भारतीय मानक

Indian Standard

IS 18756 : 2024
ISO 16495 : 2022

पैकेजिंग — खतरनाक वस्तुओं के लिए परिवहन पैकेजिंग — परीक्षण पद्धतियाँ

(पहला पुनरीक्षण)

Packaging — Transport Packaging for Dangerous Goods — Methods of Test

(First Revision)

ICS 55.020; 13.300

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

July 2024 **Price Group 14**

NATIONAL FOREWORD

This Indian Standard (*First Revision*) which is identical to ISO 16495: 2022 'Packaging — Transport packaging for dangerous goods — Test methods' issued by International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendations of Transport Packages, Packaging Codes and Pallets Sectional Committee and approval of the Transport Engineering Division Council.

This standard was originally published as IS/ISO 16495 : 2013 which was identical adoption of ISO 16495 : 2013. In order to harmonize with the latest international practices, this standard is being revised to harmonize it with ISO 16495 : 2022.

The major changes in this first revision of the standard are as follows:

a) Changes to Table B.1, Table B.2, Table B.3, Table C.1, Table D.1, Table D.2 and Table D.3;
b) Additional requirements in Annex H, "H.2 Preparation" added;
c) Deletion of Table H.1; and
d) Editorial improvements.

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain terminologies and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this daft standard, they should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standards*	*Degree of Equivalence*
ISO 2206 : 1987 Packaging — Complete, filled transport packages — Identification of parts when testing	IS 7030 : 1988 Identification of parts for complete, filled transport packages when testing (first revision)	Modified/Technically Equivalent
ISO 2248 : 1985 Packaging — Complete, filled transport packages — Vertical impact testing by dropping	IS 7028 (Part 4) : 1987/ISO 2248 : 1985 Performance tests for complete, filled transport packages: Part 4 vertical impact drop (*first revision*)	Identical
ISO 2875 : 2000 Packaging — Complete, filled transport packages and unit load — Water-spray test	IS 7028 (Part 8) : 2002/ISO 2875 : 2000 Performance tests for complete, filled transport packages: Part 8 water spray test (*second revision*)	Identical
ISO/IEC 17025 : 2017 General requirements for the competence of testing and calibration laboratories united nations recommendation on the transport of dangerous goods — Model regulations	IS/ISO/IEC 17025 : 2017 General requirements for the competence of testing and calibration laboratories (*second revision*)	Identical

(*Continued on third cover*)

Contents

Page

Introduction

This document was developed to provide requirements and test procedures to meet the multi-modal United Nations Recommendations on the Transport of Dangerous Goods Model Regulations referred to as "UN Recommendations" throughout this document, 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 Subcommittee of Experts on the Transport of Dangerous Goods as a 'model regulation' 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. In addition, there are 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:

— The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) (covering most of Europe)[4];

— Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (covering most of Europe, parts of North Africa and the Middle East)[5];

— The International Maritime Dangerous Goods Code (IMDG Code) (worldwide)[6];

— The International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TIs) (worldwide)[7].

Application of this document presupposes awareness 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 document.

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 document is based on Revision 21 of the UN Recommendations.

Indian Standard

PACKAGING — TRANSPORT PACKAGING FOR DANGEROUS GOODS — METHODS OF TEST

(First Revision)

1 Scope

This document specifies the information needed for the design type testing of packaging, intermediate bulk containers (IBCs) and large packaging intended for use in the transport of dangerous goods.

NOTE 1 This document can be used in conjunction with one or more of the international regulations set out in the Bibliography.

NOTE 2 The term “packaging” includes packaging for Class 6.2 infectious substances according to the United Nations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *Packaging — Complete, filled transport packages — Identification of parts when testing*

ISO 2248:1985, *Packaging — Complete, filled transport packages — Vertical impact test by dropping*

ISO 2875:2000, *Packaging — Complete, filled transport packages and unit loads — Water-spray test*

ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*

United Nations Recommendations on the Transport of Dangerous Goods — Model Regulations

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the UN Recommendations, Chapter 1.2.1, and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
brimful capacity
volume of water in litres held by the packaging, intermediate bulk container (IBC), inner 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, and considered for testing purposes as maximum capacity

3.2
nominal capacity
capacity in litres which, by convention, is used to represent a class of packaging of a similar *brimful capacity* (3.1)

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

4 Selection and preparation of packaging, IBCs and large packaging for testing

4.1 General

The type of contents (liquid, viscous or solid) is crucial for the selection and preparation of the packaging, IBCs and large packaging for testing

NOTE Guidance on the determination of the type of contents is given in Annex E.

4.2 Selection of packaging, IBCs and large packaging

Sufficient numbers of packaging, IBCs and large packaging per design type shall be:

a) selected for testing;

b) examined for damage which might invalidate the tests, in which event the packaging, IBCs and large packaging shall be replaced;

c) marked with a test reference which shall also be entered on the test record and later used on the test report;

d) individually weighed to establish the tare or filled gross mass.

The different parts of the packaging shall be identified in accordance with ISO 2206.

NOTE 1 The form of such weighing can vary according to whether the packaging, IBCs and large packaging have been supplied full or empty to the test station. Where the masses of individual empty packaging, IBCs and large packaging are recorded, it is sufficient to record only a typical filled gross mass (or vice versa).

NOTE 2 Under some circumstances it can be desirable to have a range of packaging, IBCs and large packaging tested.

Examples include:

— different sizes but of the same construction;

— a variety of closures;

— a range of solid contents for use.

In such situations selective testing procedure can be used to avoid testing of every possible permutation. The competent authority can allow this procedure after consultation.

4.3 Information to be provided with packaging, IBCs and large packaging

4.3.1 General

Each packaging, IBCs and large packaging type shall be accompanied by a specification for that design type containing the data set outlined in Annexes B, C or D and by the following additional information contained in 4.3.2 to 4.3.6 as appropriate.

4.3.2 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 characteristics, for example, bulk density or angle of repose, to clearly show equivalence of physical characteristics.

4.3.3 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.

NOTE This information can be obtained from the Safety Data Sheet for the dangerous substance(s), available from sources such as the manufacturer of the dangerous substance(s).

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 and angle of repose, to ensure physical characteristics are sufficiently identified and included. This data shall be recorded in the test report (see Annex A).

Where the tests are carried out using the actual substance to be transported then they shall be applicable for other substances having the same or similar characteristics.

4.3.4 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.

4.3.5 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.

4.3.6 Closing instructions

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

4.3.7 Handling characteristics of IBCs and large packaging

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.

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

4.4.1 General

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

— 98 % of brimful capacity for liquids, and

— 95 % of brimful capacity for solids.

NOTE There can be exceptions, some flexible packaging (see 4.4.4) and some packaging designed to be transported part full (see 4.4.5).

Packaging, IBCs, the inner packaging of combination packaging and large packaging for liquids, or those capable of containing liquids, shall have their capacity determined as in 4.4.3. For other packages, the capacity shall be determined by other suitable means e.g. by calculation.

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

4.4.2.1 Determination of brimful capacity

The brimful capacity is determined for example by: weighing the empty packaging/IBC/inner packaging including closures [mass empty (m_{ep}) in kg] and weighing the packaging/IBC/inner packaging full [mass brimful (m_p) 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 (1) expresses the brimful capacity:

$$b = \frac{m_p - m_{ep}}{d} \quad (1)$$

where

b is the brimful capacity in litres;

m_p is the mass in kilograms, of packaging/IBC/inner packaging when brimful with water;

m_{ep} is the mass in kilograms, of the empty packaging/IBC/inner packaging;

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

4.4.2.2 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 below. Further samples of that design type shall be filled using a dipstick calibrated on the first sample or by mass or volume. The calculation of required volume of liquids for testing shall be as given by Formula (2):

$$V = \frac{b \times 98}{100} \quad (2)$$

where

V is the required volume of water in litres;

b is the brimful capacity in litres.

4.4.3 Rigid packaging, rigid IBCs, inner packaging of combination packaging and large packaging to contain solids

Where the packaging/IBC/inner packaging is capable of containing liquids the capacity shall be determined as in 4.4.2.1.

