1. SCOPE

1.1 This method describes the procedures for determining the asphalt content of bituminous concrete mixtures by ignition of the asphalt. This method can be used with either an automated furnace containing an internal balance, or a furnace with only temperature control.

2. APPARATUS

2.1 Automated Furnace - A forced air ignition furnace meeting the following requirements.
   2.1.1 Capable of operating at an internal temperature of at least 650 °C.
   2.1.2 Equipped with an internal balance meeting the requirements of ASTM D4753, Class GP2, with a sample capacity of at least 4000 g.
   2.1.3 Equipped with an automation system that:
      2.1.3.1 Heats the ignition chamber to ±1 °C of the test temperature.
      2.1.3.2 Allows the input of a correction factor for aggregate loss.
      2.1.3.3 Compensates for the apparent mass change due to increase temperature.
      2.1.3.4 Sounds an audible alarm, or ceases measurements, when the change in mass does not exceed 0.01% for three consecutive measurements.
   2.1.4 Equipped with a printer and capable of printing the following minimum data:
      2.1.4.1 Test time and date.
      2.1.4.2 Chamber set temperature.
      2.1.4.3 Elapsed time.
      2.1.4.4 Sample mass.
      2.1.4.5 Mass loss.
      2.1.4.6 Percent loss.
      2.1.4.7 Temperature compensation factor.
      2.1.4.8 Calibration factor.
      2.1.4.9 Calibrated asphalt content.

2.2 Non-Automated Furnace - A forced air ignition furnace meeting the following requirements.
   2.2.1 Equipped with a thermostat control to heat the furnace to ±1 °C of the test temperature.
   2.2.2 Capable of operating at an internal temperature of at least 650 °C.
   2.2.3 Having a sample capacity of at least 4000 g.

3 SAMPLES

3.1 The minimum sample size depends on the nominal maximum aggregate size of the sample, as shown in Table 1. For mixtures with a nominal maximum aggregate size smaller than 9.5 mm the maximum sample size is recommended at 1200 g.
### TABLE 1 - Minimum Sample Sizes

<table>
<thead>
<tr>
<th>Nominal Maximum Aggregate Size</th>
<th>Minimum Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 9.5 mm</td>
<td>800 g (1200 g max)</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>1200 g</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1500 g</td>
</tr>
<tr>
<td>19.0 mm</td>
<td>2000 g</td>
</tr>
<tr>
<td>25.0 mm</td>
<td>2500 g</td>
</tr>
<tr>
<td>&gt; 25.0 mm</td>
<td>3000 g</td>
</tr>
</tbody>
</table>

4. PROCEDURE

4.1 Calibration - Each aggregate blend and asphalt binder combination will behave differently during the ignition process. A separate calibration has to be performed for each JMF.

4.1.1 Obtain samples of the aggregate, and asphalt binder or asphalt emulsion representative of the materials used in the production of the bituminous concrete mixture. Obtain all samples according to the procedures given in Materials Method 5.0.

4.1.2 Prepare at least three calibration samples at the design aggregate gradation and asphalt content according to Department written instructions.

4.1.3 Follow the procedure detailed under ASPHALT CONTENT DETERMINATION, for the appropriate furnace type. Preheat the furnace to 538 ±1 °C. Enter a calibration factor of 0.00 (automated furnaces only). Hot mix asphalt calibration samples do not need to be dried to constant mass. If the samples are allowed to cool after mixing, heat them to 125 °C for 25 minutes before testing. If the samples contain asphalt emulsion, dry them to constant mass at 125 °C before testing.

4.1.4 If the range (difference between highest and lowest) of the measured asphalt contents is greater than 0.15%, prepare and test two more calibration samples. From the four tests, discard the high and low results, and use the remaining results in Step 4.1.5.

4.1.5 Determine the calibration factor for the mixture using Equation 1.

\[
C_f = \frac{\sum (\%AC_{\text{test}} - \%AC_{\text{actual}})}{n} 
\]

where:

- \( C_f \) = Calibration factor
- \( \%AC_{\text{test}} \) = Measured asphalt content for each specimen
- \( \%AC_{\text{actual}} \) = Actual asphalt content for each specimen
- \( n \) = Number of calibration specimens.

