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An American National Standard

Standard Test Methods for Impact Resistance of Flat, Rigid Plastic Specimens by Means of a Tup (Falling Weight)¹

This standard is issued under the fixed designation D 3029; 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. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope

1.1 These test methods cover the determination of the relative ranking of materials according to the energy required to crack or break flat, rigid plastic specimens under various specified conditions of impact of a free-falling tup or weight.

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. Specific hazards statements are given in Section 8.*

2. Referenced Documents

2.1 ASTM Standards:

- D 374 Test Methods for Thickness of Solid Electrical Insulation²
- D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing³
- D 883 Terminology Relating to Plastics³
- D 1600 Terminology for Abbreviated Terms Relating to Plastics³
- D 1709 Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method³
- D 1898 Practice for Sampling of Plastics³
- D 2188 Practice for Statistical Design in Interlaboratory Testing of Plastics⁴
- D 2444 Test Method for Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)⁵
- D 2794 Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)⁶
- D 4000 Classification System for Specifying Plastic Materials⁷

D 4066 Specification for Nylon Injection and Extrusion Materials⁷

E 171 Specification for Standard Atmospheres for Conditioning and Testing Materials⁸

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁹

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method⁹

3. Terminology

3.1 *Definitions*—For definitions of plastic terms used in these test methods, see Terminology D 883 and Terminology D 1600.

3.2 Descriptions of Terms Specific to This Standard:

3.2.1 *failure (of test specimen)*—the presence of any crack or split created by the impact of the falling tup, that can be seen by the naked eye under normal laboratory lighting conditions.

3.2.2 *mean failure energy (mean impact resistance)*—the energy required to produce 50 % failures, equal to the product of the drop height and the mean-failure weight, or the product of the constant weight and mean failure height.

3.2.3 *mean failure height (impact failure height)*—the height at which a standard weight, when dropped on test specimens, will cause 50 % failures.

3.2.4 *mean failure weight (impact failure weight)*—the weight of tup that, when dropped on test specimens from a standard height, will cause 50 % of them to fail.

3.2.5 *tup*—See 7.2 and Fig. 3.

NOTE 1—Cracks usually start at the surface opposite the one that is struck. Occasionally incipient cracking in glass-reinforced polymers, for example, may be difficult to differentiate from the reinforcing fibers. In such cases, a penetrating dye may be used to confirm the onset of crack formation.

4. Summary of Test Methods

4.1 Two basically different test methods, F and G, are described. These differ in the design of the machine and method of holding and striking the specimen. Each test method has characteristics that may dictate its use.

4.2 In Test Method F (Sections 7 to 15), a free-falling dart (tup) is allowed to strike a supported specimen directly. Either a dart having a fixed weight may be dropped from various heights, or a dart having an adjustable weight may be

¹ These test methods are under the jurisdiction of ASTM Committee D-20 on Plastics and are the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

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² Annual Book of ASTM Standards, Vol 10.01.

³ Annual Book of ASTM Standards, Vol 08.01.

⁴ Discontinued, see 1982 Annual Book of ASTM Standards, Vol 08.02.

⁵ Annual Book of ASTM Standards, Vol 08.04.

⁶ Annual Book of ASTM Standards, Vol 06.01.

⁷ Annual Book of ASTM Standards, Vol 08.02.

⁸ Annual Book of ASTM Standards, Vol 15.09.

⁹ Annual Book of ASTM Standards, Vol 14.02.