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 kilograms, of solids;

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

d is the bulk density of the test contents in kg/l.

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 4.4.5).

4.4.4 Flexible packaging, flexible inner packaging and flexible IBCs to contain solids

Flexible packaging/flexible inner packaging (bags) and flexible IBCs shall be filled to the required testing mass at which the designer of the flexible packaging/flexible inner packaging 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 transported or solids of similar characteristics in respect of mass, grain size and flow characteristics. The test contents used shall be recorded in the test report.

4.4.5 Packaging/inner packaging designed to be used part full

Packaging/inner packaging designed to be transported with filling test levels less than 98 % for liquids or less than 95 % for solids shall be filled as prepared for transport to the capacity the user intends to employ. The filled volume and mass shall be recorded in the test report.

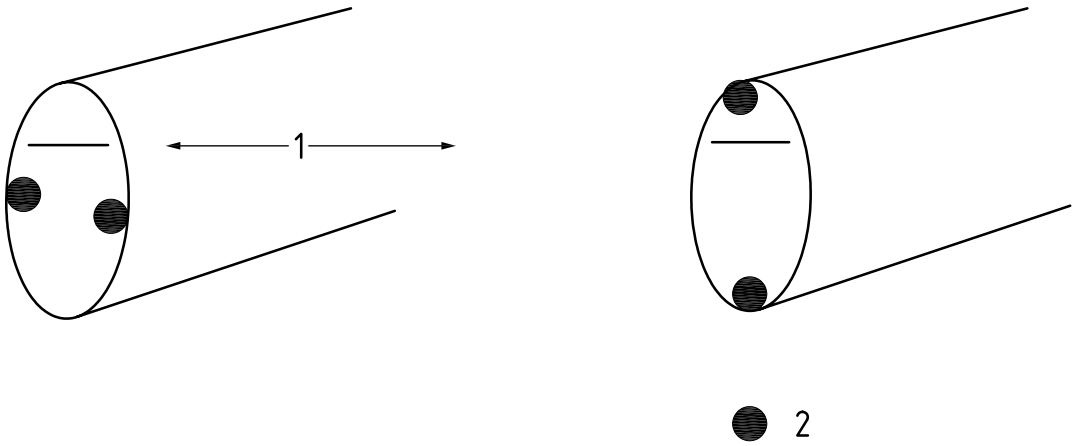
4.5 Closing packaging, IBCs and large packaging

4.5.1 Drums, jerricans, composites and inner packaging, IBCs

Screw type closures shall be tightened to the torque specified by the applicant where appropriate before conditioning, or when specified during or after the conditioning period and shall be recorded in the test report.

Closure torque shall be the same for all tests. If it is necessary to revise a closure torque following a failure in one test, then all tests shall be completed using that torque setting.

Where vented closures are intended for use in the packaging, they shall be fitted for drop and stacking tests. Packaging fitted with vented closures shall be filled and after closing be inverted or laid on their side (see Figure 1) and observed for leakage for a period of 5 min. Leakage from the closure vent will result in termination of the test.



a) Acceptable **b) Unacceptable**

Key

1 liquid level

2 closure

Figure 1 — Packaging fitted with vented closure, laid on their side

4.5.2 Bags

The packaging shall be closed as it would be for transport.

To ensure that the test packagings are closed in a manner representative of production packaging, the same equipment and the same filling time should be used whenever practicable.

4.5.3 Other packaging

Packaging for solids shall be filled as in 4.4.4 and closed in accordance with any special instructions including any fitments or cushioning.

The closure elements used to secure the packaging (e.g. closure tape, where applicable), shall be defined specified in accordance with the specifications given in Annexes B, C or D.

4.6 Check of design type specification with requirements

Following receipt of the samples(s) and their specification (see 4.3.1), a check shall be made that the design type corresponds with the definition of the type and all additional constructional requirements set out for the type in the UN Recommendations.

4.7 Conformity check of test samples with design type specification

The specification of a representative sample of the packaging, IBC and large packaging to be tested shall be checked by visual inspection and actual measurements as detailed in Annexes B, C or D. Aspects such as external dimensions shall be checked at this preparatory stage. A record of each specification check shall be included in the test report. Where a checked sample is found to be outside of the specification tolerances, the samples shall not be accepted as the same design type.

NOTE Aspects (other than external dimensions), such as measurements of material thickness, can be carried out on completion of the test(s).

5 Test methods

Test methods to be followed are specified in the UN Recommendations on the transport of dangerous goods. Additional provisions are described in Annexes F, G, H, I, J, K, L, M, N, O, P and Q.

6 Facilities for testing

6.1 General requirements

Tests shall be carried out at a testing facility capable of meeting the operational provisions specified in ISO/IEC 17025:2017, Clause 5.

NOTE 1 This does not imply a requirement for accreditation but if appropriate such external approval can be obtained from either a national accreditation body or from the competent authority.

NOTE 2 Testing staff can find it useful to have knowledge of the principles of the dangerous goods regulations as set out in the UN Recommendations.

6.2 Accuracy of measurement equipment

The accuracy of measuring equipment shall be more precise than the accuracy of the measurements in testing, as specified in 6.3, unless otherwise approved by the competent authority. The measuring equipment shall be calibrated in accordance with ISO/IEC 17025.

6.3 Accuracy of measurements in testing

Measurement equipment shall be selected such that the uncertainties of individual measurements shall not exceed the following values:

Mass in kilograms (kg):	±2 %
Pressure in kilopascals (kPa):	±3 %
Distance/length in millimetres (mm):	±2 %
Temperature in degrees Celsius (°C):	±1 °C
Humidity in percentage (%):	Tolerances are as specified in the agreed test methods
Time in minutes (min):	±3 %
Torque in Newton metres (Nm):	±10 %

NOTE For some measurements the tolerances can be lower in order to have meaningful measurements, e.g. when measuring masses or dimensions of empty packaging.

Where only maximum or minimum values are specified in this document and the UN Recommendations, tolerances are one-sided.

6.4 Climatic conditions

There shall be adequate climatic facilities to meet the requirements of conditioning during tests.

6.5 Reassessment when failure occurs

If failure occurs, the tests on the packagings submitted shall be ended, unless one of the reassessment procedures is used:

a) The tests shall be repeated at a lower level of intensity. For example, if two packagings pass and one fails, the hydraulic pressure test at 200 kPa, a fourth packaging shall be tested at 150 kPa and the design type shall be regarded as passing at the latter level;

b) Where only one packaging fails on one test, that test shall be repeated on twice the normal number of identical packagings for that test. If they all pass, the design type shall be regarded as meeting the test requirements;

Where a reassessment procedure is used, this shall be fully recorded in the test report.

EXAMPLE Where one of the three test packagings fails the drop test in the second orientation, but all the other test packagings have passed the drop test in the first orientation and the other tests (namely leakproofness, internal pressure and stacking), then six packagings are tested in the second orientation.

7 Test report

All packaging, intermediate bulk containers (IBCs) and large packaging tested for conformity with the UN Recommendations shall be the subject of a test report in accordance with Annex A, which should include a specification check prepared in accordance with Annexes 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 packaging, IBCs and large packaging or by inclusion of sufficient photographs and/or drawings with unique references to enable identification of the packaging, IBCs and large packaging and all its components.

The test report shall specify the following:

a) the test facility (name and address) (see A.1);

b) the applicant (name and address) (see A.2);

c) the report number (see A.3);

d) the date (see A.4);

e) the manufacturer (see A.5);

f) the packaging/IBC/large packaging description (see A.6);

g) the capacities (see A.7);

h) the test contents (see A.8);

i) the test description and results (see A.9);

j) the signature (see A.10).

Annex A
(normative)

Test report

A.1 Test facility (name and address)

This shall be the organization that undertook the actual testing. The front page of the report shall be on the headed paper of the test facility. If headed paper is not available, the report shall be clearly traceable to the author and the test facility.

A.2 Applicant (name and address)

The applicant can be the manufacturer, the user of the packaging/IBC/large packaging or any person in the packaging chain.

