

**PEMANFAATAN *CRUMB RUBBER* DAN *STEEL SLAG*
DALAM MODIFIKASI CAMPURAN ASPAL PADA LAPIS
ASPHALT CONCRETE - WEARING COURSE (AC-WC)
TERHADAP NILAI KARAKTERISTIK MARSHALL**

Sarah Amelia Putri, Carissa Azzahra
Jurusan Teknik Sipil, Politeknik Negeri Sriwijaya

ABSTRAK

Peningkatan beban lalu lintas dan kondisi cuaca ekstrem di Kota Palembang menuntut inovasi perkerasan jalan dengan durabilitas tinggi. Penelitian ini bertujuan menganalisis pengaruh modifikasi aspal menggunakan *crumb rubber* (3%) dan substitusi agregat halus dengan *steel slag* (5%, 10%, 15%, 20%) terhadap karakteristik Marshall pada lapis *Asphalt Concrete-Wearing Course* (AC-WC). Eksperimen dilakukan melalui pengujian laboratorium sesuai spesifikasi Bina Marga 2018 (Revisi 2) di Laboratorium Teknik Sipil Politeknik Negeri Sriwijaya dan Laboratorium Balai Bahan Konstruksi PUPR. Tahapan penelitian dimulai dengan penentuan Kadar Aspal Optimum (KAO) pada campuran normal, yang kemudian menjadi acuan untuk seluruh variasi campuran modifikasi. Parameter yang dievaluasi meliputi stabilitas, *flow*, *void in mix* (VIM), *void in mineral aggregate* (VMA), *void filled with asphalt* (VFA), dan Marshall *Quotient* (MQ).

Hasil penelitian menunjukkan bahwa seluruh variasi campuran berhasil memenuhi persyaratan stabilitas minimum (>800 kg) dan rentang *flow* standar (2,0 mm – 4,0 mm), meskipun terdapat tren penurunan nilai stabilitas seiring dengan meningkatnya kadar *steel slag*. Namun, parameter VIM dan VMA pada seluruh variasi belum mencapai ambang batas yang disyaratkan oleh spesifikasi teknis. Secara keseluruhan, studi ini memberikan kontribusi dalam pengembangan solusi perkerasan jalan yang lebih tahan lama sekaligus mendukung konsep keberlanjutan melalui pemanfaatan limbah industri (*crumb rubber* dan *steel slag*) secara ramah lingkungan.

Kata Kunci: *Crumb rubber*, *Steel Slag*, Lapis AC-WC, Karakteristik Marshall

**UTILISATION OF CRUMB RUBBER AS ASPHALT MODIFIER
AND STEEL SLAG AS FINE AGGREGATE SUBSTITUTE
IN ASPHALT CONCRETE - WEARING COURSE (AC-WC) ON MARSHALL
CHARACTERISTIC VALUES**

Sarah Amelia Putri, Carissa Azzahra
Civil Engineering Department, Sriwijaya State Polytechnic

ABSTRACT

Increasing traffic loads and extreme weather conditions in Palembang City demand innovations in pavement construction to achieve higher durability. This study aims to analyze the effect of asphalt modification using crumb rubber (3%) and the substitution of fine aggregates with steel slag (5%, 10%, 15%, 20%) on the Marshall characteristics of Asphalt Concrete-Wearing Course (AC-WC) layers. Laboratory experiments were conducted in accordance with the 2018 Bina Marga specifications (Revision 2) at the Civil Engineering Laboratory of Politeknik Negeri Sriwijaya and the PUPR Construction Materials Laboratory. The research process began with determining the Optimum Asphalt Content (OAC) for a standard mixture, which then served as a benchmark for all modified mixture variations. The evaluated parameters included stability, flow, voids in mix (VIM), voids in mineral aggregate (VMA), voids filled with asphalt (VFA), and Marshall Quotient (MQ).

The results demonstrate that all mixture variations successfully met the minimum stability requirement (>800 kg) and the standard flow range (2.0 mm – 4.0 mm), although a declining trend in stability values was observed as the steel slag content increased. However, the VIM and VMA parameters for all variations did not yet meet the threshold limits required by the technical specifications. Overall, this study contributes to the development of more durable pavement solutions while supporting the concept of sustainability through the environmentally friendly utilization of industrial waste (crumb rubber and steel slag).

Keywords: *Crumb rubber, Steel Slag, AC-WC Coating, Marshall Characteristics*