A STUDY ON PLASTIC DEFORMATION RESISTANCE TEST BETWEEN GLASS FIBER REINFORCED ASPHALT AND MODIFIED SMA MIXTURE

Ki-Soo Park
Korea Institute of Civil Engineering and Building Technology
283, Goyangdae-Ro, Ilsanseo-Gu, Goyang-Si, Gyeonggi-Do, 10223, Korea
Phone: + 82 1024150447 E-mail: kisoopark@kict.re.kr

Co-authors(s); Pyeong-Jun Yoo, Korea Institute of Civil Engineering and Building Technology; Byung-Sik Ohm, Korea Institute of Civil Engineering and Building Technology; Ji-young Choi, Korea Institute of Civil Engineering and Building Technology; Jae-Kyu Lim, Korea Institute of Civil Engineering and Building Technology.

ABSTRACT
In recent years, modified SMA (Stone Mastic Asphalt) mixtures, which exhibit high performance in terms of plastic deformation and crack resistance, have been widely used in Korea. However, the modified SMA mixture is difficult to supply and receive aggregate, and has a problem that it costs more than a normal hot-mix asphalt mixture.

Recently, glass fiber reinforced asphalt mixtures have been developed as an alternative to the modified SMA blend. In this study, the plastic deformation resistance of the glass fiber reinforced asphalt mixture and the modified SMA mixture was evaluated by Hamburg Wheel Tracking and APT (Accelerated Pavement Testing). It has its purpose.

The modified SMA used in the experiment was a mixture of a PG76-22 binder commonly used in Korea and a maximum particle diameter of 13 mm. The glass fiber reinforced asphalt mixture was analyzed for air void and Marshall stability according to the amount of fiber added to the mixture of normal hot-mix asphalt mixture using WC-2 particle size and PG64-22 binder commonly used in Korea and the optimum fiber amount was deduced. Three kinds of fiber addition were selected as 0.25%, 0.5% and 1.0%, and three marshall specimens were prepared for each case to analyze porosity and Marshall stability. As a result of regression analysis, it was shown that the maximum Marshall stability was satisfied in the range of satisfying the porosity criterion when 0.6% of fiber was added.

For each of the above mixtures, a Hamburg wheel tracking specimen with air void of 7% was fabricated using a gyrotary compaction machine. In the Hamburg wheel tracking test, 20,000 loadings were applied under the condition that each mixture specimen was immersed in water at 50 °C, and the Permanent Deformation of each mixture specimen was measured by LVDT (Linear Variable Differential Transformer). The results of the Hamburg wheel tracking test are shown in Figure 1.
APT was constructed by dividing the modified SMA and glass fiber reinforced asphalt mixture on the same concrete base layer. After the test bed was constructed, the initial load of 4.1 ton was started by using Heavy Vehicle Simulator (HVS), and the load was gradually increased to 6.15 ton and 8.2 ton. The loads were converted into ESALs. Loads of about 690,000ESALs were carried out at an average temperature of 31.6 °C and two lateral profile measurement points were selected for each mixture section. Figure 2, 3 shows the lateral profiles obtained by measuring the distance to the surface of the surface layer at intervals of 1 cm with respect to the selected lateral profile points according to the load. Using the derived lateral profile, the Rut Depth was calculated as shown in Fig. 2, and the plastic deformation resistance between the modified SMA and the glass fiber reinforced asphalt mixture was evaluated.
Figure 2: Profile of Glass Fiber Reinforced Asphalt Section

Figure 3: Profile of Modified SMA Section
The Hamburg wheel tracking tests and APT between the glass fiber reinforced asphalt mixture and the modified SMA mixture showed that the glass fiber reinforced asphalt mixture had higher plastic deformation resistance than the modified SMA mixture.

REFERENCES

