



Standard Test Method for Impact Attenuation of Athletic Shoe Cushioning Systems and Materials¹

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1. Scope

1.1 This test method describes the use of a gravity-driven impact test to measure certain impact attenuation characteristics of cushioning systems and cushioning materials employed in the soles of athletic shoes.

1.2 This test method uses an 8.5 kg mass dropped from a height of 30-70 mm to generate force-time profiles that are comparable to those observed during heel and forefoot impacts during walking, running and jump landings.

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 outer layer, a midsole of compliant cushioning materials or structures forming an intermediate layer, an insole, insole board, or other material layers overlying the midsole, parts of the upper and heel counter reinforcement which extend beneath the foot, and an insock, sockliner or other cushioning layers, either fixed or removable, inside the shoe.

1.4 This test method may also be employed in to measure the impact attenuation of cushioning system components and cushioning material specimens.

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

1.6 The type, size or dimensions and thickness of the specimen, the total energy input and prior conditioning shall qualify test results obtained by this test method.

1.6.1 The range of tests results is limited by the calibrated range of the test device's force transducer. Combinations of thin specimens, high specimen stiffness and high total energy input may produce forces that exceed the transducer's capacity

and are hence not measurable. In practice, the specified force transducer range (10 kN) accommodates more than 99 % of typical shoe soles and cushioning material specimens that are 7 mm or more in thickness at a total energy input of 5 Joules.

1.6.2 The nominal value of the total energy input applied by this test method is 5 J for shoes, such as running shoes, which are subject to moderate impacts during normal use. Total energy inputs of 7.0 J and 3.0 J may be used for shoes (e.g. basketball shoes) which are subject to higher impact loads during normal use. Other values of total energy input may be used, if they are stated in the report.

1.6.3 Results from tests performed with different total energy inputs or with different masses are not directly comparable.

1.6.4 Specimen thickness has a significant effect on impact attenuation outcomes. Consequently, results from tests of material specimens of different thicknesses cannot be directly compared.

1.6.5 The impact attenuation of cushioning materials may change over time and with use (e.g. wear or durability testing) or prior conditioning (e.g. from previous tests). Consequently, test results obtained using this test method shall be qualified by the age and prior conditioning of the samples.

1.7 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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:²

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
F1614 Test Method for Shock Attenuating Properties of

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

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² 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.