

Laboratory performance of chained interlocking plastic-beads in stone mastic asphalt mixture

ABSTRACT

The use of Stone Mastic Asphalt (SMA) has been increasing from year to year especially in Europe and other developed countries even though the cost is 20-30% compared to the traditional hot mix asphalt (HMA). Many attempts have been made through research and innovations to minimize the cost of SMA. Most of the research carried out this far attempted to improve either the binder or aggregate MA mix designs. It is also a known fact that SMA is generally a rut resistant mix rather than a fatigue resistant mix. An idea was thought out to reinforce SMA mixtures in terms of fatigue and other properties using recycled waste plastics as This study was aimed to determine the effects of incorporating specially formulated chained interlocking beads from waste plastics. The shapes and sizes were developed based on the total Voids in mineral Aggregate (VMA) and the percentage of aggregates passing 8 mm and retained on 4.75mm sieve sizes. A total of five combination of mix designs were carried out using 4 and 6 mm bead sizes and link diameters of 0.5 and 1 mm with link length of 20mm. The beads were coded as M4/0.5, M4/1.0,M6/0.5, and M6/1.0and used in percentages of 0.5%, 1%, and 1.05% by total weight aggregates. The percentages were worked out based on a newly devised replacement technique in aggregates passing 8mm and retained on the 4.75mm sieve. The mix designs with various bead size and link thickness were analyzed for Marshall stability, flow, density, Marshall Quotient as well as air voids and voids in mineral aggregates. It e performance of the specimens with plastic beads outperformed the control samples without the bead reinforcement.

Keyword: Chained plastic-beads; Waste; Interlocking; Marshallproperties; Reinforcement