



Designation: D7030 – 04 (Reapproved 2022)

# Standard Test Method for Short Term Creep Performance of Corrugated Fiberboard Containers Under Constant Load Using a Compression Test Machine<sup>1</sup>

This standard is issued under the fixed designation D7030; 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 covers determining the resistance of an empty paper corrugated shipping container to a vertically applied constant compression load for a specified time. The test method may also include palletized or unitized loads made of such containers. The boxes are tested in the orientation that they are most likely to be stacked in a unitized or palletized load.

1.2 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.

1.3 *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.*

1.4 *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:<sup>2</sup>

**D642** Test Method for Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads

**D644** Test Method for Moisture Content of Paper and

Paperboard by Oven Drying (Withdrawn 2010)<sup>3</sup>

**D685** Practice for Conditioning Paper and Paper Products for Testing

**D996** Terminology of Packaging and Distribution Environments

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

**D4577** Test Method for Compression Resistance of a Container Under Constant Load

**E4** Practices for Force Calibration and Verification of Testing Machines

**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*—General definitions for the packaging and distribution environments are found in Terminology **D996**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *constant load*—a load that is invariable or unchanging.

3.2.2 *creep*—continued deformation over time while under constant load.

3.2.3 *load*—the force applied to a body.

3.2.4 *static load*—an imposed stationary force, constant in magnitude and direction.

## 4. Significance and Use

4.1 In the distribution system, the packaged product may be stored for a period of time in a manner such that one or more containers are stacked on one another. The bottom package is thus continually subjected to a constant compression load.

4.2 This test method subjects an empty container to a predetermined static load and to specified atmospheric conditions, if required, over a short period of time using fixed platen compression testing equipment. Deflection is measured over time.

<sup>1</sup> This test method 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

4.3 Deflection versus time data can be used to predict time to failure of corrugated shipping containers under constant load.

## 5. Apparatus

5.1 *Fixed-Platen Testing Machine*—Two platens, flat to within 0.01 in. (0.25 mm) for each 12 in. (304.8 mm) in length, one of which is movable in the vertical direction so as to compress the container between the platens. One is the load measuring platen, and both should be of sufficient size so that the test container does not extend beyond the edges of the platens. Both platens are fixed in the horizontal directions so that the lateral movement is not greater than 0.05 in. (1.3 mm), and are held parallel throughout the test to within 0.04 in. (1 mm) for each 12 in. (304.8 mm) in the length and width dimensions. See Fig. 1. The testing machine should be capable to maintain load within 1 % of the required level for the duration of the test.

5.2 *Closing Equipment for Fiberboard Boxes*—Suitable materials and application equipment for closing boxes should be used. If adhesives are used, sealing boards described in Test Method D642 may be needed.

5.3 *Conditioning Apparatus*—Adequate facilities shall be provided to maintain a conditioned atmosphere of temperature and humidity as required for the purpose of the test.

5.4 *Miscellaneous Equipment*—Drying oven, scales, knife, saws, and the like, for use in determination of the moisture content or for making other supplementary tests of the materials from which the containers are made.

## 6. Calibration

6.1 The accuracy of the test equipment must be verified to ensure reliable test data.

6.1.1 The overall system accuracy of the recorded or indicated applied load (force) shall be verified in accordance with Practice E4. The verified loading range shall be specified, and errors within the loading range shall not exceed  $\pm 1.0\%$  of the reading (as calculated in Practice E4). If testing below the Practice E4 verified loading range is desired, then the maximum permissible error shall not exceed  $\pm 0.2\%$  of the full range of the force sensor, calculated as follows:

$$E = F_s \times 0.002$$



FIG. 1 Corrugated Container Under Creep Test in Compression Test Machine