

The effect of binder type and temperature differential on the rutting performance of hot mix asphalt

ABSTRACT

During the last decades by increasing vehicle number and weight on roads, road pavement has been subjected to greater damages which in many cases occurred even before expected pavement service life. Rutting is one of the major distress mechanism in flexible pavement placed due to that increasing tire pressure and axial loads further to climatic condition such as increasing of temperature. This study aims to evaluate the effect of binder types and differential of temperatures on the HMA mixtures in term of rutting resistance in four steps. In the first step, rheological properties of different binders (80-100, 60-70 and PG76) were assessed by using DSR test to identify the gradation of the binders and comprehend of the rheological properties of binders in addition to conventional tests. In the second step, HMA cylindrical specimens (100 mm) was prepared by utilizing Superpave mix design. 9 samples were prepared for each type of binder in order to determine the optimum asphalt content (OAC). In the third step, mixtures which contained different types of binder was exposed to the repeated-load indirect tension test at variable temperature levels (30 °C, 40°C and 50°C) in order to compare the resilience behavior of HMA under the influence of temperature variety as well as forecast the performance of mixture with variable types of binder. Finally, repeated load axial test (RLAT) was performed using MATTA machine to identify the potential of rutting for HMA mixtures. 27 HMA specimens each 9 samples contain different type of binder were tested, Three testing temperature levels (30 °C, 40 °C and 50°C) were considered, (1Hz) loading frequency and 100 KPa axial stress was repeated 3600 times. The results from the DSR test, resilient modulus test and the RLAT showed a trend that the HMA mixes that contain stiffer asphalt binder (higher elasticity) had superior performance under three different temperatures and considerably improved their rutting resistance.

Keyword: Hot mix asphalt, Rutting, Repeated load axial test, Indirect Tensile Test, DSR