

INTISARI

Campuran beraspal hangat (*Warm Mix Asphalt*) merupakan teknologi berbasis *green construction* yang dikembangkan sebagai salah satu alternatif solusi untuk mengurangi konsumsi energi dan emisi gas buang dengan cara menurunkan temperatur pencampuran dan pemadatan antara 20°C-40°C lebih rendah dari campuran aspal panas (*Hot Mix Asphalt*). Dalam penelitian ini, WMA dengan aditif *Zycotherm* diaplikasikan pada campuran *Stone Matrix Asphalt* (SMA) yang memiliki ketahanan terhadap alur, fleksibilitas dan durabilitas yang tinggi. Penelitian ini bertujuan untuk menentukan temperatur pencampuran dan pemadatan WMA untuk campuran SMA berdasarkan *Workability Index* (WI), merancang campuran, dan menganalisis durabilitas serta kinerja stabilitas dinamis WMA untuk campuran SMA.

Dalam penelitian ini dibuat tiga variasi campuran yaitu satu variasi campuran SMA-0 (aspal Pen 60/70) sebagai kontrol dan dua variasi kadar aditif *Zycotherm* (terhadap berat aspal) yaitu WMSMA-1 (0,1%) dan WMSMA-2 (0,2%). Temperatur pencampuran dan pemadatan WMA untuk campuran SMA berdasarkan nilai WI diperoleh dari pengujian dengan *Gyratory Compactor Machine*. Campuran dirancang dengan Metode Marshall untuk mendapatkan Kadar Aspal Optimum (KAO) dan campuran pada KAO dilakukan pengujian karakteristik durabilitas terhadap pengaruh air dengan metode Marshall *Immersion* dan kinerja campuran berdasarkan karakteristik stabilitas dinamis menggunakan *Wheel Tracking Machine*.

Dari hasil pengujian diperoleh temperatur pencampuran dan pemadatan berdasarkan nilai WI rata-rata untuk WMSMA-1 sebesar 4,41 (120°C/110°C) dan WMSMA-2 sebesar 4,62 (130°C/120°C), nilai WI yang dipilih mendekati nilai WI rata-rata campuran SMA-0 sebesar 4,70 (158°C/143°C). Nilai KAO untuk SMA-0, WMSMA-1 dan WMSMA-2 berturut-turut sebesar 6,7%, 6,6% dan 6,8%. Campuran WMSMA-1 dan WMSMA-2 menunjukkan tingkat durabilitas yang lebih baik, dengan nilai *Index Retained Stability* (IRS) SMA-0 (90,15%), WMSMA-1 (91,73%) dan WMSMA-2 (95,09) telah memenuhi persyaratan minimum 90%. Nilai stabilitas dinamis SMA-0, WMSMA-1 dan WMSMA-2 pada temperatur pengujian 45°C berturut-turut sebesar 3.706 lintasan/mm, 3.938 lintasan/mm dan 3.706 lintasan/mm sedangkan pada temperatur pengujian 60°C berturut-turut sebesar 630 lintasan/mm, 516 lintasan/mm dan 389 lintasan/mm.

Kata Kunci : WMA, *Zycotherm*, SMA, WI, IRS, Stabilitas Dinamis.

ABSTRACT

Warm Mix Asphalt is a green construction technology developed as an alternative solution to reduce energy consumption and exhaust emissions by lowering the mixing temperature and compacting the asphalt mixture between 20°C-40°C lower than Hot Mix Asphalt (HMA). In this study, WMA with Zycotherm additive was applied to Stone Matrix Asphalt (SMA) which has high rutting resistance, high flexibility and durability. This study aims to determine mixing temperature and compaction WMA for SMA mixture based on Workability Index (WI), mixture design, to determine durability and dynamic stability of WMA for SMA mixture.

In this study, there are three mixture variations, one variation of SMA-0 (asphalt Pen 60/70) as control and two variations of *Zycotherm* additive content (to asphalt weight), WMSMA-1 (0,1%) and WMSMA-2 (0,2%). Determination of mixing and compacting temperature of WMSMA mixture based on WI value obtained from Gyratory Compactor test. Each mixed variation was designed with the Marshall Method to obtain the Optimum Asphalt Content (OAC). Furthermore, the mixture on OAC was tested for the durability characteristics of the influence of water by Marshall Immersion method and mixed performance based on dynamic stability characteristics using Wheel Tracking Machine.

The test results obtained mixing and compacting temperature based on the average of WI value for WMSMA-1 is 4.41 (120°C/110°C) and WMSMA-2 is 4.62 (130°C/120°C), WI-value of WMSMA-1 and WMSMA-2 selected which its close to the average of WI-value SMA-0 is 4.70 (158°C/143°C). The Optimum Asphalt Content for SMA-0, WMSMA-1 and WMSMA-2 were respectively 6.7%, 6.6% and 6.8%. WMSMA-1 and WMSMA-2 show better durability, with the Index Retained Stability (IRS) SMA-0 (90.15%), WMSMA-1 (91.73%) and WMSMA-2 (95.09) meets the minimum 90%. The dynamic stability values of SMA-0, WMSMA-1 and WMSMA-2 at temperature 45°C were 3,706 passes/mm, 3,938 passes/mm and 3,706 passes/mm while at 60°C were respectively 630 passes/mm, 516 passes/mm and 389 passes/mm.

Kata Kunci : WMA, *Zycotherm*, SMA, WI, IRS, Dynamic Stability.