A.3 Report number

This shall be a number which enables full traceability back to the original test facility working documents that refer to the original test. The report number shall appear on every page of the report and any annexes. Any subsequent amendments shall include the number and clearly show it is an amendment to or an addition to the original report.

A.4 Date

This shall be the date the report was completed, rather than the date that testing was completed. The report shall also include the date of the start and completion of the tests and the date of receipt of test items.

A.5 Manufacturer

The test report shall include the manufacturer of the packaging.

NOTE As packaging/IBC/large packaging specifications (see Annexes B, C and D) are a part of the report, the manufacturer's name in the main body of the report can be ignored, provided that this is clearly stated in one of the annexes which can be clearly linked to the main report.

A.6 Packaging/IBC/large packaging description

The description of the packaging design type (including dimensions, closures) shall include the method of manufacture (e.g. blow moulding).

The main report shall include a general description of the packaging/IBC/large packaging. Full details of the packaging/IBC/large packaging components and material shall be included either in the specification as shown in Annexes B, C or D, (provided there is a clear link between it and the main report) or in the main report. A check for conformity with the relevant definition in the regulations shall be included.

NOTE It can also include drawing(s) and/or photographs.

A.7 Capacities

The test report shall include the nominal capacity and the brimful capacity in litres. For packaging/IBC/large packaging for liquids, the test report shall include brimful capacity in litres. For packaging/IBC/large packaging for solids (including inner packaging and articles) the test report shall include the gross mass in kilograms.

A.8 Test contents

Characteristics of test contents shall include, for example, viscosity and relative density for liquids and bulk density, particle size for solids and angle of repose.

A.9 Test description and results

The report shall identify the number of packaging/IBC/large packagings as submitted for testing. Each packaging/IBC/large packaging sample shall have a unique identification number which shall be documented. There shall be a description of each test and how it was performed.

The report shall include a conclusion clearly indicating the packing group and the test levels achieved particularly hydraulic pressure for liquid packaging/IBC and the maximum gross mass and density for combination packaging/large packaging.

Where a competent authority has agreed to deviations from the standard methods set out in this document, reference to such authorization shall be included in the test report.

A.10 Signature

The test report shall be signed with the name and status of the signatory.

The person who was responsible for the testing, shall sign the report against his/her typed name and position in the laboratory. That person might be the tester or his/her supervisor.

The report shall include the following statements:

'This packaging was tested as prepared for transport in accordance with the provisions of part … of Chapter … of the UN Recommendations, in particular sections … .'

'The use of other packaging methods or components shall render it invalid.'

A copy of the test report shall be available to the competent authority.

NOTE 1 The competent authority can require the test report to be retained for a specified period of time.

NOTE 2 The competent authority can require the reference to relevant regulations.

Annex B
(normative)

Packaging specifications

To assist in the identification of a packaging, following the issue of a test report it is necessary to have a detailed specification. The following Tables B.1 to B.3, correlate the different packaging types with data that is necessary for the identification of test packagings by users, test facilities and competent authorities. There are four parts to this Annex:

a) Drums, jerricans, and composite packagings – Table B.1;

b) Boxes and composite packagings (in the shape of a box) – Table B.2;

c) Bags – Table B.3;

d) Notes to packaging specification tables – Table B.4.

Examples of how this specification data may be represented in paper form are to be found at https://standards.iso.org/iso/16495/

The specification check shall be done visually and where relevant by measuring main dimensions and thicknesses. The specification check data as measured on the test samples shall be recorded and shall be compared with the design type specification including manufacturing tolerances.

Table B.1 — Specification detail single packaging – Drums, jerricans, composite packagings

No.	Specification detail	0 Light gauge metal packagings		1 Drum									3 Jerrican						6 Composite packaging				
		A1	A2	A1	A2	B1	B2	D	G	H1	H2	N	A1	A2	B1	B2	H1	H2	HA1	HB1	HD1	HG1	HH1
1	Packaging description (code and, if necessary, trade name) [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2	Manufacturer's name and address [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3	Method of construction [a]									•	•	•					•	•	•	•	•	•	•
4	Nominal capacity [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5	Brimful capacity [a]	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+
7	Diameter, external at widest point	+	+	+	+	+	+	+	+	+	+	+							+	+	+	+	+
8	Diameter, external at narrowest point (e.g. conical pails)	+	+	+	+	+	+	+	+	+	+	+											
9a	Dimension external (length, width, height)	+	+										+	+	+	+	+	+					
11	Overall height	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12	Stacking height [a]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13	End seams type	•	•	•	•	•	•	•	•			•	•	•	•	•			•	•	•		
14	Side seam type	•	•	•	•	•	•					•	•	•	•	•			•	•	•		
15	Handles, material type, number and position	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
16	Closure(s), diameter(s),design(s) (thread, type, pitch and venting) and material(s)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
17	Closure(s), (or neck(s)) position(s)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
21	Mass of closures with gasket/wad	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
22	Closure manufacturer's name	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
23	Closure torque(s)	•	•	•	•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•
25	Closure(s)(e.g screw cap, Lid): material	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
31	Tare mass	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
32a	Wall thickness, top head, bottom head, body, removable head	+	+	+	+	+	+	+	+	∇	∇	+	+	+	+	+	∇	∇	+	+	+	+	+
33	Material type and grade (polymer), top head, bottom head, body, removable head	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
39	Body corrugations, number	•	•	•	•	•	•												•	•			
41	Rolling hoops, number, height and location			•	•	•	•					•											
42	Closing ring, description, material, thickness		•		•		•	•	•		•			•		•		•					
45	Number of plies / Grammage per ply body, and combined (body)							•	•														

Table B.1 *(continued)*

No.	Specification detail	0 Light gauge metal packagings		1 Drum									3 Jerrican						6 Composite packaging				
		A1	A2	A1	A2	B1	B2	D	G	H1	H2	N	A1	A2	B1	B2	H1	H2	HA1	HB1	HD1	HG1	HH1
47	Inner liner type, material,	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					
48	Chime reinforcement							•	•														
49	Method of lid retention (other than closing ring)							•	•														
50	Mass inner receptacles																		+	+	+	+	+

+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report Data are part of the component drawing, or, if necessary in manufacturer's specification sheets	∇	Wall thickness distribution has to be measured

empty = not applicable

[a] See Table B.4.

Table B.2 — Single packaging or outer packaging of a combination packaging

No.	Specification detail	4 Box								6 Composite Packaging					
		A	B	C	D	F	G	H1	H2	HA2	HB2	HC	HD2	HG2	HH2
1	Packaging description (code and, if necessary, trade name) [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2	Manufacturer's name and address [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3	Method of construction [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•
9a	Dimension external (length x width x height)	+	+	+	+	+	+	+	+	+	+	+	+	+	+
9b	Dimension internal (length, width, height)	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12	Stacking height [a]	+	+	+	+	+	+	+	+	+	+	+	+	+	+
15	Handles, material type, number and position	•	•	•	•	•	•	•	•	•	•	•	•	•	•
31	Tare mass	+	+	+	+	+	+	+	+	+	+	+	+	+	+
32 a	Wall thickness, top head, bottom head, body, removable head	+	+	+	+	+		∇	∇	+	+	+	+		+
33	Material type and grade (polymer), top head, bottom head, body, removable head	•	•	•	•	•		•	•	•	•	•	•		•
53	Closures, number, type, position and materials [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•
54	Reinforcements, type, position and materials	•	•	•	•	•	•	•	•	•	•	•	•	•	•
55	Material ends	•	•	•	•	•	•	•	•	•	•	•	•	•	•
56	Method of joining panels	•	•	•	•	•	•	•	•	•	•	•	•	•	•
58	Grammage by paper and paper type						+							+	
59	Corrugated flute type						+							+	
60	Corrugated combined grammage						+							+	
61	Edge compression test (ECT)						+							+	
62	Burst strength						+							+	
64	top inner flap: gap or meet						•							•	
65	top outer flap: meet or overlap						•							•	
66	bottom inner flap: gap or meet						•							•	
67	bottom outer flap: meet or overlap						•							•	
91	Puncture resistance						+							+	
105	Water resistance of the outer surface of a cutout of fibreboard carton by Cobb method						+							+	

+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report Data are part of the component drawing, or, if necessary in manufacturer's specification sheets	∇	Wall thickness distribution has to be measured
empty = not applicable		[a] See Table B.4.			

