

**SPECIFICATIONS FOR  
INTERMEDIATE BULK CONTAINERS  
FOR THE TRANSPORT OF DANGEROUS GOODS**

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Prepared by the Advisory Committee on the Transport of Dangerous Goods

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## TABLE OF CONTENTS

Section	Title	Page
<b>1.0</b>	<b>PREAMBLE</b>	<b>1</b>
<b>2.0</b>	<b>GENERAL REQUIREMENTS APPLICABLE TO ALL TYPES OF IBCs</b>	<b>3</b>
2.1	Definitions	3
2.2	Categories of IBCs	3
2.3	Designatory Code System for IBCs	4
2.4	Construction requirements	6
2.5	General provisions for the use of IBCs	7
2.6	Testing, certification and inspection	8
<b>3.0</b>	<b>MARKING</b>	<b>11</b>
3.1	Marking	11
3.2	Additional marking	12
3.3	Conformity to design type	13
<b>4.0</b>	<b>SPECIFIC REQUIREMENTS FOR INTERMEDIATE BULK CONTAINERS</b>	<b>15</b>
4.1	Specific requirements for metal IBCs	15
4.2	Specific requirements for flexible IBCs	16
4.3	Specific requirements for rigid plastics IBCs	18
4.4	Specific requirements for composite IBCs with plastic inner receptacles	18
4.5	Specific requirements for fibreboard IBCs	21
4.6	Specific requirements for wooden IBCs	22
<b>5.0</b>	<b>TEST REQUIREMENTS FOR INTERMEDIATE BULK CONTAINERS</b>	<b>25</b>
5.1	Performance and frequency of tests	25
5.2	Design type tests	25
5.3	Preparation of IBCs for testing	26
5.4	Bottom lift test	27
5.5	Top lift test	27
5.6	Stacking test	28
5.7	Leakproofness test	29
5.8	Hydraulic pressure test	29
5.9	Drop test	31
5.10	Tear test	32
5.11	Topple test	33
5.12	Righting test	33
5.13	Test report	34
5.14	Initial and periodic testing of individual metal, rigid plastics and composite IBCs.	34

**SECTION 1      PREAMBLE**

- 1.1 These Specifications for Intermediate Bulk Containers (IBCS) have been prepared by the Competent Authorities Sub-committee of the Advisory Committee on the Transport of Dangerous Goods and reflect the Recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods. These Specifications may be reviewed in light of future United Nations recommendations or national / international requirements.
- 1.2 The requirements in this supplement apply to IBCs intended for the transport of certain dangerous goods. The provisions set out general requirements for multimodal transport and do not establish special requirements that may be required for a particular mode.
- 1.3 The Competent Authority may restrict the use of IBCs meeting these Specifications to certain specified dangerous goods, or specified classes of dangerous goods.
- 1.4 Exceptionally, IBCs and their service equipment not conforming strictly to the requirements herein, but having acceptable alternatives, may be considered by the competent authority for approval. In addition, in order to take into account progress in science and technology, the use of alternative arrangements which offer at least equivalent safety in use in respect of compatibility with the properties of the substances carried and equivalent or superior resistance to impact, loading and fire, may be considered by the competent authority.
- 1.5 IBCs constructed in accordance with this specification will be accepted for the transport of dangerous goods in Australia. Type approval will be required for each new design of an IBC. This may be obtained by application to one of the listed Competent Authorities. Each application shall be supported by test results, specifications and drawings of the proposed IBC. The design type tests shall be performed:
- a) by a testing laboratory registered by the National Association of Testing Authorities (NATA) for the relevant packaging tests and the results reported on a NATA endorsed certificate;
  - b) by a testing laboratory located overseas and recognised by the Competent Authority;  
or
  - c) where no such laboratory is available, by any other testing facility, provided the tests are witnessed by a representative from the Competent Authority.
- 1.6 The use of IBCs to transport dangerous goods in Australia must be in accordance with this specification, the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (ADG Code) and any other legislative requirements.
- 1.7 Imported IBCs which comply to UN Specifications will be deemed approved in Australia if operated in accordance with the procedures of the Australian Code for the Transport of Dangerous Goods by Road Rail (ADG Code) and any other legislative requirements.

## SECTION 2 GENERAL REQUIREMENTS APPLICABLE TO ALL TYPES OF IBCs

### 2.1 Definitions

**Body:** (for all categories of IBCs other than composite IBCs) means the receptacle proper, including openings and their closures, but does not include service equipment.

**Handling device:** (for flexible IBCs) means any sling, loop, eye or frame attached to the body of the IBC or formed from a continuation of the IBC body material.

**Liner:** (for flexible, fibreboard and wooden IBCs) means a separate tube or bag inserted in the body but not forming an integral part of it, including the closures of its openings.

**Maximum permissible gross mass:** (for all categories of IBCs other than flexible IBCs) means the mass of the IBC and its service equipment and structural equipment and the maximum permissible load.

**Maximum permissible load:** for flexible IBCs, means the maximum net mass for which the IBC is intended to be used and which it is authorised to carry.

**Plastics:** when used in connection with inner receptacles for composite IBCs, is taken to include other polymeric materials such as rubber, etc.

**Protected:** (for metal IBCs) means being provided with additional protection against impact, the protection taking the form of, for example, a multi-layer (sandwich) or double wall construction or a frame with a metal lattice-work casing.

**Service equipment:** means filling and discharge devices and, according to the category of IBC, pressure relief or venting, safety, heating and heat-insulating devices and measuring instruments.

**Structural equipment:** (for all categories of IBCs other than flexible IBCs) means the reinforcing, fastening, handling, protective or stabilising members of the body, including the base pallet for composite IBCs with plastics inner receptacle, fibreboard and wooden IBCs.

**Woven plastics:** (for flexible IBCs) means a material made from stretched tapes or monofilaments of a suitable plastics material.

### 2.2 Categories of IBCs

**Metal IBCs** consist of a metal body together with appropriate service and structural equipment.

**Flexible IBCs** consist of a body constituted of film, woven fabric or any other flexible material or combinations thereof, and if necessary an inner coating or liner, together with any appropriate service equipment and handling devices.

**Rigid plastics IBCs** consist of a rigid plastics body, which may have structural equipment together with appropriate service equipment.

**Composite IBCs** consist of structural equipment in the form of a rigid outer casing enclosing a plastics inner receptacle together with any service or other structural equipment. They are so constructed that the inner receptacle and outer casing once assembled form, and are used as, an integrated single unit to be filled, stored, transported or emptied as such.

**Fibreboard IBCs** consist of a fibreboard body with or without separate top and bottom caps, if necessary an inner liner (but no inner packagings), appropriate service and structural equipment.

**Wooden IBCs** consist of a rigid or collapsible wooden body together with an inner liner (but no inner packagings) and appropriate service and structural equipment.

## 2.3 Designatory Code System for IBCs

2.3.1 The code shall consist of two Arabic numerals as specified in (a); followed by a capital letter(s) specified in (b); followed, when specified in an individual section, by an Arabic numeral indicating the category of IBC.

