



Standard Test Method for Susceptibility of Polyethylene Bottles to Soot Accumulation¹

This standard is issued under the fixed designation D 2741; 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.

1. Scope

1.1 This test method covers the determination of the relative susceptibility of polyethylene bottles to soot accumulation.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

NOTE 1—There is no similar or equivalent ISO standard.

1.3 *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 precautionary statements are given in Section 8 and Note 7.

2. Referenced Documents

2.1 ASTM Standards:

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²

D 883 Terminology Relating to Plastics²

E 104 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions³

3. Terminology

3.1 Definitions:

3.1.1 Standard definitions for plastics as they appear in Terminology D 883 shall apply.

3.1.2 *soot*—the finely divided carbon rich particles resulting from incomplete combustion of an organic material.

4. Summary of Test Method

4.1 An electrostatic charge is generated on the bottle surface. Under controlled conditions, the charged samples are exposed in a chamber to soot created by burning toluene-wetted filter paper. Soot accumulation is rated visually by comparing the amount of carbon particles accumulated on the bottle to that shown on a preestablished graded scale.

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.20 on Plastic Products.

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vols 08.03 and 11.03.

5. Significance and Use

5.1 This test method provides a useful means for determining the relative susceptibility of polyethylene bottles to accumulate soot. In particular, this test method has been found useful in evaluating antistatic additives or antistatic bottle surface treatments, or both. Experience has shown that the behavior of bottles in this test can be directly related to dust and lint accumulation under actual use conditions.

5.2 This test method provides a means of accelerating soot accumulation. However, the correlation of the results of this test method to actual use conditions must be established for each application.

5.3 Although no formal round-robin testing has been done on other types of plastics, this test method has been found useful for testing other than polyethylene plastics.⁴

5.4 Before proceeding with this test method, reference should be made to the specification of the material being tested. Any test specimen preparation, conditioning, dimensions, or testing parameters, or combination thereof, covered in the materials specification shall take precedence over those mentioned in this test method. If there are no material specifications, then the default conditions apply.

6. Apparatus

6.1 *Soot Test Chamber*, having a 0.066-m³ (2.3-ft³) testing volume essentially like that shown in Fig. 1 and Fig. 2. Chambers of other design (normally larger or having multiple test chambers to allow testing of greater numbers of bottles at the same time) that provide comparable results are considered acceptable alternatives. With such chambers it is essential that the following items be sized and kept in direct proportion to the total test chamber volume:

6.1.1 Blower or fan size,

6.1.2 Amount of filter paper and toluene, and

6.1.3 Amount of drying agent if required.

6.2 *Manifold System* has been proven desirable for uniform air circulation in larger units. Experience has shown that 0.05 mL of toluene on 452 mm² of filter paper/0.028 m³ (1 ft³) of test chamber volume produces a satisfactory smoke concentration. The test chamber shall be equipped with:

⁴ Schanzle, R. E., "New Test for Plastics Antistatics," *Modern Packaging*, MOPAA, May 1964, pp. 129, 130, and 204.

