

UNIVERSITI TEKNOLOGI MARA

**PERFORMANCE OF STONE MASTIC
ASPHALT (SMA) MIX USING
SELECTED FIBRES**

SYAHIRAH BINTI MANSOR

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AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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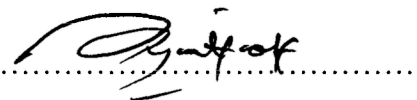
Name of Candidate : Syahirah Bt. Mansor

Candidate I.D. No. : 2012945631

Programme : Master of Science in Highway Engineering

Faculty : Faculty of Civil Engineering

Thesis Tittle : Performance of Stone Mastic Asphalt (SMA) Using Selected Fibres

Signature of Candidate: 

Date : July 2014

ABSTRACT

Stone Mastic Asphalt (SMA) is a gap-graded asphalt mixture that depends on the stone-to-stone contact to provide its load carrying capacity against rutting. However, binder draindown is a problem for SMA mixtures, due to its intentional high binder content. The objectives of this study were to evaluate the volumetric properties, binder drainage, rutting and stripping performances in the SMA14 mixture. Two different cellulose fibres were used in SMA14 mix, which is synthetic fibre (Viatop66) and natural fibre (Kenaf) to prevent binder drainage. In this study, 0.3 percent cellulose fibres, by weight of mixture, were uniformly combined with the dried aggregate before the asphalt cement was added during mixing process. Laboratory specimens were prepared using 50 blows of the Marshall hammer per side. The optimum binder content (OBC) for SMA14 mixtures was selected to produce 4 percent air voids and draindown of less than 0.3 percent. The OBC for the SMA14 mix with synthetic fibre (Viatop66) was found to be 6.1 percent at 4 percent air voids, while the OBC for the SMA14 mix with natural fibre (Kenaf) was found to be 5.9 percent at 4 percent air voids. The obtained OBC was used to prepare samples for rutting and stripping tests. Number of compaction applied for rutting and stripping samples were based on a trial and error method to obtain 7 ± 0.5 percent of air voids. Rut depth for SMA14 mix with natural fibre (Kenaf) obtained is 1.6 mm compared to SMA14 mix with synthetic fibre (Viatop66) which is 1.8 mm. The tensile strength ratio recorded for both mixes are greater than 80 percent, that resulting in enough stripping resistance. Based on ESEM, in SMA14 mix with natural fibre, the voids were filled with natural fibre and the fibre interacts well with the other substances. This indicates that the natural fibre could efficiently retain the binder in the mix. Therefore, natural fibre could be an alternative material to replace the synthetic fibre for the SMA14 mixture.

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