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Indian Standard

**PERFORMANCE TESTS FOR
COMPLETE, FILLED TRANSPORT PACKAGES**

PART 4 VERTICAL IMPACT DROP TEST

(*First Revision*)

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COMPLETE, FILLED TRANSPORT PACKAGES

PART 4 VERTICAL IMPACT DROP TEST

(First Revision)

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Indian Standard

PERFORMANCE TESTS FOR COMPLETE, FILLED TRANSPORT PACKAGES

PART 4 VERTICAL IMPACT DROP TEST

(*First Revision*)

0. FOREWORD

0.1 This Indian Standard (Part 4) (First Revision) was adopted by the Bureau of Indian Standards on 28 April 1987, after the draft finalized by the Transport Packages Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 This standard was first published in 1973 and was based on the International Standard ISO 2248-1972 'Packaging — Complete, filled transport packages — Vertical impact test by dropping' issued by the International Organization for Standardization (ISO). Subsequent to the revision of the ISO standard in 1985, this standard has also been revised to bring it in line with the latest ISO standard. In this revision, 4 on package preparation has been added besides some changes incorporated in 6.1, 7.1 and Appendix A.

0.3 Packages intended for transport of goods are required to fulfil the primary function of physical protection to the contents. The packages are transported normally by road, rail, sea and air, as also inland waterways either by one or a combination of these modes. The nature of the hazards that are confronted during transport is widely varying depending upon the distribution system, handling methods and skills of staff employed. Performance tests are developed for complete, filled transport packages with a view to enabling one to determine in advance as to how a package would fare in a given distribution system.

0.4 Packages in the loading and unloading operation in various modes of transport are likely to fall from the stacks or vehicles or from heights while handling. A package test for vertical impact by dropping may be performed either as a single test or to investigate the effects of drop or free fall, or as part of sequence of test designed to measure the ability of a package to withstand the distribution system that includes a vertical impact hazard.

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0.5 The actual requirements for severity level and criteria of conformity of the performance tests shall be included in the specifications for individual packages. Also the standard range of intensities of tests and criterion of acceptance will be covered in a separate standard.

1. SCOPE

1.1 This standard specifies a method of conducting a vertical impact test on a complete, filled transport package by dropping. It may be performed either as a single test to investigate the effects of vertical impact or as part of a sequence of tests designed to measure the ability of a package to withstand a distribution system that includes a vertical impact hazard.

2. PRINCIPLE

2.1 Raising the package above a rigid plane surface and releasing it to strike this surface (the 'impact surface') after a free fall. The atmospheric conditions, the height of drop and the attitude of the package are predetermined.

NOTE — In some circumstances a completely free fall may not be possible; in such circumstances the impact velocity shall be within 1 percent of that which is achieved by a free fall.

3. APPARATUS

3.1 Lifting Arrangement — Which will not damage the package during either lifting or release.

3.2 Means of Holding the Package — Prior to release in its predetermined attitude.

NOTE — The difference in behaviour of a sack, for example, suspended from the top or supported below in an end drop, could be significant. In such instance, the method of holding the package before dropping shall be described in the test report.

3.3 Release Mechanism — To release the package in such a way that its fall is not obstructed by any part of the apparatus before striking the impact surface (**3.4**).

3.4 Impact Surface — Horizontal and flat, massive enough to be immovable and rigid enough to be non-deformable under test conditions.

3.4.1 In normal circumstances the impact surface provided shall be:

- a) integral with a mass at least 50 times that of the heaviest package to be tested;
- b) flat, such that no two points on its surface differ in level by more than 2 mm;
- c) rigid, such that it will not be deformed by more than 0.1 mm when an area of 100 mm² is loaded statically with 10 kg anywhere on the surface; and
- d) sufficiently large to ensure that the test package falls entirely upon the surface.

3.4.2 In addition the apparatus shall meet the requirements and tolerances of **6.3**.

4. PACKAGE PREPARATION

4.1 The test package shall normally be filled with its intended contents. However, simulated or dummy contents may be used on condition that the dimensions and physical properties of such contents shall be as close as possible to those of the intended contents.

4.2 Ensure that the package is closed normally, as if ready for distribution. If simulated or dummy contents are used, ensure that the normal method of closure is still employed.

