

**COMMITTEE OF EXPERTS ON THE TRANSPORT OF  
DANGEROUS GOODS AND ON THE GLOBALLY  
HARMONIZED SYSTEM OF CLASSIFICATION  
AND LABELLING OF CHEMICALS**

**Sub-Committee of Experts on the  
Transport of Dangerous Goods**

(Twenty-fifth session, 5-14 July 2004,  
agenda item 4 (a))

**PACKAGINGS (INCLUDING IBC'S AND LARGE PACKAGINGS)**

**Evaluation of the United Nations packaging requirements**

**Transmitted by the expert from the Netherlands**

**Introduction**

1. In the Netherlands proposal ST/SG/AC.10/C.3/2004/67, paragraph 6 it is indicated that the proposed amendments concerning the proposal will be given in ST/SG/AC.10/C.3/2004/70 and in information document UN/SCETDG/25/INF.5.

The document ST/SG/AC.10/C.3/2004/70 contains only the amended paragraphs, and the informal document UN/SCETDG/25/INF.5 contains the full text of all amended chapters.

2. The proposed amendments concern changes in Chapters 6.1, 6.3, 6.5 and 6.6 (with corresponding changes in Part 4).

3. All amendments, where new text is shown by a different color + underlining and text to be deleted by a strike out, are integrated in the current text of Part 4 and Part 6 of the 13th revised edition of the 'Orange Book' and are accompanied, between brackets and in italics, with a short explanation.

**Proposal**

4. The Sub-Committee is invited to consider the proposed amendments given in the Annex, where Part I of this Annex contains the amendments to Part 6 and Part II the amendments to Part 4, in conjunction with proposal ST/SG/AC.10/C.3/2004/67 and take action as deemed appropriate.

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**Part I: ANNEX III: PROPOSED CHANGES IN CHAPTER 6.1, 6.3, 6.5 AND 6.6**

**PART 6**

**REQUIREMENTS  
FOR THE CONSTRUCTION AND TESTING  
OF PACKAGINGS, INTERMEDIATE BULK CONTAINERS (IBCs), LARGE PACKAGINGS,  
PORTABLE TANKS,  
MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs) AND BULK CONTAINERS**

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## CHAPTER 6.1

### REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS (OTHER THAN FOR DIVISION 6.2 SUBSTANCES)

#### 6.1.1 General

6.1.1.1 The requirements of this Chapter do not apply to:

- (a) Packages containing radioactive material, which shall comply with the Regulations of the International Atomic Energy Agency (IAEA), except that:
  - (i) Radioactive material possessing other dangerous properties (subsidiary risks) shall also comply with special provision 172; and
  - (ii) Low specific activity (LSA) material and surface contaminated objects (SCO) may be carried in certain packagings defined in these Regulations provided that the supplementary provisions set out in the IAEA Regulations are also met;
- (b) Pressure receptacles;
- (c) Packages whose net mass exceeds 400 kg;
- (d) PPpackagings (excluding outer packagings of combination packagings) with a capacity exceeding 450 litres.

*(This makes it clear, that the maximum capacity is not meant for the outer packaging of a combination packaging)*

6.1.1.2 The requirements for packagings in 6.1.4 are based on packagings currently used. In order to take into account progress in science and technology, there is no objection to the use of packagings having specifications different from those in 6.1.4, provided that they are equally effective, acceptable to the competent authority and able successfully to withstand the tests described in 6.1.1.3 and 6.1.5. Methods of testing other than those described in these Regulations are acceptable, provided they are equivalent.

6.1.1.3 Every packaging intended to contain liquids shall successfully undergo a suitable leakproofness test, and be capable of meeting the appropriate test level indicated in 6.1.5.4.3:

- (a) Before it is first used for transport;
- (b) After remanufacturing or reconditioning, before it is re-used for transport.

For this test, packagings need not have their own closures fitted.

The inner receptacle of composite packagings may be tested without the outer packaging provided the test results are not affected. This test is not necessary for inner packagings of combination packagings.

6.1.1.4 Packagings shall be manufactured, reconditioned and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each packaging meets the requirements of this Chapter.

6.1.1.5 Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required

gaskets) and any other components needed to ensure that packages as presented for transport are capable of passing the applicable performance tests of this Chapter.

### **6.1.2 Code for designating types of packagings**

6.1.2.1 The code consists of:

- (a) An Arabic numeral indicating the kind of packaging, e.g. drum, jerrican, etc., followed by;
- (b) A capital letter(s) in Latin characters indicating the nature of the material, e.g. steel, wood, etc., followed where necessary by;
- (c) An Arabic numeral indicating the category of packaging within the kind to which the packaging belongs.

6.1.2.2 In the case of composite packagings, two capital letters in Latin characters are used in sequence in the second position of the code. The first indicates the material of the inner receptacle and the second that of the outer packaging.

6.1.2.3 In the case of combination packagings, only the code number for the outer packaging is used.

6.1.2.4 The letters "T" or "V" or "W" may follow the packaging code. The letter "T" signifies a salvage packaging conforming to the requirements of 6.1.5.1.11. The letter "V" signifies a special packaging conforming to the requirements of 6.1.5.1.7. The letter "W" signifies that the packaging, although of the same type indicated by the code, is manufactured to a specification different from that in 6.1.4 and is considered equivalent under the requirements of 6.1.1.2.

6.1.2.5 The following numerals shall be used for the kinds of packaging:

1. Drum
2. Wooden barrel
3. Jerrican
4. Box
5. Bag
6. Composite packaging

6.1.2.6 The following capital letters shall be used for the types of material:

- 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)
- P. Glass, porcelain or stoneware

6.1.2.7 The following table indicates the codes to be used for designating types of packagings depending on the kind of packagings, the material used for their construction and their category; it also refers to the paragraphs to be consulted for the appropriate requirements:

<b>Kind</b>	<b>Material</b>	<b>Category</b>	<b>Code</b>	<b>Paragraph</b>
1. Drums	A. Steel	non-removable head	1A1	6.1.4.1
		removable head	1A2	
	B. Aluminium	non-removable head	1B1	6.1.4.2
		removable head	B2	
	D. Plywood		1D	6.1.4.5
	G. Fibre		1G	6.1.4.7
	H. Plastics	non-removable head	1H1	6.1.4.8
removable head		1H2		
N. Metal, other than steel or aluminium	non-removable head	N1	6.1.4.3	
	removable head	N2		
2. Barrels	C. Wooden	bung type	2C1	6.1.4.6
		removable head	2C2	
3. Jerricans	A. Steel	non-removable head	3A1	6.1.4.4
		removable head	3A2	
	B. Aluminium	non-removable head	3B1	6.1.4.4
		removable head	3B2	
	H. Plastics	non-removable head	3H1	6.1.4.8
		removable head	3H2	
4. Boxes	A. Steel		4A	6.1.4.14
	B. Aluminium		4B	6.1.4.14
	C. Natural wood	ordinary	4C1	6.1.4.9
		with sift-proof walls	4C2	
	D. Plywood		4D	6.1.4.10
	F. Reconstituted wood		4F	6.1.4.11
	G. Fibreboard		4G	6.1.4.12
	H. Plastics	expanded	4H1	6.1.4.13
		solid	4H2	
5. Bags	H. Woven plastics	without inner liner or coating	5H1	6.1.4.16
		sift-proof	5H2	
		water resistant	5H3	
	H. Plastics film		5H4	6.1.4.17
	L. Textile	without inner liner or coating	5L1	6.1.4.15
		sift proof	5L2	
		water resistant	5L3	
	M. Paper	multiwall	5M1	6.1.4.18
		multiwall, water resistant	5M2	

Kind	Material	Category	Code	Paragraph
6.Composite packagings	H. Plastics receptacle	in steel drum	6HA1	6.1.4.19
		in steel crate or box	6HA2	6.1.4.19
		in aluminium drum	6HB1	6.1.4.19
		in aluminium crate or box	6HB2	6.1.4.19
		in wooden box	6HC	6.1.4.19
		in plywood drum	6HD1	6.1.4.19
		in plywood box	6HD2	6.1.4.19
		in fibre drum	6HG1	6.1.4.19
		in fibreboard box	6HG2	6.1.4.19
		in plastics drum	6HH1	6.1.4.19
	in solid plastics box	6HH2	6.1.4.19	
	P. Glass, porcelain or stoneware receptacle	in steel drum	6PA1	6.1.4.20
		in steel crate or box	6PA2	6.1.4.20
		in aluminium drum	6PB1	6.1.4.20
		in aluminium crate or box	6PB2	6.1.4.20
		in wooden box	6PC	6.1.4.20
		in plywood drum	6PD1	6.1.4.20
		in wickerwork hamper	6PD2	6.1.4.20
		in fibre drum	6PG1	6.1.4.20
		in fibreboard box	6PG2	6.1.4.20
in expanded plastics packaging		6PH1	6.1.4.20	
in solid plastics packaging	6PH2	6.1.4.20		

### 6.1.3 Marking

**NOTE 1:** *The marking indicates that the packaging which bears it corresponds to a successfully tested design type and that it complies with the requirements of this Chapter which are related to the manufacture, but not to the use, of the packaging. In itself, therefore, the mark does not necessarily confirm that the packaging may be used for any substance: generally the type of packaging (e.g. steel drum), its maximum capacity and/or mass, and any special requirements are specified for each substance in Part 3 of these Regulations.*

**NOTE 2:** *The marking is intended to be of assistance to packaging manufacturers, reconditioners, packaging users, carriers and regulatory authorities. In relation to the use of a new packaging, the original marking is a means for its manufacturer(s) to identify the type and to indicate those performance test regulations that have been met.*

**NOTE 3:** *The marking does not always provide full details of the test levels, etc., and these may need to be taken further into account, e.g. by reference to a test certificate, to test reports or to a register of successfully tested packagings. For example, a packaging having an X or Y marking may be used for substances to which a packing group having a lesser degree of danger has been assigned with the relevant maximum permissible value of the relative density<sup>1</sup> determined by taking into account the factor 1.5 or 2.25 indicated in the test requirements for packagings in 6.1.5 as appropriate, i.e. packing group I packaging tested for products of relative density 1.2 could be used as a packing group II packaging for products of relative density 1.8 or a packing group III packaging of relative density 2.7, provided of course that all the*

<sup>1</sup> *Relative density (d) is considered to be synonymous with Specific Gravity (SG) and is used throughout this text.*



*performance criteria can still be met with the higher relative density product.*

6.1.3.1 Each packaging intended for use according to these Regulations shall bear markings which are durable, legible and placed in a location and of such a size relative to the packaging as to be readily visible. For packages with a gross mass of more than 30 kg, the markings or a duplicate thereof shall appear on the top or on a side of the packaging. Letters, numerals and symbols shall be at least 12 mm high, except for packagings of 30 litres or 30 kg capacity or less, when they shall be at least 6 mm in height and for packagings of 5 litres or 5 kg or less when they shall be of an appropriate size.

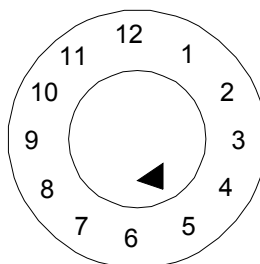
The marking shall show:

- (a) The United Nations packaging symbol



This shall not be used for any purpose other than certifying that a packaging complies with the relevant regulations in this Chapter. For embossed metal packagings the capital letters "UN" may be applied as the symbol;

- (b) The code designating the type of packaging according to 6.1.2;
- (c) A code in two parts:
- (i) a letter designating the packing group(s) for which the design type has been successfully tested:  
X for packing groups I, II and III  
Y for packing groups II and III  
Z for packing group III only;
  - (ii) the relative density, rounded off to the first decimal, for which the design type has been tested for packagings without inner packagings intended to contain liquids; this may be omitted when the relative density does not exceed 1.2. For packagings intended to contain solids or inner packagings, the maximum gross mass in kilograms, rounded off to 1 kg for a gross mass greater than 10 kg, to 0.5 kg for a gross mass between 2 and 10 kg and to 0.1 kg for a gross mass smaller than 2 kg ; (This makes it clear how to round off the maximum gross mass)
- (d) Either the letter "S" denoting that the packaging is intended for the transport of solids or inner packagings or, for packagings (other than combination packagings) intended to contain liquids, the hydraulic test pressure which the packaging was shown to withstand in kPa rounded down to the nearest 10 kPa;
- (e) The last two digits of the year during which the packaging was manufactured. Packagings of types IH and 3H shall also be appropriately marked with the month of manufacture; this may be marked on the packaging in a different place from the remainder of the marking. An appropriate method is:



- (f) The State authorizing the allocation of the mark, indicated by the distinguishing sign for motor vehicles in international traffic;
- (g) The name of the manufacturer or other identification of the packaging specified by the competent authority.

6.1.3.2 In addition to the durable markings prescribed in 6.1.3.1, every new metal drum of a capacity greater than 100 litres shall bear the marks described in 6.1.3.1 (a) to (e) on the bottom, with an indication of the nominal thickness of at least the metal used in the body (in mm, to 0.1 mm), in permanent form (e.g. embossed). When the nominal thickness of either head of a metal drum is thinner than that of the body, the nominal thicknesses of the top head, body, and bottom head shall be marked on the bottom in permanent form (e.g. embossed), for example "1.0-1.2-1.0" or "0.9-1.0-1.0". Nominal thicknesses of metal shall be determined according to the appropriate ISO standard, for example ISO 3574:1999 for steel. The marks indicated in 6.1.3.1 (f) and (g) shall not be applied in a permanent form (e.g. embossed) except as provided in 6.1.3.5.

6.1.3.3 Every packaging other than those referred to in 6.1.3.2 liable to undergo a reconditioning process shall bear the marks indicated in 6.1.3.1 (a) to (e) in a permanent form. Marks are permanent if they are able to withstand the reconditioning process (e.g. embossed). For packagings other than metal drums of a capacity greater than 100 litres, these permanent marks may replace the corresponding durable markings prescribed in 6.1.3.1.

6.1.3.4 For remanufactured metal drums, if there is no change to the packaging type and no replacement or removal of integral structural components, the required markings need not be permanent (e.g. embossed). Every other remanufactured metal drum shall bear the markings in 6.1.3.1 (a) to (e) in a permanent form (e.g. embossed) on the top head or side.

6.1.3.5 Metal drums made from materials (e.g. stainless steel) designed to be reused repeatedly may bear the markings indicated in 6.1.3.1 (f) and (g) in a permanent form (e.g. embossed).

6.1.3.6 Packagings manufactured with recycled plastics material as defined in 1.2.1 shall be marked "REC". This mark shall be placed near the mark prescribed in 6.1.3.1.

6.1.3.7 Marking shall be applied in the sequence shown in 6.1.3.1; each element of the marking required in these sub-paragraphs and when appropriate, (h) to (j) of 6.1.3.8, shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable. For examples, see 6.1.3.10.






Any additional markings authorized by a competent authority shall still enable the parts of the mark to be correctly identified with reference to 6.1.3.1.

