ABSTRACT

The utilisation of Reclaimed Asphalt Pavement (RAP) in the construction of pavement plays an inevitable role in the sustainable development of developing countries like India. The present study investigates on the effect of fine RAP and coarse RAP inclusion in Bituminous Concrete (BC) mixes because Hot Mix Asphalt (HMA) is most commonly used technology in India. In this study, BC mixes were prepared with different proportions (10%, 20%, and 30%) of Fine RAP (F), Coarse RAP (C) and Whole RAP (W) using a single source with BC Grade II mid value gradation. This study also investigates the feasibility of using milled RAP as such, obtained from the source without further treatment. Fine and coarse RAP mixes were compared to whole RAP in terms of moisture susceptibility, mechanical and volumetric properties. The Moisture Induced Stress Tester (MIST) was also used to investigate moisture susceptibility, which can simulate field moisture conditions in the lab. The optimum binder content of RAP mixes was reduced in comparison to the BC control mix, among which fine RAP mixes requires less virgin binder than whole RAP and coarse RAP mixes to achieve the desired volumetric properties. 30% RAP mixes showed better performance compared to BC control mix in terms of strength, rutting resistance, and moisture susceptibility. Fine RAP mixes had the highest Marshall stability value, which was nearly comparable to whole RAP, whereas coarse RAP had the minimum value. Volumetric properties of all mixes were within MoRTH specifications. Indirect Tensile Strength (ITS) and rutting performance of 30% RAP mixes were also significantly higher than the control mix, however, fine RAP mixes outperformed whole and coarse RAP. MIST conditioning, on the other hand, has reduced the Marshall stability and ITS of all the mixes because it simulates field conditions. The results reveal that natural aggregates can be partially replaced by fine RAP, whole RAP, and coarse RAP in the preparation of BC mixes without significantly affecting performance-related properties. Among these RAP mixes, the properties of fine RAP outperforms in terms of Marshall stability, rutting resistance, and moisture susceptibility.

Keywords: RAP, bituminous concrete mix, MIST, fine RAP, coarse RAP, moisture susceptibility