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**Packaging — Transport packages for  
dangerous goods — Test methods for  
large packagings**

*Emballages — Emballages de transport pour marchandises  
dangereuses — Méthodes d'essai pour gros emballages*

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ISO 16883:2007

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16883 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests for means of packaging, packages and unit loads*.

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## Introduction

This International Standard was developed to provide requirements and test procedures to meet the multi-modal United Nations Recommendations on the Transport of Dangerous Goods<sup>[1]</sup> and successful passing of the tests may lead to the allocation of an appropriate UN large packaging mark. The UN Recommendations have been developed by the United Nations Committee of Experts on the Transport of Dangerous Goods as a model regulation (referred to in this document as the UN Recommendations) in the light of technical progress, the advent of new substances and materials, the exigencies of modern transport systems and, above all, the need to ensure the safety of people, property and the environment. Amongst other aspects, the UN Recommendations cover principles of classification and definition of classes, listing of the principal dangerous goods, general packing requirements, testing procedures, marking, labelling or placarding, and shipping documents. There are in addition special recommendations related to particular classes of goods.

The UN Recommendations are given legal entity by the provisions of a series of international modal agreements and national legislation for the transport of dangerous goods. The international agreements include the following:

- European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (covering most of Europe)<sup>[2]</sup>;
- Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (covering most of Europe, parts of North Africa and the Middle East)<sup>[3]</sup>;
- The International Maritime Dangerous Goods Code (worldwide)<sup>[4]</sup>.

The application of this International Standard will need to take account of the requirements of these international agreements and the relevant national regulations for domestic transport of dangerous goods.

It is important to note that there will be certain modal differences from the UN Recommendations and that the schedule for revision of the Recommendations and modal provisions may lead to temporary inconsistencies with this International Standard, which is regularly updated to the latest version of the UN Recommendations.

It is noted that success in the tests and the allocation of an official UN mark do not on their own authorize the use of a large packaging for any dangerous goods. There are other regulatory provisions that have to be taken into account in each instance.

This International Standard is based on Revision 14 of the UN Recommendations.

# Packaging — Transport packages for dangerous goods — Test methods for large packagings

## 1 Scope

This International Standard specifies the design type test requirements for large packagings (see definition 3.2) intended for use in the transport of dangerous goods.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment).

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

## 3 Terms and definitions (standards.iteh.ai)

For the purposes of this document, the following terms and definitions apply.

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### 3.1

#### competent authority

any national regulatory body or authority designated or otherwise recognized as such for any purpose in connection with the regulations specified in this International Standard

### 3.2

#### large packaging

packaging consisting of an outer packaging that contains article(s) or inner packaging(s), and that

- are designed for mechanical handling, and
- exceed 400 kg net mass or 450 l capacity but have a volume of not more than 3 m<sup>3</sup>

### 3.3

#### large packaging design type

large packaging of one design, size, material and thickness, manner of construction and packing, which may include various surface treatments, together with large packagings which differ from the design type only in their smaller design height

### 3.4

#### inner packaging

packaging for which an outer packaging is required for transport

**3.5**  
**liquids**  
dangerous goods which at 50 °C have a vapour pressure of not more than 300 kPa (3 bar), which are not completely gaseous at 20 °C and at a pressure of 101,3 kPa, and which have a melting point or initial melting point of 20 °C or less at a pressure of 101,3 kPa

NOTE An expansion of this definition is given in Annex A.

**3.6**  
**solids**  
dangerous goods, other than gases, that do not meet the definition of liquids

### 3.7 Capacity

**3.7.1**  
**brimful capacity**  
maximum volume of water, in litres, held by the inner or outer packaging when filled through the designed filling orifice to the point of overflowing in its normal position of filling

**3.7.2**  
**nominal capacity**  
capacity, in litres, which, by convention, is used to represent a class of packagings of similar brimful capacities

**3.7.3**  
**maximum capacity**  
maximum inner volume of receptacles or packagings, expressed in litres

NOTE This may be either the brimful capacity or the capacity calculated from the interior measurements.

**3.8**  
**packing groups**  
group to which substances and articles of most classes of dangerous goods are assigned according to the degree of danger presented:

- packing group I: high danger
- packing group II: medium danger
- packing group III: low danger

NOTE The severity of a large packaging test (e.g. the drop height) varies with the packing group of the substance. The allocation of packing groups to substances and articles may be found in the dangerous goods list of the UN Recommendations <sup>[1]</sup>.

