

THE EFFECT OF ASPHALT SUBSTITUTION WITH LDPE (LOW DENSITY POLYETHYLENE) PLASTIC WASTE IN AC- BASE MIXTURES ON MARSHALL CHARACTERISTICS

Student New : Ummi Najiha
Number ID : 4204221489
Supervisor : Ir. Lizar , ST., MT

ABSTRACT

Flexible pavement deterioration and the rising volume of Low-Density Polyethylene (LDPE) plastic waste are issues requiring attention due to their impact on road infrastructure quality and the environment. Utilizing plastic waste as a partial substitute for asphalt is expected to enhance pavement mixture performance while simultaneously reducing environmental pollution. This study aims to analyze the effect of using LDPE plastic waste—specifically from plastic bags and plastic cups—on the Marshall characteristics of Asphalt Concrete-Base (AC-Base) mixtures. A laboratory experimental method with a quantitative approach was employed, utilizing a hot-mix asphalt and cold-mix plastic blending technique. LDPE content variations of 0%, 2.5%, 5%, 7.5%, 10%, 12.5%, and 15% of the optimum asphalt weight were tested. The parameters evaluated included stability, flow, Voids in the Mix (VIM), Voids in Mineral Aggregate (VMA), Voids Filled with Asphalt (VFA), and Marshall Quotient (MQ). The results indicate that the use of LDPE plastic waste influences the Marshall characteristics of AC-Base mixtures. The optimum content for plastic bag waste was found to be 5%, yielding a stability of 2,159.30 kg, VIM of 4.92%, VMA of 16.22%, VFA of 70.13%, and MQ of 589.86 kg/mm. Meanwhile, the optimum content for plastic cup waste was 2.5%, yielding a stability of 1,832.04 kg, VIM of 4.80%, VMA of 16.43%, VFA of 71.05%, and MQ of 460.46 kg/mm. Thus, LDPE plastic waste shows potential as an environmentally friendly asphalt substitute capable of enhancing AC-Base mixture performance at specific dosage levels.

Keywords: AC-Base, Marshall characteristics, LDPE plastic waste, asphalt substitution, stability.