(a)

Type	For solids, discharged		For liquids
	by gravity	under pressure of more than 10 kPa (0.1 bar)	
Rigid	11	21	31
Flexible	13	-	-

(b)

- A. Steel (all types and surface treatments)
- B. Aluminium
- C. Natural wood
- D. Plywood
- F. Reconstituted wood
- G. Fibreboard
- H. Plastics material
- L. Textile
- M. Paper, multiwall
- N. Metal (other than steel or aluminium).

2.3.2 For composite IBCs, two capital letters in Latin characters shall be used in sequence in the second position of the code. The first shall indicate the material of the inner receptacle of the IBC and the second that of the outer packaging of the IBC.

### 2.3.3 The following types and codes of IBC are assigned:

<b>Material</b>	<b>Category</b>	<b>Code</b>	<b>Paragraph</b>
<b><u>Metal</u></b>			
A. Steel	for solids, loaded or discharged by gravity for solids, loaded or discharged under pressure for liquids	11A 21A 31A	4.1
B. Aluminium	for solids, loaded or discharged by gravity for solids, loaded or discharged under pressure for liquids	11B 21B 31B	
N. Other than steel or aluminium	for solids, loaded or discharged by gravity for solids, loaded or discharged under pressure for liquids	11N 21N 31N	
<b><u>Flexible</u></b>			
H. Plastics	woven plastics without coating or liner woven plastics, coated woven plastics with liner woven plastics, coated and with liner plastics film	13H1 13H2 13H3 13H4 13H5	4.2
L. Textile	without coating or liner coated with liner coated and with liner	13L1 13L2 13L3 13L4	
M. Paper	multiwall multiwall, water resistant	13M1 13M2	
H. <b><u>Rigid Plastics</u></b>	for solids, loaded or discharged by gravity, fitted with structural equipment for solids, loaded or discharged by gravity, freestanding for solids, loaded or discharged under pressure, fitted with structural equipment for solids, loaded or discharged under pressure, freestanding for liquids, fitted with structural equipment for liquids, freestanding	11H1 11H2 21H1 21H2 31H1 31H2	4.3
HZ. <b><u>Composite with plastic inner receptacle */</u></b>	for solids, loaded or discharged by gravity, with rigid plastics receptacle for solids, loaded or discharged by gravity, with flexible plastics receptacle for solids, loaded or discharged under pressure, with rigid plastics receptacle for solids, loaded or discharged under pressure, with flexible plastics receptacle for liquids, with rigid plastics receptacle for liquids, with flexible plastics receptacle	11HZ1 11HZ2 21HZ1 21HZ2 31HZ1 31HZ2	4.4
G. <b><u>Fibreboard</u></b>	for solids, loaded or discharged by gravity	11G	4.5
<b><u>Wooden</u></b>			
C. Natural wood	for solids, loaded or discharged by gravity with inner liner	11C	4.6
D. Plywood	for solids, loaded or discharged by gravity, with inner liner	11D	
F. Reconstituted wood	for solids, loaded or discharged by gravity, with inner liner	11F	

\*\_/ *The code shall be completed by replacing the letter Z by a capital letter in accordance with 2.3.1 (b) to indicate the nature of the material used for the outer casing.*

## **2.4 Construction requirements**

- 2.4.1** IBCs shall be resistant to or adequately protected from deterioration due to the external environment.
- 2.4.2** IBCs shall be so constructed and closed that none of the contents can escape under normal conditions of transport including the effect of vibration, or by changes in temperature, humidity or pressure.
- 2.4.3** IBCs and their closures shall be constructed of materials compatible with their contents, or be protected internally, so that they are not liable:
- (a)** to be attacked by the contents so as to make their use dangerous;
  - (b)** to cause the contents to react or decompose, or form harmful or dangerous compounds with the IBCs.
- 2.4.4** Gaskets, where used, shall be made of materials not subject to attack by the contents of the IBCs.
- 2.4.5** All service equipment shall be so positioned or protected as to minimise the risk of escape of the contents owing to damage during handling and transport.
- 2.4.6** IBCs, their attachments and their service and structural equipment shall be designed to withstand, without loss of contents, the internal pressure of the contents and the stresses of normal handling and transport. IBCs intended for stacking shall be designed for stacking. Any lifting or securing features of IBCs shall be of sufficient strength to withstand the normal conditions of handling and transport without gross distortion or failure and shall be so positioned that no undue stress is caused in any part of the IBC.
- 2.4.7** Where an IBC consists of a body within a framework it shall be so constructed that:
- (a)** the body does not chafe or rub against the framework so as to cause material damage to the body;
  - (b)** the body is retained within the framework at all times;
  - (c)** the items of equipment are fixed in such a way that they cannot be damaged if the connections between body and frame allow relative expansion or movement.
- 2.4.8** Where a bottom discharge valve is fitted, it shall be capable of being made secure in the closed position and the whole discharge system shall be suitably protected from damage. Valves having lever closures shall be able to be secured against accidental opening and the open or closed position shall be readily apparent. For IBCs containing liquids, a secondary means of sealing the discharge aperture shall also be provided, e.g. by a blank flange or equivalent device.
- 2.4.9** Each IBC shall be capable of passing the relevant performance tests.

## **2.5 General provisions for the use of IBCs**

- 2.5.1** Before being filled and handed over for transport, every IBC shall be inspected to ensure that it is free from corrosion, contamination or other damage and with regard to proper functioning of any service equipment. Any IBC which shows signs of reduced strength as compared with the tested design type shall no longer be used or shall be so repaired that it is able to withstand the design type tests.
- 2.5.2** When filling IBCs with liquids, sufficient ullage shall be left to ensure that at the mean bulk temperature of 50°C the IBC is not filled to more than 98% of its water capacity.
- 2.5.3** Where two or more closure systems are fitted in series, that nearest to the substance being carried shall be closed first.
- 2.5.4** During carriage, no dangerous residue may adhere to the outside of the IBC.
- 2.5.5** During carriage, IBCs shall be securely fastened to or contained within the transport unit so as to prevent lateral or longitudinal movement or impact, and so as to provide adequate external support.
- 2.5.6** An empty IBC that has contained a dangerous substance shall be treated in the same manner as is required by these Regulations for a filled IBC, unless adequate measures have been taken to nullify any hazard.
- 2.5.7** When IBCs are used for the transport of liquids with a flash point of 60.5°C (closed cup) or lower or of powders liable to dust explosion, measures shall be taken to prevent a dangerous electrostatic discharge.
- 2.5.8** IBCs used for solids which may become liquid at temperatures likely to be encountered during transport shall also be capable of containing the substance in the liquid state.
- 2.5.9** Every IBC intended to contain liquids shall successfully undergo a suitable leakproofness test, and be capable of meeting the appropriate level prescribed under 5.7 for the various types of IBCs.
- (a) before it is first used for transport,
- (b) after any repair, before it is reused for transport.

For this test the IBC need not have its closures fitted. The inner receptacle of composite IBCs may be tested without the outer packaging provided the test results are not affected.

- 2.5.10** The periodic testing and inspection requirements for IBCs are provided in 2.6.

