



Designation: D 3748 – 98

Standard Practice for Evaluating High-Density Rigid Cellular Thermoplastics¹

This standard is issued under the fixed designation D 3748; 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 practice covers the basic test procedures for determination of the physical properties and reporting of data for high-density rigid cellular thermoplastics.

NOTE 1—This practice and ISO Standard 9054 are not technically equivalent.

2. Referenced Documents

2.1 ASTM Standards:

- C 177 Test Method for Steady-State Heat-Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus²
- C 518 Test Method for Steady-State Heat-Flux Measurements and Thermal Transmission Properties by Means of Heat Flow Meter Apparatus²
- D 149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies³
- D 570 Test Method for Water Absorption of Plastics⁴
- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing⁴
- D 638M Test Method for Tensile Properties of Plastics [Metric]⁴
- D 648 Test Method for Deflection Temperature of Plastics Under Flexural Load⁴
- D 695 Test Method for Compressive Properties of Rigid Plastics⁴
- D 696 Test Method for Coefficient of Linear Thermal Expansion of Plastics⁴
- D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials⁴
- D 883 Terminology Relating to Plastics⁴
- D 1622 Test Method for Apparent Density of Rigid Cellular Plastics⁴

3. Significance and Use

3.1 This practice provides appropriate testing methods, and a specific data reporting procedure for high-density rigid cellular thermoplastics.

4. Terminology

4.1 Definitions:

4.1.1 *cellular plastics*—plastics containing numerous small cavities (cells), interconnecting or not, distributed throughout the mass. These cells cannot be mechanically assembled, but are produced through the “in situ” plastics processing methods.

4.1.2 *density, apparent*—the mass, in air, of a unit volume of a material.

4.1.3 *high density*—greater than 20 lb/ft³ or 320 kg/m³ (0.32 g/cm³) apparent density.

4.1.4 *rigid*—having an apparent flexural modulus greater than 689.5 MPa (100 000 psi) when tested at 23°C in accordance with Test Methods D 790.

4.1.5 *skin*—a relatively dense layer at the surface of a cellular polymeric material.

4.1.6 *thermoplastic, n*—a plastic that repeatedly can be softened by heating and hardened by cooling through a temperature range characteristic of the plastic, and that in softened state can be shaped by flow into articles by molding or extrusion.

4.1.7 For definitions of other terms used in this practice, refer to Terminology D 883.

5. Sample Preparation

5.1 Samples may be processed directly into proper size specimens or prepared from larger sections as specified in each individual test.

5.2 The report section should be precise as to the manner of sample preparation.

6. Conditioning

6.1 Condition specimens prior to testing in accordance with Procedure A of Practice D 618.

7. Number of Test Specimens

7.1 Cellular plastics are often nonuniform in density distribution; therefore, there should be a minimum of five specimens tested per testing method to obtain representative values.

¹ This practice is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.22 on Cellular Materials—Plastics and Elastomers.

Current edition approved July 10, 1998. Published December 1998. Originally published as D 3748 – 78. Last previous edition D 3748 – 94.

² *Annual Book of ASTM Standards*, Vol 04.06.

³ *Annual Book of ASTM Standards*, Vol 10.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.01.

*A Summary of Changes section appears at the end of this standard.



8. Test Methods

8.1 Where technically suitable, reference is made to existing ASTM test methods. Otherwise, comments or changes are outlined in accordance with this practice.

8.2 *Apparent Density*—Test Method D 1622.

8.3 *Compressive Strength*—Test Method D 695.

8.4 *Tensile Properties*—Test Method D 638.

8.5 *Coefficient of Linear Thermal Expansion*—Test Method D 696.

8.6 *Apparent Flexural Properties*—Test Methods D 790.

8.7 *Deflection Temperature*—Test Method D 648.

8.8 *Dielectric Breakdown Voltage and Dielectric Strength*—Test Methods D 149

8.9 *Thermal Conductivity*—Test Methods C 177 or C 518.

NOTE 2—Test Method C 518 should only be used for materials having densities less than 900 kg/m³.

8.10 *Water Absorption Rate*—Test Method D 570.

9. Report

9.1 Report the following information:

9.1.1 Complete identification of the tested material as to

material supplier and nomenclature, source of samples, lot or run number, and type of part.

9.1.2 Type of manufacturing process used to make the part, for example, extrusion, injection molding, casting, etc.

9.1.3 Technique used to prepare the test specimens, for example, directly-molded or extruded, cut from larger part and edges tensile cut, etc.

9.1.4 Number of uncut skins on the specimen when in test (refers to skins not cut in sample preparation).

9.1.5 Location of skins (cut and uncut) while the specimen is in test, that is, horizontal, vertical, none, etc.

9.1.6 Dimensions (length, width, thickness) of the specimen.

9.1.7 Apparent density. If the apparent density varies, report the maximum, minimum, average, and density within 12.7 mm (0.5 in.) of the test area.

9.1.8 Conditioning temperature and time.

9.1.9 Date of the test.

10. Keywords

10.1 high density; rigid cellular plastics; thermoplastics

SUMMARY OF CHANGES

Committee D-20 has identified the location of selected changes to this practice since the last issue that may impact the use of this practice:

D 3748 – 98:

(1) The ISO equivalency statement was changed.

(2) The word “weight” was replaced with “mass” in the definition of apparent density.

(3) The name of the jurisdictional subcommittee was updated.

(4) Summary of Changes section was added.

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).