



Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam¹

This standard is issued under the fixed designation D747; 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 apparent bending modulus² of plastics by means of a cantilever beam. It is well suited for determining relative flexibility of materials over a wide range. It is particularly useful for materials too flexible to be tested by Test Methods D790.

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

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.*

NOTE 1—There is no known ISO equivalent to this standard.

2. Referenced Documents

2.1 ASTM Standards:³

- D618 Practice for Conditioning Plastics for Testing
- D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- D4000 Classification System for Specifying Plastic Materials
- D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens
- E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods
- E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties. Current edition approved April 1, 2010. Published April 2010. Originally approved in 1943. Last previous edition approved in 2008 as D747-08. DOI: 10.1520/D0747-10.

² This property was designated stiffness in versions of this test method issued prior to 1984.

³ 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.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *apparent bending modulus*—an apparent modulus of elasticity obtained in flexure, using a cantilever beam testing apparatus, where the deformation involved is not purely elastic but contains both elastic and plastic components.

4. Significance and Use

4.1 This test method provides a means of deriving the apparent bending modulus of a material by measuring force and angle of bend of a cantilever beam. The mathematical derivation assumes small deflections and purely elastic behavior. Under actual test conditions, the deformation has both elastic and plastic components. This test method does not distinguish or separate these, and hence a true elastic modulus is not calculable. Instead, an apparent value is obtained and is defined as the apparent bending modulus of the material. The tangent modulus obtained by Test Methods D790 is preferred, when the material can be tested by the Test Methods D790 test procedure.

4.2 Because of deviations from purely elastic behavior, changes in span length, width, and depth of the specimen will affect the value of the apparent bending modulus obtained; therefore, values obtained from specimens of different dimensions are not necessarily comparable.

4.3 Rate of loading is controlled only to the extent that the rate of angular change of the rotating jaw is fixed at 58 to 66°/min. Actual rate of stressing will be affected by span length, width, depth of the specimen, and weight of the pendulum.

4.4 For many materials, there are specifications that require the use of this test method, but with some procedural modifications that take precedence when adhering to the specification. Therefore, it is advisable to refer to that material specification before using this test method. Table 1 of Classification System D4000 lists the ASTM materials standards that currently exist.

NOTE 2—A discussion of the theory of obtaining a purely elastic bending modulus, using a cantilever beam testing apparatus, can be found in Appendix X1. The results obtained under actual test conditions will be

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