### **2.5.11 Additional general provisions for the use of IBCs for substances of Division 5.2:**

- 2.5.11.1** To prevent explosive rupture of metal IBCs or composite IBCs with complete metal casing, the emergency devices shall be designed to vent all the decomposition products and vapours evolved during a period of not less than one hour of complete fire-engulfment (heat load 11 W/cm<sup>2</sup>)

## **2.5.12 Additional general provisions for the use of rigid plastics and composite IBCs for liquids:**

**2.5.12.1** For rigid plastics IBCs and composite IBCs with plastics inner receptacles, unless otherwise approved by the competent authority, the period of use permitted for transport of dangerous liquids shall be five years from the date of manufacture of the receptacle except where a shorter period of use is prescribed because of the nature of the liquid to be transported.

**2.5.12.2** For rigid plastics IBCs and composite IBCs with plastics inner receptacles, liquids shall be filled only into IBCs which have an appropriate resistance to internal pressure that may develop under normal conditions of transport. Such IBCs marked with the hydraulic test pressure prescribed in 3.2.1 shall be filled only with a liquid having a vapour pressure:

- (a) such that the total gauge pressure in the IBC (i.e. the vapour pressure of the filling substance plus the partial pressure of air or other inert gases, less 100 kPa) at 55°C, determined on the basis of a maximum degree of filling in accordance with 2.5.2 and a filling temperature of 15°C, will not exceed two-thirds of the marked test pressure; or
- (b) at 50°C less than four-sevenths of the sum of the marked test pressure plus 100 kPa; or
- (c) at 55°C less than two-thirds of the sum of the marked test pressure plus 100 kPa.

**2.5.12.3** IBCs of type 31HZ2 shall be filled to at least 80% of the volume of the outer casing.

**2.5.12.4** In addition, IBCs of type 31HZ2 shall always be carried in closed transport units.

## **2.6 Testing, certification and inspection**

### **2.6.1** *Quality assurance:*

The IBCs shall be manufactured and tested under a quality assurance program which satisfies the competent authority, in order to ensure that each manufactured IBC meets the requirements of these specifications.

### **2.6.2** *Test requirements:*

IBCs shall be subject to design type tests and, if applicable, to initial and periodic tests in accordance with 5.14.

**2.6.3** *Certification:*

In respect of each design type of IBC a certificate and mark (as in Section 3 - Marking) shall be issued attesting that the design type including its equipment meets the test requirements.

**2.6.4** *Inspection:*

Every metal, rigid plastics and composite IBCs shall be inspected to the satisfaction of the competent authority

- (a) before it is put into service, and thereafter at intervals not exceeding five years, with regard to:
  - (i) conformity to design type including marking;
  - (ii) internal and external condition;
  - (iii) proper functioning of service equipment.

Thermal insulation, if any, need be removed only to the extent necessary for a proper examination of the body of the IBC.

- (b) at intervals of not more than two and a half years, with regard to:
  - (i) external condition;
  - (ii) proper functioning of service equipment.

Thermal insulation, if any, need be removed only to the extent necessary for a proper examination of the body of the IBC.

A report of each inspection shall be kept at least until the date of the next inspection.

**2.6.5** When the structure of an IBC is impaired as a result of impact (accident) or any other cause, it shall be repaired and then subjected to the full testing and inspection as set out in 5.14.3 and 2.6.4 (a).

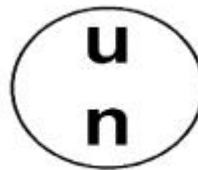
**2.6.6** The competent authority may at any time require proof, by tests in accordance with this supplement, that IBCs meet the requirements of the design type tests.

## SECTION 3      MARKING

### 3.1      Marking

3.1.1      *Primary marking.* Each IBC manufactured and intended for use according to these Regulations shall bear durable and legible markings showing:

(a)      The United Nations packaging symbol:








For metal IBCs on which the marking is stamped or embossed, the capital letters 'UN' may be applied instead of the symbol.

- (b)      The code designating the type of IBC according to 2.3.
- (c)      A capital letter designating the packing group(s) for which the design type has been approved:
- (i)      X for Packing Groups I, II and III (IBCs for solids only);
  - (ii)     Y for Packing Groups II and III;
  - (iii)    Z for Packing Group III only.
- (d)      The month and year (last two digits) of manufacture.
- (e)      The State authorising the allocation of the mark; indicated by the distinguishing sign for motor vehicles in international traffic.
- (f)      The name or symbol of the manufacturer and other identification of the IBC as specified by the competent authority.
- (g)      The stacking test load in kg. For IBCs not designed for stacking, the figure "0" shall be shown.
- (h)      The maximum permissible gross mass or, for flexible IBCs, the maximum permissible load, in kg.

The primary marking required above shall be applied in the sequence of the subparagraphs. The marking required by 3.2 and any further marking authorised by a competent authority shall still enable the parts of the mark to be correctly identified.

Examples of markings for various types of IBC in accordance with (a) to (h) above:

	11A/Y/02 97 AUS/XXX 007 5500/1500	For a metal IBC for solids discharged for instance by gravity and made from steel / for Packing Groups II and III/ manufactured in February 1997 / authorised by Australia / manufactured by XXX and of a design type to which the competent authority has allocated serial number 007 / the stacking test load in kg / the maximum permissible gross mass in kg
	13H3/Z/03.97 AUS/XXX 1713 0/1500	For a flexible IBC for solids discharged for instance by gravity and made from plastics with a liner/not designed to be stacked
	31H1/Y/04 97 AUS/XXX 10800/1200	For a rigid plastics IBC for liquids made from plastics with structural equipment withstanding the stack load
	31HA1/Y/05 97 AUS/XXX 1683 10800/1200	For a composite IBC for liquids with a rigid plastics inner receptacle and a steel outer casing
	11C/X/01 97 AUS/XXX 9876 3000/910	For a wooden IBC for solids with an inner liner and authorised for Packing Group 1 solids

### 3.2 Additional marking

3.2.1 Each IBC shall bear the markings required in 3.1.1 and, in addition, the following information which may appear on a corrosion-resistant plate permanently attached in a place readily accessible for inspection:

Additional marking	Category of IBC				
	Metal	Rigid Plastics	Composite	Fibreboard	Wooden
Capacity in litres */ at 20°C	X	X	X		
Tare mass in kg */	X	X	X	X	X
Test (gauge) pressure, in kPa or bar */ , if applicable		X	X		
Maximum loading / discharge pressure in kPa or bar */ , if applicable	X	X	X		
Body material and its minimum thickness in mm	X				
Date of last leakproofness test,	X	X	X		

Additional marking	Category of IBC				
	Metal	Rigid Plastics	Composite	Fibreboard	Wooden
if applicable (month and year)					
Date of last inspection (month and year)	X	X	X		
Serial number of the manufacturer	X				

*\*/ The unit used shall be indicated.*

- 3.2.2 In addition to the markings required in 3.1.1, flexible IBCs may bear a pictogram indicating recommended lifting methods.
- 3.2.3 The inner receptacle of composite IBCs shall be marked with at least the following information:
- (a) The name or symbol of the manufacturer and other identification of the IBC as specified by the competent authority as in 3.1.1 (f)
  - (b) The date of manufacture, as in 3.1.1 (d)
  - (c) The distinguishing sign of the State authorising the allocation of the mark, as in 3.1.1 (e).
- 3.2.4 Where the outer casing of composite IBCs can be dismantled, each of the detachable parts shall be marked with the month and year of manufacture and the name or symbol of the manufacturer and other identification of the IBC as specified by the competent authority (see 3.1.1 (f)).
- 3.3 Conformity to design type**
- 3.3.1 The marking indicates that IBCs correspond to a successfully tested design type and that the requirements referred to in the certificate have been met.

