Laboratory Comparison of Full Depth Reclamation Stabilization Techniques Using Arkansas Field Materials

The United States is faced with an aging infrastructure and a lack of funds, an issue that has no one solution. Pavements fail for a variety of reasons, but some of the common reasons are due to age, increased traffic and loads, as well as weather. Conventional methods for addressing pavement distresses in the state of Arkansas often do not exceed past the top layer of the structure, which will provide a smooth surface for a short time, but don’t often address the underlying cause of the problem. Complete removal and reconstruction of a pavement is expensive and harmful to the environment, forcing agencies to look for new methods to rehabilitate a distressed pavement.

One such technique that addresses subsurface problems on flexible pavements while being cost effective and environmentally friendly is full depth reclamation (FDR). FDR is a pavement recycling technique that incorporates the entire pavement section to create a rehabilitated, stabilized base course. The existing roadway and a predetermined amount of underlying materials are crushed and blended with a stabilizing agent and compacted to form a stabilized base course. FDR has been explored and utilized in various states, unfortunately never in Arkansas.

It is the goal of this study to explore three different mix designs on field materials from four different Arkansas highways. Materials from Arkansas Highways 5, 36, 98, and 134 were collected to be stabilized with three different stabilization agents. Portland cement (FDR-PC), asphalt foam (FDR-AF), and asphalt emulsion (FDR-AE) will be utilized to stabilize the FDR samples, following the Portland Cement Association, Wirtgen, and North Carolina mix designs, respectively. The mix designs will be evaluated to determine optimal stabilizer using the unconfined compression test (UCS) (ASTM D 1633) for the cement stabilized samples and the indirect tension test (IDT) (AASHTO T 283) for the asphalt stabilized samples. Performance testing will be performed once optimal stabilizing agent contents have been established. The FDR-PC samples will undergo the Tube Suction Test (TST) to determine water susceptibility, Semi-Circular Bend Test (SC(B)) (AASHTO TP 105-13) to understand cracking characteristics, and the Evaluator of Rutting and Stripping in Asphalt (ERSA) (adheres to all specifications set for the Hamburg Wheel Tracking Test – AASHTO T 32) to understand moisture damage and rutting characteristics of the samples. The FDR-AF and FDR-AE samples will undergo SC(B), ERSA, Creep Compliance (AASHTO T 322) to determine rutting characteristics, and Dynamic Modulus (E*) (AASHTO TP 62) to determine stress-strain characteristics of the samples. Using the data collected from the performance samples and a life cycle cost analysis, it is the goal of this research to compare and contrast the stabilization techniques to assist the Arkansas State Highway and Transportation Department (AHTD) in developing specifications and test standards for FDR in the state of Arkansas.