Method of Test for
DETERMINATION OF ASPHALT ABSORPTION FACTOR OF
AGGREGATE AND EFFECTIVE ASPHALT CONTENT FOR
ASPHALTIC MIXTURES
DOTD Designation: TR 320-87

Scope

1. This method of test is intended to determine both the asphalt absorption of coarse, fine or combined aggregates and the effective asphalt content of the asphaltic mixture. This method is to be used for aggregates having a water absorption greater than 2.0 percent or an asphalt absorption greater than 0.5 percent such as slag, shell, porous stone, recycled portland cement concrete, expanded clay, etc.

Apparatus

2. Same as DOTD Designation: TR 300, Method C, and AASHTO Designation: T 84 or T 85.

Sample

3. Same as DOTD Designation: TR 300, Method C, and AASHTO Designation: T 84 or T 85.

Procedure

4. (a) Determine the effective specific gravity of the aggregate in accordance with DOTD Designation: TR 300, Method C.

(b) Determine the bulk specific gravity of the aggregate in accordance with AASHTO Designation: T 84 or T 85.

(c) Determine the asphalt absorption as described in paragraph 5(a).

(d) Determine the effective asphalt content of the paving mixture as described in paragraph 5(b).

NOTE: The effective asphalt content ($AC_e$) of a paving mixture is the total asphalt content minus the quantity of asphalt lost by absorption into the aggregate particles. It is the portion of the total asphalt content that remains as a coating on the outside of the aggregate particles, and is the asphalt content on which service performance of an asphaltic paving mixture depends.

Calculations

5. (a) Calculate the asphalt absorption ($AC_a$) using the following formula:

$$AC_a = 100 \left( \frac{C_e - C_b}{C_e \cdot C_b} \right) \cdot G_a$$

where:

$AC_a = \text{absorbed asphalt, } \% \text{ by weight of aggregate}$

$C_e = \text{effective specific gravity of aggregate}$

$C_b = \text{bulk specific gravity of aggregate}$

$G_a = \text{specific gravity of asphalt (AASHTO Designation: T 228)}$

example:

effective specific gravity, $C_e = 2.59$
bulk specific gravity, $C_b = 2.45$
asphalt specific gravity, $G_a = 1.03$

$$AC_a = 100 \left( \frac{2.59 - 2.45}{(2.59)(2.45)} \right) \cdot 1.03$$

$$= 100 \left( \frac{0.14}{6.345} \right) \cdot 1.03 \approx 2.266$$

Absorbed Asphalt by Weight of Aggregate $= 2.3\%

(b) Calculate the effective asphalt content ($AC_e$) using the following formula:

$$AC_e = AC_m - \left( \frac{AC_a}{100} \times AGC \right)$$
where:

\[ AC_e = \text{effective asphalt content, } \% \text{ by total weight of mixture} \]
\[ AC_m = \text{asphalt content, } \% \text{ by total weight of mixture; taken from job mix formula (JMF)} \]
\[ AC_a = \text{absorbed asphalt content, } \% \text{ by weight of aggregate} \]
\[ AGG = \text{aggregate, } \% \text{ by total weight of mixture; taken from JMF} \]

Example:

\[ AC_m = 5.3\% \text{ taken from JMF} \]
\[ AC_a = 2.3\% \text{ determined by step 4(c)} \]
\[ AGG = 30.0\% \text{ taken from JMF} \]

\[ AC_e = 5.3 - \left( \frac{2.3}{100} \times 30.0 \right) = 5.3 - 0.689 = 5.3 - 0.7 = 4.6\% \]

Report

6. Report asphalt absorption (AC_a) and effective asphalt content of mixture (AC_e) to the nearest one-tenth of one percent (0.1%).

NOTE: Use effective asphalt content of the mixture to calculate percent voids filled with asphalt (% VFA) in the asphaltic concrete mixture. (See DOTD Designation: TR 306 Method B.)

Normal testing time is 2 days.