5. CONDITIONING

5.1 The package shall be conditioned in accordance with one of the conditions described in IS : 7031-1987*.

6. PROCEDURE

6.1 Whenever possible, the test shall be carried out in the same atmospheric conditions as used for conditioning, where this is critical to the materials or application of the package. In other circumstances, the test shall be carried out in the atmospheric conditions which are as near as practicable to those used for conditioning.

6.2 Lift the package and hold it in the predetermined attitude given in Appendix A at a height within ± 2 percent of the predetermined drop height as defined by the distance between the lowest point on the package at the time of release and the nearest point on the impact surface.

*Method of conditioning of complete, filled transport packages (first revision).

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6.3 Release the package from its predetermined attitude within the following tolerances:

- a) for face or edge drops: 2° maximum between the impacting face, or edge, and the horizontal surface; and
- b) for edge or corner drops: the angle between a prescribed surface of the package and the horizontal surface $\pm 5^{\circ}$ or ± 10 percent of the angle, whichever is greater.

The velocity at impact shall be within ± 1 percent of that which would be achieved by a free fall.

7. TEST REPORT

7.1 The test report shall include the following particulars:

- a) reference of this standard;
- b) the number of replicate package tested;
- c) full description of the package, including dimensions, structural and material specifications of the package and its fittings, cushioning, blocking, closure or reinforcing arrangements;
- d) description of contents, whether simulated or dummy contents were used, full details shall be given;
- e) gross mass of package and net mass of contents, in kilograms;
- f) relative humidity, temperature and time of conditioning, temperature and time of conditioning, temperature and relative humidity of test area at time of test; whether these values comply with the requirements of IS : 7031-1987*;
- g) the attitude in which the package was tested, stated in one of the ways given in the Appendix A;
- h) drop height, in millimetres;
- j) type of apparatus;
- k) any deviations from the test method described in this standard;
- m) a record of the result, with any observations which may assist in correct interpretation;
- n) date of the test; and
- p) signature of tester.

*Method of conditioning of complete, filled transport packages (*first revision*).

APPENDIX A

(Clause 6.2)

PREDETERMINED ATTITUDE OF THE PACKAGES

A-0. The predetermined attitude of the package shall be expressed in one of the following ways, using the method of identification given in IS : 7030-1973*.

NOTE— Where bungs and enclosures of fittings are present, the attitude at impact may be related to their position.

A-1. PARALLELEPIPEDAL PACKAGES

A-1.1 Impact on a Face — State face 1, 2, 3, etc.

A-1.2 Impact on an Edge — State edge 1-2, 2-3, 3-4, etc, and the angle between one of two surfaces forming the edge and the plane of the impact surface; or

State the edge, and that the centre of gravity of the test package tested shall be vertically above the point of impact; or

State the edge, and that the two parallel edges of the test package nearest to the impact edge shall lie in a horizontal plane.

A-1.3 Impact on a Corner — State corner 1-2-5, 3-4-6, etc, and the angles between two of the faces forming the corner and the plane of the impact surface; or state the corner, and that the centre of gravity of the test package shall be vertically above the point of impact.

A-2. CYLINDRICAL PACKAGES OF CIRCULAR CROSS-SECTION

A-2.0 In all instances, the centre of gravity of the test package shall be vertically above the point, line or plane of impact with the impact surface.

A-2.1 Impact on top or bottom faces.

A-2.2 Impact at any of the points, 1, 2, 3, etc, on either the edge or rim.

*Method of identification of parts for complete, filled transport packages.

IS : 7028 (Part 4) - 1987

A-2.3 Impact on any of the lines 1-2, 3-4, etc, parallel to the axis of the cylinder.

A-3. SACKS AND BAGS

A-3.0 The centre of gravity of the sack shall be vertically above the face, end or side involved in the impact.

A-3.1 Impact on a Face — State face 1 or 3.

A-3.2 Impact on an End — State end 5 or 6.

A-3.3 Impact on a Side — State side 2 or 4.

A-4. MISCELLANEOUS PACKAGES

A-4.0 The attitude of the packages shall be based on the most appropriate attitudes given in **A-1**, **A-2** and **A-3**.

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