# ASTM D 5276- Standard Test Method for Drop Test of Loaded Containers by Free Fall- Drop Tester for Containers and Boxes

## Description

**Apparatus**
5.1 Free-Fall Drop Test Equipment, conforming to the following requirements:
5.1.1 It shall permit the container to be placed, prior to release, in a position that will ensure correct orientation, within 2 degrees upon impact, for flat-face drops or flat drops on ends or sidewalls of cylindrical containers, and within 5Â° upon impact for other drops, such as edge drops and corner drops for rectangular containers, bags, and sacks and diagonal drops on chimes on cylindrical containers.
5.1.2 It shall permit accurate control of the drop from specified heights.
5.1.3 It shall utilize lifting devices that will not damage the test container.
5.1.4 It shall provide a release mechanism that does not impart vertical, rotational, or sideways forces to the test container. 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.
5.1.5 It shall provide an impact surface, horizontal and flat, massive enough to be immovable and rigid enough to be nondeformable under the test conditions.
5.1.5.1 The impact surface shall be of concrete, stone, or steel. If the dropping surface is a steel plate, it must be at least 1â•„2 in. (13 mm) thick and must be anchored firmly to the mass.

NOTE 1â€”Grout (a thin mortar used to fill crevices) is recommended over the entire surface of the mass below the plate to ensure positive contact.
5.1.5.2 The impact surface shall be integral with a mass at least 50 times that of the heaviest container to be tested. Neither the depth nor width of the mass shall be less than half the length.

5.1.5.3 For drop testing of containers not exceeding 110 lb (50 kg), the impact surface shall be flat, such that no two points on the surface differ in level by more than 5â•„64 in. (2 mm).
5.1.5.4 The impact surface shall be rigid, such that it will not be deformed by more than 0.0039 in. (0.1 mm) when an area of 0.1550 in.2 (100 mm2 ) is loaded statically with 22.05 lb (10 kg) anywhere on the surface.
5.1.5.5 The impact surface shall be sufficiently large to ensure that the containers being tested fall entirely upon the surface.
5.1.6 A rupture hazard may be used for determining the rupture resistance of cylindrical containers or bags. Unless otherwise specified, the rupture hazard should consist of a 4 by 4-in. (102 by 102-mm) timber, of oak or other wood of equivalent hardness, approximately 4 ft (1.2 m) long, having the edges rounded to a radius of not more than 1â•„4 in. (6.35 mm).

5.1.6.1 For testing of 49 CFRâ€”DOT 21C fiber drums, a 2 by 6-in. (51 by 152-mm) timber, with a 6-in. (152-mm) vertical dimension, shall be used. The drum shall be dropped at right angles to the timber. The drop height shall be measured from the top of the timber.
5.1.7 For very large containers, it may be necessary to use a hoist, sling, and tripping devices, or a

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solenoid-operated drop test mechanism and suspension devices, such as those described in Appendix X1.
5.1.8 Conditioning Apparatusâ€”Adequate facilities shall be provided for conditioning test specimens at the proper humidity and temperature prior to testing, in accordance with the specification covering the containers to be tested.
5.1.8.1 Conditioningâ€”Depending on the purpose of the tests, containers may be conditioned prior to the drop test by either a different physical test, water immersion, exposure to water spray, or exposure to standard or other fixed air temperature or humidity conditions. It is recommended that special atmospheres for conditioning be selected from those given in Practice D 4332. Unless otherwise specified, fiber-board or paperboard containers shall be conditioned in accordance with the preconditioning and standard conditioning atmospheres specified in Practice D 4332 (see also Practice D 4169 for additional guidance).
5.1.8.2 Where the moisture content of fiberboard containers is determined, it should be determined in accordance with Test Method D 644.

**Sampling**
6.1 The test specimens and number of samples shall be chosen to permit an adequate determination of representative performance. Practice E 122 is recommended. Unless otherwise specified, Practice D 585 shall be used for acceptance testing of fiberboard containers.
6.2 In the absence of any sampling plan, at least three representative specimens should be selected for performance evaluation.