**3.9**  
**maximum net mass**  
maximum combined mass of the inner packagings and the contents thereof, expressed in kilograms

**3.10**  
**maximum permissible gross mass**  
mass of the large packaging and any service or structural equipment, together with the maximum net mass

**3.11**  
**rigid large packaging**  
metal, rigid plastics, rigid fibreboard or wooden large packaging

**3.12**  
**flexible large packaging**  
large packaging with a flexible outer packaging made from paper or plastics material



## 4 Test requirements

### 4.1 General

Before a large packaging is used for dangerous goods, tests shall be carried out successfully on each large packaging design type (see 3.3), which may lead to the issuing of a UN large packaging mark. Tests shall be repeated after any modification that alters the design, material or manner of construction of large packagings. All large packagings for dangerous goods shall be tested in accordance with Table 1 and shall meet the requirements contained in 4.2 to 4.5.

**Table 1 — Design type tests required**

Test	Is test required?	Requirement clause	Testing clause
Bottom lift	Yes <sup>a</sup>	4.2	7.2
Top lift	Yes <sup>b</sup>	4.3	7.3
Stacking	Yes <sup>c</sup>	4.4	7.4
Drop	Yes	4.5	7.5
<sup>a</sup> When large packagings are fitted with means of lifting from the base. <sup>b</sup> When large packagings are intended to be lifted from the top and fitted with means of lifting. <sup>c</sup> When large packagings are designed to be stacked on each other during transport.			

### 4.2 Criteria for passing the bottom lift test

When tested in accordance with 7.2, there shall be no permanent deformation which renders the large packaging unsafe for transport, and no loss of contents.

### 4.3 Criteria for passing the top lift test

#### 4.3.1 For rigid large packaging

When tested in accordance with 7.3, there shall be no permanent deformation which renders the large packaging, including the base pallet if any, unsafe for transport, and no loss of contents.

#### 4.3.2 For flexible large packaging

When tested in accordance with 7.3, there shall be no damage to the flexible large packaging or its lifting devices which renders the large packaging unsafe for transport or handling, and no loss of contents.

### 4.4 Criteria for passing the stacking test

#### 4.4.1 For all types of large packagings other than flexible large packagings

When tested in accordance with 7.4, there shall be no permanent deformation which renders the large packaging, including the base pallet if any, unsafe for transport, and no loss of contents.

#### 4.4.2 For flexible large packaging

When tested in accordance with 7.4, there shall be no deterioration of the body which renders the flexible large packaging unsafe for transport, and no loss of contents.

#### 4.5 Drop test

When tested in accordance with 7.5

- a) the large packaging shall not exhibit any damage liable to affect safety during transport (see Note),
- b) there shall be no leakage of the filling substance from inner packaging(s) or article(s),
- c) no rupture is permitted in large packagings for articles of Class 1 which would permit the spillage of loose explosive substances or articles from the large packaging,
- d) the sample passes the test if the entire contents are retained, even if the closure is no longer siftproof.

NOTE For example, for a), the large packaging cannot be moved without leaking.

#### 4.6 Test report

All large packagings tested for conformity with this International Standard shall be the subject of a test report and specification check prepared in accordance with Annexes B and C. It shall be possible to specifically identify the large packaging relative to each test report, either by the retention of uniquely referenced large packagings or by the inclusion of sufficient photographs and/or drawings with unique references to enable identification of the large packaging and all its components. Large packagings tested for use with goods of Class 1 (explosives) shall be identified as such in the test report.

Each test report should be available to the users of the large packaging.

NOTE The competent authority may have established procedures for the retention and/or disposal of test items.

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### 5 Selection and preparation of large packagings for test

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#### 5.1 Selection of large packagings

Sufficient large packagings per design type

- a) shall be submitted for testing in accordance with Table 1,
- b) shall be marked with a test reference (identification) which shall also be entered on the test record and later used in the test report,
- c) shall be individually weighed to establish the tare or filled mass (see Note 1), and
- d) shall be examined for damage which might invalidate the tests, in which event the large packaging shall be replaced.

NOTE 1 The form of weighing may be varied to correspond with whether the large packagings have been supplied full or empty to the test station. Where the tare masses of individual large packagings are recorded, it is necessary to record only a typical filled mass (or vice-versa).

NOTE 2 The competent authority may permit selective testing of large packagings.

#### 5.2 Information to be provided with large packagings

##### 5.2.1 General

Each large packaging type shall be accompanied by specification(s) for that design type containing the information set out in Annex C and by the additional information specified in 5.2.2 to 5.2.6, as relevant.

