ASPHALT FILM THICKNESS IN BITUMINOUS MIXTURES

1.0 SCOPE

1.1 This procedure is used to estimate the asphalt film thickness for a bituminous mixture. The calculated asphalt film thickness is the volume of the effective asphalt divided by the calculated surface area of the aggregate.

1.2 The calculated surface area of the aggregate consists of multiplying the total percentage passing each sieve size by a "surface-area factor". The accumulated products represent the equivalent surface area in terms of square meters per kilogram. All surface-area factors must be used in the calculation. Also, a different series of sieves will require different surface-area factors.

2.0 APPLICABLE DOCUMENTS

2.1 AASHTO T270 Centrifuge Kerosene Equivalent and Approximate Bitumen Ratio (ABR)

2.2 California Test 303 Method of Test for Centrifuge Kerosene Equivalent and Approximate Bitumen Ratio (ABR)

2.3 Asphalt Institute’s MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types

3.0 PROCEDURE

3.1 Determine the job mix formula gradation, bulk specific gravity of the aggregate and the compacted mixture, asphalt content, specific gravity of the asphalt and the asphalt absorption.

4.0 CALCULATE

4.1 Calculate the volume of effective asphalt as follows:

\[
\text{Volume of effective asphalt (m}^3) = \frac{\text{wt. of effective asphalt}}{\text{specific gravity of asphalt}} \times \frac{1}{1000}
\]
Where:

weight of effective asphalt =
weight of mix - weight of dry aggregate - weight of absorbed asphalt

Where:

weight of dry aggregate = \( \frac{\text{weight of mix}}{1 + \% \text{ asphalt}} \)

weight of absorbed asphalt = weight of dry aggregate \( \times \frac{\text{asphalt absorption}}{100} \)

4.2 Calculate the surface area as follows:

Surface area (m\(^2\)/kg) =

\[ 0.41 + 0.0038a + 0.0078b + 0.0155c + 0.029d + 0.054e + 0.1218f + 0.290g \]

Where:

\[
\begin{align*}
a &= \text{percent passing 5000} \\
b &= \text{percent passing 2500} \\
c &= \text{percent passing 1250} \\
d &= \text{percent passing 630} \\
e &= \text{percent passing 315} \\
f &= \text{percent passing 160} \\
g &= \text{percent passing 80}
\end{align*}
\]

Correct for aggregate bulk specific gravity by multiplying:

Surface area (m\(^2\)/kg) \( \times \frac{2.650}{\text{aggregate bulk specific gravity}} \)

4.3 Calculate the asphalt film thickness as follows:

Asphalt film thickness (µm) = \( \frac{\text{volume of effective asphalt}}{\text{calculated surface area of aggregate}} \times 10^6 \)

Where:

surface area of aggregate = surface area \( \times \) weight of aggregate

5.0 REPORT

5.1 The Asphalt Film Thickness results are presented within the mix design summary report.