## SECTION 4      SPECIFIC REQUIREMENTS FOR INTERMEDIATE BULK CONTAINERS

### 4.1      Specific requirements for metal IBCs

4.1.1      These requirements apply to metal IBCs intended for the carriage of solids and liquids. There are three categories of metal IBCs:

- (a)      those for solids which are loaded or discharged by gravity (11A, 11B, 11N);
- (b)      those for solids which are loaded or discharged at a gauge pressure greater than 10 kPa (0.1 bar) (21A, 21B, 21N); and
- (c)      those for liquids (31A, 31B, 31N). IBCs intended for the carriage of liquids and being in accordance with these specifications shall not be used to carry liquids having a vapour pressure of more than 110 kPa (1.1 bar) at 50 °C or 130 kPa (1.3 bar) at 55 °C.

4.1.2      Bodies shall be made of suitable ductile metal in which the weldability has been fully demonstrated. Welds shall be skilfully made and afford complete safety. Low-temperature performance shall be taken into account when appropriate.

4.1.3      Care shall be taken to avoid damage by galvanic action due to the juxtaposition of dissimilar metals.

4.1.4      Aluminium IBCs intended for the carriage of flammable liquids shall have no movable parts, such as covers, closures, etc., made of unprotected steel liable to rust, which might cause a dangerous reaction by coming into frictional or percussive contact with the aluminium.

4.1.5      Metal IBCs shall be made of metals which meet the following requirements:

- (a)      for steel the elongation at fracture, in %, shall not be less than  $\frac{10000}{R_m} 1$  with an absolute minimum of 20 %;  
             where  $R_m$  = guaranteed minimum tensile strength of the steel to be used, in N/mm<sup>2</sup>;
- (b)      for aluminium the elongation at fracture, in %, shall not be less than  $\frac{10000}{6R_m} 2$  with an absolute minimum of 8 %.

Specimens used to determine the elongation at fracture shall be taken transversely to the direction of rolling and be so secured that:

$$L_0 = 5d \quad \text{or}$$

$$L_0 = 5.65 A$$

where:  $L_0$  = gauge length of the specimen before the test  
 $d$  = diameter  
 $A$  = cross-sectional area of test specimen.

#### 4.1.6 Minimum wall thickness:

- (a) for a reference steel having a product of  $R_m \times A_0 = 10,000$ , the wall thickness shall not be less than:

Capacity in m <sup>3</sup>	Wall thickness in mm			
	Types 11A, 11B, 11N		Types 21A, 21B, 21N, 31A, 31B, 31N	
	Unprotected	Protected	Unprotected	Protected
≤ 1.0	2.0	1.5	2.5	2.0
> 1.0 - 2.0	2.5	2.0	3.0	2.5
> 2.0 - 3.0	3.0	2.5	4.0	3.0

where:  $A_0$  = minimum elongation (as a percentage) of the reference steel to be used on fracture under tensile stress (see 4.1.5).

- (b) for metals other than the reference steel described in (a), the minimum wall thickness is given by the following equivalence formula:

$$e_1 = \frac{21.4 \times e_0}{\sqrt[3]{R_{m1} A_1}}$$

where:  $e_1$  = required equivalent wall thickness of the metal to be used (in mm);  
 $e_0$  = required minimum wall thickness for the reference steel (in mm);  
 $R_{m1}$  = guaranteed minimum tensile strength of the metal to be used (in N/mm<sup>2</sup>)  
 $A_1$  = minimum elongation (as a percentage) of the metal to be used on fracture under tensile stress (see 4.1.5);

However, in no case shall the wall thickness be less than 1.5 mm.

#### 4.1.7 Pressure relief requirements:

IBCs for liquids shall be capable of releasing a sufficient amount of vapour in the event of fire engulfment to ensure that no rupture of the body will occur. This can be achieved by conventional pressure relief devices or by other constructional means. The start-to-discharge pressure shall not be higher than 65 kPa (0.65 bar) and no lower than the total gauge pressure experienced in the IBC (i.e. the vapour pressure of the filling substance plus the partial pressure of the air or other inert gases, minus 100 kPa (1 bar)) at 55 °C, determined on the basis of a maximum degree of filling as defined in 2.5.2. The required relief devices shall be fitted in the vapour space.

## 4.2 Specific requirements for flexible IBCs

### 4.2.1 These requirements apply to flexible IBCs of the following types:

13H1 woven plastics without coating or liner  
 13H2 woven plastics, coated  
 13H3 woven plastics with liner  
 13H4 woven plastics, coated and with liner  
 13H5 plastics film  
 13L1 textile without coating or liner  
 13L2 textile, coated  
 13L3 textile with liner

13L4 textile, coated and with liner  
13M1 paper, multiwall  
13M2 paper, multiwall, water resistant

Flexible IBCs are intended for the transport of solids only.

- 4.2.2 Bodies shall be manufactured from suitable materials. The strength of the material and the construction of the flexible IBC shall be appropriate to its capacity and its intended use.
- 4.2.3 All materials used in the construction of flexible IBCs of types 13M1 and 13M2 shall, after complete immersion in water for not less than 24 hours, retain at least 85 % of the tensile strength as measured originally on the material conditioned to equilibrium at 67 % relative humidity or less.
- 4.2.4 Seams shall be formed by stitching, heat sealing, gluing or any equivalent method. All stitched seam-ends shall be secured.
- 4.2.5 Flexible IBCs shall provide adequate resistance to ageing and to degradation caused by ultraviolet radiation or the climatic conditions, or by the substance contained, thereby rendering them appropriate to their intended use.
- 4.2.6 For plastics flexible IBCs where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the body. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.
- 4.2.7 Additives may be incorporated into the material of the body to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.
- 4.2.8 No material recovered from used receptacles shall be used in the manufacture of IBC bodies. Production residues or scrap from the same manufacturing process may, however, be used. Component parts such as fittings and pallet bases may also be used provided such components have not in any way been damaged in previous use.
- 4.2.9 When filled, the ratio of height to width shall be not more than 2:1.
- 4.2.10 The liner shall be made of a suitable material. The strength of the material used and the construction of the liner shall be appropriate to the capacity of the IBC and the intended use. Joins and closures shall be sift proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport.

### 4.3 Specific requirements for rigid plastics IBCs

4.3.1 These requirements apply to rigid plastics IBCs for the transport of solids or liquids. Rigid plastics IBCs are of the following types:

- 11H1 fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for solids which are loaded or discharged by gravity
- 11H2 freestanding, for solids which are loaded or discharged by gravity
- 21H1 fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for solids which are loaded or discharged under pressure
- 21H2 freestanding, for solids which are loaded or discharged under pressure
- 31H1 fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for liquids
- 31H2 freestanding, for liquids.