6.1.3.8 After reconditioning a packaging, the reconditioner shall apply to it, in sequence, a durable marking showing:



- (h) The State in which the reconditioning was carried out, indicated by the distinguishing sign for motor vehicles in international traffic;
- (i) The name of the reconditioner or other identification of the packaging specified by the competent authority;
- (j) The year of reconditioning; the letter "R"; and, for every packaging successfully passing the leakproofness test in 6.1.1.3, the additional letter "L".

6.1.3.9 When, after reconditioning, the markings required by 6.1.3.1 (a) to (d) no longer appear on the top head or the side of a metal drum, the reconditioner also shall apply them in a durable form followed by 6.1.3.8 (h), (i) and (j). These markings shall not identify a greater performance capability than that for which the original design type had been tested and marked.

**6.1.3.10 Examples of markings for NEW packagings:**

	4G/Y145/S/02 NL/VL823	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new fibreboard box
	1A1/Y1.4/150/98 NL/VL824	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new steel drum to contain liquids
	1A2/Y150/S/01 NL/VL825	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new steel drum to contain solids, or inner packagings
	4HW/Y136/S/98 NL/VL826	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a new plastics box of equivalent specification
	1A2/Y/100/01 USA/MM5	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)	For a remanufactured steel drum to contain liquids

**6.1.3.11 Examples of markings for RECONDITIONED packagings**

	1A1/Y1.4/150/97 NL/RB/01 RL	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.8 (h), (i) and (j)
	1A2/Y150/S/99 USA/RB/00 R	as in 6.1.3.1 (a), (b), (c), (d), and (e) as in 6.1.3.8 (h), (i) and (j)

**6.1.3.12 Example of marking for SALVAGE packagings:**

	1A2T/Y300/S/01 USA/abc	as in 6.1.3.1 (a), (b), (c), (d) and (e) as in 6.1.3.1 (f) and (g)
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**NOTE:** *The markings, for which examples are given in 6.1.3.10, 6.1.3.11 and 6.1.3.12, may be applied in a single line or in multiple lines provided the correct sequence is respected.*

**6.1.4 Requirements for packagings**

**6.1.4.1 Steel drums**

- 1A1 non-removable head
- 1A2 removable head

6.1.4.1.1 Body and heads shall be constructed of steel sheet of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

**NOTE:** *In the case of carbon steel drums, "suitable" steels are identified in ISO 3573:1999 "Hot rolled carbon steel sheet of commercial and drawing qualities" and ISO 3574:1999 "Cold-reduced carbon steel sheet of commercial and drawing qualities". For carbon steel drums below 100 litres "suitable" steels in addition to the above standards are also identified in ISO 11949:1995 "Cold-reduced electrolytic tinplate", ISO 11950:1995 "Cold-reduced electrolytic chromium/chromium oxide-coated steel" and ISO 11951:1995 "Cold-reduced blackplate in coil form for the production of tinplate or electrolytic chromium/chromium-oxide coated steel".*

6.1.4.1.2 Body seams shall be welded on drums intended to contain more than 40 litres of liquid. Body seams shall be mechanically seamed or welded on drums intended to contain solids or 40 litres or less of liquids.

6.1.4.1.3 Chimes shall be mechanically seamed or welded. Separate reinforcing rings may be applied.

6.1.4.1.4 The body of a drum of a capacity greater than 60 litres shall, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they shall be fitted tightly on the body and so secured that they cannot shift. Rolling hoops shall not be spot welded.

6.1.4.1.5 Openings for filling, emptying and venting in the bodies or heads of non-removable head (1A1) drums shall not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1A2). Closures for openings in the bodies and heads of drums shall be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges may be mechanically seamed or welded in place. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.1.6 Closure devices for removable head drums shall be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements shall be used with all removable heads.

6.1.4.1.7 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments shall be applied. These coatings or treatments shall retain their protective properties under normal conditions of transport.

6.1.4.1.8 Maximum capacity of drum: 450 litres

6.1.4.1.9 Maximum net mass: 400 kg

#### **6.1.4.2 *Aluminium drums***

1B1 non-removable head

1B2 removable head

6.1.4.2.1 Body and heads shall be constructed of aluminium at least 99% pure or of an aluminium base alloy. Material shall be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

6.1.4.2.2 All seams shall be welded. Chime seams, if any, shall be reinforced by the application of separate reinforcing rings.

6.1.4.2.3 The body of a drum of a capacity greater than 60 litres shall, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they shall be fitted tightly on the body and so secured that they cannot shift. Rolling hoops shall not be spot welded.

6.1.4.2.4 Openings for filling, emptying and venting in the bodies or heads of non-removable head (1B1) drums shall not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1B2). Closures for openings in the bodies and heads of drums shall be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges shall be welded in place so that the weld provides a leakproof seam. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.2.5 Closure devices for removable head drums shall be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements shall be used with all removable heads.

6.1.4.2.6 Maximum capacity of drum: 450 litres

6.1.4.2.7 Maximum net mass: 400 kg

#### **6.1.4.3 *Drums of metal other than steel or aluminium***

1N1 non-removable head

1N2 removable head

6.1.4.3.1 The body and heads shall be constructed of a metal or of a metal alloy other than steel or aluminium. Material shall be of a suitable type and of adequate thickness in relation to the capacity of the drum and to its intended use.

6.1.4.3.2 Chime seams, if any, shall be reinforced by the application of separate reinforcing rings. All seams, if any, shall be joined (welded, soldered, etc.) in accordance with the technical state of the art for the used metal or metal alloy.

6.1.4.3.3 The body of a drum of a capacity greater than 60 litres shall, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops. If there are separate rolling hoops they shall be fitted tightly on the body and so secured that they cannot shift. Rolling hoops shall not be spot welded.

6.1.4.3.4 Openings for filling, emptying and venting in the bodies or heads of non-removable head (1N1) drums shall not exceed 7 cm in diameter. Drums with larger openings are considered to be of the removable head type (1N2). Closures for openings in the bodies and heads of drums shall be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Closure flanges shall be joined in place (welded, soldered, etc.) in accordance with the technical state of the art for the used metal or metal alloy so that the seam join is leakproof. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.3.5 Closure devices for removable head drums shall be so designed and applied that they will remain secure and drums will remain leakproof under normal conditions of transport. Gaskets or other sealing elements shall be used with all removable heads.

6.1.4.3.6 Maximum capacity of drum: 450 litres

6.1.4.3.7 Maximum net mass: 400 kg

#### **6.1.4.4 *Steel or aluminium jerricans***

3A1 steel, non-removable head

3A2 steel, removable head

3B1 aluminium, non-removable head

3B2 aluminium, removable head

6.1.4.4.1 Body and heads shall be constructed of steel sheet, of aluminium at least 99% pure or of an aluminium base alloy. Material shall be of a suitable type and of adequate thickness in relation to the capacity of the jerrican and to its intended use.

6.1.4.4.2 Chimes of steel jerricans shall be mechanically seamed or welded. Body seams of steel jerricans intended to contain more than 40 litres of liquid shall be welded. Body seams of steel jerricans intended to contain 40 litres or less shall be mechanically seamed or welded. For aluminium jerricans, all seams shall be welded. Chime seams, if any, shall be reinforced by the application of a separate reinforcing ring.

6.1.4.4.3 Openings in jerricans (3A1 and 3B1) shall not exceed 7 cm in diameter. Jerricans with larger openings are considered to be of the removable head type (3A2 and 3B2). Closures shall be so designed that they will remain secure and leakproof under normal conditions of transport. Gaskets or other sealing elements shall be used with closures, unless the closure is inherently leakproof.

6.1.4.4.4 If materials used for body, heads, closures and fittings are not in themselves compatible with the contents to be transported, suitable internal protective coatings or treatments shall be applied. These coatings or treatments shall retain their protective properties under normal conditions of transport.

6.1.4.4.5 Maximum capacity of jerrican: 60 litres

6.1.4.4.6 Maximum net mass: 120 kg

#### **6.1.4.5 *Plywood drums***

1D

6.1.4.5.1 The wood used shall be well-seasoned, commercially dry and free from any defect likely to lessen the effectiveness of the drum for the purpose intended. If a material other than plywood is used for the manufacture of the heads, it shall be of a quality equivalent to the plywood.

6.1.4.5.2 At least two-ply plywood shall be used for the body and at least three-ply plywood for the heads; the plies shall be firmly glued together by a water resistant adhesive with their grain crosswise.

6.1.4.5.3 The body and heads of the drum and their joints shall be of a design appropriate to the capacity of the drum and to its intended use.

6.1.4.5.4 In order to prevent sifting of the contents, lids shall be lined with kraft paper or some other equivalent material which shall be securely fastened to the lid and extend to the outside along its full circumference.

6.1.4.5.5 Maximum capacity of drum: 250 litres

6.1.4.5.6 Maximum net mass: 400 kg

#### **6.1.4.6 *Wooden barrels***

2C1 bung type

2C2 removable head

6.1.4.6.1 The wood used shall be of good quality, straight grained, well-seasoned and free from knots, bark, rotten wood, sapwood or other defects likely to lessen the effectiveness of the barrel for the purpose intended.

6.1.4.6.2 The body and heads shall be of a design appropriate to the capacity of the barrel and to its intended use.

6.1.4.6.3 Staves and heads shall be sawn or cleft with the grain so that no annual ring extends over more than half the thickness of a stave or head.

6.1.4.6.4 Barrel hoops shall be of steel or iron of good quality. The hoops of 2C2 barrels may be of a suitable hardwood.

6.1.4.6.5 Wooden barrels 2C1: the diameter of the bunghole shall not exceed half the width of the stave in which it is placed.

6.1.4.6.6 Wooden barrels 2C2: heads shall fit tightly into the crozes.

6.1.4.6.7 Maximum capacity of barrel: 250 litres

6.1.4.6.8 Maximum net mass: 400 kg

**6.1.4.7 *Fibre drums***

1G

6.1.4.7.1 The body of the drum shall consist of multiple plies of heavy paper or fibreboard (without corrugations) firmly glued or laminated together and may include one or more protective layers of bitumen, waxed kraft paper, metal foil, plastics material, etc.

6.1.4.7.2 Heads shall be of natural wood, fibreboard, metal, plywood, plastics or other suitable material and may include one or more protective layers of bitumen, waxed kraft paper, metal foil, plastics material, etc.

6.1.4.7.3 The body and heads of the drum and their joints shall be of a design appropriate to the capacity of the drum and to its intended use.

6.1.4.7.4 The assembled packaging shall be sufficiently water resistant so as not to delaminate under normal conditions of transport.

6.1.4.7.5 Maximum capacity of drum: 450 litres

6.1.4.7.6 Maximum net mass: 400 kg

**6.1.4.8 *Plastics drums and jerricans***

1H1 drums, non-removable head

1H2 drums, removable head

3H1 jerricans, non-removable head

3H2 jerricans, removable head

6.1.4.8.1 The packaging shall be manufactured from suitable plastics material and be of adequate strength in relation to its capacity and intended use. Except for recycled plastics material as defined in 1.2.1, no used material other than production residues or regrind from the same manufacturing process may be used. The packaging shall be adequately resistant to ageing and to degradation caused either by the substance contained or by ultra-violet radiation.

6.1.4.8.2 If protection against ultra-violet 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 packaging. 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 the carbon black content does not exceed 2% by mass or if the pigment content does not exceed 3% by mass; the content of inhibitors of ultra-violet radiation is not limited.

6.1.4.8.3 Additives serving purposes other than protection against ultra-violet radiation may be included in the composition of the plastics material provided that they do not adversely affect the chemical and physical properties of the material of the packaging. In such circumstances, retesting may be waived.

6.1.4.8.4 The wall thickness at every point of the packaging shall be appropriate to its capacity and intended use, taking into account the stresses to which each point is liable to be exposed.

6.1.4.8.5 Openings for filling, emptying and venting in the bodies or heads of non-removable head drums (1H1) and jerricans (3H1) shall not exceed 7 cm in diameter. Drums and jerricans with larger openings are considered to be of the removable head type (1H2 and 3H2). Closures for openings in the bodies or heads of drums and jerricans shall be so designed and applied that they will remain secure and

leakproof under normal conditions of transport. Gaskets or other sealing elements shall be used with closures unless the closure is inherently leakproof.

6.1.4.8.6 Closure devices for removable head drums and jerricans shall be so designed and applied that they will remain secure and leakproof under normal conditions of transport. Gaskets shall be used with all removable heads unless the drum or jerrican design is such that, where the removable head is properly secured, the drum or jerrican is inherently leakproof.

6.1.4.8.7 Maximum capacity of drums and jerricans: 1H1, 1H2: 450 litres  
3H1, 3H2: 60 litres

6.1.4.8.8 Maximum net mass: 1H1, 1H2: 400 kg  
3H1, 3H2: 120 kg

#### **6.1.4.9 *Boxes of natural wood***

4C1 ordinary  
4C2 with sift-proof walls

6.1.4.9.1 The wood used shall be well-seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the box. The strength of the material used and the method of construction shall be appropriate to the capacity and intended use of the box. The tops and bottoms may be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.1.4.9.2 Fastenings shall be resistant to vibration experienced under normal conditions of transport. End grain nailing shall be avoided whenever practicable. Joins which are likely to be highly stressed shall be made using clenched or annular ring nails or equivalent fastenings.

6.1.4.9.3 Box 4C2: each part shall consist of one piece or be equivalent thereto. Parts are considered equivalent to one piece when one of the following methods of glued assembly is used: Lindermann joint, tongue and groove joint, ship lap or rabbet joint or butt joint with at least two corrugated metal fasteners at each joint.

6.1.4.9.4 Maximum net mass: 400 kg

#### **6.1.4.10 *Plywood boxes***

4D

6.1.4.10.1 Plywood used shall be at least 3-ply. It shall be made from well-seasoned rotary cut, sliced or sawn veneer, commercially dry and free from defects that would materially lessen the strength of the box. The strength of the material used and the method of construction shall be appropriate to the capacity and intended use of the box. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used together with plywood in the construction of boxes. Boxes shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.1.4.10.2 Maximum net mass: 400 kg

#### **6.1.4.11 *Reconstituted wood boxes***

4F

6.1.4.11.1 The walls of boxes shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type. The strength of the material used and the method of construction shall be appropriate to the capacity of the boxes and to their intended use.



6.1.4.11.2 Other parts of the boxes may be made of other suitable material.

6.1.4.11.3 Boxes shall be securely assembled by means of suitable devices.

6.1.4.11.4 Maximum net mass: 400 kg

**6.1.4.12 *Fibreboard boxes***

4G

6.1.4.12.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) shall be used, appropriate to the capacity of the box 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 g/m<sup>2</sup> - 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.

6.1.4.12.2 The ends of boxes may have a wooden frame or be entirely of wood or other suitable material. Reinforcements of wooden battens or other suitable material may be used.

