



Standard Practice for Performance Testing of Shipping Containers and Systems¹

This standard is issued under the fixed designation D 4169; 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.

1. Scope

1.1 This practice provides a uniform basis of evaluating, in a laboratory, the ability of shipping units to withstand the distribution environment. This is accomplished by subjecting them to a test plan consisting of a sequence of anticipated hazard elements encountered in various distribution cycles. This practice is not intended to supplant material specifications or existing preshipment test procedures.

1.2 The suitability of this practice for use with hazardous materials has not been determined.

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 precautionary statements are given in 1.1.

2. Referenced Documents

2.1 ASTM Standards:²

- D 642 Test Method for Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads
- D 880 Test Method for Impact Testing for Shipping Containers and Systems
- D 951 Test Method for Water Resistance of Shipping Containers by Spray Method
- D 996 Terminology of Packaging and Distribution Environments
- D 999 Test Methods for Vibration Testing of Shipping Containers
- D 4003 Methods of Programmable Horizontal Impact Test for Shipping Containers

¹ This practice is under the jurisdiction of ASTM Committee D10 on Packaging and is 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 service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- D 4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing
- D 4728 Test Method for Random Vibration Testing of Shipping Containers
- D 5276 Test Method for Drop Test of Loaded Containers by Free Fall
- D 5277 Test Method for Performing Programmed Horizontal Impacts Using an Inclined Tester
- D 5487 Test Method for Simulated Drop of Loaded Containers by Shock Machines
- D 6055 Test Methods for Mechanical Handling of Unitized Loads and Large Shipping Cases and Crates
- D 6179 Test Methods for Rough Handling of Unitized Loads and Large Shipping Cases and Crates

2.2 Military Standards:³

- MIL-STD-2073-1 DOD Standard Practice for Military Packaging

3. Terminology

3.1 *Definitions*—General definitions for the packaging and distribution environments are found in Terminology D 996.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acceptance criteria*—the acceptable quality level that must be met after the shipping unit has been subjected to the test plan. See Section 7.

3.2.2 *assurance level*—the level of test intensity based on its probability of occurring in a typical distribution cycle.

3.2.2.1 *Discussion*—Level I is a high level of test intensity and has a low probability of occurrence. Level III is a low level of test intensity, but has a correspondingly high probability of occurrence. Level II is between these extremes. For Distribution Cycle 18, DC-18 see MIL-STD-2073-1 for definitions of military levels of protection.

3.2.3 *coefficient of restitution*—the ratio of the rebound velocity to the impact velocity.

3.2.4 *distribution cycle (DC)*—the sequential listing of the test schedules employed to simulate the hazard elements

³ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

