
Test Procedure for

DETERMINING ASPHALT CONTENT OF ROCK ASPHALT BY HOT SOLVENT EXTRACTION



TxDOT Designation: Tex-215-F

Effective Date: December 2004

1. SCOPE

- 1.1 Use this test method to determine, by hot solvent extraction, the percentage of asphalt in native rock asphalt aggregate. Other methods to determine asphalt content that correlate satisfactorily to the Soxhlet procedure results may be used.
 - 1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.
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2. APPARATUS

- 2.1 *Soxhlet apparatus*, extractor consisting of a vertical glass cylinder with two tubes (one a siphon tube) attached at the upper end to a reflux condenser and a 500 mL (17 fl. oz.) Pyrex glass flask at the lower end. (See Figure 1.)
 - 2.2 *Whatman fat-free filter thimble* (or equivalent), 80 mm (3.15 in.) in length and 33 mm (1.3 in.) in diameter.
 - 2.3 *Electric hot plate, heat lamp, or other suitable source of heat.*
 - 2.4 *Burner or muffle furnace.*
 - 2.5 *Electric oven*, capable of maintaining a temperature of 60–110°C (140–230°F).
 - 2.6 *Balance*, Class G1 in accordance with Tex-901-K.
 - 2.7 *Mechanical pulverizer.*
 - 2.8 *Dessicator.*
 - 2.9 *Silica ignition dish*, 125 mL (4.3 fl. oz.) capacity.
 - 2.10 *Miscellaneous items*, including tubing, small scoop, spatula, brush, and tongs.
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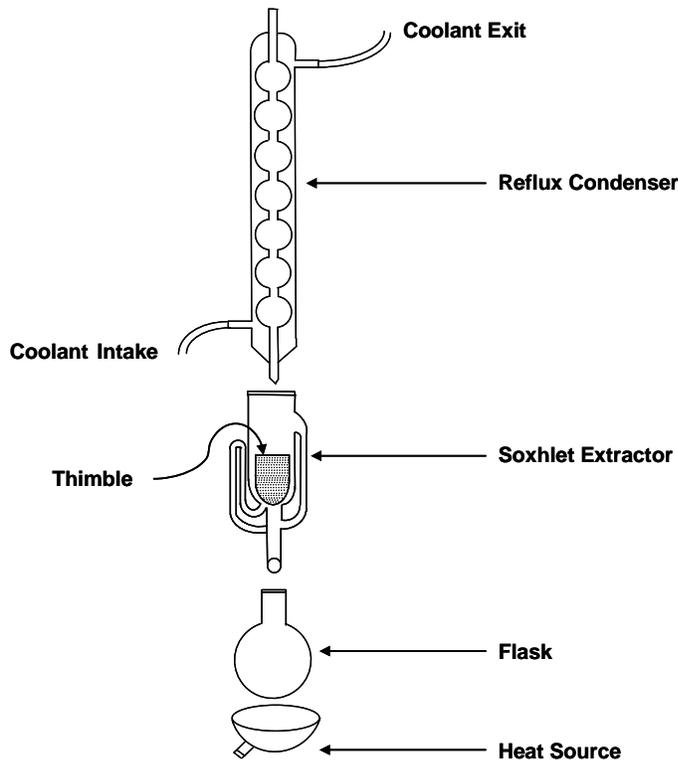


Figure 1—Soxhlet Apparatus

3. MATERIALS

- 3.1 Solvent, trichlorethylene or methylene chloride
- 3.2 Ammonium carbonate solution, saturated solution of ACS Grade $(\text{NH}_4)_2\text{CO}_3$.

4. PREPARING SAMPLE

- 4.1 Mix the rock asphalt aggregate and quarter to obtain a representative sample weighing 1000 g.
- 4.2 Thoroughly blend the material and take small portions from several places in the pan.
- 4.3 Pulverize this material in mechanical pulverizer to pass the 2.00 mm (No. 10) sieve.

5. PROCEDURE

- 5.1 Place a filter thimble and cotton plug (sufficient to plug the open end of thimble) in a 60°C (140°F) oven to dry for approximately 30 min.
- 5.2 Allow to cool to room temperature in a desiccator and obtain the weight to nearest 0.01 g. Record this weight as *B* under Section 6.

Note 1—Support the thimble with a suitable weighing bottle, or indent the bottom of the thimble so it will stand erect while weighing.

- 5.3 Transfer 50 ± 3 g of the pulverized rock asphalt into the filter thimble (about half full).
- 5.4 Place the loose cotton plug in the top of the thimble, and place in an oven and dry to a constant weight at a minimum temperature of 60°C (140°F). Avoid overheating. Dry in a pan in an oven before placing in filter thimble.
- 5.5 Weigh the thimble, contents, and cotton plug to the nearest 0.01 g. Record this weight as *A* under Section 6.
- 5.6 Place the thimble and contents directly into the Soxhlet extraction apparatus.
- 5.7 Fill the flask about half full of solvent, and place a ball of cotton loosely in the open end at the top of the condenser. Ensure a continuous flow of cool water through the condenser.
- 5.8 Heat the flask just enough to vaporize the solvent.
- Note 2**—Condense the solvent vapor in the condenser so that it drops back upon the sample through which it filters, thus dissolving out the asphalt.
- 5.9 Distill the solvent again by siphoning from the cylinder back into the flask.
- 5.10 Collect the asphalt in the bottom of the distillation flask.
- 5.11 Continue the extraction process until the solvent becomes colorless as it fills the vertical glass cylinder surrounding the filter.
- Note 3**—Time of extraction will depend upon the amount of asphalt in the sample.
- 5.12 Remove the heat source and allow the apparatus to cool.
- 5.13 Lift the thimble, allow it to drip dry, and then dry the thimble and contents in an oven at a minimum temperature of 60°C (140°F).
- 5.14 Cool the contents to room temperature (preferably in desiccator) and weigh. Record the weight as *E* under Section 6.
- 5.15 Weigh a silica dish and record its weight as *D* under Section 6. Pour the solution from the flask into the weighed silica dish.
- 5.16 After the solvent has evaporated, ignite the residue over a burner to ash the bituminous material. If a muffle furnace is available, place ashed material in the furnace at approximately 650°C ($1,200^{\circ}\text{F}$) for 15–20 min.
- 5.17 Cool the dish and contents and add just enough ammonium carbonate to wet the ash remaining in the dish.
- 5.18 Evaporate the ammonium carbonate from the sample on a hot plate until the ash is completely dry.

- 5.19 Cool the dish and contents to room temperature in a desiccator and weigh. Record the weight to nearest estimated 0.01 g as *C* under Section 6.
- 5.20 Use the net weight of the ash (*C - D*) to correct for the fine mineral matter. Omit the use of ammonium carbonate if prior tests do not indicate a need for the re-carbonation of the ash. Determine the frequency of ash determination necessary for daily control testing.
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6. CALCULATIONS

- 6.1 Calculate the percent of asphalt in native rock asphalt:

$$\text{Percent asphalt} = \frac{A - (E + C - D)}{A - B} \times 100$$

Where:

A = weight of sample, filter thimble, and cotton

B = weight of filter thimble and cotton

C = weight of silica dish and ash

D = weight of silica dish

E = weight of sample, filter thimble, and cotton after extraction.

7. ARCHIVED VERSIONS

- 7.1 Archived versions are available.