

EVALUATION OF FRACTURE RESISTANCE OF WMA MIXES USING SEMI-CIRCULAR BENDING TEST

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ABSTRACT

The present study was undertaken to evaluate fracture resistance of hot mix asphalt (HMA) and warm mix asphalt (WMA) using semi-circular bending (SCB) test. Two different WMA additives, one wax based (Sasobit®) and one chemical based (Evotherm®) were selected in this study. A dense graded asphalt mix with 19 mm nominal maximum aggregate size was designed in the laboratory using Marshall mix design method. The SCB samples of 150 mm diameter and 50 mm height with different notch depths: 20 mm, 25 mm and 32 mm were prepared in the laboratory with target air voids in range of $6.5 \pm 0.5\%$. The samples were tested by applying monotonic load at a rate of 0.5 mm/min at 35°C. The following parameters were estimated for each of the mixes: J-Integral or J_c , strain energy at failure, peak load at failure, and deformation at failure. It was found that the strain energy and peak load of all the mixes decrease with an increase in notch depth. The deformation at failure did not exhibit a clear trend with notch depth, it may be because of initiation of crack, which depends on aggregates geometry, mastic and orientation of the samples. The strain energy of WMA- Evotherm® (WMA-E) mix was found to be the highest followed by HMA and WMA- Sasobit® (WMA-S). The load at failure was found to be the highest for WMA-E and HMA mix, at 20 mm and 32 mm notch depths, compared to WMA- S mix. The deformation at failure was observed to be maximum for WMA- E. A large deformation at failure indicates a ductile behaviour of a mix. The J_c value for HMA, WMA- S and WMA- E mixes was found to be 0.21, 0.20, and 0.12 kJ/m², indicating that both HMA and WMA- S mixes performed equally good, whereas, WMA- E mix had a poor fracture resistance.