



Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene¹

This standard is issued under the fixed designation D2042; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers the determination of the degree of solubility in trichloroethylene of asphalt materials having little or no mineral matter.

NOTE 1—This method is not applicable to tars and their distillation residues or highly cracked petroleum products. For methods covering tars, pitches, and other highly cracked petroleum products, and the use of other solvents, see Test Methods [D4](#), [D2318](#), and [D2764](#).

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific precaution statements are given in Section [7](#).

2. Referenced Documents

2.1 ASTM Standards:²

- [C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials](#)
- [D4 Test Method for Bitumen Content](#)
- [D2318 Test Method for Quinoline-Insoluble \(QI\) Content of Tar and Pitch](#)
- [D2764 Test Method for Dimethylformamide-Insoluble \(DMF-I\) Content of Tar and Pitch](#)
- [D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials](#)

¹ This test method is under the jurisdiction of ASTM Committee [D04](#) on Road and Paving Materials and is the direct responsibility of Subcommittee [D04.47](#) on Miscellaneous Asphalt Tests.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- [D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials](#)
- [2.2 AASHTO Standard:³](#)
- [T44 Solubility of Bituminous Materials in Organic Solvents](#)

3. Summary of Method

3.1 The sample is dissolved in trichloroethylene and filtered through a glass fiber pad. The insoluble material is washed, dried, and weighed.

4. Significance and Use

4.1 This test method is a measure of the solubility of asphalt in trichloroethylene. The portion that is soluble in trichloroethylene represents the active cementing constituents.

NOTE 2—The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of Specification [D3666](#) are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with Specification [D3666](#) alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of Specification [D3666](#) or some similar acceptable guideline provides a means of evaluating and controlling some of these factors.

5. Apparatus and Materials

5.1 The assembly of a typical filtering apparatus is illustrated in [Fig. 1](#). Details of the component parts are as follows:

- 5.1.1 *Bitumen Crucible or Gooch Crucible*, glazed inside and outside with the exception of outside bottom surface. The approximate dimensions shall be a diameter of 44 mm at the top, tapering to 36 mm at the bottom, and a depth of 20-30 mm.
- 5.1.2 *Glass Microfiber Filter Pad*, 32–34 mm diameter, fine porosity, fast flow rate, 1.5 μm particle retention.
- 5.1.3 *Filter Flask*, heavy-wall, with side tube, 250-, 500-, or 1000-mL capacity.
- 5.1.4 *Filter Tube*, 40- to 42-mm inside diameter.
- 5.1.5 *Rubber Tubing or Adapter*, for holding the crucible on the filter tube.

³ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, <http://www.transportation.org>.

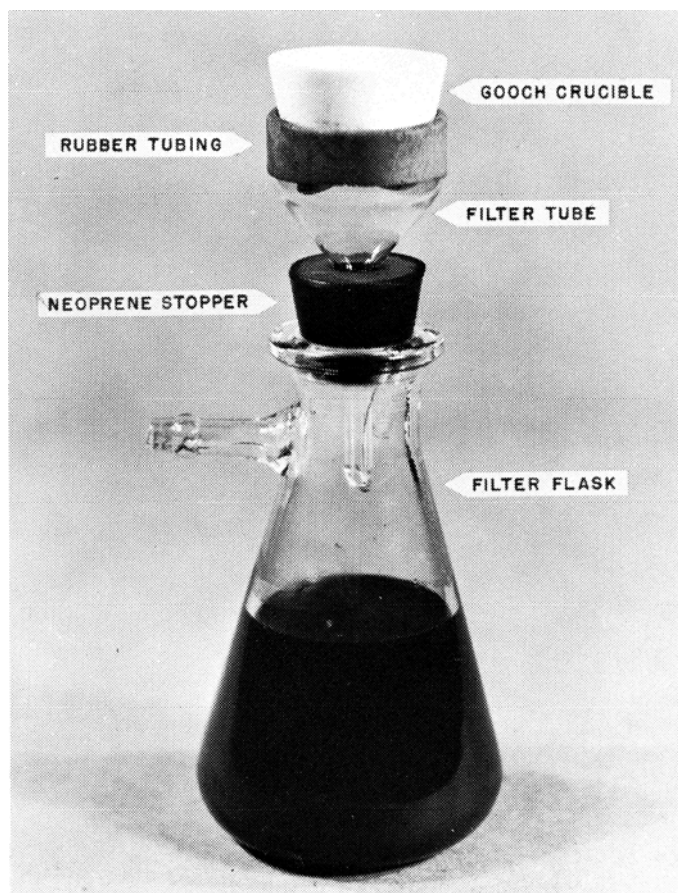


FIG. 1 Filtering Apparatus Assembly

NOTE 3—Other suitable assemblies permitting vacuum filtration with a crucible may be used.

