition survey. The type, extent and severity of distress should be identified along the project. Types of distress of interest include rutting, flushing, raveling, shoving, corrugations, alligator cracking, transverse cracking and longitudinal cracking. The amount of patching should also be collected.

The historic records describing the **pavement materials and thicknesses** should be verified as budget allows. Ground Penetrating Radar (GPR) information should be collected (Figure 2) to **verify the thicknesses** of the pavement layers as well as identify wet areas in the pavement.

Figure 2. Ground Penetrating Radar.

Figure 3. Falling Weight Deflectometer

Figure 4. Dynamic Cone Penetrometer.

Falling Weight Deflectometer (FWD) (Figure 3) data can be collected and analyzed to determine the load carrying ability of the existing materials and pavement.

Dynamic Cone Penetrometer (DCP) (Figure 4) testing will supply an estimate of the strength of the in-place materials in the pavement section.

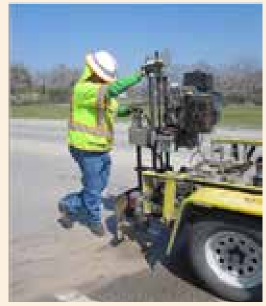

Figure 5. Coring.

Coring (Figure 5) of the existing pavement provides information that will improve the accuracy of the GPR and FWD data as well as confirm the historic pavement cross section data. Coring also will supply samples that will be needed for pavement materials characterization and **mixture design**.

Figure 6. Material Sampling.

More extensive **sampling** may be necessary to secure sufficient materials for mixture design purposes (Figure 6).

Materials sampled from the pavements and any additional materials that will be added to the structural sections should be appropriately combined and characterized and mixture designs performed. TxDOT mixture designs associated with the type of pavement layer selected should be utilized.

Pavement thickness designs should be determined for the project. TxDOT method of pavement design (FPS-21) is recommended for use. A quick but less accurate method is available in other Energy Sector Briefs and their back-up documentation. **Traffic** volumes and weights need to be determined to perform the structural design of the pavement and select the maintenance/ rehabilitation alternative.

Information collected using this approach can be used to identify maintenance and rehabilitation repair alternatives as well as for forensic analysis. Experienced pavement design engineers should be consulted whenever possible. Note that TxDOT's Construction Division (CST) has a dedicated field investigation group.

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