Table B.3 — Single packaging

No.	Specification detail	5 Bags								
		H1	H2	H3	H4	L1	L2	L3	M1	M2
1	Packaging description (code and, if necessary, trade name) [a]	•	•	•	•	•	•	•	•	•
2	Manufacturer's name and address [a]	•	•	•	•	•	•	•	•	•
3	Method of construction [a]	•	•	•	•	•	•	•	•	•
9c	Dimensions external (length, width, height), flat unopened (where applicable)	+	+	+	+	+	+	+	+	+
31	Tare mass	+	+	+	+	+	+	+	+	+
46	Grammage of material per square metre	+	+	+		+	+	+		
58	Grammage by paper and paper type								+	+
69	Gusset, open width	+	+	+	+	+	+	+	+	+
70	Bottom width, flat unopened	+	+	+	+	+	+	+	+	+
71	Valve width	+	+	+	+	+	+	+	+	+
73	Closure method (top, base, side)	•	•	•	•	•	•	•	•	•
74	Perforations	•	•	•	•	•	•	•	•	•
75	Sewing, style and density of stitches	•	•	•	•	•	•	•	•	•
76	Type of thread and minimum breaking load	•	•	•	•	•	•	•	•	•
78	Adhesive, type	•	•	•	•	•	•	•	•	•
79	Fabric (warp/weft), tapes per 100 mm					•	•	•		
82	Coating, material, thickness, mass		•	•			•	•	•	•
83	Liner material, thickness		+	+			+	+	+	+
84	Material strength, tensile (energy absorption) and elongation	+	+	+	+	+	+	+		
106	Structure of wall: number, type and specification of plies								•	•
107	film thickness				+					
+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report							
			Data are part of the component drawing, or, if necessary in manufacturer's specification sheets							
empty = not applicable		[a] See Table B.4.								

Table B.4 — Notes to packaging specification tables

No.	Specification detail	Clarification
1	Packaging description	Type code, standard design references (if applicable), industrial agreed reference codes, and all possible deviations to previous ones, trade name etc.
2	Manufacturer's name and address	In addition, manufacturing facility (e.g. when different). For composite packagings: manufacturer of the inner receptacle, outer packaging and company responsible for the assembling
3	Method of construction	e.g. welded, extrusion moulded, rotomoulded, glued and stitched; nailed etc.
4	nominal capacity	See 3.2.
5	brimful capacity	See 3.1.
12	Stacking height	Adjusted height to allow for any interlocking features of packaging; may also include battens on boxes.

Table B.4 *(continued)*

No.	Specification detail	Clarification
30	Material type	For plastics materials the minimum is the generic identity of the material, e.g. HDPE, PET etc.
33	Material type and grade (polymer), body, base	Grade is not required for flexible packagings, IBC's and LP
53	Closures, number, type, position and materials	This is to include taping patterns and any additional means of closing such as straps.

Annex C
(normative)

IBC specifications

To assist in the identification of an IBC, following the issue of a test report, it is necessary to have a detailed specification.

Table C.1 correlates the different IBC types with data that are necessary for the identification of test IBCs by users, test facilities and competent authorities.

The specification check shall be done visually and, where relevant, by measuring main dimensions and thicknesses.

The specification check data as measured on the test samples should be recorded and compared with the design type specification including manufacturing tolerances. Because of the range and variety of IBCs there may be additional items that should be specified and specification checked for a particular IBC and similarly some items shown as required on the specification may not be present. Users should endeavour to ensure all the required data (where appropriate) is given.

Table C.1 — Specification detail IBCs

		11 Rigid for solids											21 Rigid for solids							31 Rigid for liquids							13 Flexible								
No.	**Specification detail**	**A**	**B**	**C**	**D**	**F**	**G**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**A**	**B**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**A**	**B**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**H1**	**H2**	**H3**	**H4**	**H5**	**L1**	**L2**	**L3**	**L4**	**M1**	**M2**
1	IBC description (code and, if necessary, trade name) [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2	Manufacturer's name and address [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3	Method of construction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4	Nominal capacity [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5	Brimful capacity [a]	+	+					+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+										
9c	Dimensions external (length, width, height), flat unopened (where applicable)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12	Number of identical IBC's to be stacked on top during transport [a]	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
15a	Top lift devices: Number, material, position	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	+	+	+	+	+	+	+	+	+	+
16a	Filling and discharge aperture closure, material, type and identification	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
17a	Filling and discharge aperture(s), internal diameter, design, position	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				
17b	Pressure relief fittings, internal diameter and design, position												•	•	•	•	•	•	•	•	•	•	•	•	•	•										
23	Closure torque(s)	•	•					•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
31	Tare mass	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
32b	Nominal thickness and material type and grade, head or lid, body, base	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•					•					
32c	Material type																										•	•	•	•	•	•	•	•	•	•

Table C.1 *(continued)*

		11 Rigid for solids											21 Rigid for solids							31 Rigid for liquids							13 Flexible									
No.	**Specification detail**	**A**	**B**	**C**	**D**	**F**	**G**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**A**	**B**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**A**	**B**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**H1**	**H2**	**H3**	**H4**	**H5**	**L1**	**L2**	**L3**	**L4**	**M1**	**M2**
38	Material lid gasket	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
42	Closing ring, description, material, thickness	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
45a	Number of plies				•																														•	•
46	Grammage of material per square metre						+																				+	+	+						•	•
47	Inner liner type,material			•	•	•	•																													
49	Method of lid retention (other than closing ring)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•										
53a	Fastening system: Number, position, material			•	•	•	•																													
56	Method of joining panels			•	•	•	•																													
59	Corrugated flute type						+																													
60	Corrugated combined grammage						+																													
61	Edge compression test (ECT)						+																													
75	Sewing: Style and density of stitches																										•	•	•	•	•	•	•	•	•	•	•
76	Type of thread and minimum breaking load																										•	•	•	•	•	•	•	•	•	•	•
77	Filter cord																										•	•	•	•	•	•	•	•	•	•	•
78	Adhesive, type																										•	•	•	•	•	•	•	•	•	•	•
79	Fabric (warp/weft), tapes per 100 mm																										+	+	+	+		+	+	+	+		
82	Coating, material, thickness, mass																											•	•	•			•	•	•	•	•
83	Liner: material, thickness																											+	+	+			+	+	+	+	+

Table C.1 *(continued)*

		11 Rigid for solids											21 Rigid for solids							31 Rigid for liquids							13 Flexible									
No.	**Specification detail**	**A**	**B**	**C**	**D**	**F**	**G**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**A**	**B**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**A**	**B**	**H1**	**H2**	**HZ1**	**HZ2**	**N**	**H1**	**H2**	**H3**	**H4**	**H5**	**L1**	**L2**	**L3**	**L4**	**M1**	**M2**
84	Material strength, tensile (energy absorption) and elongation																										+	+	+	+	+						
91	Puncture resistance						+																														
92	Diameter, external (at widest point) of receptacle	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+											
93	Diameters, external conical type receptacle	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+											
94	Cross-section dimensions non-round receptacles	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+											
101	Type of base, material and means of attachment (where appropriate)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•											
104	Seams: Type																										•	•	•	•	•	•	•	•	•	•	•

+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report Data are part of the component drawing, or, if necessary in manufacturer's specification sheets	∇	Minimum wall thickness has to be measured
[a]	See Table B.4.		empty = not applicable		

Annex D
(normative)

Large packaging specifications

To assist in the identification of a packaging, following the issue of a test report, it is necessary to have a detailed specification.

Tables D.1 to D.3 correlate the different packaging types with data which are necessary for the identification of test packagings by users, test facilities and competent authorities.

There are three parts to this annex:

a) Specification detail large packaging — Table D.1;

b) Inner fittings, inner packaging (or articles) of combination packaging and large packaging — Table D.2;

c) Fittings of combination packaging and large packaging — Table D.3.

