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EVALUATION OF THICK OPEN-GRADED AND BONDED FRICTION COURSES FOR FLORIDA

BACKGROUND

The surface texture of an asphalt pavement is a critical factor with regard to hydroplaning on high-speed, multi-lane facilities. In order to minimize such problems, a friction course (FC-2) consisting of a 3/8-inch Nominal Maximum Aggregate Size (NMAS) open-graded mixture placed approximately ½ inch thick was developed in Florida in the mid-1970's. In the1990's, the FC-2 was replaced by a slightly coarser open-graded friction course (FC-5), a ½ inch NMAS mixture placed approximately ¾ inch thick. More recently, a number of European countries, as well as several states in the US, have developed a porous friction course, which is an open-graded friction course (OGFC) placed in thicknesses ranging from 1¼ to 2 inches thick. The combination of the high in-place air void content of this mixture, coupled with the thickness at which it is placed, gives this type of pavement surface a great deal of potential with regard to storage and drainage of water during a rainstorm. However, there are also a number of questions associated with these types of pavements, such as durability, rutting resistance, and long-term porosity.

Multiple studies by the University of Florida on the mechanisms of top-down cracking have confirmed that a significant amount of the distress on high-volume Florida pavements is caused by surface initiated wheel path cracking from lateral stresses generated by radial truck tires. Based on these studies, there is a high likelihood that bonded friction courses that use a special paver to lay a heavy polymer-modified tack coat immediately in front of the hot mix mat could significantly extend the crack resistance life of open-graded mixes in Florida. It is also highly likely that raveling resistance of the friction course will be improved as well.

OBJECTIVES

This study consisted of two primary parts: (1) to evaluate open-graded friction courses and (2) to evaluate bonded friction courses. The first part of the study included the following tasks:

- Address the suitability of the use of thick OGFCs with aggregates typically used in Florida.
- Determine mixture design procedures, based on Superpave gyratory compaction, that are suitable for thick OGFC mixtures in Florida.
- Define the relative performance of thick OGFC under field traffic conditions compared to FC-5 OGFC using Florida limestone and granite aggregates.
- Develop guidelines for specifications for use of thick open graded friction courses in Florida.

The second part of the study included the following tasks:

- Evaluate the feasibility of using bonded friction courses in Florida with aggregates common in Florida.

- Evaluate the rutting and cracking performance differences between bonded and conventional friction courses for Florida conditions based on a detailed laboratory investigation.
- Evaluate the field performance of bonded friction courses using field test sections in Florida.

FINDINGS AND CONCLUSIONS

The first part of this research documents the development of a new mixture design procedure for open-graded friction courses and thick porous friction courses. Researchers developed a draft Florida method for open-graded and porous friction courses and laid the groundwork a draft specification for porous friction courses in Florida. Porous friction course mixtures prepared according to the new mix design procedure were evaluated for fracture and rutting resistance in the laboratory and on a field test project on I-295, in Duval County.

In part two of the project, the researchers evaluated bonded open-graded friction courses on US-27, in Highlands County, which were placed with a thick polymer modified tack coat. The performance of these bonded open-graded friction courses were compared to open-graded friction courses laid with a regular tack coat. They were also compared to a Novachip mixture, which is, basically, a stone matrix asphalt mixture with a thick polymer-modified tack coat.

The following conclusions may be drawn from the laboratory and field evaluations:

- The new porous friction course and open-graded friction course mixture design procedure appears to result in reasonable design asphalt contents. The implementation of the research findings should focus on determining how to best ensure durability of this new mixture type for Florida conditions.
- The presence of a bonded polymer-modified tack coat appears to improve both the cracking and rutting resistance of friction course mixtures.
- The Superpave Indirect Tension Test and the Florida Cracking Model worked well for evaluating the fracture performance and moisture susceptibility of the mixtures studied.

BENEFITS

In this project, researchers developed a draft Florida method for open-graded and porous friction courses and draft specifications for porous friction courses in Florida, using materials common to Florida. The research demonstrated the benefits of a thick polymer-modified tack coat that for increased rutting and cracking resistance, while not adversely affecting pavement friction and noise characteristics. The research suggests that use of these results will improve the rutting and cracking resistance of porous friction course mixtures composed of materials common to Florida

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