6.1.4.12.3 Manufacturing joints in the body of boxes shall be taped, lapped and glued, or lapped and stitched with metal staples. Lapped joints shall have an appropriate overlap.

6.1.4.12.4 Where closing is effected by gluing or taping, a water resistant adhesive shall be used.

6.1.4.12.5 Boxes shall be designed so as to provide a good fit to the contents.

6.1.4.12.6 Maximum net mass: 400 kg

**6.1.4.13 *Plastics boxes***

4H1 expanded plastics boxes

4H2 solid plastics boxes

6.1.4.13.1 The box shall be manufactured from suitable plastics material and be of adequate strength in relation to its capacity and intended use. The box shall be adequately resistant to ageing and to degradation caused either by the substance contained or by ultra-violet radiation.

6.1.4.13.2 An expanded plastics box shall comprise two parts made of a moulded expanded plastics material, a bottom section containing cavities for the inner packagings and a top section covering and interlocking with the bottom section. The top and bottom sections shall be designed so that the inner packagings fit snugly. The closure cap for any inner packaging shall not be in contact with the inside of the top section of this box.

6.1.4.13.3 For dispatch, an expanded plastics box shall be closed with a self-adhesive tape having sufficient tensile strength to prevent the box from opening. The adhesive tape shall be weather resistant and its adhesive compatible with the expanded plastics material of the box. Other closing devices at least equally effective may be used.

6.1.4.13.4 For solid plastics boxes, protection against ultra-violet radiation, if required, 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 box. 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 the carbon black content does not exceed 2% by mass or if the pigment content does not exceed 3% by mass; the content of inhibitors of ultra-violet radiation is not limited.

6.1.4.13.5 Additives serving purposes other than protection against ultra-violet radiation may be included in the composition of the plastics material provided that they do not adversely affect the chemical or physical properties of the material of the box. In such circumstances, retesting may be waived.

6.1.4.13.6 Solid plastics boxes shall have closure devices made of a suitable material of adequate strength and so designed as to prevent the box from unintentional opening.

6.1.4.13.7 Maximum net mass: 4H1: 60 kg  
4H2: 400 kg

**6.1.4.14 *Steel or aluminium boxes***

4A steel  
4B aluminium

6.1.4.14.1 The strength of the metal and the construction of the box shall be appropriate to the capacity of the box and to its intended use.

6.1.4.14.2 Boxes shall be lined with fibreboard or felt packing pieces or shall have an inner liner or coating of suitable material, as required. If a double seamed metal liner is used, steps shall be taken to prevent the ingress of substances, particularly explosives, into the recesses of the seams.

6.1.4.14.3 Closures may be of any suitable type; they shall remain secured under normal conditions of transport.

6.1.4.14.4 Maximum net mass: 400 kg

**6.1.4.15 *Textile bags***

5L1 without inner liner or coating  
5L2 sift-proof  
5L3 water resistant

6.1.4.15.1 The textiles used shall be of good quality. The strength of the fabric and the construction of the bag shall be appropriate to the capacity of the bag and to its intended use.

6.1.4.15.2 Bags, sift-proof, 5L2: the bag shall be made sift-proof, for example by the use of:

- (a) Paper bonded to the inner surface of the bag by a water resistant adhesive such as bitumen; or
- (b) Plastics film bonded to the inner surface of the bag; or
- (c) One or more inner liners made of paper or plastics material.

6.1.4.15.3 Bags, water resistant, 5L3: to prevent the entry of moisture the bag shall be made waterproof, for example by the use of:

- (a) Separate inner liners of water resistant paper (e.g. waxed kraft paper, tarred paper or plastics-coated kraft paper); or
- (b) Plastics film bonded to the inner surface of the bag; or
- (c) One or more inner liners made of plastics material.

6.1.4.15.4 Maximum net mass: 50 kg

#### 6.1.4.16 *Woven plastics bags*

- 5H1 without inner liner or coating
- 5H2 sift-proof
- 5H3 water resistant

6.1.4.16.1 Bags shall be made from stretched tapes or monofilaments of a suitable plastics material. The strength of the material used and the construction of the bag shall be appropriate to the capacity of the bag and to its intended use.

6.1.4.16.2 If the fabric is woven flat, the bags shall be made by sewing or some other method ensuring closure of the bottom and one side. If the fabric is tubular, the bag shall be closed by sewing, weaving or some other equally strong method of closure.

6.1.4.16.3 Bags, sift-proof, 5H2: the bag shall be made sift-proof, for example by means of:

- (a) Paper or a plastics film bonded to the inner surface of the bag; or
- (b) One or more separate inner liners made of paper or plastics material.

6.1.4.16.4 Bags, water resistant, 5H3: to prevent the entry of moisture, the bag shall be made waterproof, for example by means of:

- (a) Separate inner liners of water resistant paper (e.g. waxed kraft paper, double-tarred kraft paper or plastics-coated kraft paper); or
- (b) Plastics film bonded to the inner or outer surface of the bag; or
- (c) One or more inner plastics liners.

6.1.4.16.5 Maximum net mass: 50 kg

#### 6.1.4.17 *Plastics film bags*

5H4

6.1.4.17.1 Bags shall be made of a suitable plastics material. The strength of the material used and the construction of the bag shall be appropriate to the capacity of the bag and to its intended use. Joins and closures shall withstand pressures and impacts liable to occur under normal conditions of transport.

6.1.4.17.2 Maximum net mass: 50 kg

#### 6.1.4.18 *Paper bags* *(The proposed changes in 6.1.4.18 are meant to clarify, that for a 5M2 type bag the purpose is to protect inner layer(s) against moisture and that the bag is thus made waterproof)*

- 5M1 multiwall
- 5M2 multiwall, water-~~proof~~ resistant

6.1.4.18.1 Bags shall be made of a suitable kraft paper or of an equivalent paper with at least three plies, the middle ply of which may be net-cloth with adhesive bonding to the outer ply. The strength of the paper and the construction of the bags shall be appropriate to the capacity of the bag and to its intended use. Joins and closures shall be sift-proof.

6.1.4.18.2 Bags 5M2: to protect the inner plies against ~~to prevent the entry of~~ moisture, a bag of four plies or more shall be made waterproof by the use of either a water resistant ply as one of the two outermost plies or a water resistant barrier made of a suitable protective material between the two outermost plies; a bag of three plies shall be made waterproof by the use of a water resistant ply as the outermost ply. A water

resistant ply can consist of a ply with a suitable coating, e.g. plastics. Where there is a danger of the substance contained reacting with moisture or where it is packed damp, a water resistant proof ply or barrier, such as double-tarred kraft paper, plastics-coated kraft paper, plastics film bonded to the inner surface of the bag, or one or more inner plastics liners, shall also be placed next to the substance. Joins and closures shall be waterproof.

6.1.4.18.3 Maximum net mass: 50 kg

#### **6.1.4.19 Composite packagings (plastics material)**

6HA1	plastics receptacle with outer steel drum
6HA2	plastics receptacle with outer steel crate or box
6HB1	plastics receptacle with outer aluminium drum
6HB2	plastics receptacle with outer aluminium crate or box
6HC	plastics receptacle with outer wooden box
6HD1	plastics receptacle with outer plywood drum
6HD2	plastics receptacle with outer plywood box
6HG1	plastics receptacle with outer fibre drum
6HG2	plastics receptacle with outer fibreboard box
6HH1	plastics receptacle with outer plastics drum
6HH2	plastics receptacle with outer solid plastics box

##### 6.1.4.19.1 *Inner receptacle*

6.1.4.19.1.1 The requirements of 6.1.4.8.1 and 6.1.4.8.3 to 6.1.4.8.6 apply to inner plastics receptacles.

6.1.4.19.1.2 The inner plastics receptacle shall fit snugly inside the outer packaging, which shall be free of any projection that might abrade the plastics material.

6.1.4.19.1.3 Maximum capacity of inner receptacle:

6HA1, 6HB1, 6HD1, 6HG1, 6HH1:	250 litres
6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2:	60 litres

6.1.4.19.1.4 Maximum net mass:

6HA1, 6HB1, 6HD1, 6HG1, 6HH1:	400 kg
6HA2, 6HB2, 6HC, 6HD2, 6HG2, 6HH2:	75 kg

##### 6.1.4.19.2 *Outer packaging*

6.1.4.19.2.1 Plastics receptacle with outer steel or aluminium drum 6HA1 or 6HB1; the relevant requirements of 6.1.4.1 or 6.1.4.2, as appropriate, apply to the construction of the outer packaging.

6.1.4.19.2.2 Plastics receptacle with outer steel or aluminium crate or box 6HA2 or 6HB2; the relevant requirements of 6.1.4.14 apply to the construction of the outer packaging.

6.1.4.19.2.3 Plastics receptacle with outer wooden box 6HC; the relevant requirements of 6.1.4.9 apply to the construction of the outer packaging.

6.1.4.19.2.4 Plastics receptacle with outer plywood drum 6HD1; the relevant requirements of 6.1.4.5 apply to the construction of the outer packaging.

6.1.4.19.2.5 Plastics receptacle with outer plywood box 6HD2; the relevant requirements of 6.1.4.10 apply to the construction of the outer packaging.

6.1.4.19.2.6 Plastics receptacle with outer fibre drum 6HG1; the requirements of 6.1.4.7.1 to 6.1.4.7.4

apply to the construction of the outer packaging.

6.1.4.19.2.7 Plastics receptacle with outer fibreboard box 6HG2; the relevant requirements of 6.1.4.12 apply to the construction of the outer packaging.

6.1.4.19.2.8 Plastics receptacle with outer plastics drum 6HH1; the requirements of 6.1.4.8.1 and 6.1.4.8.2 to 6.1.4.8.6 apply to the construction of the outer packaging.

6.1.4.19.2.9 Plastics receptacles with outer solid plastics box (including corrugated plastics material) 6HH2; the requirements of 6.1.4.13.1 and 6.1.4.13.4 to 6.1.4.13.6 apply to the construction of the outer packaging.

#### **6.1.4.20 Composite packagings (glass, porcelain or stoneware)**

6PA1	receptacle with outer steel drum
6PA2	receptacle with outer steel crate or box
6PB1	receptacle with outer aluminium drum
6PB2	receptacle with outer aluminium crate or box
6PC	receptacle with outer wooden box
6PD1	receptacle with outer plywood drum
6PD2	receptacle with outer wickerwork hamper
6PG1	receptacle with outer fibre drum
6PG2	receptacle with outer fibreboard box
6PH1	receptacle with outer expanded plastics packaging
6PH2	receptacle with outer solid plastics packaging

##### **6.1.4.20.1 Inner receptacle**

6.1.4.20.1.1 Receptacles shall be of a suitable form (cylindrical or pear-shaped) and be made of good quality material free from any defect that could impair their strength. The walls shall be sufficiently thick at every point.

6.1.4.20.1.2 Screw-threaded plastics closures, ground glass stoppers or closures at least equally effective shall be used as closures for receptacles. Any part of the closure likely to come into contact with the contents of the receptacle shall be resistant to those contents. Care shall be taken to ensure that the closures are so fitted as to be leakproof and are suitably secured to prevent any loosening during transport. If vented closures are necessary, they shall comply with 4.1.1.8.

6.1.4.20.1.3 The receptacle shall be firmly secured in the outer packaging by means of cushioning and/or absorbent materials.

6.1.4.20.1.4 Maximum capacity of receptacle: 60 litres

6.1.4.20.1.5 Maximum net mass: 75 kg

##### **6.1.4.20.2 Outer packaging**

6.1.4.20.2.1 Receptacle with outer steel drum 6PA1; the relevant requirements of 6.1.4.1 apply to the construction of the outer packaging. The removable lid required for this type of packaging may nevertheless be in the form of a cap.

6.1.4.20.2.2 Receptacle with outer steel crate or box 6PA2; the relevant requirements of 6.1.4.14 apply to the construction of the outer packaging. For cylindrical receptacles the outer packaging shall, when upright, rise above the receptacle and its closure. If the crate surrounds a pear-shaped receptacle and is of matching shape, the outer packaging shall be fitted with a protective cover (cap).

6.1.4.20.2.3 Receptacle with outer aluminium drum 6PB1; the relevant requirements of 6.1.4.2 apply to the construction of the outer packaging.

6.1.4.20.2.4 Receptacle with outer aluminium crate or box 6PB2; the relevant requirements of 6.1.4.14 apply to the construction of the outer packaging.

6.1.4.20.2.5 Receptacle with outer wooden box 6PC; the relevant requirements of 6.1.4.9 apply to the construction of the outer packaging.

6.1.4.20.2.6 Receptacle with outer plywood drum 6PD1; the relevant requirements of 6.1.4.5 apply to the construction of the outer packaging.

6.1.4.20.2.7 Receptacle with outer wickerwork hamper 6PD2; the wickerwork hamper shall be properly made with material of good quality. It shall be fitted with a protective cover (cap) so as to prevent damage to the receptacle.

6.1.4.20.2.8 Receptacle with outer fibre drum 6PG1; the relevant requirements of 6.1.4.7.1 to 6.1.4.7.4 apply to the construction of the outer packaging.

6.1.4.20.2.9 Receptacle with outer fibreboard box 6PG2; the relevant requirements of 6.1.4.12 apply to the construction of the outer packaging.

6.1.4.20.2.10 Receptacle with outer expanded plastics or solid plastics packaging (6PH1 or 6PH2); the materials of both outer packagings shall meet the relevant requirements of 6.1.4.13. Solid plastics packaging shall be manufactured from high density polyethylene or some other comparable plastics material. The removable lid for this type of packaging may nevertheless be in the form of a cap.

## **6.1.5 Test requirements for packagings**

### **6.1.5.1 *Performance and frequency of tests***

6.1.5.1.1 The design type of each packaging shall be tested as provided in 6.1.5 in accordance with procedures established by the competent authority.

6.1.5.1.2 Tests shall be successfully performed on each packaging design type before such packaging is used. A packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes packagings which differ from the design type only in their lesser design height.

6.1.5.1.3 Tests shall be repeated on production samples at intervals established by the competent authority. For such tests on paper or fibreboard packagings, preparation at ambient conditions is considered equivalent to the requirements of 6.1.5.2.3.

6.1.5.1.4 Tests shall also be repeated after each modification which alters the design, material or manner of construction of a packaging.

6.1.5.1.5 The competent authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and packagings such as drums, bags and boxes which are produced with small reductions in external dimension(s).