The specification check shall be done visually and, where relevant, by measuring main dimensions and thicknesses.

The specification check data as measured on the test samples shall be recorded and compared with the design type specification including manufacturing tolerances.

Table D.1 — Specification detail large packaging - 50A, 50B, 50C, 50D, 50F, 50G, 50H, 50N, 51H, 51M

No.	Specification detail	50 Rigid								51 Flexible	
		A	B	C	D	F	G	H	N	H	M
1	Packaging description (code and trade name) [a]	•	•	•	•	•	•	•	•	•	•
2	Manufacturer's name and address [a]	•	•	•	•	•	•	•	•	•	•
3	Method of construction [a]	•	•	•	•	•	•	•	•	•	•
4	Nominal capacity [a]									•	•
9b	Dimension internal (length, width, height)	•	•	•	•	•	•	•	•		
9c	Dimensions external (length, width, height), flat unopened (where applicable)	+	+	+	+	+	+	+	+	+	+
15	Handles, material type, number and position	•	•	•	•	•	•	•	•		
31	Tare mass	+	+	+	+	+	+	+	+		
32b	Nominal thickness and material type and grade, head or lid, body, base	•	•	•	•	•	•	•	•	•	
32c	Material type									•	•
38	Material lid gasket	•	•					•	•		
45a	Number of plies										+
46	Grammage of material per square metre									+	+
53	Closures, number, type, position and materials [a]	•	•	•	•	•	•	•	•		
54	Reinforcements, type, position and materials	•	•	•	•	•	•	•	•		
56	Method of joining panels			•	•	•	•				
58	Grammage by paper and paper type						+				
59	Corrugated flute type						+				
60	Corrugated combined grammage						+				
61	Edge compression test (ECT)						+				
62	Burst strength						+				
69	Gusset, open width									+	+
70	Bottom width, flat unopened									+	+
71	Valve width									+	+
73	Closure method (top, base, side)									+	+
74	Perforations									•	•
75	Sewing, style and density of stitches									•	•
76	Type of thread and minimum breaking load									•	•
77	Filter cord									•	•
78	Adhesive, type									•	•
79	Fabric (warp/weft), tapes per 100 mm									+	
82	Coating, material, thickness, mass									•	•
83	Liner, material, thickness									+	+
84	Material strength, tensile (energy absorption) and elongation									+	
91	Puncture resistance						+				
+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report								
			Data are part of the component drawing, or, if necessary in manufacturer's specification sheets								
empty = not applicable		[a] See Table B.4.									

Table D.2 — Inner packaging (or articles) of combination packaging and large packaging

No.	Specification detail	Inner packagings	Articles
1a	Description	•	•
27	Tare mass	+	
30	Material type	•	
32	Nominal thickness	•	
51	Design standard or drawing	•	•
52	Dimensions	•	•
87	Quantity or number	•	•
90	Orientation and arrangement of inner packagings and articles	•	•
+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report
			Data are part of the component drawing, or, if necessary in manufacturer's specification sheets
empty = not applicable			

Table D.3 — Fittings of combination packaging and large packaging

No.	Specification detail	Removable fittings	Permanent fittings
1a	Description	•	•
27	Tare mass	+	
30	Material type	•	•
52	Dimensions	+	
87	Quantity or number	•	•
88	Location(s)		•
89	Means of fixing to packaging		•
+	Required in specification checks. (Data in component drawing (reference value) has to be compared with actual (measured) value, if applicable)	•	Data shall be mentioned in test report
			Data are part of the component drawing, or, if necessary in manufacturer's specification sheets
empty = not applicable			

Annex E
(informative)

Type of contents

The substances packed in packaging include free-flowing liquids, pastes, viscous substances, powders and granules. The choice of tests for any packaging depends crucially on whether the design type is to be tested for liquids or solids. There is, however, no simple, absolute and natural distinction between the two. Moreover, some substances which are solids at say 20 °C becomes liquid at 55 °C which is the reference temperature for that which may be experienced in transport. General guidance on whether a design type should be tested for liquids or solids is provided in a) of this note with specific advice on substances which may become liquid during a journey in b) and on phlegmatized substances in c).

a) The UN Recommendations and the international agreements contain definitions making the distinction between liquids and solids from measurements of specific melting point or by penetrometer testing. Such measurements are rarely necessary in relation to packaging testing which may be carried out in a facility not equipped to make such measurements. In most instances there should be little difficulty in choosing between testing for liquid or for solid contents. In many instances a packaging should be designed for liquids and tested using water as contents without reference to any specific dangerous liquid to be carried. Similarly, a packaging should be designed for solids and tested using, for example, a mixture of plastics granules and fine powder without reference to any specific dangerous solid to be carried. In such circumstances it is appropriate for each user of the packaging to check that the testing has been suitable for the dangerous substance. In other instances, however, the design type tests for a packaging should be undertaken in relation to a specific dangerous substance. If that substance should be borderline between a liquid and a solid, then it is recommended that the appropriate data on it should be obtained before tests are selected and commenced.

b) Packaging being tested for solids which are likely to melt during the intended journey should be tested as for liquids.

c) Packaging being tested for solids which require phlegmatizing with a liquid for safe transport, such that there is free liquid in the packaging, should be subjected to the appropriate tests for liquids with the test contents being a representative mixture of solids and liquids.

Annex F
(informative)

Drop test

F.1 Applicability

This is for all types of packaging, IBCs and large packaging.

F.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

The elapsed time between the removal of the packaging/IBC/large packaging from conditioning and performance of the test shall be kept as short as possible and in any event not more than 5 min.

NOTE Conditioning can be carried out immediately before, or after filling the package with the test contents provided that such a procedure would not affect the test results.

For the cold drop test, the temperature of the test sample contents shall be taken immediately after the test.

Non-plastics packagings (such as fibreboard or metal packagings) with plastics closures are not required to undergo the cold drop test.

Packagings made of materials not specifically requiring a cold drop test may be considered for this test when the closures are made of plastics and greater than 7 cm.

F.3 Test method

F.3.1 General

The tests shall be carried out in accordance with ISO 2248:1985, except for 7.2, the drop heights, drop attitude and number of samples to be tested shall be determined from the UN Recommendations. For drops performed on packaging other than flat drops, the centre of gravity shall be vertically over the point of impact.

Prior to carrying out the test, ensure that the drop area is clean and dry.

ISO 2248:1985, 4.4, does not apply. Impact surfaces shall be in accordance with the UN Recommendations.

NOTE For packaging, a suitable impact surface can have a mass at least 50 times the mass of the test item and have a maximum length of 5 times of its thickness. This note does not apply to IBCs or large packaging.

F.3.2 Information drops for packaging

To assess the weakest point, information drops may be performed. Where such investigation drops are undertaken they may be done with packaging already used in other tests. Each packaging shall strike the target in an orientation designed to investigate the weakest part. The orientations to be taken into account vary with designs. Information drops should be used to seek an alternative orientation where the design is not a common design.

NOTE 1 Failure in an information drop does not constitute failure of the design type test.

NOTE 2 When packaging is available there is no objection to information drops being carried out on other packaging other than those used for the first drop.

NOTE 3 When packaging under test is of a new or significantly modified design, more than three investigatory drops can be conducted.

NOTE 4 The drop can take place on an area of the packaging not already tested.

NOTE 5 Where information drops have been undertaken they can be reported in the test records.

F.3.3 Corrections to the drop height for packaging/large packaging with inner packaging containing liquids of different densities

Where the inner packaging contains liquid substances of various densities, the drop test shall be based on the most severe packing group (of the liquid substances to be transported) and the average density.

The average density shall be calculated by multiplying the filling volume of each inner packaging by the relative density of the contents to be transported in that packaging and aggregating the results. The correction for density should be applied using the aggregate result in accordance with UN Recommendations.

F.4 Method of assessment

F.4.1 General

Following each drop, there shall be an assessment of the result. Single packaging/IBC containing liquids or solids shall be assessed according to procedures in F.4.2 and combination packaging, packaging containing articles or large packaging shall be assessed according to F.4.3.