4.3.2 The body shall be manufactured from suitable plastics material of known specifications and be of adequate strength in relation to its capacity and its intended use. The material shall be adequately resistant to ageing and to degradation caused by the substance contained or, where relevant, by ultraviolet radiation. Low temperature performance shall be taken into account when appropriate. Any permeation of the substance contained shall not constitute a danger under normal conditions of transport.

4.3.3 Where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the body. Where use is made of carbon black, pigments or inhibitors other than those used in the manufacture of the tested design type, re-testing may be waived if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

4.3.4 Additives may be incorporated in the material of the body to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.

4.3.5 No used material other than production residues or regrind from the same manufacturing process may be used in the manufacture of rigid plastics IBCs.

4.3.6 A relief device shall be fitted to each IBC intended for the transport of liquids, capable of releasing sufficient vapour to prevent the body of the IBC from rupturing if it is subjected to an internal pressure in excess of that for which it was hydraulically tested. This can be achieved by conventional relief devices or by other means of construction.

### 4.4 Specific requirements for composite IBCs with plastics inner receptacles

4.4.1 These requirements apply to composite IBCs for the transport of solids and liquids of the following types:

- 11HZ1 Composite IBCs with a rigid plastics inner receptacle, for solids loaded or discharged by gravity
- 11HZ2 Composite IBCs with a flexible plastics inner receptacle, for solids loaded or discharged by gravity
- 21HZ1 Composite IBCs with a rigid plastics inner receptacle, for solids loaded or discharged under pressure

- 21HZ2 Composite IBCs with a flexible plastics inner receptacle, for solids loaded or discharged under pressure
- 31HZ1 Composite IBCs with a rigid plastics inner receptacle, for liquids
- 31HZ2 Composite IBCs with a flexible plastics inner receptacle, for liquids.

This code shall be completed by replacing the letter Z by a capital letter in accordance with 2.3.1 (b) to indicate the nature of the material used for the outer casing.

- 4.4.2 The inner receptacle is not intended to perform a containment function without its outer casing. A "rigid" inner receptacle is a receptacle which retains its general shape when empty without closures in place and without benefit of the outer casing. Any inner receptacle that is not "rigid" is considered to be "flexible".
- 4.4.3 The outer casing normally consists of rigid material formed so as to protect the inner receptacle from physical damage during handling and transport but is not intended to perform the containment function. It includes the base pallet where appropriate.
- 4.4.4 A composite IBC with a fully enclosing outer casing shall be so designed that the integrity of the inner container may be readily assessed following the leakproofness and hydraulic tests.
- 4.4.5 IBCs of type 31HZ2 shall be limited to a capacity of not more than 1250 litres.
- 4.4.6 The inner receptacle shall be manufactured from suitable plastics material of known specifications and be of adequate strength in relation to its capacity and its intended use. The material shall be adequately resistant to ageing and to degradation caused by the substance contained or, where relevant, by ultraviolet radiation. Low temperature performance shall be taken into account when appropriate. Any permeation of the substance contained shall not constitute a danger under normal conditions of transport.
- 4.4.7 Where protection against ultraviolet radiation is required, it shall be provided by the addition of carbon black or other suitable pigments or inhibitors. These additives shall be compatible with the contents and remain effective throughout the life of the inner receptacle. Where use is made of carbon black, pigments or inhibitors, other than those used in the manufacture of the tested design type, retesting may be waived if changes in carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.
- 4.4.8 Additives may be incorporated in the material of the inner receptacle to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.
- 4.4.9 No used material other than production residues or regrind from the same manufacturing process may be used in the manufacture of inner receptacles.
- 4.4.10 A relief device shall be fitted to each IBC intended for the transport of liquids, capable of releasing sufficient vapour to prevent the inner receptacle of the IBC from rupturing if it is subjected to an internal pressure in excess of that for which it was hydraulically tested. This can be achieved by conventional relief devices or by other means of construction.
- 4.4.11 The inner receptacle of IBCs type 31HZ2 shall consist of at least three plies of film.
- 4.4.12 The strength of the material and the construction of the outer casing shall be appropriate to the capacity of the composite IBC and its intended use.
- 4.4.13 The outer casing shall be free of any projection that might damage the inner receptacle.

- 4.4.14 Outer casings of steel or aluminium shall be constructed of a suitable metal of adequate thickness.
- 4.4.15 Outer casings of natural wood shall be of well seasoned wood, commercially dry and free from defects that would materially lessen the strength of any part of the casing. The tops and bottoms may be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.
- 4.4.16 Outer casings of plywood shall be made of well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the casing. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used with plywood for the construction of casings. Casings shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.
- 4.4.17 The walls of outer casings of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type. Other parts of the casings may be made of other suitable material.
- 4.4.18 For fibreboard outer casings, strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) shall be used appropriate to the capacity of the casing and to its intended use. The water resistance of the outer surface shall be such that the increase in mass, as determined in a test carried out over 30 minutes by the Cobb method of determining water absorption, is not greater than  $155 \text{ g/m}^2$  (see ISO 535: 1991). It shall have proper bending qualities. Fibreboard shall be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting of corrugated fibreboard shall be firmly glued to the facings.
- 4.4.19 The ends of fibreboard outer casings may have a wooden frame or be entirely of wood. Reinforcements of wooden battens may be used.
- 4.4.20 Manufacturing joins in the fibreboard outer casing shall be taped, lapped and glued, or lapped and stitched with metal staples. Lapped joins shall have an appropriate overlap. Where closing is effected by gluing or taping, a water resistant adhesive shall be used.
- 4.4.21 Where the outer casing is of plastics material, the relevant requirements of 4.4.6 to 4.4.9 apply.
- 4.4.22 The outer casing of a 31HZ2 shall enclose the inner receptacle on all sides.
- 4.4.23 Any integral pallet base forming part of an IBC or any detachable pallet shall be suitable for mechanical handling with the IBC filled to its maximum permissible gross mass.
- 4.4.24 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the IBC that might be liable to damage in handling.
- 4.4.25 The outer casing shall be secured to any detachable pallet to ensure stability in handling and transport. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the IBC.
- 4.4.26 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the inner receptacle.
- 4.4.27 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner. Such IBCs shall be designed so that the load is not supported by the inner receptacle.

