HIGHLIGHTER

DEVELOPMENT OF ALTERNATIVE HIGH FRICTION SURFACES FOR OKLAHOMA

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PROJECT TITLE
DEVELOPMENT OF ALTERNATIVE HIGH FRICTION SURFACES FOR OKLAHOMA

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OVERVIEW Safety is commonly measured as a rate of crashes, especially wet-weather crashes, and is related to aggregate micro-texture and mixture macro-texture. Essentially, micro-texture is the quantitative measure of aggregate surface friction properties that contribute to skid resistance, while macro-texture is the quantitative measure of pavement surface physical properties (dominated by the size, shape and spacing of coarse aggregate) that contribute to drainability, whereby reducing hydroplaning risk and enhancing skid resistance. This project examined surface friction performance of asphalt surface mixtures using regionally available aggregates as alternatives to a standard high friction surface treatment (HFST) that uses resin binder and imported calcined bauxite aggregate (Figure 1). It also evaluated different types of tack coats to determine the best tack application for the selected friction surfaces. Results were intended to guide decisions for further field testing at the *National Center for Asphalt Technology (NCAT) Test Track* for the 2015-2018 research cycle.

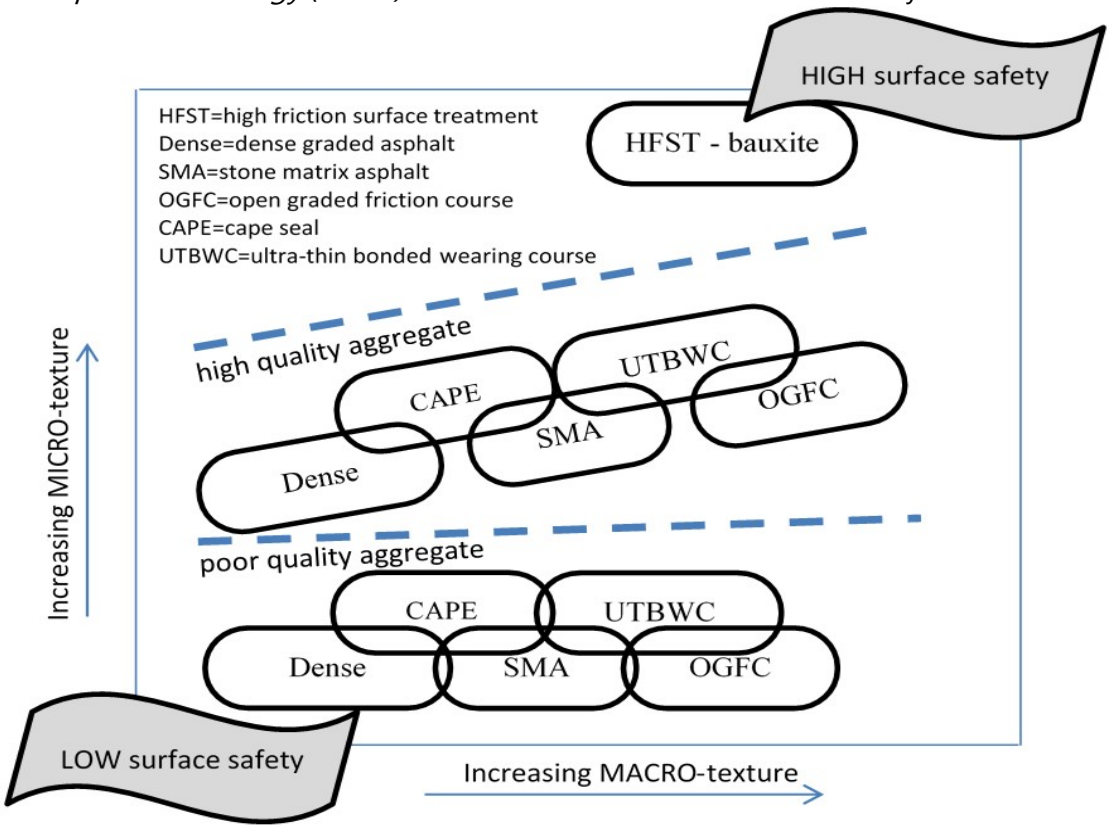

Figure 1 General surface friction ranking

RESULTS This study compared aggregate/mixture combinations in the laboratory that were expected to provide the best potential for high pavement surface friction characteristics and provided an objective measure of friction performance for Oklahoma

Department of Transportation (ODOT) asphalt mixtures based upon aggregate type and size, binder type, and mixture type. A testing and conditioning protocol developed at NCAT was used for measuring the friction performance of pavement surfaces. Since there is no standard value for pavement friction, the study used field results from Oklahoma sections on the NCAT Test Track as a point of reference to compare the measurements from the study. Results provided a baseline understanding of "conventional" friction from Oklahoma surface mixtures.

