SUMMARY REPORT 234-1F(S)

PERFORMANCE OF OPEN-GRADED FRICTION COURSES

SUMMARY REPORT
of
Research Report Number 234-1F

Cooperative Reserach Program of the
Texas Transportation Institute
and the
State Department of Highways and Public Transportation
In cooperation with the
U.S. Department of Transportation, Federal Highway Administration

June, 1979

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Performance of Open-Graded Friction Courses

by

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Although open-graded asphalt friction courses (OGAFC) have been applied successfully in Texas and other states for a number of years as a means of improving wet weather highway safety, a number of problems remain to be solved before such overlays can be applied with full confidence on a routine basis.

The report summarized in these pages deals with a study in which solutions to such problems were sought by, 1) reviewing the experience with and making field evaluations of the performance of 22 different examples of OGAFC overlays in Texas, including 4 experimental sections conducted under TTI supervision, 2) conducting laboratory studies including examination of cores from the evaluation and experimental OGAFC sections and developing and applying methods for accurate determination of the internal drainage capacity of OGAFC layers and 3) reviewing applicable published studies of OGAFC performance.

The findings of the study have indicated that materials selection criteria, mix design methods and construction techniques used for the OGAFC surfaces evaluated in this study have resulted in acceptable pavement structural performance and durability. However, pavement rating scores and ride roughness measurements used as indicators of such performance factors, were strongly influenced by the surface condition, structural section and roughness of the underlying pavement. In addition, the internal drainage capacity of the OGAFC mats considered in the study often was significantly lower than desired which indicates a need for increasing layer thickness and improving mix design and/or construction procedures.

Satisfactory OGAFC pavements can be produced in Texas using mixes made with AC-20 asphalt cement and Grade 4 surface treatment aggregates. However, it may be desirable to use somewhat more restrictive specification requirements for these raw materials. In particular, better oxidation stability (as may be indicated by the thin film oven test or by other methods) is required for the AC-20 asphalt cement. Under high-speed heavy traffic conditions a minimum SN_{40} of 40 is suggested. Less demanding traffic may permit a lower value. The amount of aggregate passing a 3/8 inch sieve and retained on a No. 4 sieve should be no less than 60 percent, the proportion of flat and elongated

aggregate particles allowed should be strictly limited, and consideration should be given to reducing the L. A. Abrasion loss limit on lightweight aggregates used in OGAFC mixes.

The current FHWA design procedure[1] appears to be the best choice for estimating the proportion of asphalt cement in an OGAFC mix. Addition of up to 10 to 12 percent of fine aggregate (passing a No. 10 sieve) appears to be desirable but care should be taken to ensure that the VMA of the coarse aggregate will allow such additions without severely reducing the internal drainage capacity of the compacted OGAFC mat. Further study appears to be necessary to find a method for estimating the optimum content of fine aggregate in an OGAFC mix that takes into account such factors as fine aggregate particle shape and size distribution.

A method for accurately determining OGAFC layer permeability was developed in this study that will reliably predict the rainfall intensity which will cause incipient flooding of the pavement surface (see Appendices B and C for details). This method can be applied for field measurements to monitor the internal drainage capacity of OGAFC overlays when they are constructed as well as to assess changes in this aspect of performance that may result from layer densification by traffic. Such permeability measurements appear to be more practical and meaningful as OGAFC drainage capacity indicators than air void determinations.

Separation or drainage of asphalt from OGAFC hot mixes during transport continues to be a problem. A possible solution is the addition of a suitable mineral filler (material passing a No. 200 sieve) to the OGAFC mix; about 3 percent is suggested.

Guidelines for selecting pavements for OGAFC application and recommendations for further study are also given in this report.

[1]Smith, R. W., Rice, J. M., and Spelman, S. R., "Design of Open-Graded Asphalt Friction Courses," Report No. FHWA-RD-74-2 and Supplement No. 1, Federal Highway Administration, Washington, D.C., January 1974 and July 1975.

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