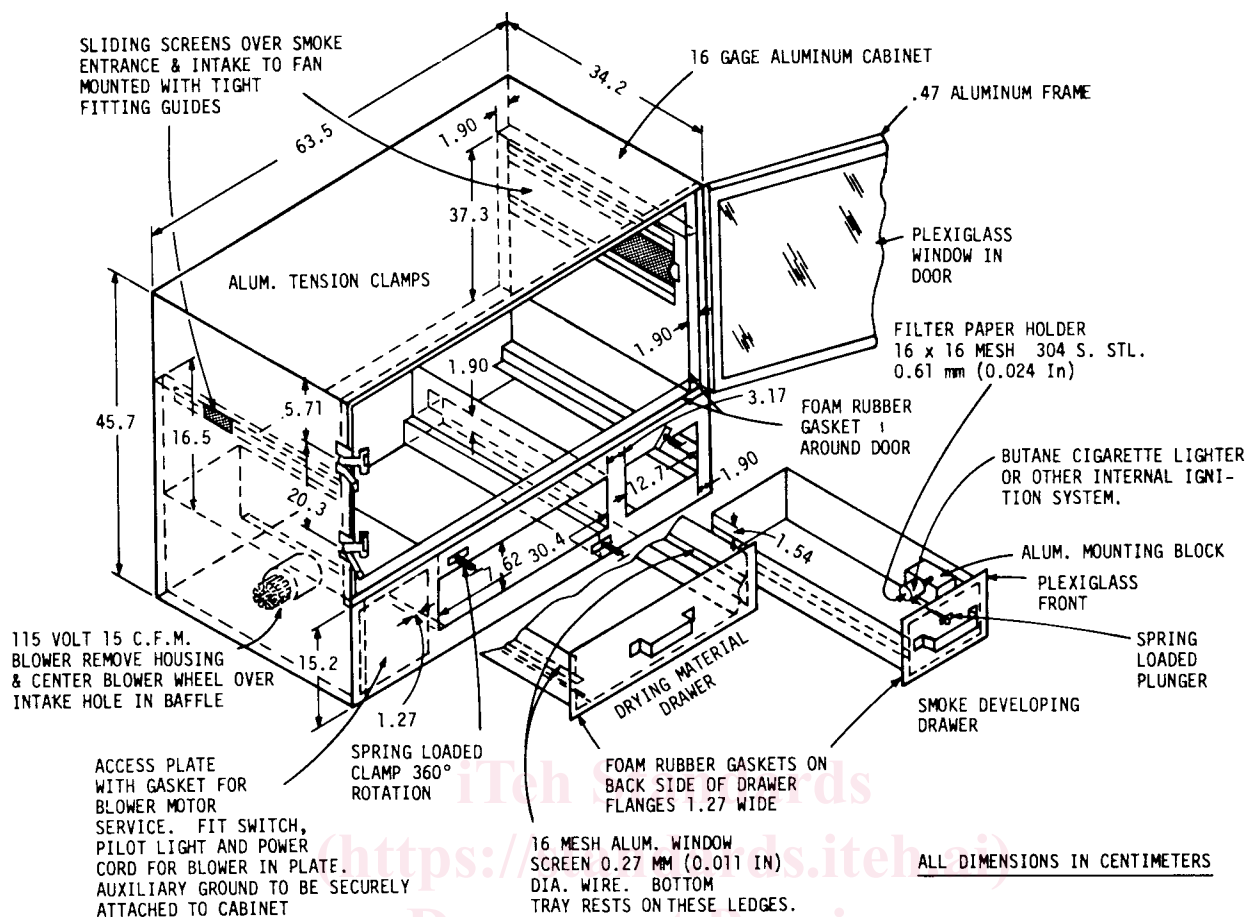


FIG. 1 Smoke Chamber for Plastic Bottle Soot Accumulation Test

6.2.1 Means for maintaining a $15 \pm 5\%$ relative humidity atmosphere (Note 2),

6.2.2 A fan or blower for air circulation,

6.2.3 Means for igniting toluene wetted filter paper, and

6.2.4 Removable 80-mesh wire screens covering test chamber inlet and outlet.

NOTE 2—The test chamber described in this procedure provides for humidity reduction by means of a chemical drying agent contained within the chamber. However, satisfactory results have been obtained by locating the chamber in a room maintained in 15% humidity or by use of other air drying equipment.

6.3 Tongs.

6.4 Dry Cloth.

6.5 Paper Towels.⁵

6.6 Filter Paper, 24 mm in diameter, ashless type.

6.7 Relative Humidity Indicator.⁶

7. Materials

7.1 Trichlorethylene, **Caution**, see 8.1.

7.2 Toluene, **Caution**, see Section 8.

7.3 Calcium Chloride, or equivalent granules, 8-mesh.

⁵ Kaypee Industrial Wipes, Tidi-Unidisco Co., Troy, MI, or equivalent have been found satisfactory for this purpose.

⁶ Abbeon Relative Humidity Indicator Model HTAB-169, Abbeon Cal, Inc., 123-56Y Gray Avenue, Santa Barbara, CA 93101.

NOTE 3—Not required when humidity reduction is obtained by other means.

8. Safety Precautions

8.1 Use caution when handling toluene and trichlorethylene. Small quantities may produce noticeable toxic effects if inhaled, contacted, or ingested. Have adequate ventilation.

8.2 Have a fire extinguisher nearby when handling and igniting toluene.

9. Test Specimens

9.1 The test specimens shall be the plastic bottles under investigation. For accurate determination of relative soot accumulation properties, all of the bottles should be of the same configuration. The specimens shall be free from visible water and dirt. Surfaces to be judged for soot accumulation properties shall not be handled either beforehand or during the performance of the test. A minimum of three specimens for each test variable is necessary.

10. Calibration and Standardization

10.1 Check for test chamber tightness by sealing off smoke entrance and exit screens (Note 4), generating smoke as indicated in 12.8, and inspecting for smoke leakage into test chamber.

NOTE 4—Two-mil thick polyethylene film may be placed over the openings and held in place with pressure-sensitive tape.