CE 890 Graduate Seminar

SPEAKER: Farhana Rahman

TOPIC: "Evaluation of Performance of 4.75 mm NMAS Superpave Mix"

DATE: April 22, 2009

TIME: 4:00 p.m. (refreshments at 3:45 p.m.)

PLACE: 2144 Fiedler Hall

ABSTRACT

The Superpave asphalt mixture with 4.75 mm Nominal Maximum Aggregate Size (NMAS) is a promising treatment in the maintenance of highway pavements. Such mix has the potential to provide a very smooth riding surface, can be used for thin-lift applications, correct surface defects, decrease construction time and provide a very economical surface mixture for low to medium volume facilities. Due to budget constraints in highway construction and preservation program and numbers of application advantages of such a mix, many highway agencies including the Kansas Department of Transportation (KDOT) are looking forward to implementing this fine mix in pavement preservation. The main objective of this research study is to develop an optimized 4.75 mm NMAS Superpave mixture in Kansas. In addition, the study will also determine the optimum tack coat application rate for the 4.75 mm NMAS mix layer.

In this study, three test sections with different tack coat application rates were built on two rehabilitation projects on US-160 and K-25. Field tack coat application rate was measured during construction and cores from each test section were collected after one month and one year of traffic operation. Materials from the US-160 and K-25 projects were also collected to evaluate laboratory mix performance. Laboratory mix design within KDOT specifications is developed considering two different aggregate sources with three different natural sand ratios (35%, 25% and 15%) and two binder grade (PG 64-22 and PG 70-22). The designed mixes are investigated based on the volumetric and performance specifically rutting, stripping, and long-time fatigue failure.

Hamburg Wheel Test showed that the average in-place density and aggregate source of field cores had potential influence on rutting performance of the mix regardless of the tack coat application rate. Pull-off strength test also demonstrated that the 4.75 mm NMAS thin overlay was well bonded to the underneath Hot-In-Place Recycle (HIPR) layer on the most test sections. Rutting performance of the laboratory 4.75 mm NMAS mix was significantly affected by the aggregate source, binder grade and natural sand ratio. Mixes with anti-stripping agent had higher tensile strength ratio and performed better against moisture. Statistical analysis identifies that the volumetric properties of the superpave mix such as design asphalt content, maximum specific gravity at initial number of gyration, dust to binder ratio and percent free asphalt are influential factors to develop the optimized performance model of 4.75 mm NMAS superpave mixture.