## 4.5 Specific requirements for fibreboard IBCs

- 4.5.1 These requirements apply to fibreboard IBCs for the transport of solids which are loaded or discharged by gravity. Fibreboard IBCs are of the following type: 11G.
- 4.5.2 Fibreboard IBCs shall not incorporate top lifting devices.
- 4.5.3 The body shall be made of strong and good quality solid or double-faced corrugated fibreboard (single or multiwall), appropriate to the capacity of the IBC and to its intended use. The water resistance of the outer surface shall be such that the increase in mass, as determined in a test carried out over a period of 30 minutes by the Cobb method of determining water absorption, is not greater than  $155 \text{ g/m}^2$  - see ISO 535: 1991. It shall have proper bending qualities. Fibreboard shall be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting or corrugated fibreboard shall be firmly glued to the facings.
- 4.5.4 The walls, including top and bottom, shall have a minimum puncture resistance of 15 J measured according to ISO 3036:1975.
- 4.5.5 Manufacturing joins in the body of IBCs shall be made with an appropriate overlap and shall be taped, glued, stitched with metal staples or fastened by other means at least equally effective. Where joins are effected by gluing or taping, a water resistant adhesive shall be used. Metal staples shall pass completely through all pieces to be fastened and be formed or protected so that any inner liner cannot be abraded or punctured by them.
- 4.5.6 The liner shall be made of a suitable material. The strength of the material used and the construction of the liner shall be appropriate to the capacity of the IBC and the intended use. Joins and closures shall be sift proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport.
- 4.5.7 Any integral pallet base forming part of an IBC or any detachable pallet shall be suitable for mechanical handling with the IBC filled to its maximum permissible gross mass.
- 4.5.8 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the IBC that might be liable to damage in handling.
- 4.5.9 The body shall be secured to any detachable pallet to ensure stability in handling and transport. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the IBC.
- 4.5.10 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.
- 4.5.11 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

## 4.6 Specific requirements for wooden IBCs

- 4.6.1 These requirements apply to wooden IBCs for the transport of solids which are loaded or discharged by gravity. Wooden IBCs are of the following types:
- 11C Natural wood with inner liner

- 11D Plywood with inner liner
- 11F Reconstituted wood with inner liner.

- 4.6.2 Wooden IBCs shall not incorporate top lifting devices.
- 4.6.3 The strength of the materials used and the method of construction of the body shall be appropriate to the capacity and intended use of the IBC.
- 4.6.4 Natural wood shall be well seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the IBC. Each part of the IBC shall consist of one piece or be equivalent thereto. Parts are considered equivalent to one piece when a suitable method of glued assembly is used as for instance Lindermann joint, tongue and groove joint, ship lap or rabbet joint; or butt joint with at least two corrugated metal fasteners at each joint, or when other methods at least equally effective are used.
- 4.6.5 Bodies of plywood shall be at least 3-ply. It shall be made of well seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the body. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used with plywood for the construction of the body.
- 4.6.6 Bodies of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.
- 4.6.7 IBCs shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.
- 4.6.8 The liner shall be made of a suitable material. The strength of the material used and the construction of the liner shall be appropriate to the capacity of the IBC and the intended use. Joins and closures shall be sift proof and capable of withstanding pressures and impacts liable to occur under normal conditions of handling and transport.

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- 4.6.9 Any integral pallet base forming part of an IBC or any detachable pallet shall be suitable for mechanical handling with the IBC filled to its maximum permissible gross mass.
  - 4.6.10 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the IBC that might be liable to damage in handling.
  - 4.6.11 The body shall be secured to any detachable pallet to ensure stability in handling and transport. Where a detachable pallet is used, its top surface shall be free from sharp protrusions that might damage the IBC.
  - 4.6.12 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.
  - 4.6.13 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

## SECTION 5 TEST REQUIREMENTS FOR INTERMEDIATE BULK CONTAINERS

### 5.1 Performance and frequency of tests

- 5.1.1 Tests shall be successfully performed on each IBC design type before such an IBC is used. An IBC design type is defined by the design, size, material and thickness, manner of construction and means of filling and discharging but may include various surface treatments. It also includes IBCs which differ from the design type only in their lesser external dimensions.
- 5.1.2 Tests shall be carried out on IBCs prepared for transport. IBCs shall be filled as indicated in the relevant sections. The substances to be transported in the IBCs may be replaced by other substances except where this would invalidate the results of the tests. For solids, when another substance is used it shall have the same physical characteristics (mass, grain size, etc.) as the substance to be carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.
- 5.1.3 In the drop tests for liquids, when another substance is used, its relative density and viscosity shall be similar to those of the substance to be carried. Water may also be used for the liquid drop test under the following conditions:
- (a) where the substances to be carried have a relative density not exceeding 1.2, the drop heights shall be those shown on the table in 5.9.4;
  - (b) where the substances to be carried have a relative density exceeding 1.2, the drop heights shall be calculated on the basis of the relative density (d) of the substance to be carried rounded up to the first decimal as follows:

Packing Group I	Packing Group II	Packing Group III
d x 1.5 m	d x 1.0 m	d x 0.67 m

### 5.2 Design type tests

- 5.2.1 One IBC of each design type, size, wall thickness and manner of construction shall be submitted to the tests listed in the order shown in 5.3.5 and as set out in 5.5 to 5.12. These design type tests shall be carried out as required by the competent authority.
- 5.2.2 The competent authority may permit the selective testing of IBCs which differ only in minor respects from a tested type, e.g. with small reductions in external dimensions.
- 5.2.3 If detachable pallets are used in the tests, the test report issued in accordance with 5.13 shall include a technical description of the pallets used.

### 5.3 Preparation of IBCs for testing

5.3.1 Paper and fibreboard IBCs and composite IBCs with fibreboard outer casings shall be conditioned for at least 24 hours in an atmosphere having a controlled temperature and relative humidity (r.h.). There are three options, one of which shall be chosen. The preferred atmosphere is  $23 \pm 2$  °C and  $50 \% \pm 2$  % r.h. The two other options are  $20 \pm 2$  °C and  $65 \% \pm 2$  % r.h.; or  $27 \pm 2$  °C and  $65 \% \pm 2$  % r.h.

**Note:** Average values shall fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary by up to  $\pm 5$  % relative humidity without significant impairment of test reproducibility.

5.3.2 Additional steps shall be taken to ascertain that the plastics material used in the manufacture of rigid plastics IBCs (types 31H1 and 31H2) and composite IBCs (types 31HZ1 and 31HZ2) complies respectively with the requirements in 4.3.2 to 4.3.4 and 4.4.6 to 4.4.9.

5.3.3 This may be done, for example, by submitting sample IBCs to a preliminary test extending over a long period, for example six months, during which the samples would remain filled with the substances they are intended to contain or with substances which are known to have at least as severe a stress-cracking, weakening or molecular degradation influence on the plastics materials in question, and after which the samples shall be submitted to the applicable tests listed in table 5.3.5.

5.3.4 Where the behaviour of the plastics material has been established by other means, the above compatibility test may be dispensed with.

5.3.5 Design type tests required and sequential order:

Type of IBC	Bottom lift	Top lift (a)	Stacking (b)	Leak-proofness	Hydraulic pressure	Drop	Tear	Topple	Righting (c)
Metal: 11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B, 31C	1st (a) 1st (a)	2nd 2nd	3rd 3rd	- 4th	- 5th	4th (e) 6th (e)	-	-	-
Flexible (d)	-	x (c)	x	-	-	x	x	x	x
Rigid plastics: 11H1, 11H2, 21H1, 21H2, 31H1, 31H2	1st (a) 1st (a)	2nd 2nd	3rd 3rd	- 4th	- 5th	4th 6th	- -	- -	- -
Composite: 11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1, 31HZ2	1st (a) 1st (a)	2nd 2nd	3rd 3rd	- 4th	- 5th	4th (e) 6th (e)	- -	- -	- -
Fibreboard	1st	-	2nd	-	-	3rd	-	-	-
Wooden	1st	-	2nd	-	-	3rd	-	-	-

(a) When IBCs are designed for this method of handling.

