

Kowalski, Karol J. Ph.D., Purdue University, December 2007. Influence of Mixture Composition on the Noise and Frictional Characteristics of Flexible Pavements.

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ABSTRACT

Both traffic noise and wet pavement-tire friction are mainly affected by the tire/pavement interaction. The existing laboratory test methods allow for evaluation of polishing resistance of the aggregates only. Currently, there is no generally accepted standardized laboratory test method to address noise related issues and the overall frictional properties of pavements (including macrotexture). In this research, which included both laboratory and field components, friction and noise properties of the flexible (asphalt) pavements were investigated. As a part of the study, the laboratory device to polish asphalt specimens was developed and the procedure to evaluate mixture frictional properties was proposed. Following this procedure, forty six different Superpave mixtures (each utilizing different aggregate blend), one stone matrix asphalt (SMA) mixture and one porous friction course (PFC) mixture were tested. Six of the above mixes (four Superpave mixtures, SMA mixture and PFC mixture) were selected for laboratory noise testing. This testing was performed using one-of-a-kind tester called Tire/Pavement Test Apparatus (TPTA). In addition, the field sections constructed using Superpave, SMA and PFC mixtures were also periodically tested for friction and noise. Field measurements included testing of total of 23 different asphalt and two concrete pavements. The field friction testing was performed using both portable CTM and DFT devices and the (ASTM E 274) locked wheel friction trailer. The laboratory friction testing was performed using CTM and DFT devices only. The result of both field and laboratory friction measurements were used to develop an International Friction Index (IFI)-based frictional requirement for laboratory friction measurements. The results collected in the course of the study indicate that the IFI-based flag values could be successfully used in place of SN-based flag values to characterize frictional characteristics of pavements.