

0-6880: Expanding FDR Technologies in Maintenance Operations

Background

Full-depth reclamation (FDR) is the main approach used across Texas to rehabilitate thin roadways that are structurally damaged. In the FDR process, the existing surface and base materials are pulverized, mixed together, and treated with a stabilizer. The compacted treated base then receives a final surfacing. The stabilizers historically used by the Texas Department of Transportation (TxDOT) include cement, lime, emulsified asphalt, and fly ash. While cement-treated material is the most frequently used, combinations of stabilizers may be desirable.

With the Eagle Ford Shale boom, TxDOT faced the need to rehabilitate many miles of pavement in energy-sector areas of the state and open the roadway to energy-sector traffic at the end of each working day. Based on this need, TxDOT's Corpus Christi District performed an FDR pilot using foamed asphalt treatment in June 2014. Traffic was turned within 2 hours of working and treating a half section, and the district reported good performance of the FDR mix under intense early energy-sector traffic loads. This success led to increased interest in emerging FDR approaches, especially asphalt-based FDR treatments, within TxDOT.

Some concerns do exist with asphalt-based stabilization, however. The foamed asphalt or emulsified asphalt treatments are more expensive than cement, and the performance of asphalt-based stabilization with variable field materials is not well defined in Texas. Thus, the

objective of this project was to identify generally short sections of high-profile roadways with TxDOT and then design and construct experimental sections with a focus on using foamed asphalt or emulsion.

What the Researchers Did

Researchers gathered information on the current state of the practice and emerging FDR technologies. Researchers then worked with TxDOT districts to plan, design, and construct 12 test sections using foamed asphalt or emulsion and evaluate their performance over time. Researchers monitored the test sections, gathered stakeholder feedback on how to improve the FDR workflow, and used the results to develop guidelines and workflow forms suitable to assist stakeholders in successfully developing and delivering a project in the maintenance setting.

What They Found

About 75 percent of nominated pavement sections were viable candidates for asphalt-based FDR. From the 12 constructed test sections, the results showed that FDR with foamed asphalt or emulsion can offer a viable

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solution for rehabilitating pavements with rapid project delivery time, generally successful early opening to traffic, and an average FDR layer modulus generally exceeding 200 ksi. In fact, in some cases, the data suggest that materials may be over-stabilized. Results also showed development of successful mix designs with thin existing pavements of marginal materials by incorporation of additional reclaimed asphalt pavement into the mix and/or reducing the material plasticity index through lime pretreatment. Items of concern included some instances of the seal coat peeling and a few test sections where cement or lime additive rates resulted in transverse shrinkage cracking.

Regarding stakeholder input, participants provided generally positive feedback on the FDR process and speed of construction. For areas of improvement, material cost and staff turnover/loss of expertise remain top concerns. Additionally, some districts expressed desire for a defined process to set up projects, or for turnkey assistance to analyze and help plan and develop a candidate section.

What This Means

Based on the results from this project, FDR with foamed asphalt or emulsified asphalt can offer a viable solution to rehabilitate distressed pavements, and the 200-ksi FDR layer design assumption is reasonable based on the data. Particular care should be taken to properly

develop and design sections, making sure the technology is compatible with actual site materials prior to construction. Even when working with marginal materials, upfront testing, analysis, and design often can produce a viable treatment. Approaches for using these asphalt-based FDR tools with maintenance resources may include the following:

- Place short evaluation sections for districts with limited experience with the technologies.
- Fix problematic excerpts of larger corridors that are otherwise in acceptable condition. This approach could particularly be valuable in seal coat preparation or preparation for other planned upcoming pavement preservation or preventive maintenance.
- Rehabilitate loops, spurs, or farm-to-market roads that are in poor condition and have low probability of warranting construction projects.

The successes revealed in this project have several districts interested in placing additional sections, and during the performance of this research, TxDOT lettings using foamed asphalt and emulsion grew significantly. Interested districts should contact the TxDOT Research and Technology Implementation Division or TxDOT Maintenance Division for further resources available to assist in selecting, planning, and delivering projects using these FDR tools.

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