(b) When IBCs are designed to be stacked.

(c) When IBCs are designed to be lifted from the top or the side.

(d) Required test indicated by x; an IBC which has passed one test may be used for other tests, in any order.

(e) Another IBC of the same design may be used for the drop test.

## 5.4 Bottom lift test

### 5.4.1 *Applicability:*

For all fibreboard and wooden IBCs, and for all types of IBC which are fitted with means of lifting from the base, as a design type test.

### 5.4.2 *Preparation of IBCs for test:*

The IBC shall be loaded to 1.25 times its maximum permissible gross mass, the load being evenly distributed.

### 5.4.3 *Method of testing:*

The IBC shall be raised and lowered twice by a lift truck with the forks centrally positioned and spaced at three quarters of the dimension of the side of entry (unless the points of entry are fixed). The forks shall penetrate to three quarters of the direction of entry. The test shall be repeated from each possible direction of entry.

### 5.4.4 *Criteria for passing the test:*

No permanent deformation which renders the IBC, including the base pallet, if any, unsafe for transport and no loss of contents.

## 5.5 Top lift test

### 5.5.1 *Applicability:*

For all types of IBC which are designed to be lifted from the top and for flexible IBCs designed to be lifted from the top or the side, as a design type test.

### 5.5.2 *Preparation of IBCs for test:*

Metal, rigid plastics and composite IBCs shall be loaded to twice its maximum permissible gross mass. Flexible IBCs shall be filled to six times its maximum permissible load, the load being evenly distributed.

### 5.5.3 *Methods of testing:*

Metal and flexible IBCs shall be lifted in the manner for which they are designed until clear of the floor and maintained in that position for a period of five minutes.

Rigid plastics and composite IBCs shall be lifted:

- (a) by each pair of diagonally opposite lifting devices, so that the hoisting forces are applied vertically, for a period of five minutes; and
- (b) by each pair of diagonally opposite lifting devices, so that the hoisting forces are applied toward the centre at 45° to the vertical, for a period of five minutes.

### 5.5.4 Other methods of top lift testing and preparation at least equally effective may be used for flexible IBCs.

### 5.5.5 *Criteria for passing the test:*

- (a) Metal, rigid plastics and composite IBCs: no permanent deformation which renders the IBC, including the base pallet, if any, unsafe for transport and no loss of contents.
- (b) Flexible IBCs: no damage to the IBC or its lifting devices which renders the IBC unsafe for transport or handling.

## 5.6 Stacking test

### 5.6.1 *Applicability:*

For all types of IBC which are designed to be stacked on each other, as a design type test.

### 5.6.2 *Preparation of IBCs for test:*

IBCs, other than flexible IBCs, shall be loaded to their maximum permissible gross mass. Flexible IBCs shall be filled to not less than 95 % of their capacity and to their maximum permissible load, the load being evenly distributed.

### 5.6.3 *Methods of testing:*

- (a) The IBC shall be placed on its base on level hard ground and subjected to a uniformly distributed superimposed test load (see 5.6.4). IBCs shall be subjected to the test load for a period of at least:
  - (i) 5 minutes, for metal IBCs;
  - (ii) 28 days at 40°C, for rigid plastics IBCs of types 11H2, 21H2 and 31H2 and for composite IBCs with outer casings of plastics material which bear the stacking load (i.e., types 11HH1, 11HH2, 21HH1, 21HH2, 31HH1 and 31HH2);
  - (iii) 24 hours, for all types of IBCs.
- (b) The load shall be applied by one of the following methods:
  - (i) one or more IBCs of the same type filled to the maximum permissible gross mass and, in the case of flexible IBCs, the maximum permissible load and stacked on the test IBC;
  - (ii) appropriate weights loaded on to either a flat plate or a reproduction of the base of the IBC, which is stacked on the test IBC.

#### 5.6.4 *Calculation of superimposed test load:*

The load to be placed on the IBC shall be 1.8 times the combined maximum permissible gross mass of the number of similar IBCs that may be stacked on top of the IBC during transport.

#### 5.6.5 *Criteria for passing the test:*

- (a) All types of IBCs other than flexible IBCs: no permanent deformation which renders the IBC including the base pallet, if any, unsafe for transport and no loss of contents.
- (b) Flexible IBCs: no deterioration of the body which renders the IBC unsafe for transport and no loss of contents.

### **5.7 Leakproofness test**

#### 5.7.1 *Applicability:*

For those types of IBCs used for liquids or for solids loaded or discharged under pressure, as design type test and periodic test.

#### 5.7.2 *Preparation of IBCs for test:*

The test shall be carried out before the fitting of any thermal insulation equipment. Vented closures shall either be replaced by similar non-vented closures or the vent shall be sealed.

#### 5.7.3 *Method of testing and pressure to be applied:*

The test shall be carried out for a period of at least 10 minutes using air at a gauge pressure of not less than 20 kPa (0.2 bar). The air tightness of the IBC shall be determined by a suitable method such as by air-pressure differential test or by immersing the IBC in water or, for metal IBCs, by coating the seams and joints with a soap solution. In the latter case a correction factor shall be applied for the hydrostatic pressure. Other methods at least equally effective may be used.

#### 5.7.4 *Criterion for passing the test:*

No leakage of air.

### **5.8 Hydraulic pressure test**

#### 5.8.1 *Applicability:*

For those types of IBCs used for liquids or for solids loaded or discharged under pressure, as a design type test.

### 5.8.2 *Preparation of IBCs for test:*

The test shall be carried out before the fitting of any thermal insulation equipment. Pressure relief devices shall be removed and their apertures plugged, or shall be rendered inoperative.

### 5.8.3 *Method of testing:*

The test shall be carried out for a period of at least 10 minutes applying a hydraulic pressure not less than that indicated in 5.8.4. The IBCs shall not be mechanically restrained during the test.

### 5.8.4 *Pressures to be applied:*

#### 5.8.4.1 Metal IBCs:

- (a) for IBCs of types 21A, 21B and 21N, for Packing Group I solids, a 250 kPa (2.5 bar) gauge pressure;
- (b) for IBCs of types 21A, 21B, 21N, 31A, 31B and 31N, for Packing Groups II or III substances, a 200 kPa (2 bar) gauge pressure;
- (c) in addition, for IBCs of types 31A, 31B and 31N, a 65kPa (0.65 bar) gauge pressure. This test shall be performed before the 200 kPa test.