[6.1.5.1.6 will be moved to chapter 4.1 as new 4.1.1.5.2 \(This part is meant for the user\)](#)

~~6.1.5.1.6 Where an outer packaging of a combination packaging has been successfully tested with different types of inner packagings, a variety of such different inner packagings may also be assembled in this outer packaging. In addition, provided an equivalent level of performance is maintained, the following variations in inner packagings are allowed without further testing of the package:~~

~~(a) Inner packagings of equivalent or smaller size may be used provided:~~

- ~~(i) The inner packagings are of similar design to the tested inner packagings (e.g. shape round, rectangular, etc.);~~
  - ~~(ii) The material of construction of the inner packagings (glass, plastics, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested inner packaging;~~
  - ~~(iii) The inner packagings have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc.);~~
  - ~~(iv) Sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the inner packagings; and~~
  - ~~(v) Inner packagings are oriented within the outer packaging in the same manner as in the tested package.~~
- ~~(b) A lesser number of the tested inner packagings, or of the alternative types of inner packagings identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the inner packagings.~~

6.1.5.1.67 Articles or inner packagings of any type for solids or liquids may be assembled and transported without testing in an outer packaging under the following conditions:

- (a) The outer packaging shall have been successfully tested in accordance with 6.1.5.3 with fragile (e.g. glass) inner packagings containing liquids using the packing group I drop height;
- (b) The total combined gross mass of inner packagings shall not exceed one half the gross mass of inner packagings used for the drop test in (a) above;
- (c) The thickness of cushioning material between inner packagings and between inner packagings and the outside of the packaging shall not be reduced below the corresponding thicknesses in the originally tested packaging; and if a single inner packaging was used in the original test, the thicknesses of cushioning between inner packagings shall not be less than the thickness of cushioning between the outside of the packaging and the inner packaging in the original test. If either fewer or smaller inner packagings are used (as compared to the inner packagings used in the drop test), sufficient additional cushioning material shall be used to take up void spaces;
- (d) The outer packaging shall have passed successfully the stacking test in 6.1.5.6 while empty. The total mass of identical packages shall be based on the combined mass of inner packagings used for the drop test in (a) above;
- (e) Inner packagings containing liquids shall be completely surrounded with a sufficient quantity of absorbent material to absorb the entire liquid contents of the inner packagings;
- (f) If the outer packaging is intended to contain inner packagings for liquids and is not leakproof, or is intended to contain inner packagings for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage shall be provided in the form of a leakproof liner, plastics bag or other equally efficient means

of containment. For packagings containing liquids, the absorbent material required in (e) above shall be placed inside the means of containing the liquid contents;

- (g) For air transport, packagings shall comply with 4.1.1.4.1;
- (h) Packagings shall be marked in accordance with 6.1.3 as having been tested to packing group I performance for combination packagings. The marked gross mass in kilograms shall be the sum of the mass of the outer packaging plus one half of the mass of the inner packaging(s) as used for the drop test referred to in (a) above. Such a packaging mark shall also contain a letter "V" as described in 6.1.2.4.

6.1.5.1.78 The competent authority may at any time require proof, by tests in accordance with this section, that serially-produced packagings meet the requirements of the design type tests.

6.1.5.1.89 If an inner treatment or coating is required for safety reasons, it shall retain its protective properties even after the tests.

6.1.5.1.940 Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one sample.

#### 6.1.5.1.1044 *Salvage packagings*

Salvage packagings (see 1.2.1) shall be tested and marked in accordance with the provisions applicable to packing group II packagings intended for the transport of solids or inner packagings, except as follows:

- (a) The test substance used in performing the tests shall be water, and the packagings shall be filled to not less than 98% of their maximum capacity. 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. Alternatively, in performing the drop test, the drop height may be varied in accordance with 6.1.5.3.5 (b);
- (b) Packagings shall, in addition, have been successfully subjected to the leakproofness test at 30 kPa, with the results of this test reflected in the test report required by 6.1.5.7; and
- (c) Packagings shall be marked with the letter "T" as described in 6.1.2.4.

#### 6.1.5.2 *Preparation of packagings for testing*

6.1.5.2.1 Tests shall be carried out on packagings prepared as for transport including, with respect to combination packagings, the inner packagings used. Inner or single receptacles or packagings other than bags shall be filled to not less than 98% of their maximum capacity for liquids or 95% for solids. Bags shall be filled to the maximum mass at which they may be used. For combination packagings where the inner packaging is designed to carry liquids and solids, separate testing is required for both liquid and solid contents. The substances or articles to be transported in the packagings may be replaced by other substances or articles 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.

6.1.5.2.2 In the drop tests for liquids, when another substance is used, it shall be of similar relative density and viscosity to those of the substance being transported. Water may also be used for the liquid drop test under the conditions in 6.1.5.3.5.

6.1.5.2.3 Paper or fibreboard packagings 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.*

6.1.5.2.4 Bung-type barrels made of natural wood shall be left filled with water for at least 24 hours before the tests.

6.1.5.2.5 Additional steps shall be taken to ascertain that the plastics material used in the manufacture of plastics drums, plastics jerricans and composite packagings (plastics material) intended to contain liquids complies with the requirements in 6.1.1.2, 6.1.4.8.1 and 6.1.4.8.3. This may be done, for example, by submitting sample receptacles or packagings 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, and after which the samples shall be submitted to the applicable tests listed in 6.1.5.3, 6.1.5.4, 6.1.5.5 and 6.1.5.6. For substances which may cause stress-cracking or weakening in plastics drums or jerricans, the sample, filled with the substance or another substance that is known to have at least as severe a stress-cracking influence on the plastics material in question, shall be subjected to a superimposed load equivalent to the total mass of identical packages which might be stacked on it during transport. The minimum height of the stack including the test sample shall be 3 metres.

### 6.1.5.3 Drop test

6.1.5.3.1 Number of test samples (per design type and manufacturer) and drop orientation

For other than flat drops the centre of gravity shall be vertically over the point of impact.

Where more than one orientation is possible for a given drop test, the orientation most likely to result in failure of the packaging shall be used.

<b>Packaging</b>	<b>No. of test samples</b>	<b>Drop orientation</b>
Steel drums Aluminum drums Metal drums, other than steel or aluminum drums Steel jerricans Aluminum jerricans Plywood drums Wooden barrels Fibre drums Plastics drums and jerricans Composite packagings which are in the shape of a drum	Six (three for each drop)	<i>First drop</i> (using three samples): the packaging shall strike the target diagonally on the chime or, if the packaging has no chime, on a circumferential seam or an edge.  <i>Second drop</i> (using the other three samples): the packaging shall strike the target on the weakest part not tested by the first drop, for example a closure or, for some cylindrical drums, the welded longitudinal seam of the drum body.
Boxes of natural wood Plywood boxes Reconstituted wood boxes Fibreboard boxes Plastics boxes Steel or aluminum boxes Composite packagings which are in the shape of a box	Five (one for each drop)	<i>First drop:</i> flat on the bottom <i>Second drop:</i> flat on the top <i>Third drop:</i> flat on the long side <i>Fourth drop:</i> flat on the short side <i>Fifth drop:</i> on a corner

(cont'd on next page)

Packaging	No. of test samples	Drop orientation
Bags – single-ply with a side seam	Three (three drops per bag)	<i>First drop:</i> flat on a wide face <i>Second drop:</i> flat on a narrow face <i>Third drop:</i> on an end of the bag
Bags – single-ply without a side seam, or multi-ply	Two (two drops per bag)	<i>First drop:</i> flat on a wide face <i>Second drop:</i> on an end of the bag

#### 6.1.5.3.2 *Special preparation of test samples for the drop test*

The temperature of the test sample and its contents shall be reduced to -18 °C or lower for the following packagings:

- (a) Plastics drums (see 6.1.4.8);
- (b) Plastics jerricans (see 6.1.4.8);
- (c) Plastics boxes other than expanded plastics boxes (see 6.1.4.13);
- (d) Composite packagings (plastics material) (see 6.1.4.19); and
- (e) Combination packagings with plastics inner packagings, other than plastics bags intended to contain solids or articles.

Where test samples are prepared in this way, the conditioning in 6.1.5.2.3 may be waived. Test liquids shall be kept in the liquid state by the addition of anti-freeze if necessary.

6.1.5.3.3 Removable head packagings for liquids shall not be dropped until at least 24 hours after filling and closing to allow for any possible gasket relaxation.

#### 6.1.5.3.4 *Target*

The target shall be a rigid, non-resilient, flat and horizontal surface.

#### 6.1.5.3.5 *Drop height*

For solids and liquids, if the test is performed with the solid or liquid to be carried or with another substance having essentially the same physical characteristics:

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

For liquids in single packagings and for inner packagings of combination packagings, if the test is performed with water:

**NOTE:** *The term water includes water/antifreeze solutions with a minimum specific gravity of 0.95 for testing at - 18 °C.*

- (a) Where the substances to be transported have a relative density not exceeding 1.2:

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

- (b) Where the substances to be transported have a relative density exceeding 1.2, the drop height 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
$d \times 1.5$ (m)	$d \times 1.0$ (m)	$d \times 0.67$ (m)

6.1.5.3.6 Criteria for passing the test:

6.1.5.3.6.1 Each packaging containing liquid shall be leakproof when equilibrium has been reached between the internal and external pressures, except for inner packagings of combination packagings when it is not necessary that the pressures be equalized.

6.1.5.3.6.2 Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle (e.g. a plastics bag), even if the closure while retaining its containment function, is no longer sift-proof.

6.1.5.3.6.3 The packaging or outer packaging of a composite or combination packaging shall not exhibit any damage liable to affect safety during transport. There shall be no leakage of the filling substance from the inner receptacle or inner packaging(s).

6.1.5.3.6.4 Neither the outermost ply of a bag nor an outer packaging may exhibit any damage liable to affect safety during transport.

6.1.5.3.6.5 A slight discharge from the closure(s) upon impact is not considered to be a failure of the packaging provided that no further leakage occurs.

6.1.5.3.6.6 No rupture is permitted in packagings for goods of Class 1 which would permit the spillage of loose explosive substances or articles from the outer packaging.

#### 6.1.5.4 *Leakproofness test*

The leakproofness test shall be performed on all design types of packagings intended to contain liquids; however, this test is not required for the inner packagings of combination packagings.

6.1.5.4.1 *Number of test samples:* three test samples per design type and manufacturer.

6.1.5.4.2 *Special preparation of test samples for the test:* either vented closures shall be replaced by similar non-vented closures or the vent shall be sealed.

6.1.5.4.3 *Test method and pressure to be applied:* the packagings including their closures shall be restrained under water for 5 minutes while an internal air pressure is applied, the method of restraint shall not affect the results of the test.

The air pressure (gauge) to be applied shall be:

Packing group I	Packing group II	Packing group III
Not less than 30 kPa (0.3 bar)	Not less than 20 kPa (0.2 bar)	Not less than 20 kPa (0.2 bar)

Other methods at least equally effective may be used.

6.1.5.4.4 *Criterion for passing the test:* there shall be no leakage.

### **6.1.5.5**        *Internal pressure (hydraulic) test*

6.1.5.5.1        *Packagings to be tested:* the internal pressure (hydraulic) test shall be carried out on all design types of metal, plastics and composite packagings intended to contain liquids. This test is not required for inner packagings of combination packagings.

6.1.5.5.2        *Number of test samples:* three test samples per design type and manufacturer.

6.1.5.5.3        *Special preparation of packagings for testing:* either vented closures shall be replaced by similar non-vented closures or the vent shall be sealed.

6.1.5.5.4        *Test method and pressure to be applied:* metal packagings and composite packagings (glass, porcelain or stoneware) including their closures shall be subjected to the test pressure for 5 minutes. Plastics packagings and composite packagings (plastics material) including their closures shall be subjected to the test pressure for 30 minutes. This pressure is the one to be included in the marking required by 6.1.3.1 (d). The manner in which the packagings are supported shall not invalidate the test. The test pressure shall be applied continuously and evenly; it shall be kept constant throughout the test period. The hydraulic pressure (gauge) applied, as determined by any one of the following methods, shall be:

- (a) Not less than the total gauge pressure measured in the packaging (i.e. the vapour pressure of the filling liquid 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 4.1.1.4 and a filling temperature of 15 °C;
- (b) Not less than 1.75 times the vapour pressure at 50 °C of the liquid to be transported, minus 100 kPa but with a minimum test pressure of 100 kPa;
- (c) Not less than 1.5 times the vapour pressure at 55 °C of the liquid to be transported, minus 100 kPa but with a minimum test pressure of 100 kPa.

6.1.5.5.5        In addition, packagings intended to contain liquids of packing group I shall be tested to a minimum test pressure of 250 kPa (gauge) for a test period of 5 or 30 minutes depending upon the material of construction of the packaging.

6.1.5.5.6        The special requirements for air transport, including minimum test pressures, may not be covered in 6.1.5.5.4.

6.1.5.5.7        *Criterion for passing the test:* no packaging may leak.

### **6.1.5.6**        *Stacking test*

All design types of packagings other than bags are subject to a stacking test.

6.1.5.6.1        *Number of test samples:* three test samples per design type and manufacturer.

6.1.5.6.2        *Test method:* the test sample shall be subjected to a force applied to the top surface of the test sample equivalent to the total weight of identical packages which might be stacked on it during transport; where the contents of the test sample are liquids with relative density different from that of the liquid to be transported, the force shall be calculated in relation to the latter. The minimum height of the stack including the test sample shall be 3 meters. The duration of the test shall be 24 hours except that plastics drums, jerricans, and composite packagings 6HH1 and 6HH2 intended for liquids shall be subjected to the stacking test for a period of 28 days at a temperature of not less than 40°C.

6.1.5.6.3        *Criterion for passing the test:* no test sample may leak. In composite packagings or combination packagings, there shall be no leakage of the filling substance from the inner receptacle or inner packaging. No test sample may show any deterioration which could adversely affect transport safety or any

distortion liable to reduce its strength or cause instability in stacks of packages. Plastics packagings shall be cooled to ambient temperature before the assessment.

#### **6.1.5.7        *Test Report***

6.1.5.7.1        A test report containing at least the following particulars shall be drawn up and shall be available to the users of the packaging:

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 packaging;
6.    Description of the packaging 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.

6.1.5.7.2        The test report shall contain statements that the packaging prepared as for transport was tested in accordance with the appropriate requirements of this Chapter 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.

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## CHAPTER 6.3

### REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS FOR DIVISION 6.2 SUBSTANCES

#### 6.3.1 General

6.3.1.1 The maximum nett mass shall be 400 kg. *(upper limit as in 6.1)*

6.3.1.2 The requirements for packagings in 6.3 are based on packagings currently used. In order to take into account progress in science and technology, there is no objection to the use of packagings having specifications different from those in 6.3, provided that they are equally effective, acceptable to the competent authority and able successfully to withstand the tests described in 6.3.2. Methods of testing other than those described in these Regulations are acceptable, provided they are equivalent. *(This paragraph is equivalent to 6.1.1.2)*

6.3.1.3~~4~~ A packaging that meets the requirements of this section and of 6.3.2 shall be marked with:

- (a) The United Nations packaging symbol;
- (b) The code designating the type of packaging according to the requirements of 6.1.2;
- (c) The text "CLASS 6.2";
- (d) The last two digits of the year of manufacture of the packaging;
- (e) The state authorizing the allocation of the mark, indicated by the distinguishing sign for motor vehicles in international traffic;
- (f) The name of the manufacturer or other identification of the packaging specified by the competent authority;
- (g) For packagings meeting the requirements of 6.3.2.79, the letter "U", inserted immediately following the marking required in (b) above.

