Colorado Procedure 42-05

Standard Method of Test for

Estimation of Asphalt Content in Hot Mix Asphalt Through Back Calculations Using G_{se}

1. SCOPE

1.1 This is a Colorado investigative procedure that covers the quantitative estimation of the asphalt cement content of hot mix asphalt mixtures by calculating the value from the maximum specific gravity and the effective specific gravity of the aggregate. This procedure is not appropriate for determining percent asphalt content for payment.

2. REFERENCED DOCUMENTS

2.1 *Colorado Procedures:*

CP 30 Sampling of Aggregates
CP 32 Reducing Field Samples of Aggregate to Testing Size
CP 41 Sampling Hot Mix Asphalt
CP 51 Determining the Maximum Specific Gravity of Bituminous Mixtures
CP 55 Reducing Field Samples of Hot Mix Asphalt to Testing Size

CP-L 5115 Preparing and Determining the Density of Bituminous Mixture Test Specimens Compacted by the Superpave Gyratory Compactor.

3. SIGNIFICANCE AND USE

3.1 Current procedures for determining the percent binder in hot mix asphalt are greatly affected by changes in the percent lime in the mix. If there is less lime in a mix than the nuclear gauge or ignition oven was correlated with, the mix will yield a low percent binder in the nuclear gauge and a high percent binder in the ignition oven. The reverse is true if there is more lime in the mix than the nuclear gauge or ignition oven was correlated with. This procedure can be used to further investigate the percent binder in the mix. This procedure may yield questionable results when used with absorptive aggregates.

4. APPARATUS

4.1 CP 51, Subsections 3.1 – 3.8

4.2 Mixing bowl and mixing utensils.

5. PROCEDURE

5.1 Sample aggregates per CP 30. The aggregates should be representative of the aggregates in the asphalt mix; therefore pull the aggregate sample near the time the plant-produced hot mix asphalt is produced. Reduce the aggregates for mixing per CP 32. Utilizing CP 51 and the mix's nominal maximum aggregate size determine the minimum size of the aggregate sample needed for mixing.

5.2 Reduce the plant-produced hot mix asphalt per CP 55 and determine the maximum specific gravity per CP 51.

5.3 Mix the aggregates at the optimum percent binder. The required mixing temperature is in CP-L 5115.

5.4 Cure the lab produced mixture for 2-3 hours or, if you know how long the plant-produced material was cured, then cure the lab-produced sample for the same length of time. The cure time is particularly important for mixes with absorptive aggregates.

5.5 Determine the maximum specific gravity of the lab-produced mixture per CP 51.

6. CALCULATIONS

6.1 Determine the Gse of the lab- produced material as follows:

$$\mathbf{Gse} = \frac{\mathbf{100 - Pb}}{\frac{\mathbf{100}}{\mathbf{Gmm}} - \frac{\mathbf{Pb}}{\mathbf{Gb}}}$$

Where:

Gse = Effective specific gravity of the aggregate,
Pb = Percent binder,
Gmm = Average maximum specific gravity,
Gb = Specific gravity of binder. (This value can be found in the mix design. If the value is unknown, use 1.03.)

6.2 Determine the percent binder of the plant-produced mix as follows:

$$\mathbf{Pb} = \mathbf{100\ x} \frac{\left(\frac{\text{Gse}}{\text{Gmm}} - \mathbf{1} \right)}{\left(\frac{\text{Gse}}{\text{Gb}} - \mathbf{1} \right)}$$

Where:

Pb = Percent binder of the Plant-produced mix,
Gse = Effective specific gravity of the aggregate from the lab-produced mix,
Gmm = Maximum specific Gravity of the field- produced mix,
Gb = Specific gravity of binder. (This value can be found in the mix design. If the value is unknown, use 1.03.)