Asphalt aging is one of the main factors deteriorating the durability of pavements. Many efforts have been made to simulate the asphalt aging in the pavement laboratory. In this study, a weathering system was built by following ASTM D 4799 – 03. The machine can simulate the asphalt aging by sunlight, rain, oxygen and heat through asphalt mixture samples instead of asphalt binder, as a result, with the effects of aggregate type and gradation on the aging. Porous European Mix (PEM) samples with SBS, Crumb Rubber Modifier (CRM) in dry process were aged in the weathering system for 1000 hrs. Selected properties of the aged samples and controls (no aging) were tested. Results indicated 1) Aged samples with SBS, crumb rubber in dry process have Cantabro loss of 18.3% and 24.7 %, respectively; 2) Aged samples with SBS, crumb rubber in dry process have rut depth of 1.75 mm and 1.73 mm after 8000 cycles in the APA, respectively.

**RESULTS & DISCUSSIONS**

1. Design of PEM mixtures

PEM mixtures were designed according to GDT 114. Rubberized PEM consists of 30 mesh crumb rubber at 10% of the weight of the asphalt cement. CRY polymer at 5% of the weight of the crumb rubber modifier, mineral fibers at 0.4% by weight of the total mix. Asphalt binder with PG 76-22, and crushed granite aggregates were used for the PEM. Optimum asphalt binder content (OAC) of rubberized PEM mixes in this report is found to be 6.0%. SBS asphalt mixes consist of mineral fibers at 0.4% by weight of the total mix. SBS modified asphalt binder with PG 76-22, and crushed granite aggregates. OAC of SBS asphalt PEM mixes in this report is also found to be 6.0%.

2. Weathering test

The PEM samples containing SBS and CRM (added in dry process) were aged in the weathering device for 1000 hours, see Figure 2, left. Testing parameters used for this study are as follows: 41 min light exposure, 9 min light and water spray, sample temperature 60°C. Figure 2, right, is the aged sample aged for 1000 hours.

3. Asphalt Pavement Analyzer (APA) test

Asphalt Pavement Analyzer (APA), Jr. from Pavement Technology, Inc., see Figure 3, was used to investigate the rutting susceptibility of asphalt mixtures containing SBS and CRM in dry process, according to ASTM D 5289. Unaged samples were tested also. Figure 4 presented the testing results. The rutting depths of the samples unaged and aged after 1000 hours with SBS, crumb rubber in dry process are 1.70 mm and 1.72 mm, respectively, after 8000 cycles in the APA, respectively. Overall, the rutting depths are very low, lower than the limit of 5 mm by GDOT. Having been Aged for 1000 hrs, the samples did not change much of the rutting. In addition, the mixtures containing CRM in dry process performed similarly to the mixes with SBS with regard to rutting resistance.

**CONCLUSIONS AND FURTHER STUDY**

1) All samples with SBS, crumb rubber in dry process have rut depth less than 2.0 mm, much less than 5.00 mm of the limit by GDOT after 8000 cycles in the APA. Weathering for the samples for 1000 hrs did not change the rutting.

2) The CRM samples have a higher Cantabro loss than SBS samples, for both unaged and aged samples. In addition, weathering has a bigger negative effect on the Cantabro loss.

3) Further Studies: A longer weathering time of 2,000 hrs will be applied for the samples before the evaluation of the mixture properties. Fatigue properties of PEM and SMA mixes after a standard weathering test will be performed using Asphalt Mixture Performance Tester (AMPT), see Figure 6.

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