Each element of the marking applied in accordance with (a) to (g) shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable.

6.3.1.4 Each packaging intended for use according to these Regulations shall bear markings which are durable, legible and placed in a location and of such a size relative to the packaging as to be readily visible. For packages with a gross mass of more than 30 kg, the markings or a duplicate thereof shall appear on the top or on a side of the packaging. Letters, numerals and symbols shall be at least 12 mm high, except for packagings of 30 litres or 30 kg capacity or less, when they shall be at least 6 mm in height and for packagings of 5 litres or 5 kg or less when they shall be of an appropriate size. *(Paragraph as in 6.1.3.1)*

6.3.1.5~~2~~ Example of marking: *(Notes are inserted as in 6.1.3)*



4G/CLASS 6.2/01

as in 6.3.1.1 (a), (b), (c) and (d)

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as in 6.3.1.1 (e), (f)

**NOTE 1:** *The marking indicates that the packaging which bears it corresponds to a successfully tested design type and that it complies with the requirements of this Chapter which are related to the manufacture, but not to the use, of the packaging. In itself, therefore, the mark does not necessarily confirm that the packaging may be used for any substance: generally the type of packaging (e.g. steel drum), its maximum*

capacity and/or mass, and any special requirements are specified for each substance in Part 3 of these Regulations.

**NOTE 2:** The marking is intended to be of assistance to packaging manufacturers, reconditioners, packaging users, carriers and regulatory authorities. In relation to the use of a new packaging, the original marking is a means for its manufacturer(s) to identify the type and to indicate those performance test regulations that have been met.

**NOTE 3:** The marking does not always provide full details of the test levels, etc., and these may need to be taken further into account, e.g. by reference to a test certificate, to test reports or to a register of successfully tested packagings.

6.3.1.6 Packagings shall be manufactured and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each packaging meets the requirements of this Chapter.(paragraph as in 6.1.1.4)

6.3.1.7~~3~~ Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that packages as presented for transport are capable of passing the applicable performance tests of this Chapter.

## **6.3.2 ~~6.3.2~~ Test requirements for packagings**

### **6.3.2.1 Performance and frequency of tests (paragraphs as in 6.1.5.1)**

6.3.2.1.1 The design type of each packaging shall be tested as provided in 6.3.2 in accordance with procedures established by the competent authority.

6.3.2.1.2 Tests shall be successfully performed on each packaging design type before such packaging is used. A packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes packagings which differ from the design type only in their lesser design height.

6.3.2.1.3 Tests shall be repeated on production samples at intervals established by the competent authority.

6.3.2.1.4 Tests shall also be repeated after each modification which alters the design, material or manner of construction of a packaging.

6.3.2.1.5 The competent authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and packagings such as drums, bags and boxes which are produced with small reductions in external dimension(s).

6.3.2.1.6 Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one sample.

6.3.2.1.7 The competent authority may at any time require proof, by tests in accordance with this section, that serially-produced packagings meet the requirements of the design type tests.

### **6.3.2.2 Preparation of packagings for testing**

6.3.2.2.1~~4~~ Other than for packagings for live animals and organisms, samples of each packaging shall be prepared for testing as described in 6.3.2.2.2 and then subjected to the tests in 6.3.2.4 to 6.3.2.6. If the nature of the packaging makes it necessary, equivalent preparation and tests are permitted, provided that these may be demonstrated to be at least as effective.



6.3.2.2.2 Samples of each packaging shall be prepared as for transport except that a liquid or solid infectious substance shall be replaced by water or, where conditioning at -18 °C is specified, by water/antifreeze. Each primary receptacle shall be filled to not less than 98% of its capacity. (filling requirement as in 6.1.5.2.1)

**6.3.2.3 Tests required**

Material of					Tests required				
Outer packaging			inner packaging		Refer to 6.3.2.5				Refer to 6.3.2.6
Fibre-board	Plastics	Other	Plastics	Other	(a)	(b)	(c)	(d)	
X			x			x	x	when dry ice is used	X
X				x		x			X
	X		x				x		X
	X			x			x		X
		x	x				x		X
		x		x	x				X

6.3.2.4 Packagings prepared as for transport shall be subjected to the tests in 6.3.2.3, which - for test purposes - categorizes packagings according to their material characteristics. For outer packagings, the headings in the table relate to fibreboard or similar materials whose performance may be rapidly affected by moisture; plastics which may embrittle at low temperature; and other materials such as metal whose performance is not affected by moisture or temperature. If a primary receptacle and a secondary packaging of an inner packaging are made of different materials, the material of the primary receptacle determines the appropriate test. In instances where a primary receptacle is made of two materials, the material most liable to damage determines the appropriate test.

6.3.2.5 (a) Samples shall be subjected to free-fall drops on to a rigid, non-resilient, flat, horizontal surface from a height of 9 m. Where the samples are in the shape of a box, five shall be dropped in sequence:

- (i) flat on to the base;
- (ii) flat on to the top;
- (iii) flat on to the longest side;
- (iv) flat on to the shortest side;
- (v) on to a corner;

Where the samples are in the shape of a drum, three shall be dropped in sequence:

- (vi) diagonally on to the top chime, with the centre of gravity directly above the point of impact;
- (vii) diagonally on to the base chime;
- (viii) flat on to the side;

Following the appropriate drop sequence, there may be no leakage from the primary receptacle(s) which shall remain protected by absorbent material in the secondary packaging (when present) (absorbent material is not required for solids);

**NOTE:** While the sample shall be released in the required orientation, it is accepted that for aerodynamic reasons the impact may not take place in that orientation.

- (b) The sample shall be subjected to a water spray that simulates exposure to rainfall of approximately 5 cm per hour for at least one hour. It shall then be subjected to the test described in (a);
- (c) The sample shall be conditioned in an atmosphere of -18 °C or less for a period of at least 24 hours and within 15 minutes of removal from that atmosphere be subjected to the test described in (a). Where the sample contains dry ice, the conditioning period may be reduced to 4 hours;
- (d) Where the packaging is intended to contain dry ice, a test additional to that specified in (a) or (b) or (c) shall be carried out. One sample shall be stored so that all the dry ice dissipates and then be subjected to the test described in (a) with a drop orientation such that the packaging shall strike the target on the weakest part. (this makes it clear that the test is performed on one sample)

6.3.2.6 Packagings with a gross mass of 7 kg or less shall be subjected to the tests described in (a) below and packagings with a gross mass exceeding 7 kg to the tests in (b) below.

- (a) Samples shall be placed on a level hard surface. A cylindrical steel rod with a mass of at least 7 kg, a diameter of not exceeding 38 mm (better defined as in (b)) and the impact end edges a radius not exceeding 6 mm, shall be dropped in a vertical free fall from a height of 1 m, measured from the impact end to the impact surface of the sample. One sample shall be placed on its base. A second sample shall be placed in an orientation perpendicular to that used for the first. In each instance the steel rod shall be aimed to impact the primary receptacle. Following each impact, penetration of the secondary packaging is acceptable, provided that there is no leakage from the primary receptacle(s);
- (b) Samples shall be dropped on to the end of a cylindrical steel rod. The rod shall be set vertically in a level hard surface. It shall have a diameter of 38 mm and the edges of the upper end a radius not exceeding 6 mm. The rod shall protrude from the surface a distance at least equal to that between the primary receptacle(s) and the outer surface of the outer packaging with a minimum of 200 mm. One sample shall be dropped in a vertical free fall from a height of 1 m, measured from the top of the steel rod. A second sample shall be dropped from the same height in an orientation perpendicular to that used for the first. In each instance the packaging shall be so orientated that the steel rod would penetrate the primary receptacle(s). Following each impact, penetration of the secondary packaging is acceptable, provided that there is shall be no leakage from the primary receptacle(s). (the same criterion as in (a))

(This is now par.6.3.2.1.5)

~~6.3.2.7 The competent authority may permit the selective testing of packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and packagings such as drums, bags and boxes which are produced with small reductions in external dimension(s).~~

(This paragraph is moved to Part 4)

~~6.3.2.8 Provided an equivalent level of performance is maintained, the following variations in the primary receptacles placed within a secondary packaging are allowed without further testing of the completed package:~~

- ~~(a) Primary receptacles of equivalent or smaller size as compared to the tested primary receptacles may be used provided:~~

- (i) ~~The primary receptacles are of similar design to the tested primary receptacle (e.g. shape: round, rectangular, etc.);~~
- (ii) ~~The material of construction of the primary receptacle (glass, plastics, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested primary receptacle;~~
- (iii) ~~The primary receptacles have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc.);~~
- (iv) ~~Sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the primary receptacles; and~~
- (v) ~~Primary receptacles are oriented within the secondary packaging in the same manner as in the tested package;~~
- (b) ~~A lesser number of the tested primary receptacles, or of the alternative types of primary receptacles identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the primary receptacles.~~

*(In order to get a uniform terminology, inner receptacle has been replaced by primary receptacle, intermediate packaging by secondary packaging in 6.3.2.9, except in (a) where intermediate packaging has been replaced by inner packaging which is the correct wording there)*

6.3.2.79 ~~Primary Inner~~ receptacles of any type may be assembled within an ~~intermediate~~ (secondary) packaging and transported without testing in the outer packaging under the following conditions:

- (a) The ~~inner/intermediate~~/outer packaging combination shall have been successfully tested in accordance with 6.3.2.3 with fragile (e.g., glass) ~~primary/inner~~ receptacles;
- (b) The total combined gross mass of ~~primary/inner~~ receptacles shall not exceed one half the gross mass of ~~primary/inner~~ receptacles used for the drop test in (a) above;
- (c) The thickness of cushioning between ~~primary/inner~~ receptacles and between ~~primary/inner~~ receptacles and the outside of the ~~secondary/intermediate~~ packaging shall not be reduced below the corresponding thicknesses in the originally tested packaging; and if a single ~~primary/inner~~ receptacle was used in the original test, the thickness of cushioning between ~~primary/inner~~ receptacles shall not be less than the thickness of cushioning between the outside of the ~~secondary/intermediate~~ packaging and the ~~primary/inner~~ receptacle in the original test. When either fewer or smaller ~~primary/inner~~ receptacles are used (as compared to the ~~primary/inner~~ receptacles used in the drop test), sufficient additional cushioning material shall be used to take up the void;
- (d) The outer packaging shall have successfully passed the stacking test in 6.1.5.6 while empty. The total mass of identical packages shall be based on the combined mass of ~~primary/inner~~ receptacles used in the drop test in (a) above;
- (e) For ~~primary/inner~~ receptacles containing liquids, an adequate quantity of absorbent material to absorb the entire liquid content of the ~~primary/inner~~ receptacles shall be present;
- (f) If the outer packaging is intended to contain ~~primary/inner~~ receptacles for liquids and is not leakproof, or is intended to contain ~~primary/inner~~ receptacles for solids and is not siftproof, a means of containing any liquid or solid contents in the event of leakage shall be provided in the form of a leakproof liner, plastics bag or other equally effective means of containment;
- (g) In addition to the markings prescribed in 6.3.1.34(a) to (f), packagings shall be marked in accordance with 6.3.1.31 (g).

### **6.3.3 Test report**

6.3.3.1 A test report containing at least the following particulars shall be drawn up and shall be available to the users of the packaging:

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 packaging;
6. Description of the packaging 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.

6.3.3.2 The test report shall contain statements that the packaging prepared as for transport was tested in accordance with the appropriate requirements of this Chapter 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.

## CHAPTER 6.5

### REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF INTERMEDIATE BULK CONTAINERS

#### 6.5.1 General requirements applicable to all types of IBCs

##### 6.5.1.1 *Scope*

6.5.1.1.1 The requirements of this Chapter 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.

6.5.1.1.2 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.

The construction, equipment, testing, marking and operation of IBCs shall be subject to acceptance by the competent authority of the country in which the IBCs are approved.

6.5.1.1.4 Manufacturers and subsequent distributors of IBCs shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that IBCs as presented for transport are capable of passing the applicable performance tests of this Chapter.

##### 6.5.1.2 *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;

*Maximum permissible gross mass* means the mass of the IBC and any service or structural equipment together with the maximum net mass;

*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 stabilizing 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.

### 6.5.1.3 *Categories of IBCs*

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

6.5.1.3.2 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.

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

6.5.1.3.4 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.

6.5.1.3.5 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.

6.5.1.3.6 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.

### 6.5.1.4 *Designatory code system for IBCs*

6.5.1.4.1 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)

<u>Type</u>	<u>For solids filled or discharged</u>		<u>For liquids</u>
	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).

6.5.1.4.2 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.

6.5.1.4.3 The following types and codes of IBC are assigned:

<b>Material</b>	<b>Category</b>	<b>Code</b>	<b>Paragraph</b>
<u>Metal</u>			6.5.3.1
A. Steel	for solids, filled or discharged by gravity for solids, filled or discharged under pressure for liquids	11A 21A 31A	
B. Aluminium	for solids, filled or discharged by gravity for solids, filled or discharged under pressure for liquids	11B 21B 31B	
N. Other than steel or aluminium	for solids, filled or discharged by gravity for solids, filled or discharged under pressure for liquids	11N 21N 31N	
<u>Flexible</u>			6.5.3.2
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	
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	
<b>H. Rigid Plastics</b>	for solids, filled or discharged by gravity, fitted with structural equipment for solids, filled or discharged by gravity, freestanding for solids, filled or discharged under pressure, fitted with structural equipment for solids, filled or discharged under pressure, freestanding for liquids, fitted with structural equipment for liquids, freestanding	11H1 11H2 21H1 21H2 31H1 31H2	6.5.3.3
<b>HZ.Composite with plastic inner receptacle<sup>a</sup></b>	for solids, filled or discharged by gravity, with rigid plastics receptacle for solids, filled or discharged by gravity, with flexible plastics receptacle for solids, filled or discharged under pressure, with rigid plastics receptacle for solids, filled 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	6.5.3.4

<sup>a</sup> The code shall be completed by replacing the letter Z with a capital letter in accordance with 6.5.1.4.1 (b) to indicate the nature of the material used for the outer casing.

Material	Category	Code	Paragraph
<b>G. Fibreboard</b>	for solids, filled or discharged by gravity	11G	6.5.3.5
<u>Wooden</u>			6.5.3.6
C. Natural wood	for solids, filled or discharged by gravity with inner liner	11C	
D. Plywood	for solids, filled or discharged by gravity, with inner liner	11D	
F. Reconstituted wood	for solids, filled or discharged by gravity, with inner liner	11F	

6.5.1.4.4 The letter "W" may follow the IBC code. The letter "W" signifies that the IBC, although of the same type indicated by the code, is manufactured to a specification different from those in section 6.5.3 and is considered equivalent in accordance with the requirements in 6.5.1.1.2.

