Florida Department of Transportation Research

Investigating the Statewide Variability and Long Term Strength Deformation Characteristics of RAP and RAP-Soil Mixtures
BDB09

Florida has large stockpiles of reclaimed asphalt pavement (RAP). RAP has excellent drainage characteristics, which make it suitable for reuse as a base course for roadway shoulders and as a sub-base beneath rigid pavements. However, RAP tends to creep and subside when subjected to heavy pressure, which renders it unsuitable as a base for flexible pavement or as fill behind stabilized earth walls.

A stock of reclaimed asphalt from a recently repaved section of US 441

Adding soil to RAP can improve its stiffness, strength, and creep resistance. However, the asphalt content of RAP obtained from different locations is not consistent; how this inconsistency would affect the performance of RAP/soil mixes was unknown.

Florida Institute of Technology researchers prepared mixtures of A-3 sand, which is a fine sand "deficient in coarse material and soil binder" (AASHTO M-145-91, 2004), and RAP from 50 locations in Florida. They evaluated blends containing 80%, 60%, 40%, and 20% RAP. They also tested the strength characteristics of each RAP sample and of A-3 sand alone. The researchers used the test data to develop strain rate equations that could be used to predict settlement times for RAP and RAP mixtures. When settlement occurs, pavement distress and damage can follow. The ability to determine settlement times would facilitate the use of the best pavement mixtures. It would also be useful for planning maintenance schedules.

The researchers found that the asphalt content of RAP can vary from 3.5% to 11.0 % as a function of location. The addition of up to 20% A-3 sand improved the gradation, density, and bearing strength of RAP. Increasing the amount of sand over 20% did not provide any additional advantage. However, none of the RAP or RAP-blend samples tested were found to be suitable for use under highway pavements. To evaluate RAP for use behind earthen walls, the researchers tested 100% RAP, a 50-50 RAP-sand blend, and 100% sand for creep. The tests showed that RAP and RAP-sand blends are not suitable for wall applications.

The researchers followed a testing procedure that utilized a one-dimensional oedometer, a device that applies load to a pavement sample and evaluates settlement and rate of settlement. This approach proved reliable for evaluating RAP performance. The prediction equations accurately characterized the RAP and RAP-blend behaviors. These test results, and the tools used to develop them, will be useful for highway planners doing risk-cost assessments to evaluate safe and durable pavement mixes. While this study did not find a new use for RAP, it is part of a process of seeking and evaluating available, cost-effective alternative materials for highway construction.

Project Manager: David Horhota, FDOT State Materials Office
Principal Investigator: Paul Cosentino, Florida Institute of Technology
For more information, visit http://dot.state.fl.us/research-center.