

Research in Progress Abstract - Construction Practice (Non-Pedagogical Content)

Using Thin Beams in Bending Beam Rheometer for Quality Control in Asphalt Pavement Construction

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In most dry freeze regions such as Colorado, Utah, Montana, Idaho, Northern Arizona, etc. low temperature cracking appears to be one of severe issues in the asphalt pavements. State highway agencies have worked diligently to ensure the long lasting quality of highway pavements. However, the low-temperature performance of asphalt pavements seems to have not met the desired expectation. One of reasons can be attributed to the inconsistencies between design and construction. While the use of asphalt mixture thin beams in estimation of stiffness of asphalt mixtures has been proposed, the method that used to prepare the specimens has not been well study. Therefore, a material testing protocol using asphalt mixture beams (5"x ½"x ¼", length x width x thickness) in the Bending Beam Rheometer (BBR) is presented to provide a methodology that can be used by highway agencies and contractors for quality control in asphalt pavement construction. The objectives of the study are to (1) present an experiment plan that describes the processes of asphalt mixture specimen production and material testing procedures using the BBR instrument, and (2) provide highway engineers and researchers with a starting point to develop a specification of using asphalt mixture beams in the BBR for evaluating the low-temperature performance of asphalt materials. As asphalt thin beams were used in the BBR, several factors that influence the accuracy of a BBR test should be taken in consideration. Air void consistency between compacted specimens and asphalt mixture beams is evaluated. To determine the number of replicates for a valid test, three different asphalt mixtures using PG 64-34, PG 64-28, and PG 58-28 binder were selected for statistical analysis. All specimens were cut and trimmed to thin asphalt mixture beams using the procedures presented in this study and tested at three different temperatures using the BBR. A follow-up series of randomizations associated with the coefficient of variance were used to observe the dispersed distributions of specimens so as to determine the minimum number of replicates in order for a BBR test to be valid. Two asphalt paving projects located in Salt Lake City (SLC), Utah, and Flagstaff, AZ were used to demonstrate the applicability of using asphalt mixture beams in the BBR for in situ quality control of asphalt pavements at low temperatures. Asphalt mixtures from each paving day were collected and tested by means of stiffness and m-values using the BBR. Based on testing results from SLC paving project, there was an anomaly on three paving days that indicated an irregularity on asphalt materials placed on site. The study concludes that the material testing methodology using asphalt mixture beams in the BBR is capable of evaluating low-temperature performance of asphalt mixtures and providing quick feedback to field engineers. The methodology can be used to facilitate the highway agencies and contractors in the evaluation of in situ quality control of asphalt pavements at low temperatures.

Key Words: Quality control, asphalt pavements, low temperature cracking