



Florida Department of Transportation Research Evaluate the Contribution of the Mixture Components on the Longevity and Performance of FC-5 BDS15-977-01

At its most basic, an asphalt mixture is asphalt binder and crushed stone aggregate. This seemingly simple mixture is very complex; method of preparation and application, additives, and aggregate type all influence the quality and durability of paved surfaces. Of course, what is in the mixture is important, but so is what “isn’t” there – the mixture’s air voids. Typical asphalt pavements contain 4-7% air voids. An open graded friction course (OGFC) mixture is a surface mixture with 18-20% voids. OGFC is known for its safety and driving comfort benefits due to better splash and spray and runoff performance.

In this project, Rutgers University researchers examined a Florida Department of Transportation (FDOT) OGFC called FC-5. FDOT had observed damage to some roadways paved with FC-5 and contracted with the researchers to examine FC-5 components to understand their contribution to FC-5’s performance.

The researchers conducted an extensive review of literature on OGFC design methods and design specifications for OGFC from several southeast U.S. and international sources. As FDOT had seen, raveling was the most common damage found on OGFC. Raveling involves loss of material from the paved surface, which can accelerate further damage. Delamination, in which patches of the surface layer are removed, was also common with OGFC. One cause of these problems and a serious concern is draindown, in which asphalt binder flows away from aggregate into the pavement’s lower air void structure.

To identify FC-5 road sections for examination, the researchers obtained data from FDOT’s Flexible Pavement Condition Survey, a database of annual evaluations of Florida highways. Data went back only to 1999, but this was considered sufficient as FC-5 pavements are regarded as having a life span around 12 years. The researchers were provided with mixture production data and traffic statistics, and they visited a number of FC-5 field sections



FC-5 asphalt concrete is the widely used on high speed, multilane roads in Florida.

to visually inspect pavements showing typical durability distresses. Pavements were classified as cracked or raveled and by other criteria.

In addition to the rich set of field data developed, researchers conducted laboratory experiments on OGFC mixes. The first series of experiments focused on the effect of aggregate absorption on asphalt mixture properties. Aggregate type and gradation, asphalt binder, binder content, and short-term oven aging were the variables of the experimental matrix. Samples were subjected to pie-plate, basket draindown, and durability testing. A second series of experiments explored effects of aggregate gradation on performance. In addition to the matrix from experiment one, samples were treated with long-term oven aging (five days). These samples were subjected to the Cantabro abrasion loss test, the overlay tester, indirect tensile strength testing, and the Hamburg wheel tracking device. In a third series of experiments, an experimental matrix and test regimen similar to the second experiment was used in examinations of effects of construction variability allowed by FDOT’s specifications.

This project will lead to development of a better mix design process to help provide longer lasting FC-5 pavements, allowing the traveling public to enjoy this mixture’s greater safety and driving comfort.