Superpave Asphalt Mix Design - Part C

Validation Procedures and Report Requirements for the Prepared HMA Test Specimens

Introduction
The final step in the Superpave mix design method is to determine if the trial batch meets the specifications. Follow the steps in the section below to determine Va, VMA, and VFA. These are the last criteria that the mix design must meet. Having met these remaining criteria, you will have successfully completed a proper Superpave mix design.

Procedures
Volumetrics
In order to determine if the trial batch meets the Design Criteria, the mix needs to be tested to determine whether the target values have been met for the particular gradation chosen. The following procedures highlight the final process of the mix design. The results will determine whether the mix meets the specified design criteria.

- HMA Maximum Theoretical Density, $G_{mm}$
  
  *Refer to AASHTO T 209 (our masses used are equivalent to the masses in T 209)*

- HMA Bulk Specific Gravity, $G_{mb}$
  
  *Refer to AASHTO T 166 Method A (our masses are equivalent to the masses in T 166)*
  
  **NOTE:** Soak specimen in water @ 25 +/- 1°C for 10 +/- 1 minutes before reading the immersed mass.

- Combined Bulk Specific Gravity of Aggregate Blend, $G_{sb}$

  When the total aggregate trial blend consists of aggregates with different specific gravities, which is usually the case, then the Bulk Specific Gravity for the blend must be calculated using:

  $$G_{sb} = \frac{P_1 + P_2 + \ldots + P_n}{G_1 + G_2 + \ldots + G_n}$$

  Where, $G_{sb}$ = bulk specific gravity of total aggregate blend
  
  $P_1, P_2, P_n$ = individual percentages by mass of aggregate
  
  $G_1, G_2, G_n$ = individual specific gravities of aggregate

- Aggregate Percentage by Mass, $P_s$

  Total percentage by mass of the batch by the total mass of the aggregate.
Calculations

Using the above values, substitute into the following equations to determine VMA, Va and VFA.

\[
\text{Property} \\
VMA = 100 - \frac{(G_{mb} \times P_s)}{G_{sb}} \\
V_a = 100 \times \frac{(G_{mm} - G_{mb})}{G_{mm}} \\
VFA = 100 \times \frac{(VMA - V_a)}{VMA}
\]

Report Requirements

After completing the lab work, you must submit a report summarizing what you learned. The data collected by your group as well as others should be included in the report. The report should be in R-4 format. R-4 report format is shown in the Report Requirements section on the CE330L web site.

In the appendix, include the following:

- Data (raw data from your group’s work, end results, i.e. G_{mm}, G_{mb} from the other groups’ results.)
- Sample calculations for aggregate gradation, specific gravity and mix volumetrics. Use the Superpave Volumetrics Worksheet as a guide.
- Plot each aggregate gradation on its own semilog gradation chart.
- Plotted 0.45 power chart (use Figure App-1) for the combined aggregate gradation.
- Plot the following curves in separate charts aligned vertically on one page showing Asphalt Content (AC) percentage on the x-axis vs. the volumetric values listed below. Draw and label the projection lines you use to find the following coordinates:
  1. Percent Air Voids (AV). Draw line from Air Voids axis to find the optimum AC at the specified air voids ratio.
  2. Percent Voids in Mineral Aggregate (VMA). Draw a line representing the required VMA minimum and indicate the point on the VFA curve corresponding to optimum AC.
  3. Percent Voids Filled with Asphalt (VFA). Draw lines representing the minimum and maximum limits of VFA and indicate the point on the VFA curve corresponding to optimum AC.