**6.5.1.5 Construction requirements *This part has been moved to 6.5.3 (All construction requirements are put in 6.5.3)***

~~6.5.1.5.1 IBCs shall be resistant to or adequately protected from deterioration due to the external environment.~~

~~6.5.1.5.2 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.~~

~~6.5.1.5.3 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.~~

~~6.5.1.5.4 Gaskets, where used, shall be made of materials not subject to attack by the contents of the IBCs.~~

~~6.5.1.5.5 All service equipment shall be so positioned or protected as to minimize the risk of escape of the contents owing to damage during handling and transport.~~

~~6.5.1.5.6 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.~~

~~6.5.1.5.7 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.~~

~~6.5.1.5.8 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.~~



~~6.5.1.5.9~~ — Each IBC shall be capable of passing the relevant performance tests.

~~6.5.1.6~~ — ~~Testing, certification and inspection~~ *This part has been moved to 6.5.4 (All test requirements are put in 6.5.4)*

~~6.5.1.6.1~~ — ~~Quality assurance:~~ the IBCs shall be manufactured and tested under a quality assurance programme which satisfies the competent authority, in order to ensure that each manufactured IBC meets the requirements of this Chapter.

~~6.5.1.6.2~~ — ~~Test requirements:~~ IBCs shall be subject to design type tests and, if applicable, to initial and periodic tests in accordance with 6.5.4.14.

~~6.5.1.6.3~~ — ~~Certification:~~ in respect of each design type of IBC a certificate and mark (as in 6.5.2) shall be issued attesting that the design type including its equipment meets the test requirements.

~~6.5.1.6.4~~ — ~~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 by the owner of the IBC at least until the next inspection. The report shall include the results of the inspection and shall identify the party performing the inspection (see also the marking requirements in 6.5.2.2.1).

~~6.5.1.6.5~~ — When an IBC is impaired as a result of impact (e.g. accident) or any other cause, it shall be repaired or otherwise maintained (see definition of "Routine maintenance of IBCs" in 1.2.1), so as to conform to the design type. The bodies of rigid plastics IBCs and the inner receptacles of composite IBCs that are impaired shall be replaced.

~~6.5.1.6.6~~ — *Repaired IBCs*

~~6.5.1.6.6.1~~ — In addition to any other testing and inspection requirements in these Regulations, an IBC shall be subjected to the full testing and inspection requirements set out in 6.5.4.14.3 and 6.5.1.6.4 (a), and the required reports shall be prepared, whenever it is repaired.

~~6.5.1.6.6.2~~ — The Party performing the tests and inspections after the repair shall durably marking the IBC near the manufacturer's UN design type marking to show:

- ~~(a) the State in which the repair was carried out;~~
- ~~(b) the name or authorized symbol of the party performing the repair; and~~
- ~~(c) the date (month and year) of the tests and inspections.~~


~~6.5.1.6.6.3 Test and inspections performed in accordance with 6.5.1.6.6.1 may be considered to satisfy the requirements for the two and a half and five year periodic tests and inspections.~~

~~6.5.1.6.7 The competent authority may at any time require proof, by tests in accordance with this Chapter, that IBCs meet the requirements of the design type tests.~~

## 6.5.2 Marking

### 6.5.2.1 Primary marking

6.5.2.1.1 Each IBC manufactured and intended for use according to these Regulations shall bear markings which are durable, legible and placed in a location so as to be readily visible. Letters, numerals and symbols shall be at least 12 mm high and shall show:

- (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 6.5.1.4;
- (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 authorizing 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 in kg.

Marking shall be applied in the sequence shown in (a) to (h); each element of the marking required in these subparagraphs and when appropriate, 6.5.2.2, shall be clearly separated, e.g. by a slash or space and presented in a way that ensures that all of the parts of the mark may be easily identified.

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

- (u) 11A/Y/02 99 For a metal IBC for solids discharged for instance by gravity and made from  
n NL/Mulder 007 steel/for packing groups II and III/ manufactured in  
5500/1500 February 1989/authorized by the Netherlands/manufactured by Mulder 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.
- (u) 13H3/Z/03 01 For a flexible IBC for solids discharged for instance by gravity and made  
n F/Meunier 1713 from woven plastics with a liner/not designed to be stacked.  
0/1500
- (u) 31H1/Y/04 99 For a rigid plastics IBC for liquids made from plastics with structural  
n GB/9099 equipment withstanding the stack load.  
10800/1200
- (u) 31HA1/Y/05 01 For a composite IBC for liquids with a rigid plastics inner receptacle and a  
n D/Muller 1683 steel outer casing.  
10800/1200
- (u) 11C/X/01 02 For a wooden IBC for solids with an inner liner and authorized for packing  
n S/Aurigny 9876 group I solids.  
3000/910

6.5.2.2 *Additional marking*

6.5.2.2.1 Each IBC shall bear the markings required in 6.5.2.1 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 <sup>a</sup> at 20 °C	X	X	X		
Tare mass in kg <sup>a</sup>	X	X	X	X	X
Test (gauge) pressure, in kPa or bar <sup>a</sup> , if applicable		X	X		
Maximum filling/discharge pressure in kPa or bar <sup>a</sup> , if applicable	X	X	X		
Body material and its minimum thickness in mm	X				
Date of last leakproofness test, if applicable (month and year)	X	X	X		
Date of last inspection (month and year)	X	X	X		
Serial number of the manufacturer	X				

<sup>a</sup> *The unit used shall be indicated.*

6.5.2.2.2 In addition to the markings required in 6.5.2.1, flexible IBCs may bear a pictogram indicating recommended lifting methods.

6.5.2.2.3 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 6.5.2.1.1 (f);
- (b) The date of manufacture, as in 6.5.2.1.1 (d);
- (c) The distinguishing sign of the State authorizing the allocation of the mark, as in 6.5.2.1.1 (e).

6.5.2.2.4 Where a composite IBC is designed in such a manner that the outer casing is intended to be dismantled for transport when empty (such as for return of the IBC for reuse to the original consignor), each of the parts intended to be detached when so dismantled 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 (6.5.2.1.1(f)).

6.5.2.3 Conformity to design type. The marking indicates that IBCs correspond to a successfully tested design type and that the requirements referred to in the certificate have been met.

### **6.5.3 Construction Specific requirements for IBCs (This chapter now includes 6.5.1.5)**

#### 6.5.3.1 General requirements for IBCs

6.5.3.1.1 IBCs shall be resistant to or adequately protected from deterioration due to the external environment.

6.5.3.1.2 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.

6.5.3.1.3 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.

6.5.3.1.4 Gaskets, where used, shall be made of materials not subject to attack by the contents of the IBCs.

6.5.3.1.5 All service equipment shall be so positioned or protected as to minimize the risk of escape of the contents owing to damage during handling and transport.

6.5.3.1.6 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.

6.5.3.1.7 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.

6.5.3.1.8 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.

6.5.3.1.9 Each IBC shall be capable of passing the relevant performance tests.  
(It is proposed to delete 6.5.3.1.9 as this subject is already covered in 4.1.1.9)

(All subsequent paragraphs of chapter 6.5.3 will have to be renumbered)

### **6.5.3.1 Specific requirements for metal IBCs**

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

- (a) Those for solids which are filled or discharged by gravity (11A, 11B, 11N);
- (b) Those for solids which are filled or discharged at a gauge pressure greater than 10 kPa (0.1 bar) (21A, 21B, 21N); and
- (c) Those for liquids (31A, 31B, 31N).

6.5.3.1.2 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.

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

6.5.3.1.4 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.

6.5.1.3.5 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  $\frac{10000}{R_m}$  with an absolute minimum of 20%;

where  $R_m$  = guaranteed minimum tensile strength of the steel to be used, in  $N/mm^2$ ;

- (b) For aluminium the elongation at fracture, in %, shall not be less than  $\frac{10000}{6R_m}$  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:

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

$$L_0 = 5.65 \sqrt{A}$$

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

#### 6.5.3.1.6 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 (C) in litres	Wall thickness (T) in mm			
	Types 11A, 11B, 11N		Types 21A, 21B, 21N, 31A, 31B, 31N	
	Unprotected	Protected	Unprotected	Protected
$C \leq 1000$	2.0	1.5	2.5	2.0
$1000 < C \leq 2000$	$T = C/2000 + 1.5$	$T = C/2000 + 1.0$	$T = C/2000 + 2.0$	$T = C/2000 + 1.5$
$2000 < C \leq 3000$	$T = C/2000 + 1.5$	$T = C/2000 + 1.0$	$T = C/1000 + 1.0$	$T = C/2000 + 1.5$

where:  $A_0$  = minimum elongation (as a percentage) of the reference steel to be used on fracture under tensile stress (see 6.5.3.1.5);

- (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  $N/mm^2$ ) (see (c));

$A_1$  = minimum elongation (as a percentage) of the metal to be used on fracture under tensile stress (see 6.5.3.1.5);

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

- (c) For purposes of the calculation described in (b), the guaranteed minimum tensile strength of the metal to be used ( $R_{m1}$ ) shall be the minimum value according to national or international material standards. However, for austenitic steels, the specified minimum value for  $R_m$  according to the material standards may be increased by up to 15% when a greater value is attested in the material inspection certificate. When no material standard exists for the material in question, the value of  $R_m$  shall be the minimum value attested in the material inspection certificate.

6.5.3.1.7 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 4.1.1.4. The required relief devices shall be fitted in the vapour space.

### 6.5.3.2 *Specific requirements for flexible IBCs*

6.5.3.2.1 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.

6.5.3.2.2 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.

6.5.3.2.3 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.

6.5.3.2.4 Seams shall be formed by stitching, heat sealing, gluing or any equivalent method. All stitched seam-ends shall be secured.

6.5.3.2.5 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.

6.5.3.2.6 For flexible plastics 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.

6.5.3.2.7 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.

6.5.3.2.8 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.

6.5.3.2.9 When filled, the ratio of height to width shall be not more than 2:1.

6.5.3.2.10 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.

### **6.5.3.3 *Specific requirements for rigid plastics IBCs***

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

6.5.3.3.2 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.

6.5.3.3.3 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.

6.5.3.3.4 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.

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

### **6.5.3.4 *Specific requirements for composite IBCs with plastics inner receptacles***

6.5.3.4.1 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 filled or discharged by gravity
- 11HZ2 composite IBCs with a flexible plastics inner receptacle, for solids filled or discharged by gravity
- 21HZ1 composite IBCs with a rigid plastics inner receptacle, for solids filled or discharged under pressure
- 21HZ2 composite IBCs with a flexible plastics inner receptacle, for solids filled 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 6.5.1.4.1 (b) to indicate the nature of the material used for the outer casing.

6.5.3.4.2 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".

6.5.3.4.3 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.

6.5.3.4.4 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.

6.5.3.4.5 IBCs of type 31HZ2 shall be limited to a capacity of not more than 1250 litres.

6.5.3.4.6 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.

6.5.3.4.7 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.

6.5.3.4.8 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.

6.5.3.4.9 No used material other than production residues or regrind from the same manufacturing process may be used in the manufacture of inner receptacles.

6.5.3.4.10 The inner receptacle of IBCs type 31HZ2 shall consist of at least three plies of film.

6.5.3.4.11 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.

6.5.3.4.12 The outer casing shall be free of any projection that might damage the inner receptacle.

6.5.3.4.13 Outer casings of steel or aluminium shall be constructed of a suitable metal of adequate thickness.

6.5.3.4.14 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.

6.5.3.4.15 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.

6.5.3.4.16 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.

6.5.3.4.17 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.

6.5.3.4.18 The ends of fibreboard outer casings may have a wooden frame or be entirely of wood. Reinforcements of wooden battens may be used.

6.5.3.4.19 Manufacturing joints in the fibreboard outer casing shall be taped, lapped and glued, or lapped and stitched with metal staples. Lapped joints shall have an appropriate overlap. Where closing is effected by gluing or taping, a water resistant adhesive shall be used.

6.5.3.4.20 Where the outer casing is of plastics material, the relevant requirements of 6.5.3.4.6 to 6.5.3.4.9 apply.

6.5.3.4.21 The outer casing of a 31HZ2 shall enclose the inner receptacle on all sides.

6.5.3.4.22 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.

6.5.3.4.23 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.

6.5.3.4.24 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.

6.5.3.4.25 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the inner receptacle.

6.5.3.4.26 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.

### **6.5.3.5 *Specific requirements for fibreboard IBCs***

6.5.3.5.1 These requirements apply to fibreboard IBCs for the transport of solids which are filled or discharged by gravity. Fibreboard IBCs are of the following type: 11G.

6.5.3.5.2 Fibreboard IBCs shall not incorporate top lifting devices.

6.5.3.5.3 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.

6.5.3.5.4 The walls, including top and bottom, shall have a minimum puncture resistance of 15 J measured according to ISO 3036:1975.

6.5.3.5.5 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.

6.5.3.5.6 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.

6.5.3.5.7 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.

6.5.3.5.8 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.

6.5.3.5.9 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.

6.5.3.5.10 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.5.3.5.11 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

#### **6.5.3.6 *Specific requirements for wooden IBCs***

6.5.3.6.1 These requirements apply to wooden IBCs for the transport of solids which are filled 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.

6.5.3.6.2 Wooden IBCs shall not incorporate top lifting devices.

6.5.3.6.3 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.

6.5.3.6.4 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.

6.5.3.6.5 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.

6.5.3.6.6 Bodies of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.5.3.6.7 IBCs shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.5.3.6.8 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.

6.5.3.6.9 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.

6.5.3.6.10 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.

6.5.3.6.11 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.

6.5.3.6.12 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.5.3.6.13 Where IBCs are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

#### ~~6.5.4~~ Test requirements for IBCs (This chapter now includes 6.5.1.6)

#### 6.5.4 Testing, certification and inspection

6.5.4.1 Quality assurance: the IBCs shall be manufactured and tested under a quality assurance programme which satisfies the competent authority, in order to ensure that each manufactured IBC meets the requirements of this Chapter.

6.5.4.2 Test requirements: IBCs shall be subject to design type tests and, if applicable, to initial and periodic tests in accordance with 6.5.4.14.

6.5.4.3 Certification: in respect of each design type of IBC a certificate and mark (as in 6.5.2) shall be issued attesting that the design type including its equipment meets the test requirements.

6.5.4.4 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 by the owner of the IBC at least until the next inspection. The report shall include the results of the inspection and shall identify the party performing the inspection (see also the marking requirements in 6.5.2.2.1).

6.5.4.5 When an IBC is impaired as a result of impact (e.g. accident) or any other cause, it shall be repaired or otherwise maintained (see definition of "Routine maintenance of IBCs" in 1.2.1), so as to conform to the design type. The bodies of rigid plastics IBCs and the inner receptacles of composite IBCs that are impaired shall be replaced.

6.5.4.6 *Repaired IBCs*

6.5.4.6.1 In addition to any other testing and inspection requirements in these Regulations, an IBC shall be subjected to the full testing and inspection requirements set out in 6.5.4.14.3 and 6.5.1.6.4 (a), and the required reports shall be prepared, whenever it is repaired.