#### 5.8.4.2 Rigid plastics and composite IBCs:

- (a) For IBCs of types 21H1, 21H2, 21HZ1 and 21HZ2: 75 kPa (0.75 bar) (gauge)
- (b) For IBCs of types 31H1, 31H2, 31HZ1 and 31HZ2: whichever is the greater of two values, the first as determined by one of the following methods:
  - (i) the total gauge pressure measured in the IBC (i.e. the vapour pressure of the filling substance and the partial pressure of the air or other inert gases, minus 100 kPa) at 55 °C multiplied by a safety factor of 1.5; this total gauge pressure shall be determined on the basis of a maximum degree of filling in accordance with 4.1.3.2 and a filling temperature of 15 °C;
  - (ii) 1.75 times the vapour pressure at 50 °C of the substance to be transported minus 100 kPa, but with a minimum test pressure of 100 kPa;
  - (iii) 1.5 times the vapour pressure at 55 °C of the substance to be transported minus 100 kPa, but with a minimum test pressure of 100 kPa;and the second as determined by the following method:
  - (iv) twice the static pressure of the substance to be transported, with a minimum of twice the static pressure of water.

### 5.8.5 *Criteria for passing the test(s):*

- (a) For IBCs of types 21A, 21B, 21N, 31A, 31B and 31N, when subjected to the test pressure specified in 5.8.4.1 (a) or (b): no leakage.
- (b) For IBCs of types 31A, 31B and 31N, when subjected to the test pressure specified in 5.8.4.1 (c): neither permanent deformation which would render the IBC unsafe for transport, nor leakage.
- (c) For rigid plastics and composite IBCs: no permanent deformation which renders the IBC unsafe for transport and no leakage.

## 5.9 **Drop test**

### 5.9.1 *Applicability:*

For all types of IBCs, as a design type test.

### 5.9.2 *Preparation of IBCs for test:*

- (a) Metal IBCs: the IBC shall be filled to not less than 95 % of its capacity for solids or 98 % for liquids in accordance with the design type. Pressure relief devices shall be removed and their apertures plugged, or shall be rendered inoperative.
- (b) Flexible IBCs: the IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible load, the load being evenly distributed.
- (c) Rigid plastics and composite IBCs: the IBC shall be filled to not less than 95 % of its capacity for solids or 98 % for liquids in accordance with the design type. Arrangements provided for pressure relief may be removed and plugged or rendered inoperative. Testing of IBCs shall be carried out when the temperature of the test sample and its contents has been reduced to minus 18 °C or lower. Where test samples of composite IBCs are prepared in this way the conditioning specified in 5.3.1 may be waived. Test liquids shall be kept in the liquid state, if necessary by the addition of anti-freeze. This conditioning may be disregarded if the materials in question are of sufficient ductility and tensile strength at low temperatures.
- (d) Fibreboard and wooden IBCs: the IBC shall be filled to not less than 95 % of its capacity in accordance with the design type.

### 5.9.3 *Method of testing:*

The IBC shall be dropped on its base onto a rigid, non-resilient, smooth, flat and horizontal surface, in such a manner as to ensure that the point of impact is that part of the base of the IBC considered to be the most vulnerable. IBCs of 0.45 m<sup>3</sup> or less capacity shall also be dropped:

- (a) Metal IBCs: on the most vulnerable part other than the part of the base tested in the first drop.
- (b) Flexible IBCs: on the most vulnerable side.
- (c) Rigid plastics, composite, fibreboard and wooden IBCs: flat on a side, flat on the top and on a corner.

- (d) The same or different IBCs may be used for each drop.

5.9.4 *Drop height:*

Packing Group I	Packing Group II	Packing Group III
1.8 m	1.2 m	0.8 m

5.9.5 *Criteria for passing the test(s):*

- (a) Metal IBCs: no loss of contents.
- (b) Flexible IBCs: no loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the IBC provided that no further leakage occurs after the IBC has been raised clear of the ground.
- (c) Rigid plastics, composite, fibreboard and wooden IBCs: no loss of contents. A slight discharge from a closure upon impact shall not be considered to be a failure of the IBC provided that no further leakage occurs.

## 5.10 Tear test

5.10.1 *Applicability:*

For all types of flexible IBCs, as a design type test.

5.10.2 *Preparation of IBCs for test:*

The IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible load, the load being evenly distributed.

5.10.3 *Method of testing:*

Once the IBC is placed on the ground, a 100 mm knife score, completely penetrating the wall of a wide face, is made at a 45° angle to the principal axis of the IBC, halfway between the bottom surface and the top level of the contents. The IBC shall then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum permissible load. The load shall be applied for at least five minutes. An IBC which is designed to be lifted from the top or the side shall then, after removal of the superimposed load, be lifted clear of the floor and maintained in that position for a period of five minutes.

5.10.4 *Criterion for passing the test:*

The cut shall not propagate more than 25 % of its original length.

## 5.11 Topple test

### 5.11.1 *Applicability:*

For all types of flexible IBCs, as a design type test.

### 5.11.2 *Preparation of IBCs for test:*

The IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible load, the load being evenly distributed.

### 5.11.3 *Method of testing:*

The IBC shall be caused to topple on to any part of its top on to a rigid, non-resilient, smooth, flat and horizontal surface.

### 5.11.4 *Topple height:*

Packing Group I	Packing Group II	Packing Group III
1.8 m	1.2 m	0.8 m

### 5.11.5 *Criteria for passing the test:*

No loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the IBC provided that no further leakage occurs.

## 5.12 Righting test

### 5.12.1 *Applicability:*

For all flexible IBCs designed to be lifted from the top or side, as a design type test.

### 5.12.2 *Preparation of IBCs for test:*

The IBC shall be filled to not less than 95 % of its capacity and to its maximum permissible load, the load being evenly distributed.

### 5.12.3 *Method of testing:*

The IBC, lying on its side, shall be lifted at a speed of at least 0.1 m/s to upright position, clear of the floor, by one lifting device or by two lifting devices when four are provided.

### 5.12.4 *Criterion for passing the test:*

No damage to the IBC or its lifting devices which renders the IBC unsafe for transport or handling.

### **5.13 Test report**

- 5.13.1 A test report containing at least the following particulars shall be drawn up and shall be available to the users of the IBC:
1. Name and address of the test facility;
  2. Name and address of applicant (where appropriate);
  3. A unique test report identification;
  4. Date of the test report;
  5. Manufacturer of the IBC;
  6. Description of the IBC design type (e.g. dimensions, materials, closures, thickness, etc.) including method of manufacture (e.g. blow moulding) and which may include drawing(s) and/or photograph(s);
  7. Maximum capacity;
  8. Characteristics of test contents, e.g. viscosity and relative density for liquids and particle size for solids;
  9. Test descriptions and results.
  10. The test report shall be signed with the name and status of the signatory.
- 5.13.2 The test report shall contain statements that the IBC prepared as for transport was tested in accordance with the appropriate requirements of these specifications and that the use of other packaging methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

### **5.14 Initial and periodic testing of individual metal, rigid plastics and composite IBCs**

- 5.14.1 These tests shall be carried out as required by the competent authority.
- 5.14.2 Each IBC shall correspond in all respects to its design type.
- 5.14.3 Each metal, rigid plastics and composite IBCs for liquids, or for solids which are loaded or discharged under pressure, shall be subjected to the leakproofness test, as an initial test (i.e., before the IBC is first used for transport) and at intervals of not more than two and a half years.
- 5.14.4 The results of tests shall be recorded in test reports to be kept by the owner of the IBC.