TDOT Department of Transportation

Research Summary

Performance Evaluation of Full Depth Reclaimed (FDR) Pavements in Tennessee

WHAT WAS THE RESEARCH NEED?

Full-Depth Reclamation (FDR) has emerged as a viable pavement rehabilitation technique that is gaining widespread acceptance to restore old and distressed asphalt pavements. This increasing interest is due to several factors: information on the long-term performance of stabilized FDR; improved and reliable equipment; the pavement section returns to service almost immediately; cost savings associated with the technique in comparison to other rehabilitation techniques; and sustainability. Some counties in Tennessee have had some experiences with FDR in mostly low volume roads like Weakley County and Rutherford County; other counties are just getting started with FDR while others have no experience at all with FDR.

Project Number:
RES2020-11

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Roadway Design

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Project Term:
August 2019 to May 2022

WHAT WERE THE RESEARCH OBJECTIVES?

The objectives of the research were:

1. Recommend criteria to select appropriate FDR treatment process.
2. Develop mix design procedures to determine the stabilization agent content for FDR.
3. Evaluate two FDR case studies.
4. Develop a selection criterion to identify suitable FDR candidates

WHAT WAS THE RESEARCH APPROACH?

A comprehensive literature review was conducted to evaluate the current practices of FDR techniques in other states. To this end, an online survey was conducted to gather information on best practices of FDR from State

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Departments of Transportation. After compiling the results of the online survey, the study embarked on mix design procedures (including laboratory procedures) for two pavement sections in Tennessee. For both pavement sections, mix designs were conducted using Portland cement and asphalt emulsion as stabilizing agent. After construction, post-construction assessment was conducted using a falling weight deflectometer test to assess the condition of the new pavement section. In addition to compiling mix design procedures, the research team was tasked with developing a robust technique for identifying potential FDR candidates.

WHAT WERE THE FINDINGS?

The following were the key finding that were observed in this research.

- Portland cement and asphalt emulsion are the two most common stabilizing agents used in FDR in the United States.
- Cement stabilization was less effective in improving the structural capacity of pavement sections with a deep asphalt layer than sections with shallow asphalt layers.
- Cement stabilization was ineffective for materials with 100% Reclaimed Asphalt Pavement (RAP) content.
- Asphalt emulsion worked well as a stabilizing agent for reclaimed materials of varying RAP contents including 100% RAP content.
- As the RAP content in the reclaimed materials increased, the emulsion content needed for effective stabilization decreased.

IMPLEMENTATION AT TDOT

Recommendations to TDOT include:

- Auger sampling can be used for material collection for purposes of mix design preparation. This will result in faster material retrieval and the creation of holes that would cost less to fill.
- A falling weight deflectometer serves as an important tool for FDR pavement candidate selection and should be effectively used in addition to core sampling and visual inspection.
- Time should be allowed for possible shrinkage to occur due to curing after construction when using Portland cement as a stabilizing agent before placing a wearing course on the newly constructed pavement. This will reduce the possibility of cracks due to shrinkage reflecting through the wearing course.
- Low cement dosage is recommended to minimize cracks.

MORE INFORMATION

Find the final report here: https://www.tn.gov/content/dam/tn/tdot/long-range-planning/research/final-reports/res2020-final-reports/RES2020-11_Final_Report_Approved_.pdf.

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