

**CITY OF COLUMBUS, OHIO**

**SUPPLEMENT 1038  
METHOD OF TEST FOR EXTRACTION OF ASPHALT BINDER  
FROM ASPHALT CONCRETE MIXTURES**

**October 31, 2011**

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**1038.01 Scope.** This method covers the procedure for the quantitative determination of asphalt binder in hot-mixed asphalt mixtures and pavement samples.

1. The aggregate remaining may be used for sieve analysis according to AASHTO T 30, Mechanical Analysis of Extracted Aggregate.

Note 1: Although asphalt binder, by definition, is material soluble in carbon disulfide, other solvents are used in this method for safety and environmental reasons.

**1038.02 Summary of Method.**

1. The mixture is extracted with a suitable solvent using the extraction equipment. The asphalt binder content is calculated by difference between the mass of the original sample and the mass of the extracted aggregate and ash from an aliquot of the extract.

**1038.03 Apparatus.**

1. Oven, capable of maintaining the temperature at  $230 \pm 9$  °F ( $110 \pm 5$  °C).
2. Pan, flat, 14 inches (350mm) long, 10 inches (250mm) wide and 2.5 inches (65mm) deep.
3. Balance: A balance conforming to the requirements of AASHTO M 231, Class D shall be provided.
4. Balance: A balance conforming to the requirements of AASHTO M 231, Class E capacity 15 kg or more.
5. Hot Plate: Electric with adjustable heating rate.
6. Graduated Cylinder: 1000 or 2000 ml capacity.
7. Ignition Dish, 120 ml capacity.
8. Balance: A balance conforming to the requirements of AASHTO M 231, Class C.
9. Muffle furnace or gas burner capable of maintaining temperatures between 500°C and 600°C.

**1038.04 Solvent.**

1. For City lab testing use trichloroethylene or alternate solvent approved by the Laboratory. Contractors may use any solvent that is determined to perform adequately.

**1038.05 Preparation of Sample and General Requirements for weighing.**

1. Place mixture in a large flat pan and dry to constant weight in an oven at a maximum temperature of 230 °F (110 °C).
2. The test sample consists of the entire sample or the end result of splitting or quartering a large sample conforming to AASHTO T 168. The size of the test sample is governed by the nominal maximum aggregate shown in the following table.

**Table 1 - Size of Sample**

<b>Nominal Maximum Aggregate Size</b>		
<b>Standard (mm)</b>	<b>Alternate</b>	<b>Minimum Mass of Sample (kg)</b>
4.75	No. 4	0.5
9.5	3/8"	1
12.5	1/2"	1.5
19.0	3/4"	2
25.0	1"	3
37.5	1 1/2"	4

Note 2: When the mass of sample is greater than the maximum capacity of the extraction equipment, divide the sample into approximately equal portions for testing. The masses for calculations will then be the sum of like masses of the test portions.

3. Weigh extraction test apparatus and/or samples on a balance meeting the requirements of 1038.03 part 3 when the capacity is sufficient; otherwise, use a balance meeting the requirements of 1038.03 part 4.

**1038.06 Apparatus**

1. In addition to the apparatus listed in section 1038.03, apparatus similar to that shown in Figure 1, AASHTO T 164(76), Method A, is required.
  - 1.1 Extraction Apparatus, consisting of a bowl approximately that shown in Figure 1 and an apparatus in which the bowl may be revolved at controlled variable speeds up to 3600 rpm. Provided a container for catching the solvent thrown from the bowl and a drain for removing the solvent.

Note 3: Similar apparatus of large size may be used.

- 1.2 Filter Ring: A smooth, white, medium fast filter paper of a diameter at least equal to the bowl sealing surfaces outside diameter and to internally exceed the bowl sealing surface width by at least 25.4 mm (1 inch).

### 1038.07 Procedure

1. Weigh a 1000 to 3000g sample into the bowl.
2. Cover the sample in the bowl with solvent and allow sufficient time for solvent to disintegrate the sample (not over 1 hour). Place the bowl containing the sample and the solvent in the extraction apparatus. Fit the filter ring around the edge of the bowl. Clamp the cover on the bowl tightly and place a graduated container under the drain to collect the extract.
3. Start the centrifuge revolving slowly and gradually increase the speed to a maximum of 3600rpm or until solvent ceases to flow from the drain. Allow the machine to stop, add 500 ml solvent and repeat the procedure. Use sufficient 500 ml solvent additions (not less than three) so that the extract is clear and near a light straw color. Collect the extract and the washings in a suitable graduate.
4. Remove as much of the mineral matter adhering to the ring as possible and add to the aggregate in the bowl. Dry the contents of the bowl to a constant mass in an oven at  $110 \pm 5 \text{ }^\circ\text{C}$  ( $230 \pm 9 \text{ }^\circ\text{F}$ ) or on a hot plate.

Note 4: Dry the sample until further drying at  $110 \pm 5 \text{ }^\circ\text{C}$  ( $230 \pm 9 \text{ }^\circ\text{F}$ ) does not alter the mass 0.1 percent,.

5. Record the volume of the total extract in the graduate. Agitate the extract thoroughly and immediately measure approximately 100 ml into a previously weighed ignition dish. Dry on a hot plate. Burn the residue at a dull red heat ( $500$  to  $600 \text{ }^\circ\text{C}$ ), cool, and weigh.

### 1038.08 Calculations

1. The mass of the mineral matter in the total volume of extract as follows:

$$\text{Total mineral value } G = \frac{V1}{V1-V2}$$

where: G = mineral matter in grams

V1 = total volume in milliliters, and

V2 = volume after removing aliquot in milliliters.

2. Calculate the percentage of asphalt binder in the sample as follows:

$$\text{Binder content of dry sample, percent} = \frac{W1 - (W2 + W3)}{W1} \times 100$$

where: W1 = mass of sample

W2 = mass of extracted mineral matter, and  
W3 = mass of mineral matter in extract.

**1038.09 Report**

1. Report the asphalt binder content to the nearest 0.1 percent.