Aggregates commonly used in Oklahoma for pavement surface friction are granite in the western portion of the state, sandstone in the eastern part, and mining chat in the northeastern part. Asphalt pavement surface mixtures are routinely dense-graded, gap-graded (commonly called stone matrix asphalt (SMA)), or open-graded (commonly called porous friction course (PFC) or open graded friction course (OGFC)). Other special asphalt surfaces are cape seal microsurfacing (CAPE) and ultra-thin bonded wearing course (UTBWC). The selection of the mixture type focused on surfaces with the potential to perform well on high traffic, medium to high speed routes that could be placed with conventional asphalt equipment. Mixture types that could experience aggregate loss (like conventional chip seals) were not considered. The study tested the three friction aggregates as open-graded mixtures and the sandstone provided the best friction performance.

The type and optimum application rate required for the tack coat to bond the OGFC to an existing pavement was also determined (Figure 2). One type of tack coat (Ultrafuse) and two application rates (0.08 and 0.15 gallons/square yard residual) were evaluated. Laboratory slab surfaces were conditioned with a grinding disc to remove the asphalt film before the tack coat was applied. The sandstone OGFC was then placed on the tacked surface.

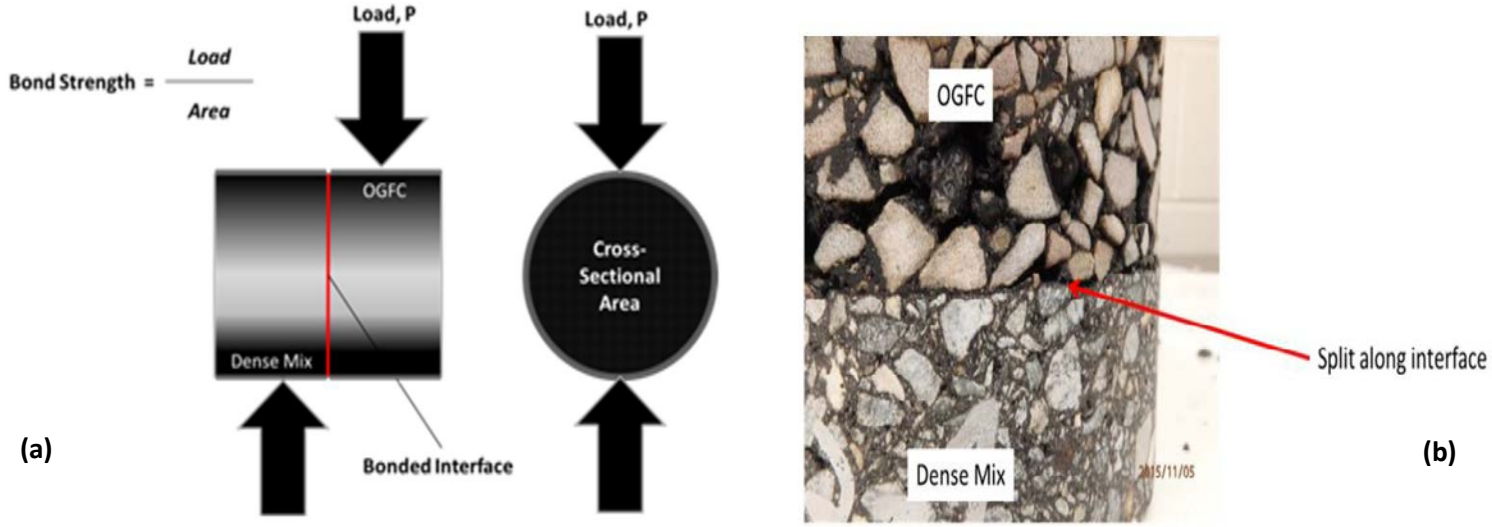

Figure 2 Tack coat testing: (a) shear bond strength testing schematic, (b) photo of shear failure at interface

Cores were cut from the prepared slabs for shear loading along the bond interface. In general, cores from the slabs with the higher application rate had higher interface bond strength.

This study provided preliminary information for further full-scale testing on the NCAT Test Track. On August 14, 2015 the micro-milled surface of NCAT/ODOT Test Section N9 was tacked with the same binder at the same application rates (0.05 and 0.10 gallons/square yard residual). The left longitudinal joint was tacked with an overlap of at least 2-inches to maximize longitudinal joint performance. The sandstone OGFC was placed in a 0.75-in thick lift on the tacked surface. Additional bond strength and friction testing will be performed over the two-year truck loading period.

POTENTIAL BENEFITS The study identified aggregate and mixture characteristics that provide higher friction performance and an optimal tack application for the purpose of enhancing safety of Oklahoma roads by reducing the risk of wet-weather crashes.