



Designation: D 1709 – 01

Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method¹

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1. Scope *

1.1 These test methods cover the determination of the energy that causes plastic film to fail under specified conditions of impact of a free-falling dart. This energy is expressed in terms of the weight (mass) of the missile falling from a specified height which would result in 50 % failure of specimens tested.

1.2 Two test methods are described:

1.2.1 *Test Method A* employs a dart with a 38.10 ± 0.13 -mm (1.500 ± 0.005 -in.) diameter hemispherical head dropped from a height of 0.66 ± 0.01 m (26.0 ± 0.4 in.). This test method may be used for films whose impact resistances require masses of about 50 g or less to about 2 kg to fracture them.

1.2.2 *Test Method B* employs a dart with a 50.80 ± 0.13 -mm (2.000 ± 0.005 -in.) diameter hemispherical head dropped from a height of 1.50 ± 0.03 m (60.0 ± 0.25 , -1.70 in.). Its range of applicability is from about 0.3 kg to about 2 kg.

1.3 Two testing techniques are described:

1.3.1 The standard technique is the staircase method. By this technique, a uniform missile weight increment is employed during test and the missile weight is decreased or increased by the uniform increment after test of each specimen, depending upon the result (fail or not fail) observed for the specimen.

1.3.2 The alternative technique provides for testing specimens in successive groups of ten. One missile weight is employed for each group and missile weight is varied in uniform increments from group to group.

1.3.3 The staircase technique and the alternative technique give equivalent results both as to the values of impact failure weight which are obtained and as to the precisions with which they are determined.

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

NOTE 1—Tests on materials that do not break, for any reason, are not considered to be valid. It has been noted that certain materials may stretch so far as to bottom out at the base of certain test instruments without

actually rupturing. Subcommittee D20.19 is currently considering methods for testing these materials. Anyone interested in participating in a Task Group should contact the Chairman of Subcommittee D20.19 through ASTM Headquarters.

NOTE 2—This test method is technically equivalent to ISO 7765-1:1988, with the exception of a larger tolerance on the drop height in Test Method B. Also, the ISO method does not allow the alternative testing technique described in Section 11 of this test method.

1.5 *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:

- D 374 Test Methods for Thickness of Solid Electrical Insulation²
- D 618 Practice for Conditioning Plastics for Testing³
- D 883 Terminology Relating to Plastics³
- D 1248 Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable³
- D 3420 Test Method for Dynamic Ball Burst (Pendulum) Impact Resistance of Plastic Film⁴
- D 4272 Test Method for Total Energy Impact of Plastic Films by Dart Drop⁴
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁵
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁵

2.2 ISO Standard:

- ISO 7765:1988 Plastic Film and Sheeting—Determination of Impact Resistance by the Free Falling Dart Method—Part 1: Staircase Method⁶

3. Terminology

3.1 *Definitions*—For definitions related to plastics, see Terminology D 883.

¹ These test methods are under the jurisdiction of ASTM Committee D20 on Plastics and are the direct responsibility of Subcommittee D20.19 on Film and Sheeting.

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² *Annual Book of ASTM Standards*, Vol 10.01.

³ *Annual Book of ASTM Standards*, Vol 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.02.

⁵ *Annual Book of ASTM Standards*, Vol 14.02.

⁶ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.