F.4.2 Single packaging/IBC for liquids or solids

Observation should be made at the time of impact for discharge. If such a discharge is observed it shall be recorded in the test report. The packaging/IBC shall be visually examined for leakage and rupture. Any packaging/IBC containing liquids shall have the internal pressure equalized with the atmospheric pressure, normally by loosening/retightening a closure, or by making a small hole in the body or end of the packaging/IBC. Impacted closures or closures suspected of leaking during the drop shall not be disturbed. When there is only one closure and it is suspected of leakage, pressure equalization shall be achieved by making a small hole in the body or end of the packaging/IBC. If there is dampness in the dropping area the packaging/IBC may be moved carefully to a suitable place and maintained in the same orientation for examination of any leakage which may occur (e.g. moved so that it is on a surface such as clean fibreboard where drips should be apparent). Examination shall start after equalization and last up to 5 min. Where a packaging/IBC for solids undergoes a drop test, the packaging/IBC shall pass the test if the entire contents are retained by an inner receptacle (e.g. a plastic bag), even if the closure is no longer sift proof. Where a packaging/IBC undergoes a cold drop test, immediately after dropping the first specimen the temperature of the packaging/IBC and/or its contents shall be checked and recorded in the test report. Subsequent packaging shall not need the temperature checked unless the first sample had not achieved the required temperature.

F.4.3 Combination packaging and large packaging

Observation should be made at the time of impact for discharge.

NOTE 1 For inner packaging or articles, discharge can appear as dampness in the drop test area, or on the outer packaging (e.g. a stain).

NOTE 2 For inner packaging or articles containing solids discharge can appear as loose solid in the drop test area or within the outer packaging.

The combination packaging/large packaging shall be visually examined for leakage and rupture, such as escapes of the inner packaging/articles. Where a combination packaging/large packaging containing

inner packaging or articles undergoes a drop test, the combination packaging/large packaging shall pass the test if the entire contents are retained by the inner packaging or inner receptacle (e.g. plastic bag) even if the closure is no longer sift proof. If there is dampness in the dropping area, the combination packaging/large packaging shall be moved carefully to a suitable place for examination of any leakage that may occur (e.g. moved so that it is on a surface such as clean fibreboard where drips should be apparent). Examination shall last up to 5 min. Where a combination packaging/large packaging undergoes a cold drop test, immediately after dropping the first combination packaging/ large packaging, the temperature of the package and/or its contents shall be checked and recorded in the test report. Subsequent packaging does not need the temperature checked unless the first sample had not achieved the required temperature.

Annex G
(informative)

Leakproofness test

G.1 Applicability

The leakproofness test is designed for:

— all types of packaging intended to contain liquids, except the inner packaging of combination packaging and large packagings;

— all types of IBCs intended to contain liquids;

— all types of IBCs intended to contain solids filled or discharged by pressure.

G.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

The method of making pressure connections shall not affect the results of the test e.g. a connection through a closure shall not reinforce that part of the packaging or IBC. There are two methods as follows:

a) Drill two holes into each packaging or IBC. One hole shall be used to connect the packaging or IBC to an adequate air supply, the second hole shall be used to connect a pressure gauge reading the test pressure in the packaging or IBC; or

b) Drill one hole into each packaging or IBC. The gauge shall be connected to the air supply line between the source of the air supply and the packaging or IBC and as near as possible to the packaging or IBC; the gauge shall only be read under no flow conditions.

It shall be ensured that the gauge is pressurized and that the supply line to the gauge is not blocked.

NOTE In some cases an existing connection in a closure (e.g. a valve in an IBC) can be used for making the pressure connection.

Each packaging or IBC shall be closed according to any special instructions. When relevant, closures shall be tightened to the appropriate torque.

Vented closures shall be replaced with non-vented closures of the same specification or the vent shall be sealed. Pressure relief devices shall be removed and their apertures plugged, or shall be rendered inoperative.

The test shall be carried out on the complete packaging or IBC and before the fitting of any thermal insulation equipment.

For composite packaging or IBCs, any leakage from the inner receptacle shall be allowed to escape through the outer packaging or casing, e.g. by drilling a hole in the outer. In this case it is possible that entrapped air escapes, before any leakage can be detected.

Alternatively, for composite packaging and IBCs, the inner receptacle may be tested without the outer packaging, provided the test results are not affected. When the test is carried out on the inner receptacle in this way, this fact shall be recorded in the test report.

G.3 Test method

Each packaging or IBC shall be placed in a tank of water and shall be restrained just below the surface (the method of restraint shall not affect the test results). Air shall be applied continuously and gradually up to the required pressure, which shall remain at or slightly above the predetermined level for the required period of time.

In order to take account of the hydrostatic test pressure, the packaging shall be turned regularly or the internal pressure increased to account for hydrostatic pressure.

NOTE Where turning is the desired option, turning is not necessary when the hydraulic pressure due to immersion, is negligible. Taking into account a maximum measurement tolerance of 3 %, which corresponds to 0,6 kPa (at 20 kPa overpressure), the maximum total depth of water, after immersion, for which turning is not required, would be 60 mm.

Alternatively, a correction factor shall be applied to the test pressure as illustrated in the following example:

EXAMPLE After immersion, if the lowest part of the test item is 2,5 m below the surface of the water then the test pressure is increased with the hydrostatic pressure, which is 25 kPa.

For packagings or IBCs, alternatively to placing the IBC in a tank of water, the seams and joints are covered with a suitable soap solution. It is also possible to surround part of the IBC with water (e.g. the bottom valve). Other alternative methods may also be acceptable.

When using this method, it is desirable to take special care with closures and the connection between the closures and the IBC.

G.4 Method of assessment

Observation should be made for the escape of air bubbles throughout the test.

Air bubbles considered to arise from entrapped air (e.g. air held initially in seams or in the thread of closures) cannot be considered as leakage: these include any bubbles which do not appear regularly or produced at intervals exceeding 1 min. If necessary, the test period should be extended to allow entrapped air to be expelled.

Annex H
(informative)

Hydraulic pressure test

H.1 Applicability

The hydraulic pressure test is designed for:

— all types of metal, plastics and composite packaging intended to contain liquids except inner packaging of combination packaging and large packagings;

— all types of metal, plastics and composite IBCs used for liquids;

— all types of metal, plastics and composite IBCs used for solids filled or discharged under pressure.

H.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4 of this document.

Each packaging or IBC shall be completely filled with water and shall be closed according to any special instructions when relevant. Closures shall be tightened to the appropriate torque.

The method of making pressure connections shall not affect the results of the test e.g. a connection through a closure shall not reinforce that part of the packaging or IBC. The method to follow is:

— Drill two holes into each packaging or IBC. One hole shall be used to connect the packaging or IBC to an adequate water supply, the second hole shall be used to connect a pressure gauge reading the test pressure in the packaging or IBC.

There may be problems drilling two holes into one packaging, for example, for packaging with small capacity (e.g. 100 ml bottles) or due to the packaging material (e.g. composite packaging with glass inner receptacle). In these cases, one hole per packaging would be sufficient to perform the test properly.

It shall be ensured that the gauge is pressurized and that the supply line to the gauge is not blocked.

NOTE 1 In some cases an existing connection in a closure (e.g. a valve in an IBC) can be used for making the pressure connection.

Vented closures shall be replaced with non-vented closures of the same specification or the vent shall be sealed. Pressure relief devices shall be removed and their apertures plugged, or shall be rendered inoperative

NOTE 2 Steps can be taken to ensure that no air (or other gas) remains inside the packaging above the level of the closure by, for example, tilting the packaging when filling.

The test with IBCs shall be carried out before the fitting of any thermal insulation material.

H.3 Test method

The packaging and IBCs shall be pressurized continuously and gradually up to the required test pressure with water.