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**Test Specimens**
7.1 When the protective capability of a container is to be evaluated, it is preferable to pack the container with the actual contents for which it was designed (Note 2). When the capability of a container to withstand rough handling is to be evaluated, pack the container with either the actual contents or a load simulating the contents. Regardless of which procedure is used, close the container in the same manner that will be used in preparing it for shipment.
NOTE 2â€”Where the use of actual contents is not feasible because of excessive cost or danger, a dummy load simulating the contents with respect to dimensions, center of gravity, moment of inertia, density, flow characteristics, etc. may be used. Accelerometers or other indicating mechanisms may be installed.
7.2 Close and seal the container in the normal manner. Dry and age sufficiently so that any adhesive, protective coatings, sealing tape, and so forth will have reached their final normal condition

**Procedure**
8.1 Identify members as specified in Annex A1, by marking, at a minimum, Faces 1, 2, and 5 of rectangular containers; Positions 1, 3, 5, and 7 of cylindrical containers; and Faces 1, 4, and 5 of sacks and bags.
8.2 Unless otherwise specified, establish failure criteria prior to the commencement of testing. (See Practice D 4169, Acceptance Criteria.)

8.3 Test containers that have been conditioned in the conditioned atmosphere or immediately upon removal from that atmosphere.
8.4 Conduct drop test procedures by dropping the container on either one member or several different members in a prescribed sequence (cyclical testing).

8.4.1 When the container is to be dropped flat on a face, position it so that, upon impact, there is no more than a 2Â° angle between the plane of this face and the impact surface.
8.4.2 When a rectangular container or bag is to be dropped on an edge, position it so that, upon impact, this edge makes no more than a 2Â° angle with the impact surface, and the plane containing this edge and the center of gravity of the container makes no more than a 5Â° angle with the vertical.
8.4.3 When a rectangular container or bag is to be dropped on a corner, position it so that, upon impact, the line containing this corner and the center of gravity of the container makes no more than a 5Â° angle with the vertical.
8.4.4 When a cylindrical container is to be dropped on either a chime or a circumferential edge, position it so that, upon impact, a plane containing this edge and the center of gravity of the container makes no more than a 5Â° angle with the vertical plane perpendicular to the drop surface.
8.4.5 When determining the rupture resistance of cylindrical containers or bags, place a rupture hazard (see 5.1.6) on the target surface, and position it so that, unless otherwise specified, the center of the cylinder sidewall or face edge or butt of the bag impacts across the hazard.
8.4.6 Before each drop of a bag or sack, distribute the contents uniformly throughout the bag or sack.
8.5 Height of Dropâ€”Determine the height of the drop by measuring from the bottom surface, edge, or corner of the container to the impact surface.

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### Test Method

This test method is intended for use in evaluating the ability of a container to withstand the sudden shock resulting from a free fall drop impact, or to evaluate the ability of a container and its inner packing to protect its contents during the sudden shock resulting from a free fall drop impact. This test method may also be used to compare the performance of different package designs. This test method may also permit observation of the progressive failure of a container and the damage to its contents. This test method is particularly suitable for containers that are normally handled manually during some part of their distribution cycle.

## Applications

- Loaded, Card board boxes
- Pails
- Bags & sacks
- Cylindrical Containers
- Crates
- Plastic containers

## Standards

- AS 2582.4 â€“ Complete, filled transport packages â€“ Methods of test Vertical impact test by dropping
- ISO 2248 Method A â€“ Packaging â€” Complete, filled transport packages â€” Vertical impact test by dropping
- ASTM D5276 â€“ Standard Test Method for Drop Test of Loaded Containers by Free Fall

## Features

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- 150kg Capacity (Other capacities as customer request)
- Max Drop Hieght: 2m (As customer request)
- Digital adjustment of drop height
- Large Steel base for test surface and mounting 1m x 1.5m x 10mm
- A hand-held control is included
- Precise drop orientations
- Lifting apparatus: Motorized
- Drop Forks: 300mm D x 278mm W (For packages up to 550mm D)- Other sizes as customer request
- Air Supply: 6 bar
- Custom made base plate
- Different fork lengths (as per customer request)
- Top Support Fixture to adjust the angle of drop

**Category**

1. Equipment for Standards
2. Standards