Florida Department of Transportation Research

Design High Water Clearances for Highway Pavements
BD543-13

The majority of state roads in Florida are built using asphalt concrete surfaces. They are constructed in layers. The bottom layer consists of the native soil. The top layer is the surface course, or pavement. It is built upon one or more intermediate layers: these are the base and stabilized subgrade layers. The stiffness of the aggregates (i.e., materials) used and the thicknesses of the layers help to determine the performance and service life of the road. The better the quality of materials and the thicker the layers, the longer the service life, but the more expensive the construction costs.

One factor that determines the design thickness of the structure is the water table. If high groundwater tables infiltrate the roadway soils, the water can soften the roadway structure. FDOT has design guidelines that call for a minimum elevation of the base above the groundwater table. If the clearance is reduced, the road can become more susceptible to damage, which can result in a shorter service life and increased maintenance costs.

To determine the effect of base clearance relative to select soils and high water table levels, researchers from the Florida A&M University - Florida State University College of Engineering evaluated the water susceptibility of 11 soil types commonly used for Florida roadways. They tested the loading resistance, or resilient modulus, of each soil type to determine the relationship between water elevation and resilient modulus. The greater the resilient modulus, the greater the resistance to damage caused by long-term loading.

The researchers tested the soils in a laboratory test-pit under a range of water table and dynamic loading conditions. They also conducted a field monitoring program at State Road 70, near Fort Pierce, to evaluate the water table during seasonal precipitation and temperature conditions. They empirically demonstrated the potentially harmful effects of reducing base clearances from the current standard of 36 inches. They also developed design alternatives for environments (e.g., urban) where the standard clearance is not feasible.

Laboratory test pit

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For more information, visit http://dot.state.fl.us/research-center.