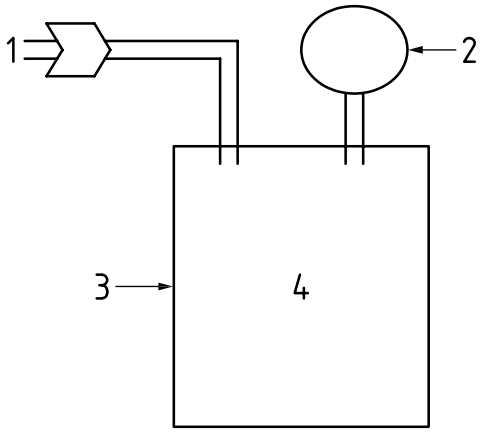
NOTE For packaging this can be done within the time of not less than 2 min and not more than 15 min. For IBCs this can be done within the time of not less than 5 min and not more than 30 min.

Figure H.1 provides a schematic representation of the test arrangements.

The test pressure in the packaging or IBCs shall be held continuously and evenly for the appropriate required test period, depending on the type of packaging and IBC. The test pressure in the packaging or IBCs shall remain at or slightly above the required level.

The manner in which packaging are supported shall not invalidate the test.

The IBCs shall not be mechanically restrained during the test.



Key

1 water feed
2 pressure sensor
3 packaging
4 water

Figure H.1 — Schematic representation of the test arrangement

H.4 Test conditions for all plastics packaging and plastics IBCs, including all composite packaging and composite IBCs with inner plastics receptacles

The temperature of the water shall be a minimum of 12 °C.

The conditions of the test shall be recorded in the test report (applied pressure and water temperature).

H.5 Method of assessment

Observation should be made throughout the test for any leakage of water.

NOTE Water drops originating from water held initially in seams in the thread or in gaskets cannot be considered as leakage – as a guide not more than one drop of water every 2 min.

Annex I
(informative)

Stacking test

I.1 Applicability

The stacking test is designed for all types of packaging except for bags, and IBCs and large packaging intended for stacking during transport.

I.2 Sample preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

NOTE For fibreboard packagings the stack test can be conducted in a conditioned environment meeting the UN Recommendations.

I.3 Calculation of the stacking load for packaging

I.3.1 General

In the following calculations, where the design type has an interstacking feature, an allowance shall be made. This usually takes the form of a small reduction in effective packaging height.

I.3.2 Solids, articles, or liquids to be transported

Where the contents are solids, articles, or the liquid to be transported, the stacking load to be superimposed on each packaging shall be calculated as given by Formula (I.1):

$$m_1 = \left(\frac{H}{h} - 1 \right) \cdot m_{\mathrm{p,f,c}} \qquad \text{(I.1)}$$

where

m_1 is the stacking load in kilograms (kg) (with closure included; see NOTE);

$m_{\mathrm{p,f,c}}$ is the mass in kilograms (kg) of the complete, filled and closed packaging as prepared for transport;

H is the relevant stack height in millimetres (mm);

h is the overall height in millimetres (mm) of packaging to be tested, allowing for any inter-stacking features.

NOTE Newtons can be used as a unit of force.

I.3.3 Other liquids

Where any other liquid is used as test contents, the stacking load to be superimposed on each packaging shall be calculated from the following:

$$m_1 = \left(\frac{H}{h} - 1 \right) \cdot \left(V \cdot d \cdot n + m_e \right)$$

where

m_1 is the stacking load in kilograms (kg) (see NOTE);

H is the relevant stack height in millimetres (mm);

h is the overall height of the packaging in millimetres (mm), allowing for any interstacking features;

V is the volume of water in litres (l) required to occupy 98 % of the capacity where the packaging is brimful or, for a combination packaging, 98 % of the capacity of one inner packaging that is brimful;

d is the relative density of the substance to be transported;

m_e is the mass in kilograms (kg) of the empty packaging (including its closures) or, for a combination packaging, the mass of all the components of one package, including any empty inner packaging (see Reference [4]);

n is the one or pieces of inner packaging (combination packaging only).

NOTE Newtons can be used as a unit of force.

I.4 Test method

I.4.1 Test methods for packaging

I.4.1.1 General

Any one of three methods shall be used by agreement between the test laboratory and the client:

a) a guided load on packaging(s);

b) an unguided load on an individual packaging;

c) an unguided load on three packagings forming one layer.

NOTE 1 Where b) or c) has been followed and the packaging did not pass the stacking test, the guided load can be used, and if it passes this test, then the result can be valid.

NOTE 2 Where the packaging has an interstacking feature, the stack loading can be applied using a reproduction of the packaging base shape as the lowest component of the stack.

The method used shall be stated in the test report.

I.4.1.2 Guided load on packaging(s)

A suitable guided load rig shall be used. Such a rig shall take the form of:

— a conventional compression testing machine with the facility of maintaining a constant load (as calculated in I.3) for the required period,

NOTE Such equipment can have short-term fluctuations of ±4 % in accordance with ISO 12048.

— a purpose-made rig, e.g. two frameworks with the upper framework being free to move vertically and with a minimum of friction in relation to the lower framework and to take the appropriate load.

For each test, the upper framework shall be loaded so that its total mass is as calculated in I.3. Except where the interstacking design is taken into account, the load shall be applied via a rigid top plate extending beyond the outermost edges of the pieces of packaging.

I.4.1.3 Unguided load on an individual packaging

The packaging shall be placed on a firm level surface. The predetermined load calculated in accordance with I.3 shall be placed centrally on the top for the period of time as required for the particular packaging type.

The load shall typically be made out of concrete or steel masses. Except where the interstacking design is taken into account, the load shall be applied via a rigid top plate extending beyond the outermost edges of the pieces of packaging.

The load shall be free to move when and if the packaging collapses.

NOTE For safety reasons, however, the load can have restricted movement, e.g. suspended by chains from overhead, but with sufficient slack in the chains not to affect the integrity of the test. Measurements of the deflection and angle of the plate with the horizontal level are normally made:

a) immediately before and after placing the load on the plate,

b) where appropriate, at intervals throughout the duration of the test, and

c) on completion of the test.

I.4.1.4 Unguided load on three packaging forming one layer

The packaging shall be placed in the same direction on a firm level surface as illustrated in Figure I.1.

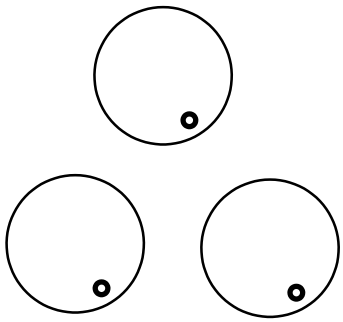


Figure I.1 — Plan view of drums stacked

The spacing between the packaging shall be as close as possible but separated to ensure that they cannot come into contact with one another when deformed.

A steel plate shall be placed over the pieces of packaging and its position shall be carefully checked. The load consists of the plate and suitable masses evenly distributed on it. The load shall have a mass three times as big as that calculated in I.3 for one packaging ($m_1 \times 3$). Except where the interstacking design is taken into account, the load shall be applied via a rigid top plate extending beyond the outermost edges of the pieces of packaging.

NOTE Measurements of the deflection and angle of the plate with the horizontal level can be made

a) immediately before and after placing the load on the plate,

b) where appropriate, at intervals throughout the duration of the test, and

c) on completion of the test.

I.4.2 Test methods for large packaging and IBC

The IBC/large packaging shall be placed on its base on level hard ground and subjected to a uniformly distributed superimposed load. It is presupposed that the test load is calculated in accordance with the relevant regulations.

The test load shall be applied by any one of the following methods:

a) a number of samples of IBCs/large packaging of the same type;

b) appropriate weights loaded onto either a flat plate or a reproduction of the base of the IBC/large packaging, which is stacked on the IBC/large packaging being tested;

c) an appropriate compression test machine.

I.5 Method of assessment

Observation should be made for leakage and deformation of packaging, inner packaging, large packaging and IBCs (excluding flexible IBCs).

Observation should be made for deterioration of the body and leakage of flexible IBCs.

A suitable method for guided loads is as follows. The packagings are removed from the stack rig. For stackable packaging, two filled of the same type should be placed centrally on the tested packaging. For not individually stackable packaging the stacked samples may be arranged as Figure I.1 on which two identical layers are placed on top using intermediate plates of suitable material. In both cases the packaging should maintain their position for one hour.

