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Laboratory Evaluation of the Use of Florida Washed Shell in Open-Graded Asphalt Mixtures

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Abstract

This study investigates the substitution of conventional aggregate with a Florida washed shell in open-graded asphalt mixtures and evaluates the optimal substitution percentage in aggregate gradations of various nominal maximum aggregate sizes (NMASs) (i.e., 4.75, 9.5, and 12.5 mm). Laboratory experiments were performed on open-graded asphalt mixture specimens with the coarse aggregate of sizes between 2.36 and 12.5 mm being replaced by the Florida washed shell at various percentages (0, 15, 30, 45, and 100%). Specimen properties relevant to the performance of open-graded asphalt mixtures in the field were tested, evaluated, and compared. Specifically, a Marshall stability test, Cantabro test, indirect tensile strength test, air void content test, and permeability test were conducted to evaluate the strength, resistance to raveling, cracking resistance, void content, and permeability of open-graded asphalt mixtures. The results show that there is no significant difference in the Marshall stability and indirect tensile strength when the coarse aggregates are replaced with Florida washed shell. This study also found that the optimum percentages of Florida washed shell in open-graded asphalt mixture were 15, 30, and 45% for 12.5, 9.5, and 4.75 mm NMAS gradations, respectively.

Keywords: open-graded asphalt mixture, aggregate gradation, Florida washed shell, sustainable pavement materials, Marshall stability, indirect tensile strength, Cantabro test