6.5.4.6.2 The Party performing the tests and inspections after the repair shall durably marking the IBC near the manufacturer's UN design type marking to show:

(a) the State in which the repair was carried out;

(b) the name or authorized symbol of the party performing the repair; and

(c) the date (month and year) of the tests and inspections.

6.5.4.6.3 Test and inspections performed in accordance with 6.5.1.6.6.1 may be considered to satisfy the requirements for the two and a half and five-year periodic tests and inspections.

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

(All subsequent paragraphs of chapter 6.5.4 will have to be renumbered)

#### **6.5.4.81 *Performance and frequency of tests***

6.5.4.1.1 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.

6.5.4.1.2 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.

6.5.4.1.3 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 6.5.4.9.4;
- (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
$d \times 1.5$ m	$d \times 1.0$ m	$d \times 0.67$ m

#### 6.5.4.2 *Design type tests*

6.5.4.2.1 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 6.5.4.3.5 and as set out in 6.5.4.5 to 6.5.4.12. These design type tests shall be carried out as required by the competent authority.

6.5.4.2.2 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.

6.5.4.2.3 If detachable pallets are used in the tests, the test report issued in accordance with 6.5.4.13 shall include a technical description of the pallets used.

#### 6.5.4.3 *Preparation of IBCs for testing*

6.5.4.3.1 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.*

6.5.4.3.2 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 6.5.3.3.2 to 6.5.3.3.4 and 6.5.3.4.6 to 6.5.3.4.9.

6.5.4.3.3 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 on the table in 6.5.4.3.5.

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

6.5.4.3.5 *Design type tests required and sequential order*

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

<sup>a</sup> When IBCs are designed for this method of handling.

<sup>b</sup> When IBCs are designed to be stacked.

<sup>c</sup> When IBCs are designated to be lifted from the top or the side.

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

<sup>e</sup> Another IBC of the same design may be used for the drop test.

**6.5.4.4 Bottom lift test**

6.5.4.4.1 *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.

6.5.4.4.2 *Preparation of the IBC for test*

The IBC shall be filled. A load shall be added and evenly distributed. The mass of the filled IBC and the load shall be 1.25 times the maximum permissible gross mass.

6.5.4.4.3 *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.

6.5.4.4.4 *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.

**6.5.4.5 Top lift test**

6.5.4.5.1 *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.

#### 6.5.4.5.2 *Preparation of the IBC for test*

Metal, rigid plastics and composite IBCs shall be filled. A load shall be added and evenly distributed. The mass of the filled IBC and the load shall be twice the maximum permissible gross mass.

Flexible IBCs shall be filled to six times their maximum design load, the load being evenly distributed.

#### 6.5.4.5.3 *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.

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

#### 6.5.4.5.5 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 and no loss of contents; *(This addition makes the criterion consistent with criteria of other tests)*

#### 6.5.4.6 **Stacking test**

##### 6.5.4.6.1 *Applicability*

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

##### 6.5.4.6.2 *Preparation of the IBC for test*

The IBC shall be filled to its maximum permissible gross mass. If the specific gravity of the product being used for testing makes this impracticable, the IBC shall be additionally loaded so that it is tested at its maximum permissible gross mass, the load being evenly distributed.

##### 6.5.4.6.3 *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 6.5.4.6.4). 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 other 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 stacked on the test IBC;
- (ii) appropriate weights loaded onto either a flat plate or a reproduction of the base of the IBC, which is stacked on the test IBC.

#### 6.5.4.6.4 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.

#### 6.5.4.6.5 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.

### 6.5.4.7 *Leakproofness test*

#### 6.5.4.7.1 *Applicability*

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

#### 6.5.4.7.2 *Preparation of the IBC 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.

#### 6.5.4.7.3 *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.

#### 6.5.4.7.4 *Criterion for passing the test*

No leakage of air.

### 6.5.4.8 *Hydraulic pressure test*

#### 6.5.4.8.1 *Applicability*

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

#### 6.5.4.8.2 *Preparation of the IBC 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.

#### 6.5.4.8.3 *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 6.5.4.8.4. The IBCs shall not be mechanically restrained during the test.

#### 6.5.4.8.4 *Pressures to be applied*

##### 6.5.4.8.4.1 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 65 kPa (0.65 bar) gauge pressure. This test shall be performed before the 200 kPa test.

##### 6.5.4.8.4.2 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 4.1.1.4 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.

##### 6.5.4.8.5 *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 6.5.4.8.4.1 (a) or (b): no leakage;
- (b) For IBCs of types 31A, 31B and 31N, when subjected to the test pressure specified in 6.5.4.8.4.1 (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 would render the IBC unsafe for transport and no leakage.

**6.5.4.9 Drop test**

6.5.4.9.1 *Applicability*

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

6.5.4.9.2 *Preparation of the IBC 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 gross mass, the contents 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 6.5.4.3.1 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.

6.5.4.9.3 *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.

The same or different IBCs may be used for each drop.

6.5.4.9.4 *Drop height*

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

6.5.4.9.5 *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.

#### **6.5.4.10**      *Tear test*

##### 6.5.4.10.1      *Applicability*

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

##### 6.5.4.10.2      *Preparation of the IBC for test*

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

##### 6.5.4.10.3      *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 gross mass. 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.

##### 6.5.4.10.4      *Criterion for passing the test*

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

#### **6.5.4.11**      *Topple test*

##### 6.5.4.11.1      *Applicability*

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

##### 6.5.4.11.2      *Preparation of the IBC for test*

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

##### 6.5.4.11.3      *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.

##### 6.5.4.11.4      *Topple height*

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

##### 6.5.4.11.5      *Criterion 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.

**6.5.4.12      *Righting test***

6.5.4.12.1      *Applicability*

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

6.5.4.12.2      *Preparation of the IBC for test*

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

6.5.4.12.3      *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.

6.5.4.12.4      *Criterion for passing the test*

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

**6.5.4.13      *Test report***

6.5.4.13.1      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

6.5.4.13.2      The test report shall contain statements that the IBC prepared as for transport was tested in accordance with the appropriate requirements of this Chapter 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.

**6.5.4.14      *Testing of metal, rigid plastics and composite IBCs***

6.5.4.14.1      These tests shall be carried out as required by the competent authority.

6.5.4.14.2      Each IBC shall correspond in all respects to its design type.

6.5.4.14.3 Each metal, rigid plastics and composite IBC for liquids, or for solids which are filled 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), after repair and at intervals of not more than two and a half years.

6.5.4.14.4 The results of tests and the identity of the party performing the tests shall be recorded in test reports to be kept by the owner of the IBC at least until the date of the next test.

## CHAPTER 6.6

### REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF LARGE PACKAGINGS

#### 6.6.1 General

6.6.1.1 The requirements of this Chapter do not apply to:

- Class 2, except articles including aerosols;
- Class 6.2, except clinical waste of UN 3291;
- Class 7 packages containing radioactive material.

6.6.1.2 Large packagings shall be manufactured and tested under a quality assurance programme which satisfies the competent authority in order to ensure that each manufactured packaging meets the requirements of this Chapter.

6.6.1.3 The specific requirements for large packagings in 6.6.4 are based on large packagings currently used. In order to take into account progress in science and technology, there is no objection to the use of large packagings having specifications different from those in 6.6.4 provided they are equally effective, acceptable to the competent authority and able successfully to withstand the tests described in 6.6.5. Methods of testing other than those described in these Regulations are acceptable provided they are equivalent.

6.6.1.4 Manufacturers and subsequent distributors of packagings shall provide information regarding procedures to be followed and a description of the types and dimensions of closures (including required gaskets) and any other components needed to ensure that packages as presented for transport are capable of passing the applicable performance tests of this Chapter.

#### 6.6.2 Code for designating types of large packagings


6.6.2.1 The code used for large packagings consists of:

- (a) Two Arabic numerals:
  - 50 for rigid large packagings; or
  - 51 for flexible large packagings; and
- (b) Capital letters in Latin characters indicating the nature of the material, e.g. wood, steel etc. The capital letters used shall be those shown in 6.1.2.6.

6.6.2.2 The letter "W" may follow the large packaging code. The letter "CW" signifies that the large packaging, although of the same type indicated by the code, is manufactured to a specification different from those in 6.6.4 and is considered equivalent in accordance with the requirements in 6.6.1.3.

**6.6.3 Marking****6.6.3.1 Primary marking**




Each large packaging manufactured and intended for the use according to these Regulations shall bear durable and legible markings showing:

- (a) The United Nations packaging symbol  ;  
For metal large packagings on which the marking is stamped or embossed, the capital letters "UN" may be applied instead of the symbol;
- (b) The code "50" designating a large rigid packaging or "51" for flexible large packagings, followed by the material type in accordance with 6.5.1.4.1 (b);
- (c) A capital letter designating the packing group(s) for which the design type has been approved:  
X for packing groups I, II and III  
Y for packing groups II and 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 large packagings as specified by the competent authority;
- (g) The stacking test load in kg. For large packagings not designed for stacking the figure "0" shall be shown;
- (h) The maximum permissible gross mass in kilograms.

The primary marking required above shall be applied in the sequence of the sub-paragraphs.

Each element of the marking applied in accordance with (a) to (h) shall be clearly separated, e.g. by a slash or space, so as to be easily identifiable.

**6.6.3.2 Examples of the marking:**

	50 A/X/05/01/N/PQRS 2500/1000	For a large steel packaging suitable for stacking; stacking load: 2500 kg; maximum gross mass: 1000 kg.
	50 H/Y04/02/D/ABCD 987 0/800	For a large plastics packaging not suitable for stacking; maximum gross mass: 800 kg.
	51H/Z/06/01/S/1999 0/500	For a large flexible packaging not suitable for stacking; maximum gross mass: 500 kg.



## **6.6.4 Specific requirements for large packagings**

### **6.6.4.1 *Specific requirements for metal large packagings***

- 50A steel
- 50B aluminium
- 50N metal (other than steel or aluminium)

6.6.4.1.1 The large packaging 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.

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

### **6.6.4.2 *Specific requirements for flexible material large packagings***

- 51H flexible plastics
- 51M flexible paper

6.6.4.2.1 The large packaging shall be manufactured from suitable materials. The strength of the material and the construction of the flexible large packagings shall be appropriate to its capacity and its intended use.

6.6.4.2.2 All materials used in the construction of flexible large packagings of types 51M 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.

6.6.4.2.3 Seams shall be formed by stitching, heat sealing, gluing or any equivalent method. All stitched seam-ends shall be secured.

6.6.4.2.4 Flexible large packagings 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.

6.6.4.2.5 For plastics flexible large packagings 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 large packaging. 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.

6.6.4.2.6 Additives may be incorporated into the material of the large packaging 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.

6.6.4.2.7 When filled, the ratio of height to width shall be not more than 2:1.

### **6.6.4.3 *Specific requirements for plastics large packagings***

- 50H rigid plastics

6.6.4.3.1 The large packaging 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.

6.6.4.3.2 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 outer packaging. 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.

6.6.4.3.3 Additives may be incorporated in the material of the large packaging 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.

#### **6.6.4.4 *Specific requirements for fibreboard large packagings***

##### 50G rigid fibreboard

6.6.4.4.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) shall be used, appropriate to the capacity of the large packagings and to their 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.

6.6.4.4.2 The walls, including top and bottom, shall have a minimum puncture resistance of 15 J measured according to ISO 3036:1975.

6.6.4.4.3 Manufacturing joints in the outer packaging of large packagings 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 joints 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.

6.6.4.4.4 Any integral pallet base forming part of a large packaging or any detachable pallet shall be suitable for mechanical handling with the large packaging filled to its maximum permissible gross mass.

6.6.4.4.5 The pallet or integral base shall be designed so as to avoid any protrusion of the base of the large packaging that might be liable to damage in handling.

6.6.4.4.6 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 large packaging.

6.6.4.4.7 Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.6.4.4.8 Where large packagings are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

#### **6.6.4.5**        *Specific requirements for wooden large packagings*

- 50C    natural wood
- 50D    plywood
- 50F    reconstituted wood

6.6.4.5.1        The strength of the materials used and the method of construction shall be appropriate to the capacity and intended use of the large packagings.

6.6.4.5.2        Natural wood shall be well-seasoned, commercially dry and free from defects that would materially lessen the strength of any part of the large packagings. Each part of the large packagings 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.

6.6.4.5.3        Large packagings of plywood shall be at least 3-ply. They 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 large packaging. All adjacent plies shall be glued with water resistant adhesive. Other suitable materials may be used with plywood for the construction of the large packaging.

6.6.4.5.4        Large packagings of reconstituted wood shall be made of water resistant reconstituted wood such as hardboard, particle board or other suitable type.

6.6.4.5.5        Large packagings shall be firmly nailed or secured to corner posts or ends or be assembled by equally suitable devices.

6.6.4.5.6        Any integral pallet base forming part of a large packaging or any detachable pallet shall be suitable for mechanical handling with the large packaging filled to its maximum permissible gross mass.

6.6.4.5.7        The pallet or integral base shall be designed so as to avoid any protrusion of the base of the large packaging that might be liable to damage in handling.

6.6.4.5.8        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 large packaging.

6.6.4.5.9        Strengthening devices such as timber supports to increase stacking performance may be used but shall be external to the liner.

6.6.4.5.10        Where large packagings are intended for stacking, the bearing surface shall be such as to distribute the load in a safe manner.

#### **6.6.5**        **Test requirements for large packagings**

##### **6.6.5.1**        *Performance and frequency of test*

6.6.5.1.1        The design type of each large packaging shall be tested as provided in 6.6.5.3 in accordance with procedures established by the competent authority.

6.6.5.1.2        Tests shall be successfully performed on each large packaging design type before such a packaging is used. A large packaging design type is defined by the design, size, material and thickness, manner of construction and packing, but may include various surface treatments. It also includes large packagings which differ from the design type only in their lesser design height.

6.6.5.1.3 Tests shall be repeated on production samples at intervals established by the competent authority. For such tests on fibreboard large packagings, preparation at ambient conditions is considered equivalent to the provisions of 6.6.5.2.3.

6.6.5.1.4 Tests shall also be repeated after each modification which alters the design, material or manner of construction of large packagings.

6.6.5.1.5 The competent authority may permit the selective testing of large packagings that differ only in minor respects from a tested type, e.g. smaller sizes of inner packagings or inner packagings of lower net mass; and large packagings which are produced with small reductions in external dimension(s).

