

THE EFFECT OF AGGREGATE'S ANGULARITY ON
ENGINEERING PROPERTIES AND PERFORMANCE OF POROUS ASPHALT

NADHIR BIN AHMAD TARMUZI

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DEDICATION...

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Sincerely,
NADHIR BIN AHMAD TARMUZI

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ABSTRACT

Porous asphalt is a flexible pavement layer with high percent of interconnected air void and constructed using open-graded type of aggregate. Aggregate shape and surface texture plays a vital role in determining the engineering properties and performance of porous asphalt. Angular-shaped aggregate which has a clear defined fracture faces and sharp edges are preferable to be used in asphalt mixture since it encourages better interlocking structures within the aggregate's skeleton. This study was carried out to evaluate the effect of aggregate's angularity on engineering properties and performance of porous asphalt using a combination of conventional method and empirical Particle Index Test method. The term of engineering properties includes experimental works to determine the resilient modulus and stability while performance deals with the porosity and durability characteristics of porous asphalt due to variations in the Particle Index Number (I_a). From laboratory data analysis, it was found that angular particles delivers larger I_a number compared to those less-angular or non-angular particles. Significant improvement in the resilient modulus and stability properties has been obtained with application of angular-shaped aggregate. Angular particles also results in higher porosity of mixture but causes undesirable durability performance on porous asphalt against abrasion loss. Some improvements have been recommended to enhance the strength properties and performance of porous asphalt based on engineering explanation.

ABSTRAK

Asfalt porous merupakan sejenis lapisan turapan anjal dan mempunyai peratus liang udara yang tinggi dan berhubung antara satu sama lain serta dihasilkan menerusi penggunaan agregat jenis gred terbuka. Bentuk agregat serta tekstur permukaannya memainkan peranan yang penting dalam menentukan ciri-ciri kejuruteraan dan prestasi asfalt porous. Agregat bersegi serta mempunyai permukaan pecah yang jelas dan tajam bersifat lebih baik untuk digunakan di dalam campuran asfalt kerana ia menghasilkan struktur saling-hubung yang lebih baik dalam rangka agregat tersebut. Kajian ini telah dijalankan untuk menilai kesan kesegian agregat terhadap ciri kejuruteraan dan prestasi asfalt porous dengan menggunakan gabungan kaedah konvensional dan kaedah Ujian Indeks Partikel yang bersifat empirikal. Ciri kejuruteraan yang dinilai dalam kajian ini termasuklah eksperimen bagi menentukan modulus daya tahan dan kestabilan manakala ciri prestasi melibatkan penentuan tahap keliangan dan ketahanan asfalt porous disebabkan variasi dalam Nombor Indeks Partikel (I_a). Daripada analisis data makmal, didapati bahawa agregat bersegi menghasilkan nombor I_a yang lebih besar berbanding agregat tidak bersegi (berbentuk bulat dan sfera). Peningkatan yang ketara dalam nilai modulus daya tahan dan ciri kestabilan telah diperolehi menerusi aplikasi agregat berbentuk segi. Partikel bersegi juga menghasilkan ciri keliangan yang lebih tinggi pada asfalt porous tetapi mengakibatkan prestasi ketahanan yang kurang baik dalam rintangan terhadap daya lelasan. Justeru, beberapa penambahbaikan telah disyorkan bagi meningkatkan ciri-ciri kekuatan dan prestasi asfalt porous melalui penjelasan kejuruteraan.