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Evaluation of the Effect of Nano-Organosilane Zycotherm and Deviation of Aggregate Gradation on Asphalt Film Thickness and Moisture Sensitivity of Hot Mix Asphalt

The durability of asphalt mixtures depends to a large extent on the asphalt film thickness. Stripping is the separation of the asphalt binder film from the aggregate surface due to the action and penetration of water. In this study, a gradation was prepared from basalt crushed aggregates. Then, by applying upper and lower allowable deviation tolerances to the fine aggregates of it, two gradations were produced. Nano-Organosilane Zycotherm was used as a liquid antistripping additive. The guidelines of the MS-2 Journal of the Asphalt Institute, NCHRP 567 report, Austroads and VicRoads reports were used to calculate the asphalt film thickness. Scanning Electronic Microscopy (SEM) was also used to show the asphalt film thickness of the three asphalt mixtures. The Marshall Stability Ratio and Indirect Tensile Strength Ratio tests according to AASHTO T283 were used to evaluate the moisture durability of asphalt mixtures. The results showed that the gradation changes in the fine aggregates caused a 12.9% decrease in asphalt film thickness in asphalt mixtures with upper allowable deviation tolerances and a 17.7% increase in asphalt film thickness in asphalt mixtures with lower allowable deviation tolerances, and these changes necessitate durability tests. Also, in the evaluation of moisture durability, all three asphalt mixtures were able to strip according to MSR and TSR indexes. Although Zycotherm had a positive effect on the MSR index of all three asphalt mixtures, according to the TSR index, the asphalt mixture with the lower allowable deviation tolerances was still able to stripe. Therefore, the moisture damage due to the gradation changes in this asphalt mixture is not improved by the Zycotherm additive.

Keywords: Allowable deviation tolerances, Asphalt film thickness, Marshall Stability Ratio, Indirect Tensile Strength Ratio, Moisture sensitivity.

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