4.1.6 If the calibration factor is greater than 0.50%, repeat the calibration process with the furnace preheated to 482 ±1 °C. Use the calibration factor determined at 482 °C, even if it is greater than 0.50%.
4.2 Asphalt Content Determination (Automated Furnace)

4.2.1 Dry all specimens to a constant mass at 125 °C before testing.
4.2.2 Preheat the furnace to the temperature that was used to determine the calibration factor. Record the furnace temperature at the start of each test.
4.2.3 Input the calibration factor previously determined for the specific mix.
4.2.4 Determine and record the mass of the entire sample basket apparatus, including the catch pan, cover and hold down.
4.2.5 Evenly distribute one sample across both baskets, placing approximately half of the sample in each basket. Keep the sample 25 mm away from the sides of the basket to minimize particle loss during burning. Determine and record the mass of the sample plus basket apparatus.
4.2.6 Calculate the sample mass, and input it into the furnace controller.
4.2.7 Place the sample in the furnace. Verify that the mass of the sample and baskets displayed by the furnace is equal to the total mass recorded earlier ±1.0 g. Differences greater than 5.0 g may indicate that the sample basket is in contact with the furnace wall.
4.2.8 Initiate the test.
4.2.9 Allow the test to continue until the furnace indicates that the test is complete. Once the test is complete, print out the results.

4.3 Asphalt Content Determination (Non-automated Furnace)

4.3.1 Dry all specimens to a constant mass at 125 °C before testing.
4.3.2 Preheat the furnace to the temperature that was used to determine the calibration factor. Record the furnace temperature at the start of each test.
4.3.3 Record the calibration factor for the specific mixture.
4.3.4 Determine and record the mass of the entire sample basket apparatus, including the catch pan, cover and hold down.
4.3.5 Evenly distribute one sample across both baskets, placing approximately half of the sample in each basket. Keep the sample 25 mm away from the sides of the basket to minimize particle loss during burning. Determine and record the mass of the sample plus basket apparatus.
4.3.6 Calculate and record the sample mass.
4.3.7 Place the sample in the furnace. Allow the test to continue for the time period indicated in Table 2.

<table>
<thead>
<tr>
<th>Sample Mass (g)</th>
<th>Test Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 - 1500</td>
<td>40</td>
</tr>
<tr>
<td>1500 - 2500</td>
<td>60</td>
</tr>
<tr>
<td>2500 - 4000</td>
<td>75 or more</td>
</tr>
</tbody>
</table>

NOTE: The test times listed in Table 2 are given as recommendations only. Not all mixtures will require the same time period to achieve complete combustion.
At the end of the test period, remove the sample and allow it to cool to 125 ± 5 °C. Record the mass of the sample and basket apparatus. Heat the furnace back to test temperature and return the sample to the furnace. Leave the sample in the furnace for 15 minutes. Remove the sample, allow it to cool to 125 ± 5 °C and determine its total mass again. Repeat until the range of three successive measurements is less than 0.1 g.

NOTE: During calibration the sample may not be at 125 °C when the first mass measurement is taken. All mass measurements must be taken at the same sample temperature. Differences in temperature will affect the accuracy of the calculation of asphalt content.

4.3.9 Calculate and record the final mass of the specimen.
4.3.10 Calculate and record the corrected asphalt content using equation 2

\[
\%AC = \left(1 - \frac{\text{final specimen mass}}{\text{original specimen mass}}\right) \times 100 - C_f \tag{2}
\]

5. REPORT

5.1 Type of oven used (automated / non-automated).
5.2 Furnace temperature at initiation of test (°C).
5.3 Mass of basket apparatus (g).
5.4 Mass of sample and basket apparatus (g).
5.5 Initial mass of sample (g).
5.6 Final mass of sample (g).
5.7 Mass loss (g).
5.8 Calibration factor (%).
5.9 Temperature compensation factor (%) (automated furnace only).
5.10 Measured asphalt content (%).
5.11 Corrected asphalt content (%).
5.12 Total test time (minutes).