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Standard Test Method for Drop Test for Loaded Boxes¹

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1. Scope

1.1 This test method covers four procedures for the drop testing of loaded boxes.

1.2 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 644 Test Method for Moisture Content of Paper and Paperboard by Oven Drying²

D 685 Method for Conditioning Paper and Paper Products for Testing²

D 880 Method for Incline Impact Test for Shipping Containers²

D 997 Method for Drop Test for Loaded Cylindrical Containers²

D 1083 Method of Testing Mechanical Handling of Unitized Loads and Large Shipping Cases and Crates²

E 122 Recommended Practice for Choice of Sample Size to Estimate the Average Quality of a Lot or Process³

3. Significance and Use

3.1 This test method is used to provide an indication of the ability of a box to withstand the damage which can be caused by the sudden shock induced by dropping a package. It simulates those shocks that are likely to occur in the handling of packages through a variety of distributions cycles and the ability of the box to protect the contents against these shocks. The test may also permit observation of progressive failure of the box and damage to the contents.

3.2 Drop tests are performed with either of the two following objectives (see Annex A1), either objective being of value for comparing the characteristics of a package design to a standard or for comparing differences in package construction:

3.2.1 *Objective A*—To measure the ability of the shipping container to withstand rough handling.

3.2.2 *Objective B*—To measure the ability of the package (shipping container and interior packing materials) to protect its contents.

3.3 These procedures are also particularly suitable for boxes that are normally handled manually. Boxes of such bulk or mass that they cannot be handled manually may be more satisfactorily tested in accordance with Methods D 880 and D 1083.

4. Apparatus

4.1 *Drop Test Apparatus*—The drop test equipment shall conform to the following requirements:

4.1.1 Permit the box to be placed in a position, prior to release, that will assure correct orientation, within 2° for flat-face drops and 10° for edge and corner drops upon impact.

4.1.2 Permit accurate control of the drop from specified heights.

4.1.3 Utilize lifting devices that will not damage the test member.

4.1.4 Provide a release mechanism that does not impart rotational or side-wise forces to the test package. If drop leaves are used, the apparatus shall provide a spring or other mechanism so that the leaves do not interfere with a free, unobstructed fall.

4.1.5 Provide a rigid and level dropping surface that is integral with a mass that shall be at least 50 times the weight of the dropping container. Neither the depth nor width of the mass shall be less than half the length. The dropping surface, firmly anchored to the mass, shall be a steel plate not less than 1/2 in. (13 mm) thick.

4.1.6 A test unit for calibration purposes should be constructed. It shall be of the same general size and mass as maximum size and mass packages to be tested, and shall be dropped from heights in the expected range. The center of gravity of the unit shall be at its geometric center. When this unit is dropped, it must strike the impact surface within the specified limits. Compliance with the specifications may conveniently be determined with a camera.

4.1.7 For very large packages it may be necessary to use a hoist, sling, and tripping devices or solenoid operated drop test mechanism and suspension devices shown in Figs. A1-A4 of Method D 997.

4.2 *Conditioning Apparatus*—Adequate facilities shall be provided for conditioning test specimens at proper humidity and temperature prior to test in accordance with the specifications covering the containers to be tested.

5. Sampling

5.1 Determine the number of specimens to be tested in accordance with Recommended Practice E 122.

¹ This test method is under the jurisdiction of ASTM Committee D-10 on Packaging and is the direct responsibility of Subcommittee D10.22 on Handling and Transportation.

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² Annual Book of ASTM Standards, Vol 15.09.

³ Annual Book of ASTM Standards, Vol 14.02.