



Designation: D 70 – 03

Standard Test Method for Density of Semi-Solid Bituminous Materials (Pycnometer Method)¹

This standard is issued under the fixed designation D 70; 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 Department of Defense.

1. Scope

1.1 This test method covers the determination of the specific gravity and density of semi-solid bituminous materials, asphalt cements, and soft tar pitches by use of a pycnometer.

NOTE 1—An alternate method for determining the density of semi-solid and solid bituminous materials is Test Method D 3289. For materials which are too fluid for use of this test method, use Test Method D 3142.

1.2 *This standard does not purport to address 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.*

2. Referenced Documents

2.1 ASTM Standards:

- C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials²
- D 140 Practice for Sampling Bituminous Materials³
- D 3142 Test Method for Density of Liquid Asphalts (Hydrometer Method)³
- D 3289 Test Method for Density of Semi-Solid and Solid Bituminous Materials (Nickel Crucible Method)³
- D 4311 Practice for Determining Asphalt Volume Correction to a Base Temperature³
- E 1 Specification for ASTM Thermometers⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *density*—the mass per unit volume of a material.

3.1.2 *relative density*—the ratio of the mass of a given volume of a material to the mass of the same volume of water at the same temperature (see Note 2).

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 *Annual Book of ASTM Standards*, Vol 04.02.

³ *Annual Book of ASTM Standards*, Vol 04.03.

⁴ *Annual Book of ASTM Standards*, Vol 14.03.

NOTE 2—Relative density is also described as specific gravity.

4. Summary of Test Method

4.1 The sample is placed in a calibrated pycnometer. The pycnometer and sample are weighed, then the remaining volume is filled with water. The filled pycnometer is brought to the test temperature, and weighed. The density of the sample is calculated from its mass and the mass of water displaced by the sample in the filled pycnometer.

5. Significance and Use

5.1 Values of density are used for converting volumes to units of mass, and for correcting measured volumes from the temperature of measurement to a standard temperature using Practice D 4311.

6. Apparatus

6.1 *Pycnometer*, glass, consisting of a cylindrical or conical vessel carefully ground to receive an accurately fitting glass stopper 22 to 26 mm in diameter. The stopper shall be provided with a hole 1.0 to 2.0 mm in diameter, centrally located in reference to the vertical axis. The top surface of the stopper shall be smooth and substantially plane, and the lower surface shall be concave to allow all air to escape through the bore. The height of the concave section shall be 4.0 to 18.0 mm at the center. The stoppered pycnometer shall have a capacity of 24 to 30 mL and shall weigh not more than 40 g. Suitable pycnometers are illustrated in Fig. 1.

6.2 *Water Bath*, constant-temperature, capable of maintaining the temperature within 0.1°C of the test temperature.

6.3 *Thermometers*, calibrated liquid in glass, total immersion type, of suitable range with graduations at least every 0.1°C and a maximum scale error of 0.1°C as prescribed in Specification E 1. Thermometer commonly used is ASTM 63°C. Older ASTM 63F thermometers may be used until supplies are exhausted. Any other thermometer device of equal accuracy may be used.

7. Materials

7.1 *Water*—Freshly boiled and cooled distilled or deionized water.