5.1.6 Erlenmeyer Flask, 125 mL.

5.1.7 Oven, capable of maintaining a temperature of $110 \pm 5^\circ\text{C}$.

6. Reagent

6.1 Trichloroethylene, technical grade.

7. Safety Precautions

7.1 Trichloroethylene is toxic, and good ventilation should be provided.

8. Preparation of Crucible

8.1 Place the crucible plus one thickness of the filter pad in an oven at $110 \pm 5^\circ\text{C}$ for 15 min, allow to cool in a desiccator for 30 ± 5 min, and then determine the mass to the nearest 0.1 mg. Designate this mass as *A*. Store in the desiccator until ready for use.

9. Sample Preparation

9.1 If the sample is not fluid, heat to any convenient temperature, but in any case not more than 100°C above the softening point. Normally the temperature at which this test is run is not critical, and it may be performed at the laboratory air temperature. For referee tests, however, the flask and sample in

solution shall be placed in a water bath maintained at $38.0 \pm 0.3^\circ\text{C}$ for 1 h before filtering.

10. Procedure

10.1 Note safety precautions in Section 7. Transfer approximately 2 g of the sample into a tared 125-mL Erlenmeyer flask or other suitable container. Smaller sample sizes may be necessary if more than 0.5 % insoluble material is expected. Allow the sample to cool to ambient temperature and then determine the mass to the nearest 1 mg. Designate this mass as *B*. Add 100 mL of the trichloroethylene to the container in small portions with continuous agitation until all lumps disappear and no undissolved sample adheres to the container. Stopper the flask or otherwise cover the container and set aside for at least 15 min (see Section 9.1).

10.2 Place the previously prepared and weighed crucible in the filtering tube. Wet the filter pad with a small portion of trichloroethylene and decant the solution through the filter pad of the crucible with or without light suction as may be necessary. When the insoluble matter is appreciable, retain as much of it as possible in the container until the solution has drained through the mat. Wash the container with a small amount of solvent and, using a stream of solvent from a wash bottle, transfer all insoluble matter to the crucible. Use a "policeman" if necessary to remove any insoluble matter adhering to the container. Rinse the policeman and container thoroughly. Wash the insoluble matter in the crucible with solvent until the filtrate is substantially colorless, then apply strong suction to remove the remaining solvent. Remove the crucible from the tube, wash the bottom free of any dissolved matter, and place the crucible on top of an oven or on a steam bath until all odor of the trichloroethylene is removed (see safety precautions in Section 7). Place the crucible in an oven at $110 \pm 5^\circ\text{C}$ for at least 20 min. Cool the crucible in a desiccator for 30 ± 5 min and determine its mass to the nearest 0.1 mg. Repeat the drying and weighing until constant mass (± 0.3 mg) is obtained. Designate this mass as *C*.

NOTE 4—To obtain precise results, the cooling time in the desiccator must be approximately the same (within ± 5 min) after all heatings. For example, if the mass of the empty crucible is determined after a 30-min cooling period in the desiccator, the mass of the crucible containing the insoluble matter should be determined after a 30 ± 5 -min cooling period in the desiccator. Either empty crucibles or crucibles containing insoluble matter that have remained in a desiccator overnight should be reheated in an oven for at least 30 min, then allowed to cool for the prescribed period before the mass is determined.

11. Calculation and Report

11.1 Calculate either the total percentage of insoluble matter or the percentage of the sample soluble in the solvent used as follows:

$$\% \text{ Insoluble} = \left(\frac{C - A}{B} \right) \times 100 \quad (1)$$

$$\% \text{ Soluble} = \left(\frac{B - (C - A)}{B} \right) \times 100 \quad (2)$$

where:

A = mass of crucible and filter,

B = mass of sample, and

C = mass of crucible, filter and insoluble material.

11.2 For percentages of insoluble less than 1.0, report to the nearest 0.01 %. For percentages of insoluble 1.0 or more, report to the nearest 0.1 %.

12. Precision

12.1 AASHTO Materials Reference Laboratory (AMRL) data for Test Method D2042 (and its AASHTO equivalent standard, T44) were analyzed in 2001 as prescribed in Practice C670. These data represent approximately 13 200 repetitions of the test, conducted on 132 samples having solubility values

between 99.5 % and 100.0 %. For samples within this range, the analysis suggests the following precision values are appropriate:

Multilab Standard Deviation (1S) = $0.01 + (0.75 \times \% \text{ Insoluble})$
Single-Operator Standard Deviation (1S) = $0.01 + (0.25 \times \% \text{ Insoluble})$

12.2 Since there is no accepted reference material suitable for determining the bias in this test method, no statement on bias is made.

13. Keywords

13.1 asphalt; Gooch crucible; solubility; trichloroethylene

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