



DRAFT INTERNATIONAL STANDARD ISO/DIS 16495

ISO/TC 122/SC 3

Secretariat: BSI

Voting begins on:
2010-11-04

Voting terminates on:
2011-04-04

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Packaging — Transport packaging for dangerous goods — Test methods

Emballages — Emballages pour le transport des marchandises dangereuses — Méthodes d'essai

ICS 13.300; 55.020

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

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Foreword

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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 16495 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, and by Technical Committee CEN/TC 261, *Packaging* in collaboration.

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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 [1] and successful passing of the tests may lead to the allocation of an appropriate UN 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 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 European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (covering most of Europe). [2]
- Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (covering most of Europe, parts of North Africa and the Middle East). [3]
- The International Maritime Dangerous Goods Code (IMDG Code) (worldwide). [4]
- The International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TIs) (worldwide). [5]

The application of this 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 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 packaging for any dangerous goods, which are subject to the packing instructions published in the various modal regulations.

This Standard is based on Revision 15 of the UN Recommendations.]

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Packaging — Transport packaging for dangerous goods — Test methods

1 Scope

This Standard specifies the general information needed for the design type testing of packagings, IBC's and Large Packagings intended for use in the transport of dangerous goods.

NOTE This Standard should be used in conjunction with one or more of the International regulations set out in the Bibliography.

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 amendments) applies.

ISO 2206:1987, Packaging — Complete filled transport packages — Identification of parts when testing

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

EN ISO 2431, Paints and varnishes - Determination of flow time by use of flow caps (ISO 2431:1993, including Technical Corrigendum 1:1994)

ISO 6789, Assembly tools for screws and nuts – Hand torque tools – Requirements and test methods for design testing, quality conformance testing and calibration procedure

3 Terms and definitions

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

3.1

brimful (overflow, maximum) capacity

volume of water in litres held by the packaging, IBC, inner or outer packaging of a combination packaging and/or large packaging, when filled through the designed filling orifice to the point of overflowing in its normal position of filling

3.2

nominal capacity

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

3.3

single packaging

means of packaging that does not require an inner packaging to be capable of performing its containment function and it includes composite packaging

3.4

Intermediate Bulk Container (IBC)

General : see UN recommendations chapter 1.2

4 Test report

All packagings, IBCs and large packagings tested for conformity with the UN recommendations shall be the subject of a test report (extended details in Annex A) and will include a specification check prepared in accordance with annex B, C or D. It shall be possible to specifically identify the packaging, IBC and large packaging relative to each test report, either by the retention of uniquely referenced packagings, IBCs and large packagings or by inclusion of sufficient photographs and/or drawings with unique references to enable identification of the packaging, IBCs and large packagings and all its components.

5 Selection and preparation of packagings, IBCs and large packagings for testing

NOTE For the selection and preparation of packaging, IBCs and large packagings for testing the type of contents, (liquid, viscous or solid) is decisive. Guidance on the determination of the type is given in Annex E

5.1 Selection of packagings, IBCs and large packagings

Sufficient numbers of packagings, IBCs and large packagings per design type shall be selected for testing and shall be:

- a) marked with a test reference which shall also be entered on the test record and later used on the test report;
- b) marked on each face where the packaging, IBC and large packaging is in the shape of a rectangular box in accordance with ISO 2206;
- c) individually weighed to establish the tare or filled gross mass;

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

- d) examined for damage which might invalidate the tests, in which event the packaging, IBCs and large packagings shall be replaced.

NOTE 2 Under some circumstances it may be desirable to have a range of packagings, IBCs and large packagings tested, for example :

- in a number of different sizes but of the same construction
- with variety of closures
- for use with a range of solid contents

In such situations it may not be necessary to carry out testing for every possible permutation. This selective testing procedure is recognized but only after agreement with the competent authority who will advise on options available.

5.2 Information to be provided with packagings, IBCs and large packagings

5.2.1 General

Each packaging, IBCs and large packagings type shall be accompanied by specification(s) for that design type containing the data set out in annex B, C or D and by the following additional information in 5.2.2 to 5.2.6 as relevant.

5.2.2 Test Contents - Using Water and non-dangerous substances

Where the tests are to be carried out using water or other non-dangerous substances a statement of the packing group for which the packaging is to be tested shall be provided, together with data enabling appropriate selection of inert test contents. For liquids such data shall include the required maximum relative density for the tests together with data on, for instance, the internal pressure test required. For solids such data shall include mass, grain size and any other relevant characteristic, for example, bulk density, angle of repose etc., to clearly show equivalence of physical characteristics.

