Asphalt superpave

Engineering

G. Measurements and Calculations: Perform the following calculations for each specimen tested in lab (include data from all lab groups so that means and standard deviations can be calculated).

1 Calculate the Bulk Specific Gravity Gmb of the asphalt mixture, which is defined as the ratio of the weight in air of a unit volume of a permeable material at a given temperature relative to the weight in air of an equal volume of water at the same temperature. The Bulk Specific Gravity can be calculated from

whereGmb = Bulk Specific Gravity

A = Mass of dry specimen in air, g

B = Mass of SSD specimen in air, g

C = Weight of specimen in water, g

Gmb = A/(B-C)

For specimen C

A = Mass of dry specimen in air = 4970

B = Mass of SSD specimen in air, g = 4972

C = Weight of specimen in water, g = 3035

Gmb = 4970/(4972 - 3035)

4970/1937

= 2. 5658

For specimen d

A = Mass of dry specimen in air = 4976

B = Mass of SSD specimen in air, g = 4984

C = Weight of specimen in water, g = 3050

Gmb = 4976/(4984 - 3050)

4976/1934

= 2. 573

3. Calculate the Percent Water Absorbed (by volume) = 100 x (B-A)/(B-C)

If the percent water absorbed is greater than 3 percent, Bulk Specific Gravity should be calculated using paraffin-coated specimens. Indicate whether or not your specimens are acceptable for percent water absorbed, or if they should have been paraffin-coated.

For specimen C

Percent water absorbed = = 100 x (B-A)/(B-C)

100 x (4972 – 4970)/(4972 – 3035)

100 x 2/1937

0. 10%

The percent of water absorbed is less than 3 percent consequently there was no need for paraffin-coated.

For specimen D

Percent water absorbed = = 100 x (B-A)/(B-C)

100 x (4984 – 4976)/(4984 – 3050)

100 X (8/1934)

0. 41%

The percent of water absorbed is less than 3 percent consequently there was no need for paraffin-coated.

4. Calculate the Percent Compaction and Percent Air Voids for each sample

Percent Compaction = Bulk Sp. Gravity/Max. Th. Sp. Gravity = 100 x Gmb/Gmm

For c

= 100 x 2. 5658/2. 651

96. 78%

For D

= 100 X 2. 573 x 2. 651

= 97. 05%

Percent Air Voids = 100 – Percent Compaction

For c

= 100 – 96. 78

= 3. 22%

For D

= (100 – 97. 05)%

= 2. 95%

5. Calculate averages and standard deviations using data from all samples of the same mix design. Compare average results from different design mixes. Do the samples fall within PennDOT’s acceptance criteria?

Average for bulk specific gravity = (2. 573 + 2. 5658)/2 = 2. 5694

Average for percent water absorbed = (0. 10 + 0. 41)/2 = 0. 255%

Average for percent compaction = (97. 05% + 96. 78%)/2 = 96. 92%

Average for percent air voids = (3. 22 + 2. 95)/2 = 3. 085

Discussion

The laboratory experiment was successful since the results showed that the samples prepared had compacted air voids of between 3% and 8%. For C, the percent covered by air voids was 3. 22% while for D the percent was 2. 95%. This range prevents the possibility of the voids becoming interconnected thereby reducing the susceptibility of the pavement undergoing permeation by air and moisture. The percent of water absorbed for both specimen C and D was less than 3 percent consequently there was no need for paraffin-coated. The samples fall within PennDOT’s acceptance

criteria because they have percent of air voids around 4% and 96% compaction. However, C proves to be the best sample since its values for percent air voids (3. 22) and compaction (96. 78%) are closer to PennDOT’s acceptance criteria. This means that design mixes C and D are suitable for asphalt pavement since they give assurance on the required degree of compaction and percent air voids in compacted bituminous samples.