### 5.2.2 Water and other non-dangerous substances as test contents

Where the tests are to be carried out using water or other non-dangerous substances, a statement of the packing group for which the large packaging is to be tested shall be provided, together with data enabling appropriate selection of inert test contents and test levels. For liquids, such data shall include the required maximum relative density and viscosity for the tests. For solids, such data shall include those relevant characteristics (e.g. mass, grain size, bulk density, angle of repose, etc.) that clearly show equivalence of physical characteristics.

### 5.2.3 The dangerous substance as test contents

Where the tests are to be carried out using the dangerous substance(s) to be transported, a statement of their packing group and their physical characteristics shall be provided. Liquids shall be defined by their relative density, together with viscosity and the method of determination. Solids shall be defined by those relevant characteristics (e.g. mass, grain size, bulk density, angle of repose, etc.) to ensure that physical characteristics are sufficiently identified and included. These data shall be recorded in the test report (see Annex B).

NOTE Where tests are carried out using the actual substance to be transported, the test report is then applicable to other substances having the same or equivalent characteristics.

### 5.2.4 Test contents: using articles

Where the large packaging is intended for the transport of article(s), a statement of the packing group, an appropriate description and drawing(s) of the article(s) and or photographs, and details of the way in which dummy articles were filled for the purpose of testing shall be provided.

### 5.2.5 Special instructions

Any special filling or closing instructions including, where relevant, the closure torque for example, shall be provided.

### 5.2.6 Handling characteristics

Each large packaging design type shall be accompanied by a statement of its mechanical handling characteristics. This shall relate to bottom lift, top lift or both, as applicable, and the number of large packagings to be stacked during transport.

NOTE The number of large packagings to be stacked during transport may be zero if, for example, the large packaging design type is not designed for stacking.

## 5.3 Selection of contents and filling of large packagings prior to testing

### 5.3.1 General

Inner packagings of large packagings shall be filled for testing to not less than

- 98 % of brimful capacity for liquids, and
- 95 % of brimful capacity for solids.

Inner packagings for liquids, or those capable of containing them, shall have their capacity determined as in 5.3.3. Otherwise the capacity shall be determined by other suitable means (e.g. by calculation).

### 5.3.2 Test contents

Where non-dangerous substances are to be used as test contents, they shall be selected to accord with the data referred to in 5.2.2. Water or a water/anti-freeze mixture may be used to represent any liquid.

For solids, additives such as bags of lead shot may be used to adjust the mass if required but, if used, they shall be placed in such a manner that the test results are not affected. Dangerous articles shall be replaced by dummy articles and these shall be of the same size, shape, mass and centre of gravity as the articles to be transported.

The test contents used shall be recorded in the test report.

### 5.3.3 Large packagings containing inner packagings to contain liquids

#### 5.3.3.1 Determination of brimful capacity

The inner packaging of a large packaging intended to contain liquids shall be filled to not less than 98 % of the brimful capacity. The brimful capacity is determined, for example, by weighing the empty inner packaging including closures [mass empty ( $m$ ) in kg] and weighing the inner packaging full [mass brimful ( $W$ ) in kg]. The inner packaging shall be filled with water until the water just overflows and then the closure shall be fitted and any surplus mopped up. No steps shall be taken, such as tilting or tapping the inner packaging, to enable water to penetrate into a hollow handle or other design feature above the closure.

$$b = \frac{W - m}{\rho}$$

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where

$b$  is the brimful capacity, in litres;

$W$  is the mass, in kilograms, of the inner packaging when brimful with water;

$m$  is the mass, in kilograms, of the empty inner packaging;

$\rho$  is the density of water (= 1), in kilograms per litre.

#### 5.3.3.2 Filling of the inner packaging

When filling test inner packagings with liquids, at least one inner packaging shall have its capacity and filling level determined, for example as below. Further inner packagings of that design type shall be filled using a dipstick calibrated on the first inner packaging or, in the case of small inner packagings, by mass or volume. When the capacity of the inner packaging is established with a liquid other than water (e.g. anti-freeze solution), the density of that liquid shall be taken into account, in order to obtain the correct volume of fill (at least 98 % of brimful capacity).

The calculation of required volume of liquids for testing shall be

$$V = \frac{b \times 98}{100}$$

where

$V$  is the required volume of liquid, in litres;

$b$  is the brimful capacity, in litres.