

Wittawat Raihuai 2009: Fatigue and Permanent Deformation Resistance Properties of Lab-Made Asphalt Concrete Mixtures Using Basalt Aggregates. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Watcharin Witayakul, M.Eng. 152 pages.

The objectives of this research is to study the fatigue and permanent deformation resistance properties of lab-made asphalt concrete mixtures using basalt aggregates. Also it aims to test the engineering properties of the asphalt concrete with asphalt binders penetration grade 40/50 and 60/70 (AC 40/50 and AC 60/70) and polymer modified asphalt (PMA) to compare with the present asphalt cement grade 60/70.

Results of indirect tensile strength test at 5 temperatures indicated that asphalt concrete materials with AC 40/50 have indirect tensile strength higher than those with PMA at 5-20 degree Celsius. Where as at 35-60 degree Celsius, asphalt concrete materials with PMA have higher indirect tensile strength than those with AC 40/50. Note that, at any temperature, the asphalt concrete materials with AC 60/70 have the lowest indirect tensile strength. Results of resilient modulus test at 5 temperatures that asphalt concrete materials with AC 40/50 have resilient modulus higher than those with PMA at 5-35 degree Celsius. Where as at 50-60 degree Celsius, asphalt concrete materials with PMA have higher resilient modulus than those with AC 40/50. Note that, at any temperature, the asphalt concrete materials with AC 60/70 have the lowest resilient modulus. Results of indirect tensile fatigue test at 35 degree Celsius indicated that asphalt concrete materials with AC 60/70 have fatigue life lower than those with AC40/50 and PMA respectively. Finally, the results of dynamic creep tests at 40 and 60 degree Celsius indicated that at both temperatures permanent deformation failures initiated in asphalt concrete materials with AC 60/70 curlier than those with PMA and AC40/50 respectively.

Based on the laboratory test results of asphalt concrete materials in the research, it can be concluded that asphalt concrete materials with AC 40/50 and PMA have superior properties than asphalt concrete materials with AC 60/70. Since the costs of AC 40/50 and AC 60/70 are indifferent, it is suggested in this study that the binder type of asphalt concrete materials in Thailand should be changed from AC 60/70 to AC 40/50 especially for roads with medium to high traffic.

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