*(6.6.5.1.6 will be moved to chapter 4.1 as new 4.1.1.5.2 (this part is meant for the user))*

~~6.6.5.1.6 — Where a large packaging has been successfully tested with different types of inner packagings, a variety of such different inner packagings may also be assembled in this large packaging. In addition, provided an equivalent level of performance is maintained, the following variations in inner packagings are allowed without further testing of the package:~~

~~(a) — Inner packagings of equivalent or smaller size may be used provided:~~

~~(i) — The inner packagings are of similar design to the tested inner packagings (e.g. shape round, rectangular, etc);~~

~~(ii) — The material of construction of the inner packagings (glass, plastics, metal etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested inner packaging;~~

~~(iii) — The inner packagings have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc);~~

~~(iv) — Sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the inner packagings; and~~

~~(v) — Inner packagings are oriented within the large packagings in the same manner as in the tested package;~~

~~(b) — A lesser number of the tested inner packagings, or of the alternative types of inner packagings identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the inner packagings.~~

6.6.5.1.67 The competent authority may at any time require proof, by tests in accordance with this section, that serially-produced large packagings meet the requirements of the design type tests.

6.6.5.1.78 Provided the validity of the test results is not affected and with the approval of the competent authority, several tests may be made on one sample.

## **6.6.5.2 Preparation for testing**

6.6.5.2.1 Tests shall be carried out on large packagings prepared as for transport including the inner packagings or articles used. Inner packagings shall be filled to not less than 98% of their maximum capacity for liquids or 95% for solids. For large packagings where the inner packagings are designed to carry liquids and solids, separate testing is required for both liquid and solid contents. The substances in the inner packagings or the articles to be transported in the large packagings may be replaced by other material or articles except where this would invalidate the results of the tests. When other inner packagings or articles are used they shall have the same physical characteristics (mass, etc) as the inner packagings or articles 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.

6.6.5.2.2 Large packagings made of plastics materials and large packagings containing inner

packagings of plastic materials - other than bags intended to contain solids or articles - shall be drop tested when the temperature of the test sample and its contents has been reduced to -18°C or lower. This conditioning may be disregarded if the materials in question are of sufficient ductility and tensile strength at low temperatures. Where test sample are prepared in this way, the conditioning in 6.6.5.2.3 may be waived. Test liquids shall be kept in the liquid state by the addition of anti-freeze if necessary.

6.6.5.2.3 Large packagings of fibreboard 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  $23 \pm 2^\circ\text{C}$  and  $50\% \pm 2\%$  r.h. The two other options are:  $20 \pm 2^\circ\text{C}$  and  $65\% \pm 2\%$  r.h.; or  $27 \pm 2^\circ\text{C}$  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.*

(6.6.5.2.4 is the same as the provision for IBCs, par. 6.5.4.1.3)

6.6.5.2.4 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 6.6.5.3.4.4;

(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:

<u>Packing group I</u>	<u>Packing group II</u>	<u>Packing group III</u>
<u>d x 1.5 m</u>	<u>d x 1.0 m</u>	<u>d x 0.67 m</u>

### 6.6.5.3 *Test requirements*

#### 6.6.5.3.1 *Bottom lift test*

##### 6.6.5.3.1.1 Applicability

For all types of large packagings which are fitted with means of lifting from the base, as a design type test.

##### 6.6.5.3.1.2 Preparation of large packaging for test

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

##### 6.6.5.3.1.3 Method of testing

The large packaging 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.

6.6.5.3.1.4 Criteria for passing the test

No permanent deformation which renders the large packaging unsafe for transport and no loss of contents.

6.6.5.3.2 *Top lift test*

6.6.5.3.2.1 Applicability

For types of large packagings which are intended to be lifted from the top and fitted with means of lifting, as a design type test.

6.6.5.3.2.2 Preparation of large packaging for test

The large packaging shall be loaded to twice its maximum permissible gross mass. A flexible large packaging shall be loaded to six times its maximum permissible gross mass, the load being evenly distributed.

6.6.5.3.2.3 Method of testing

The large packaging shall be lifted in the manner for which it is designed until clear of the floor and maintained in that position for a period of five minutes.

6.6.5.3.2.4 Criteria for passing the test (*Criteria are similar to IBCs, par. 6.5.4.5.5*)

~~No permanent deformation which renders the large packagings unsafe for transport and no loss of contents.~~

(a) All types of large packagings other than flexible large packagings: no permanent deformation which renders the large packaging, including the base pallet, if any, unsafe for transport and no loss of contents;

(b) Flexible large packagings: no damage to the large packaging or its lifting devices which renders the large packaging unsafe for transport or handling and no loss of contents.

6.6.5.3.3 *Stacking test*

6.6.5.3.3.1 Applicability

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

6.6.5.3.3.2 Preparation of large packaging for test

The large packaging shall be filled to its maximum permissible gross mass.

6.6.5.3.3.3 Method of testing

The large packaging shall be placed on its base on level hard ground and subjected to a uniformly distributed superimposed test load (see 6.6.5.3.3.4) for a period of at least five minutes: for large packagings of wood, fibreboard and plastics materials the period shall be 24 h.

6.6.5.3.3.4 Calculation of superimposed test load

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

6.6.5.3.3.5 Criteria for passing the test (*Criteria are the same as for IBCs, par. 6.5.4.6.5*)

~~No permanent deformation which renders the large packaging unsafe for transport and no loss of contents.~~

~~(a) All types of large packagings other than flexible large packagings: no permanent deformation which renders the large packaging including the base pallet, if any, unsafe for transport and no loss of contents;~~

~~(b) Flexible large packagings: no deterioration of the body which renders the large packaging unsafe for transport and no loss of contents.~~

6.6.5.3.4 Drop test

6.6.5.3.4.1 Applicability

For all types of large packagings as a design type test.

6.6.5.3.4.2 Preparation of large packaging for testing

The large packaging shall be filled in accordance with 6.6.5.2.1.

6.6.5.3.4.3 Method of testing

The large packaging shall be dropped 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 large packaging considered to be the most vulnerable.

6.6.5.3.4.4 Drop height

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

**NOTE:** Packagings for substances and articles of Class 1, self-reactive substances of Division 4.1 and organic peroxides of Division 5.2 shall be tested at the packing group II performance level.

6.6.5.3.4.5 Criteria for passing the test

6.6.5.3.4.5.1 The large packaging shall not exhibit any damage liable to affect safety during transport. There shall be no leakage of the filling substance from inner packaging(s) or article(s).

6.6.5.3.4.5.2 No rupture is permitted in large packagings for articles of Class 1 which would permit the spillage of loose explosive substances or articles from the large packaging.

6.6.5.3.4.5.3 Where a large packaging undergoes a drop test, the sample passes the test if the entire contents are retained even if the closure is no longer sift-proof.

*(Tear test, topple test and righting test are inserted for large packagings as for IBCs)*

### 6.6.5.3.5 Tear test

6.6.5.3.5.1 Applicability

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

6.6.5.3.5.2 Preparation of the large packaging for test

The large packaging shall be filled to not less than 95% of its capacity and to its maximum permissible gross mass, the contents being evenly distributed.

6.6.5.3.5.3 Method of testing

Once the large packaging 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 large packaging, halfway between the bottom surface and the top level of the contents. The large packaging shall then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum permissible gross mass. The load shall be applied for at least five minutes. A large packaging 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.

6.6.5.3.5.4 Criterion for passing the test

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

**6.6.5.3.6 Topple test**6.6.5.3.6.1 Applicability

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

6.6.5.3.6.2 Preparation of the large packaging for test

The large packaging shall be filled to not less than 95% of its capacity and to its maximum permissible gross mass, the contents being evenly distributed.

6.6.5.3.6.3 Method of testing

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

6.6.5.3.6.4 Topple height

<u>Packing group I</u>	<u>Packing group II</u>	<u>Packing group III</u>
<u>1.8 m</u>	<u>1.2 m</u>	<u>0.8 m</u>

6.6.5.3.6.5 Criterion 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 large packaging provided that no further leakage occurs.

**6.6.5.3.7 Righting test**6.6.5.3.7.1 Applicability

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

6.6.5.3.7.2 Preparation of the large packaging for test

The large packaging shall be filled to not less than 95% of its capacity and to its maximum permissible gross mass, the contents being evenly distributed.



6.6.5.3.7.3 Method of testing

The large packaging, 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.

6.6.5.3.7.4 Criterion for passing the test

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

**6.6.5.4 Certification and test report**

6.6.5.4.1 In respect of each design type of large packaging a certificate and mark (as in 6.6.3) shall be issued attesting that the design type including its equipment meets the test requirements.

6.6.5.4.2 A test report containing at least the following particulars shall be drawn up and shall be available to the users of the large packaging:

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 large packaging;
6. Description of the large packaging design type (e.g. dimensions, materials, closures, thickness, etc) and/or photograph(s);
7. Maximum capacity/maximum permissible gross mass;
8. Characteristics of test contents, e.g. types and descriptions of inner packagings or articles used;
9. Test descriptions and results;
10. The test report shall be signed with the name and status of the signatory.

6.6.5.4.3 The test report shall contain statements that the large packaging prepared as for transport was tested in accordance with the appropriate provisions of this Chapter 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.

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**Part II~~ANNEX III~~: PROPOSED CHANGES IN PART 4**

General remark: changes which are agreed in chapter 6.1, 6.3, 6.5 and 6.6 can have consequential amendments in Part 4 (references to these chapters)

**PART 4**

**PACKING AND TANK PROVISIONS**

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## CHAPTER 4.1

### USE OF PACKAGINGS, INCLUDING INTERMEDIATE BULK CONTAINERS (IBCs) AND LARGE PACKAGINGS

#### 4.1.1 General provisions for the packing of dangerous goods in packagings, including IBCs and large packagings

**NOTE:** *The general provisions of this section only apply to the packing of goods of Class 2, Division 6.2 and Class 7 as indicated in 4.1.8.2 (Division 6.2), 4.1.9.1.5 (Class 7) and in the applicable packing instructions of 4.1.4 (packing instructions P201 and P202 for Class 2 and P621, IBC620 and LP621 for Division 6.2).*

4.1.1.1 Dangerous goods shall be packed in good quality packagings, including IBCs and large packagings, which shall be strong enough to withstand the shocks and loadings normally encountered during transport, including trans-shipment between transport units and between transport units and warehouses as well as any removal from a pallet or overpack for subsequent manual or mechanical handling. Packagings, including IBCs and large packagings, shall be constructed and closed so as to prevent any loss of contents when prepared for transport which may be caused under normal conditions of transport, by vibration, or by changes in temperature, humidity or pressure (resulting from altitude, for example). Packagings, including IBCs and large packagings, shall be closed in accordance with the information provided by the manufacturer. No dangerous residue shall adhere to the outside of packages, IBCs and large packagings during transport. These provisions apply, as appropriate, to new, reused, reconditioned or remanufactured packagings, and to new, reused, repaired or remanufactured IBCs, and to new or reused large packagings.

4.1.1.2 Parts of packagings, including IBCs and large packagings, which are in direct contact with dangerous goods:

- (a) shall not be affected or significantly weakened by those dangerous goods; and
- (b) shall not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods.

Where necessary, they shall be provided with a suitable inner coating or treatment.

4.1.1.3 Unless provided elsewhere in these Regulations, each packaging, including IBCs and large packagings, except inner packagings, shall conform to a design type successfully tested in accordance with the requirements of 6.1.5, 6.3.2, 6.5.4 or 6.6.5, as applicable.

4.1.1.4 When filling packagings, including IBCs and large packagings, with liquids, sufficient ullage (outage) shall be left to ensure that neither leakage nor permanent distortion of the packaging occurs as a result of an expansion of the liquid caused by temperatures likely to occur during transport. Unless specific requirements are prescribed, liquids shall not completely fill a packaging at a temperature of 55 °C. However, sufficient ullage shall be left in an IBC to ensure that at the mean bulk temperature of 50 °C it is not filled to more than 98% of its water capacity.

4.1.1.4.1 For air transport, packagings intended to contain liquids shall also be capable of withstanding a pressure differential without leakage as specified in the international regulations for air transport.

~~4.1.1.5~~ 4.1.1.5.1 Inner packagings shall be packed in an outer packaging in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the outer packaging. Inner packagings that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials, etc., shall be secured in outer packagings with suitable cushioning

material. Any leakage of the contents shall not substantially impair the protective properties of the cushioning material or of the outer packaging.

*(The new 4.1.1.5.2 was formerly 6.1.5.1.6 and 6.6.5.1.6 and is considered to be meant for the user)*

*(When the new 4.1.1.5.2 and 4.1.1.5.3 are accepted, it can be considered to merge 4.1.1.5.2 and 4.1.1.5.3)*

4.1.1.5.2 Where an outer packaging of a combination packaging or a large packaging have been successfully tested with different types of inner packagings, a variety of such different inner packagings may also be assembled in this outer packaging or large packaging. In addition, provided an equivalent level of performance is maintained, the following variations in inner packagings are allowed without further testing of the package:

- (a) Inner packagings of equivalent or smaller size may be used provided:
  - (i) The inner packagings are of similar design to the tested inner packagings (e.g. shape - round, rectangular, etc.);
  - (ii) The material of construction of the inner packagings (glass, plastics, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested inner packaging;
  - (iii) The inner packagings have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc.);
  - (iv) Sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the inner packagings; and
  - (v) Inner packagings are oriented within the outer packaging or large packaging in the same manner as in the tested package.
- (b) A lesser number of the tested inner packagings, or of the alternative types of inner packagings identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the inner packagings.

*(The new 4.1.1.5.3 was formerly 6.3.2.8 and is considered to be meant for the user)*

4.1.1.5.3 Provided an equivalent level of performance is maintained, the following variations in the primary receptacles placed within a secondary packaging [(division 6.2 packagings)]are allowed without further testing of the completed package:

- (a) Primary receptacles of equivalent or smaller size as compared to the tested primary receptacles may be used provided:
  - (i) The primary receptacles are of similar design to the tested primary receptacle (e.g. shape: round, rectangular, etc.);
  - (ii) The material of construction of the primary receptacle (glass, plastics, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested primary receptacle;
  - (iii) The primary receptacles have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc.);
  - (iv) Sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the primary receptacles; and

(v) Primary receptacles are oriented within the secondary packaging in the same manner as in the tested package;

(b) A lesser number of the tested primary receptacles, or of the alternative types of primary receptacles identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the primary receptacles.

4.1.1.6 Dangerous goods shall not be packed together in the same outer packaging or in large packagings, with dangerous or other goods if they react dangerously with each other and cause:

- (a) combustion and/or evolution of considerable heat;
- (b) evolution of flammable, toxic or asphyxiant gases;
- (c) the formation of corrosive substances; or
- (d) the formation of unstable substances.

4.1.1.7 The closures of packagings containing wetted or diluted substances shall be such that the percentage of liquid (water, solvent or phlegmatizer) does not fall below the prescribed limits during transport.

4.1.1.7.1 Where two or more closure systems are fitted in series on an IBC, that nearest to the substance being carried shall be closed first.

4.1.1.8 Liquids may only be filled into inner packagings which have an appropriate resistance to internal pressure that may be developed under normal conditions of transport. Where pressure may develop in a package by the emission of gas from the contents (as a result of temperature increase or other causes), the packaging, including IBC, may be fitted with a vent. A venting device shall be fitted if dangerous

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