



Designation: D4003 – 98 (Reapproved 2024)

Standard Test Methods for Programmable Horizontal Impact Test for Shipping Containers and Systems¹

This standard is issued under the fixed designation D4003; 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 These test methods are intended to determine the ability of a package or product to withstand laboratory simulated horizontal impact forces.

1.2 The horizontal impacts used in these test methods are programmed shock inputs that represent the hazards as they occur in the shipping and handling environments. The environmental hazards may include rail switching impacts, lift truck marshalling impacts, and so forth. The following test methods apply:

1.2.1 *Method A, Rail Car Switching Impact*—This test method simulates the types of shock pulses experienced by lading in rail car switching, with the use of a rigid bulkhead on the leading edge of the test carriage, to simulate the end wall of a railcar and shock programming devices to produce representative shock pulses. With the use of backloading, this test method may also be used to simulate compressive forces experienced by lading loads during rail car switching. It is suitable for tests of individual containers or systems as they are shipped in rail cars. It may also be used to evaluate the effectiveness of pallet patterns to determine the effect of interaction between containers during rail switching operation impacts.

1.2.2 *Method B, Marshalling Impact Tests of Unit Loads*—This test method assesses the ability of unit loads to withstand the forces encountered during marshalling or loading operations.

1.3 The test levels may be varied to represent the mode on shipping and handling used for the item under test.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D996 Terminology of Packaging and Distribution Environments

D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing

D5277 Test Method for Performing Programmed Horizontal Impacts Using an Inclined Impact Tester

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology D996.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *acceleration*—the rate of change of velocity of a body with respect to time measured in in./s² (m/s²).

3.2.2 *backload*—a duplicate specimen similar to the test package or weights to simulate the other lading in the transport vehicle.

3.2.3 *shock pulse*—a substantial disturbance characterized by a rise of acceleration from a constant value and decay of acceleration to the constant value in a short period of time.

3.2.4 *shock pulse programmer*—a device to control the parameters of the acceleration versus time-shock pulse generated by a shock test impact machine.

¹ These test methods are under the jurisdiction of ASTM Committee D10 on Packaging and are the direct responsibility of Subcommittee D10.21 on Shipping Containers and Systems - Application of Performance Test Methods.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.