5.2.3 Test Contents - Using the dangerous substance

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 method of determination. Solids shall be defined by their mass and grain size and any other relevant characteristic, for example, bulk density, angle of repose etc. to ensure physical characteristics are sufficiently identified and included. This data shall be recorded in the test report (see annex A);

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

5.2.4 Vapour pressure

For liquids the vapour pressure (at a given temperature) of the substance to be carried or the hydraulic pressure to be achieved during the tests shall be provided.

5.2.5 Test Contents - Using Articles

Where the packaging and large packaging is intended for the transport of (an) 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.

5.2.6 Special instructions

Any special filling or closing instructions including, where relevant, for example the closure torque shall be provided (ISO 6789) shall be provided.

5.2.7 Handling characteristics of IBCs and Large Packagings

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

5.3 Selection of contents and filling of packaging, IBCs and large packagings prior to testing

5.3.1 General

Single packagings, IBCs, the inner packagings of combination packagings and large packagings shall be filled for drop and stacking tests to not less than:

- 98% of brimful capacity for liquids;
- 95% of brimful capacity for solids.

NOTE There are two exceptions, some flexible packagings (see 5.3.5) and some packagings designed to be transported part full (see 5.3.6).

Packagings, IBCs, the inner packagings of combination packagings and large 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 5.2.3. Water or a water/anti-freeze mixture may be used to represent any liquid provided that its density is minimum than s.g. 0.95.

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 packaging, IBC, inner packaging of combination packaging and large packaging to contain liquids

5.3.3.1 Determination of brimful capacity

A packaging, RIBC, inner packaging of combination packaging and large packaging intended to contain liquids shall be filled to not less than 98 % of the brimful capacity. The brimful (overflow) capacity is determined for example by: weighing the empty packaging/IBC/inner packaging including closures (mass empty (m) in kg) and weighing the packaging/IBC/inner packaging full (mass brimful (W) in kg). The packaging/IBC/inner packaging shall be filled with water until the water just overflows and then fitting the closure and any surplus mopped up. No steps shall be taken, e.g. by tilting or tapping the packaging/IBC/inner packaging, to enable water to penetrate into a hollow handle/lifting feature or other design feature above the closure.

The following formula expresses the brimful capacity

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

where:

b is the brimful capacity in litres

W is the mass in kg, of packaging/IBC/inner packaging when brimful with water

m is the mass in kg, of the empty packaging/IBC/inner packaging

d is the density of water (=1) in kg/litre

5.3.3.2 Filling of the packaging/IBC/inner packaging

When filling test samples of the above with liquids, at least one sample shall have its capacity and filling level determined as for example below. Further samples of that design type shall be filled using a dipstick calibrated on the first sample or by mass or volume. When the capacity of the sample 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:

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

where:

C is the required volume of water in litres;

b is the brimful capacity in litres

5.3.4 Rigid packaging, RIBCs, inner packaging of combination packaging and large packaging to contain solids

Packaging, RIBCs, inner packaging of combination packaging and large packaging intended to contain solids shall be filled to not less than 95 % of the brimful capacity. Where the packaging/IBC/inner packaging is capable of containing liquids the capacity shall be determined as in 5.3.3.1

The calculation of required mass of solids for testing shall be:

$$M = \frac{(b \times d) \times 95}{100}$$

where:

M is the required mass in kg, of solids;

b is the brimful capacity either measured or calculated in litres ;

d is the bulk density of the test contents in g/cm³

Alternatively, for cylindrical packaging/IBC/inner packaging the level of fill required to fill the packaging/IBC/inner packaging to at least 95 % of its brimful capacity shall be calculated from its internal height, taking into account any reduction in height caused by the fitting of the closure.

This procedure is not suitable for bags (see 5.3.5).

5.3.5 Flexible packagings, flexible inner packagings and Flexible IBCs to contain solids

Flexible packagings/ flexible inner packagings (bags) and flexible IBCs shall be filled to the required testing mass at which the designer of the flexible packaging/ flexible inner packagings and flexible IBCs intends it to be used or, if known, to the capacity which the user intends to employ using either the substance to be