
Kajian Keberkesanan Campuran Bitumen-Getah terhadap Ketahanan dan Rintangan Kegelinciran Turapan Jalan Raya

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Abstrak

Kajian ini dijalankan untuk menilai keberkesanan campuran bitumen-getah terhadap ketahanan dan rintangan kegelinciran turapan jalan raya. Objektif utama ialah menentukan kadar ketahanan turapan apabila dicampurkan dengan 3% tayar getah terpakai, serta menilai tahap rintangan kegelinciran. Sebanyak tiga sampel berbentuk silinder dihasilkan mengikut piawaian JKR/SPJ/2008-S4 dan diuji menggunakan dua kaedah makmal iaitu Ujian Marshall dan Ujian Rintangan Kegelinciran. Keputusan Ujian Marshall menunjukkan purata kestabilan 10,964 N dengan sisihan piawai 1,150 N (~10%) dan purata kekuatan 3,655 N/mm dengan sisihan piawai 87 N/mm (~2.4%). Kedua-dua nilai ini melepasi piawaian JKR (>8,000 N dan >2,000 N/mm). Sementara itu, Ujian Rintangan Kegelinciran mencatatkan purata 45 dengan sisihan piawai 3.0 (~6.6%), yang menepati kategori C dan sesuai digunakan pada semua jenis jalan. Nilai sisihan piawai yang rendah membuktikan bahawa data adalah konsisten dan boleh dipercayai. Dapatan ini menunjukkan bahawa campuran bitumen-getah bukan sahaja meningkatkan ketahanan turapan dan keselamatan jalan raya, malah berpotensi mengurangkan kos penyelenggaraan jangka panjang. Kajian ini menyokong penggunaan *Cup Lump Modified Asphalt* (CMA) sebagai alternatif turapan yang lebih tahan lama, selamat, dan mesra alam.

Keywords : *Turapan Jalan Raya, Kestabilan dan Kekutan, Rintangan Kegelinciran, Bitumen.*

Abstract

This study was conducted to evaluate the effectiveness of rubberized bitumen mixtures in improving pavement durability and skid resistance. The main objective was to determine the durability of asphalt when mixed with 3% waste tire rubber and to assess its skid resistance. Three cylindrical samples were prepared according to JKR/SPJ/2008-S4 standards and tested using two laboratory methods: the Marshall Test and the Skid Resistance Test. The Marshall Test results recorded an average stability of 10,964 N with a standard deviation of 1,150 N (~10%) and an average strength of 3,655 N/mm with a standard deviation of 87 N/mm (~2.4%). Both values exceeded JKR requirements (>8,000 N and >2,000 N/mm). Meanwhile, the Skid Resistance Test recorded an average value of 45 with a standard deviation of 3.0 (~6.6%), which meets Category C and is suitable for all road types. The relatively low standard deviation values confirm that the data are consistent and reliable. These findings demonstrate that rubberized bitumen mixtures not only enhance pavement durability and road safety but also have the potential to reduce long-term maintenance costs. This study supports the use of Cup Lump Modified Asphalt (CMA) as a more durable, safer, and environmentally sustainable alternative for road construction.

Keywords : *Road Pavement, Stability and Strength, Skid Resistance, Bitumen.*
