



Standard Test Method for Cushioning Properties of Athletic Shoes Using an Impact Test¹

This standard is issued under the fixed designation F 1976; 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 describes procedures for the measurement of the impact response properties of athletic shoes using Procedure A of Test Method F 1614.

1.2 This test method is limited to tests using a falling weight impact machine, as defined by Procedure A of Test Method F 1614.

1.3 This test method is intended for use on the heel and/or forefoot regions of whole, intact athletic shoe cushioning systems. An athletic shoe cushioning system is defined as all of the layers of material between the wearer's foot and the ground surface that are normally considered a part of the shoe. This may include any of the following components: outsole or other abrasion resistant layer, a midsole or other compliant cushioning layer, an insole, insole board, or other material layer overlying the midsole, parts of the upper and heel counter reinforcement which extend beneath the foot, and an insock or other cushioning layer inside the shoe.

1.4 This test method is not intended for use as a test of shoes classified by the manufacturer as children's shoes.

1.5 The type, size or dimensions and thickness of the specimen, and the reference maximum energy applied shall qualify test results obtained by this test method.

1.5.1 Nominal specimen thickness values for this test method are in the range from 10 to 60 mm (0.4 to 2.4 in.). The area of the shoe to be tested must present an approximately circular, flat surface of at least 65 mm (2.6 in.) in diameter for impacting.

1.5.2 The standard value for the reference maximum energy applied by this test method is 5 J (44.2 in.-lbf) for shoes which are subject to moderate impacts during normal use and 7.0 J (61.9 in.-lbf) for shoes which are subject to high impacts during normal use. Other values may be used, if they are stated in the report.

1.6 This test method is not appropriate for measuring the impact response of shoes that are not subjected to moderate impact or high impact in normal use.

1.7 The values stated in SI units are to be regarded as standard.

1.8 *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.*

2. Referenced Documents

2.1 ASTM Standards:

F 1614 Test Method for Shock Attenuating Properties of Materials Systems for Athletic Footwear²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *cushioning system*—one or more components of the sole of a shoe intended for the redistribution of force or shock attenuation, or both, including one or more of the insock, insole, midsole, and outsole.

3.1.2 *drop height*—the height from which the falling mass is dropped, being the distance between the top of the specimen and the top of the tup.

3.1.3 *impact*—rapid deceleration of the lower extremity due to collision between the foot and the surface.

3.1.3.1 *low impact*—an impact during which the peak ground reaction force is less than 1.5 body weights and the peak axial deceleration of the lower leg is less than 4 g.

3.1.3.2 *moderate impact*—an impact during which the peak ground reaction force is greater than 1.5 body weights and less than 3 body weights and the peak axial deceleration of the lower leg is greater than 4 g but less than 8 g.

3.1.3.3 *high impact*—an impact during which the peak ground reaction force exceeds 3 body weights or the peak axial deceleration of the lower leg exceeds 8 g.

3.1.4 *maximum energy applied*—the energy applied to the specimen up to the point of maximum compressive displacement.

3.1.5 *shoe upper*—vamp, tongue, heel counters, throat, collar, and other parts of the shoe that do not form part of the cushioning system.

¹ This test method is under the jurisdiction of ASTM Committee F-8 on Sports Equipment and Facilities and is the direct responsibility of Subcommittee F08.54 on Athletic Footwear.

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² *Annual Book of ASTM Standards*, Vol 15.07.