UNIVERSITAS
GADJAH MADA
Perbandingan Pengaruh Variasi Jenis Filler Terhadap Ketahanan Skid, Raveling, Dan Reflektivitas Permukaan Campuran AC-WC
Sandhi Vardhana Rally, Ir. Taqia Rahman, S.T., M.Sc., Ph.D., IPM.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

INTISARI

Perkerasan lentur di Indonesia didominasi penggunaan debu batu sebagai bahan pengisi. Namun, debu batu sebagai bahan pengisi pasif tergolong sangat rentan menahan kerusakan akibat kelembapan. Air yang menginfiltrasi pori-pori perkerasan dapat melemahkan ikatan adhesi antara aspal dan agregat batuan yang memicu fenomena pengelupasan (*stripping*) dan pelepasan butir agregat (*raveling*). Oleh karena itu, pemanfaatan bahan pengisi aktif seperti kapur, *hydrated* lime, dan semen dibutuhkan sebagai agen anti pengelupasan untuk mengatasi kerusakan akibat kelembapan. Tujuan penelitian ini adalah menganalisis pengaruh variasi *filler* aktif seperti kapur tohor (CaO), *hydrated lime*, semen portland terhadap performa campuran *asphalt concrete-wearing course* (AC-WC) dalam menahan kerusakan akibat kelembapan berdasarkan ketahanan kekesatan, pelepasan butir, dan refektivitas permukaan.

Penelitian ini bertujuan mencari nilai kadar aspal optimum (KAO) dari setiap variasi *filler* dengan kadar 6,5% dan mencari *filler* yang paling optimal dalam menahan kerusakan akibat kelembapan berdasarkan ketahanan kekesatan, pelepasan butir, dan reflektivitas permukaan. Pengujian yang dilakukan meliputi *skid resistance, cantabro test*, dan *albedo test* serta dilakukan menggunakan alat *british pendulum tester* (BPT), *los angeles*, dan *pyranoneter*. Digunakan sampel berbentuk slab yang dipadatkan menggunakan *slab roller compactor* untuk merepresentasikan hasil pemadatan lapangan, sementara sampel silinder diperoleh melalui *core drilling.*

Hasil pengujian menunjukan nilai kadar aspal optimum campuran aspal dengan *filler* debu batu, kapur (CaO), *hydrated lime*, dan semen secara berurutan sebesar 5,22%; 6,50%; 7,08%; dan 5,54%. Pengujian ketahanan terhadap kekesatan (*skid resistance*) menghasilkan nilai BPN pada benda uji kering (*unconditioned*) sebesar 83,90; 67,45; 73,45; dan 76,70 dan pada benda uji terkondisi (*conditioned*) sebesar 75,80; 78,30; 84,30; dan 85,20. Hasil tersebut terpengaruh oleh kekasaran fisik *filler* pada kondisi kering dan reaksi kimiawi *filler* membentuk ikatan kuat pada tahap terkondisi. Pengujian ketahanan terhadap pelepasan butir (*raveling resistance*) menghasilkan nilai *cantabro loss* pada benda uji kering (*unconditioned*) sebesar 13,55%; 5,74%; 6,53%; dan 8,16% dan pada benda uji terkondisi (*conditioned*) sebesar 15,71%; 9,14%; 8,80%; dan 13,34%. Hasil tersebut terpengaruh pada kemampuan *filler* dalam berikatan dengan aspal dan peran *anti stripping agent* untuk memperkuat ikatan dengan aspal setelah perendaman. Pengujian reflektivitas permukaan (*albedo*) menghasilkan nilai *albedo* pada benda uji kering (*unconditioned*) hampir sama sebesar $\pm 320 \times 10^{-4}$ dan pada benda uji terkondisi (*conditioned*) sebesar 337×10^{-4}; 391×10^{-4}; 402×10^{-4}; 363×10^{-4}. Nilai *albedo* dipengaruhi oleh karakteristik warna *filler* dan seberapa besar reaksi karbonasi pada permukaan aspal setelah pengkondisian.

Kata kunci: *Filler*, *Moisture Damage*, Marshall, *Skid Resistance, Cantabro*, *Albedo*

UNIVERSITAS
GADJAH MADA
Perbandingan Pengaruh Variasi Jenis Filler Terhadap Ketahanan Skid, Raveling, Dan Reflektivitas Permukaan Campuran AC-WC
Sandhi Vardhana Rally, Ir. Taqia Rahman, S.T., M.Sc., Ph.D., IPM.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

ABSTRACT

Flexible pavement construction in Indonesia predominantly utilizes stone dust as a filler material. However, stone dust acts as a passive filler and is highly susceptible to moisture-induced damage. Water infiltrating the pavement pores can weaken the adhesive bond between the asphalt and the aggregate, triggering phenomena such as stripping and raveling. Consequently, the use of active fillers—such as quicklime (CaO), hydrated lime, and Portland cement is required as an anti-stripping measure to mitigate moisture-induced damage. This study aims to analyze the influence of various active fillers (quicklime, hydrated lime, and Portland cement) on the performance of Asphalt Concrete-Wearing Course (AC-WC) mixtures regarding their resistance to moisture-induced damage, specifically evaluating skid resistance, aggregate loss (raveling), and surface reflectivity.

The research seeks to determine the Optimum Asphalt Content (OAC) for mixtures containing 6.5% of each filler type and to identify the most effective filler for resisting moisture-induced damage based on the aforementioned performance criteria. Testing included skid resistance, Cantabro tests, and albedo tests, utilizing a British Pendulum Tester (BPT), Los Angeles machine, and pyranometer, respectively. Slab samples compacted with a slab roller compactor were used to simulate field compaction, while cylindrical samples were obtained via core drilling.

The results showed that the optimum asphalt contents of mixtures containing stone dust, quicklime (CaO), hydrated lime, and Portland cement were 5.22%, 6.50%, 7.08%, and 5.54%, respectively. The skid resistance test produced British Pendulum Number (BPN) values under unconditioned conditions of 83.90, 67.45, 73.45, and 76.70, respectively, while the conditioned specimens produced BPN values of 75.80, 78.30, 84.30, and 85.20, respectively. These results were influenced by the physical surface roughness of the fillers under unconditioned conditions and the chemical reactions between the active fillers and asphalt binder that enhanced bonding during conditioning. The raveling resistance test produced Cantabro loss values under unconditioned conditions of 13.55%, 5.74%, 6.53%, and 8.16%, respectively, while the conditioned specimens produced values of 15.71%, 9.14%, 8.80%, and 13.34%, respectively. These results were influenced by the bonding capacity of the fillers with the asphalt binder and the role of the fillers as anti-stripping agents in strengthening the asphalt–aggregate bond after conditioning. The albedo test produced relatively similar values under unconditioned conditions, at approximately 320×10^{-4}, while the conditioned specimens produced albedo values of 337×10^{-4}, 391×10^{-4}, 402×10^{-4}, and 363×10^{-4}, respectively. The albedo values were influenced by the color characteristics of the fillers and the extent of carbonation reactions occurring on the asphalt surface after conditioning.

Keywords: *Filler, Moisture Damage, Marshall, Skid Resistance, Cantabro, Albedo*