Abstract

Reclaimed asphalt pavement (RAP) mixes are known to have better rutting and moisture damage resistance compared to conventional mixes. However, fatigue performance of RAP mixes is usually the controlling consideration in the design of RAP mixes. The RAP influences the fatigue performance of the RAP mixes due to the change in stiffness, brittleness, cohesion and adhesion properties and the ability to heal from damage. In-service pavements are subjected to load pulses with rest periods of varying duration. Asphalt mixes recover (heal) from the damage caused by its mechanical usage. This phenomenon contributes to the laboratory to field fatigue life shift factors. The healing potential depends on mix parameters and on the conditions of healing. Very limited research work was done in the past on the healing characteristics of RAP mixes.

In this study, the healing potential of different RAP mixes was evaluated through three experimental investigations: (a) comparing the ITS value of undamaged specimens with the ITS value of damaged (in ITS mode) and healed (at 25 ^{o}C, 40 ^{o}C and 60 ^{o}C) specimens, (b) comparing the sensitivity of the indirect tensile fatigue life to variation in rest period (0.4 s to 1.4 s) and (c) comparing the fatigue lives and resilient moduli of the undamaged specimens with those of the specimens damaged to different levels and healed (at 40 ^{o}C and 60 ^{o}C). To explain the fatigue and healing characteristics of the RAP mixes, the RAP binder blends were characterized for various rheological and chemical parameters.

Fatigue lives of the original as well as the healed RAP mixes were significantly affected by RAP content, duration of the short rest period, initial damage level and binder content. Strong correlations were observed between the mix fatigue lives and different fatigue, rheological and chemical parameters of the binders. Good correlations could also be established among different binder fatigue parameters. The healing indices obtained from different investigations were found to be significantly influenced by RAP content, binder content and the initial damage level. Surface free energy of the RAP binders could be correlated to the healing of macro-cracks in the ITS experiment.