

INFORMATION OF THE NEW CONTRIBUTIONS OF THE THESIS

The name of thesis: *“Study on the effect of some factors on cracking resistance of Superpave asphalt mixture designed according to the principle of balance in Vietnam condition”*

Field: Transport Construction Engineering

Code: 9 58 0205

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Summary of the new contributions of the thesis:

1. It was proposed to choose the method and procedure to the Balanced mix design for Superpave asphalt mixture in Vietnam according to the approach A - Superpave volumetric design with performance verification, with the test method to evaluate cracking resistance by 01 of 02 tests in order of priority as follows:

(1). IDEAL CTindex Test according to ASTM D8225 with a minimum Cracking Tolerance Index (CTindex) threshold of 70 to accept the asphalt mixture.

(2). Semi-Circular Bending Test according to TCVN 11347:2021 with minimum Flexibility index (FI) threshold of 8.0 to accept the asphalt mixture.

2. Experimental research was carried out in the laboratory with Superpave asphalt mixtures using 02 nominal maximum aggregate sizes (BTN12,5 and BTN19), 02 sources of aggregate (limestone and basalt), 03 performance grades of bitumen (PG64-16; PG64-22; PG82-22) and 03 asphalt contents (Pb-0.5, Pb, Pb+0.5), the results are given as follows:

2.1. The effect of the nominal maximum aggregate size: when the nominal maximum aggregate size is increased from 12.5mm to 19mm, the resistance to rutting of asphalt mixture is not much different, but the resistance to cracking decreases.

2.2. The effect of sources of aggregate: The cracking and rutting resistance of asphalt mixture BTN12,5 and BTN19 using basalt-aggregate are better than those of

limestone-aggregate (cracking resistance higher from 12% to 13% and rutting resistance about 12% higher).

2.3. The effect of performance grades of bitumen: The cracking and rutting resistance of asphalt mixture BTN12,5 and BTN19 using PG82-22 bitumen (PMB.III) is much better than that of PG64-22 asphalt (60/70 bitumen) and PG64-16 bitumen (40/50 bitumen). The rutting resistance of asphalt mixture BTN12,5 and BTN19 using PG64-16 bitumen is about 18% higher than that of PG64-22 bitumen, but the cracking resistance is poor 18% to 26% more.

2.4. The effect of asphalt content: The cracking resistance of asphalt mixture increases with the increase of the design asphalt content in the asphalt mixture, but the resistance to rutting decreases.

2.5. Within the framework of this study, 12 regression equations have been established between: CTindex and FI; CTindex with rut depth; FI with rut depth; CTindex with asphalt content, FI with asphalt content, rut depth with asphalt content of asphalt mixture BTN12,5 and BTN19 using PG64-22 bitumen and PG64-16 bitumen, detailed in formulas from (3.1) to (3.12).

3. The input parameters clearly affect the performance criteria of the pavement according to Mechanistic-Empirical method (Permanent deformation of total pavement, Permanent deformation of asphalt concrete layers, Bottom-up fatigue cracking and top-down fatigue cracking of asphalt concrete layers). The main effect factors in order are climate, performance grades of bitumen, asphalt content, nominal maximum aggregate size, sources of aggregate. In which climate is the biggest effect on the performance criteria (Nghean has harsher climatic conditions, the probability of safe working pavement is lower than Hanoi and Dongnai).

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