Where unguided loads have been used, this may be assessed by the angle of the top plate Anan angle of 5° or more may be considered to show significant deformation. The 5° criterion has been found to accord with the UN requirements in relation to stack stability.

Annex J
(informative)

Water spray test

J.1 Applicability

The water spray test is designed for all types of outer fibreboard packaging intended to contain dangerous goods of division 6.2 infectious substance - Category A (UN2814 and UN2900).

NOTE It can also be used for packaging of Biological Substances of Category B (UN3373).

It is done to pre-condition a packaging prior the drop tests to investigate reduction in strength caused by exposure to water as a part of a test sequence.

J.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

J.3 Test method

The test shall be carried out in accordance with ISO 2875 or another suitable method.

Test area conditions shall be in accordance with ISO 2875:2000, Clause 5, method A (continuous spraying).

The procedure of ISO 2875:2000, 7.1, shall be followed except that 7.1.4 shall read as follows:

The time taken for the first overflow shall not exceed that represented by a rate of 60 mm/h; that of the last shall not be less than that represented by 40 mm/h.

The sprays shall be turned on and shall simulate exposure to rainfall as specified in the requirements with a tolerance of ±20 %.

NOTE 1 When using rain gauges they can have a minimum capacity of 60 mm/h with a minimum accuracy of 5 mm/h.

NOTE 2 The following conversion rate applies: 1 mm/h = 1 l/(m^2·h).

J.4 Method of assessment

Not applicable.

Annex K
(informative)

Bottom lift test

K.1 Applicability

The bottom lift test is designed for:

— all types of fibreboard and wooden IBCs;

— all types of IBCs and large packaging which are fitted with means of lifting from the base.

K.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

K.3 Test method

The IBC or large packaging shall be raised and lowered using the equipment specified and employed in the prescribed manner. The number and direction of the tests shall be as prescribed.

Failure, when it occurs, often takes place during the initial acceleration of a lift. Neither the height nor the rate of elevating is specified. It is normally adequate (taking safety into account) to raise the IBC for a distance of at least 200 mm. A convenient rate of lifting results in a 200 mm lift being completed in between 5 s and 10 s. It is recommended that, after the final test, the IBC should then be lowered, the forks placed fully underneath it and the IBC lifted to a convenient height for examination of the base.

When a design of rectangular pallet can be entered from each of four sides the test should be undertaken from all sides.

K.4 Method of assessment

Observation should be made for deformation and loss of contents.

Annex L
(informative)

Top lift test

L.1 Applicability

The top lift test is designed for:

— all types of IBCs designed to be lifted from the top;

— all types of large packaging fitted with means of lifting from the top;

— all types of flexible IBCs designed to be lifted from the top or the side.

L.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

As an example, a flexible intermediate bulk container (FIBC) 1,2 m × 0,9 m × 0,9 m is designed to transport 1 000 kg of fine granules. For testing purposes, the FIBC is filled with 6 000 kg of test contents. Using 1 mm diameter lead shot with a bulk density of 7,6 g/cm^3 and 3 mm diameter polyethylene granules with a bulk density of 0,54 g/cm^3, an 80/20 mixture is required as test contents to give the correct load.

L.3 Test method

The duration of the test time and the number of lifts shall be as determined by the UN Recommendations.

When equivalence can be demonstrated from previous tests on IBCs of similar design, the approval of the competent authority, the test on rigid plastics and composite IBCs may be reduced. When reduced testing is permitted it shall be recorded in the test report.

NOTE An equivalent method for FIBCs can be found in ISO 21898.

L.4 Method of assessment

Observation should be made for deformation or loss of content of the IBC or large packaging, including any base pallet.

In addition, for FIBCs observation should be made for damage to its lifting devices.

Annex M
(informative)

Tear test

M.1 Applicability

The tear test is for all types of flexible intermediate bulk containers (FIBCs).

M.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

M.3 Test method

The test sample shall be tested as determined by the UN Recommendations.

M.4 Method of assessment

Observation should be made for propagation of the cut.

Annex N
(informative)

Topple test

N.1 Applicability

This test is for all types of flexible intermediate bulk containers (FIBCs).

N.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

N.3 Test method

N.3.1 Impact surface

The topple area impact surface shall be horizontal and flat, massive enough to be immovable and rigid enough to be non-deformable under test conditions and sufficiently large to ensure that the test IBC falls entirely upon the surface.

N.3.2 Topple test height

Test height shall be as prescribed in the UN Recommendations.

N.3.3 Procedure

The FIBC is placed on a flat surface from which it shall be caused to topple in accordance with the UN Recommendations.

During the topple test, the FIBC may not pass the rotating edge which is at a height above the impact surface corresponding to the topple height. External forces applied during the topple test may not deform the FIBC.

N.4 Method of assessment

Observation should be made for loss of contents including any discharge from closures or stitch holes, upon impact.

Annex O
(informative)

Righting test

O.1 Applicability

The righting test is for all types of flexible intermediate bulk containers (FIBCs) that are designed to be lifted from the top or the side.

O.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

NOTE The test starts with the FIBC on its side and is often done immediately following the topple test.

O.3 Test method

The test sample shall be righted as determined by the UN Recommendations.

The top lift device(s) uppermost and most accessible shall be used.

O.4 Method of assessment

Observation should be made for damage to the lifting devices.

Annex P
(informative)

Puncture test

P.1 Applicability

This puncture test is designed for all types of packagings intended to be used for the carriage of dangerous goods of division 6.2: infectious substances of Category A (UN2814 and UN2900).

P.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

P.3 Test method

Packaging parts intended to be tested shall be identified in accordance with ISO 2206 and recorded in the test report.

The test shall be carried out according to the UN Recommendations.

In the case of packagings with a gross mass of 7 kg or less, a guide for the cylindrical steel rod may be used with the minimum of friction to impact the primary receptacle (on the appropriate part on the packaging).

P.4 Method of assessment

Observation shall be made after each impact for any leakage from the primary receptacle(s).

Annex Q
(informative)

Vibration test

Q.1 Applicability

The vibration test is designed for all types of IBC intended to be used for the transport of dangerous goods liquids.

Q.2 Preparation

Samples for this test shall be prepared in accordance with the UN Recommendations and the relevant parts of Clause 4.

Q.3 Test method

The test shall be carried out according to the UN Recommendations.

NOTE ISO 2247, can be used as reference.

The desired vibration amplitude should be selected and the vibration started at a frequency of 2 Hz and slowly increased until the package separates repeatedly from the vibration table. That frequency shall be recorded in the test report. Any resonance shall be avoided by slightly changing the set frequency.

Q.4 Method of assessment

Observation shall be made throughout the test for any rupture or leakage of water from the IBC.

Bibliography

[1] ISO 2247, *Packaging — Complete, filled transport packages and unit loads — Vibration tests at fixed low frequency*

[2] ISO 12048, *Packaging — Complete, filled transport packages — Compression and stacking tests using a compression tester*

[3] ISO 21898, *Packaging — Flexible intermediate bulk containers (FIBCs) for non-dangerous goods*

[4] European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), as amended, Geneva, 30 September 1957

[5] Regulations concerning the International Carriage of Dangerous Goods by Rail (RID), appearing as Appendix C to the Convention concerning International Carriage by Rail (COTIF), as amended, Vilnius, 3 June 1999

[6] International Maritime Dangerous Goods Code (IMDG- Code), as amended, London International Maritime Organization

[7] Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO), as amended, Montreal International Civil Aviation Organization

[8] Directive 2008/68/EC of the European Parliament and of the Council of 24 September 2008 on the inland transport of dangerous goods, as amended

(*Continued from second cover*)

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights. The Bureau of Indian Standards shall not be held responsible for identifying any or all such patent rights.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: TED 24 (23275).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Manakalya, 4th Floor, NTH Complex (W Sector), F-10, MIDC, Andheri (East), Mumbai 400093	283 25838

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYANA (CHANDIGARH), HUBLI, HYDERABAD, JAIPUR, JAMMU, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi