

**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**

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PACKAGINGS

**Package Testing- Referencing ISO 16104 in the Model Regulations
Comments on ST/SG/AC.10/C.3/2003/10**

Transmitted by the expert from France

1. In document ST/SG/AC.10/C.3/2003/10 the expert from the united Kingdom proposes to delete most of chapter 6.1.5. and replace it by a reference to ISO 16104.
2. Before deleting such an important part of the model rules the committee should consider carefully the principles that have conducted the references to standards, and especially what kind of requirements belong to the level of standard and those who should be only decided by bodies working at a regulatory level.
3. The working group tried, for practical reasons, to develop a standard that would be self supporting in order to facilitate its use by manufacturer and testing bodies. Because of that the standard includes prescriptions that normally belong to the regulatory level.
4. For instance, essential requirements such as:
 - the type of test
 - the severity level
 - the criteria for passing the testbelong to the level of regulatory text and should not be deleted from the model regulations. Also any prescription concerning the competent authority shall not be deleted.
5. The standard should only clarify the way the essential requirements mentioned above shall be fulfilled and seek worldwide harmonization on it. And it certainly does. Therefore the expert of France supports the reference to the standard but proposes to keep some regulatory text in 6.1.5.
6. Furthermore there are some points that are not addressed by the standard such as chemical compatibility (6.1.5.2.).
7. The standard also introduce substantial changes for “reassessment when failure occurs” (paragraph 7.5.b) that are in contradiction with 4.1.1.9 because it is accepted that one on a sample of nine packagings fails the tests. We propose not to accept this procedure in the model regulations.
8. An other substantial change is the introduction of a procedure for testing packagings part full. We recognize that this covers a need but there should be consequential amendments to 6.1.3 dealing with the marking in order to avoid misuse of these packagings

9. Based on the above mentioned point the expert from France proposes the following amendments to 6.1.5. and consequential amendments.

1.) Amendements to 6.1.5

6.1.5 Test requirements for packagings

6.1.5.1 Performance and frequency of tests

6.1.5.1.1 ~~6.1.5.1.1~~—The design type of each packaging shall be tested as provided in 6.1.5. 6.1.5. defines the required type of tests, the level of testing and the criteria for passing the test.

Where applicable, and unless otherwise specified, the tests shall be carried out in accordance with procedures ~~established by the competent authority~~set out in ISO 16104:2003:

NOTE : packagings tested in accordance with of ISO 16104 , 7.7. are subject to 6.1.1.2. and 6.1.2.4

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~~ISO 16104 , 4.1 , table 1, columns (G) and (L)

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)~~as described in of ISO 16104 , 5.1 and annex F.

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.

6.1.5.1.7

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) ~~(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 package mark shall also contain a letter "V" as described in 6.1.2.4.

NOTE: Additional requirements are set out in annex C1 of ISO 16104

6.1.5.1.8 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.

~~6.1.5.1.9 6.1.5.1.9~~—If an inner treatment or coating is required for safety reasons, it shall retain its protective properties even after the tests.

6.1.5.1.10 *Reassessment when failure occurs*

The reassessment procedure in paragraph 7.5b) of ISO 16104 shall not be used in the frame of these regulations.

~~6.1.5.1.10~~—~~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.~~

6.1.5.1.11 *Salvage packagings*

Salvage packagings (see 1.2.1) shall be tested and marked in accordance with the requirements applicable to packing group II packagings intended for the carriage 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 6.1.5.3.24 (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 6.1.5.79; and

~~(c)~~ (e) Packagings shall be marked with the letter "T" as described in 6.1.2.4.

NOTE: ADDITIONAL REQUIREMENTS ARE SET OUT IN ANNEX C2 OF ISO 16104

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 in accordance with 6.1.5 including, with respect to combination packagings, the inner packagings used. Inner or single receptacles or packagings shall be filled to not less than 98% of their maximum capacity for liquids or 95% for solids. 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 carried 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 carried. Water may also be used for the liquid drop test under the conditions in 6.1.5.3.4.

~~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 ± 2 °C and $50\% \pm 2\%$ r.h. The two other options are 20 ± 2 °C and $65\% \pm 2\%$ r.h. or 27 ± 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~~ 6.1.5.2.2 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 6.1.4.8.4. 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 three metres.

6.1.5.3 *Drop test (see also ISO 16104, 7.1)*

The drop test shall be performed on all design types of packagings.

~~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.~~

Packaging	No. of test samples	Drop orientation
(a) Steel drums — Aluminium drums — Drums of metal other than steel or aluminium — Steel jerricans — Aluminium jerricans — Plywood drums — Wooden barrels — Fibre drums — Plastics drums and jerricans — Composite packagings which are in the shape of a drum — Light gauge metal packagings	Six (three for each drop)	First drop (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. Second drop (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
(b) Boxes of natural wood — Plywood boxes — Reconstituted wood boxes — Fibreboard boxes — Plastics boxes — Steel or aluminium boxes — Composite packagings which are in the shape of a box	Five (one for each drop)	First drop: flat on the bottom Second drop: flat on the top Third drop: flat on the long side Fourth drop: flat on the short side Fifth drop: on a corner
(c) Bags—single ply with a side seam	Three (three drops per bag)	First drop: flat on a wide face Second drop: flat on a narrow face Third drop: on an end of the bag
(d) Bags—single ply without a side seam, or multi ply	Three (two drops per bag)	First drop: flat on a wide face Second drop: on an end of the bag
(e) Composite packagings (glass, stoneware or porcelain), marked with the symbol "RID/ADR" according to 6.1.3.1 (a) (ii) and which are in the shape of a drum or box	Three (one for each drop)	Diagonally on the bottom chime, or, if there is no chime, on a circumferential seam or the bottom edge

~~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.~~

6.1.5.3.13 *Target*

The target shall be a rigid, non-resilient, flat and horizontal surface in accordance with ISO 2208.

6.1.5.3.24 *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 if the test is performed with water:

- (a) where the substances to be carried 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)

6.1.5.3.35 *Criteria for passing the test*

- 6.1.5.3.35.1 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 pressure be equalized.
- 6.1.5.3.35.2 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 is no longer sift-proof.
- 6.1.5.3.35.3 The packaging or outer packaging of a composite or combination packaging shall not exhibit any damage liable to affect safety during carriage. There shall be no leakage of the filling substance from the inner receptacle or inner packaging(s).
- 6.1.5.3.35.4 Neither the outermost ply of a bag nor an outer packaging may exhibit any damage liable to affect safety during carriage.
- 6.1.5.3.35.5 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.

6.1.3.5.3.6 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.

6.1.3.5.3.7.1. The packaging shall not exhibit any damage liable to affect safety during transport, for example the package cannot be moved without leaking.

6.1.5.4 Leakproofness test (see also ISO 16104, 7.3)

6.1.5.4.1 Packagings to be tested 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.~~

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

6.1.5.5 Internal pressure (hydraulic) test (see also ISO 16104, 7.4)

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 the 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; or~~

~~(b) not less than 1.75 times the vapour pressure at 50 °C of the liquid to be carried, minus 100 kPa but with a minimum test pressure of 100 kPa; or~~

~~(c) not less than 1.5 times the vapour pressure at 55 °C of the liquid to be carried, 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.~~

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

6.1.5.6 Stacking test *(see also ISO 16104, 7.2)*

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 carriage; where the contents of the test sample are liquids with relative density different from that of the liquid to be carried, the force shall be calculated in relation to the latter. The minimum height of the stack including the test sample shall be 3 metres. 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.~~

~~For the test in accordance with 6.1.5.2.5, the original filling substance shall be used. For the test in accordance with 6.1.5.2.6, a stacking test shall be carried out with a standard liquid.~~

6.1.5.6.23 *Criteria 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 *Cooperage test for bung type wooden barrels*~~

~~6.1.5.7.1 *Number of samples:* one barrel.~~

~~6.1.5.7.2 *Method of testing:* remove all hoops above the bilge of an empty barrel at least two days old.~~

~~6.1.5.7.3 *Criterion for passing test:* the diameter of the cross section of the upper part of the barrel shall not increase by more than 10 %.~~

6.1.5.78 Test Report

~~6.1.5.8.1~~ ~~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.~~

~~6.1.5.8.2~~ ~~The~~ A test report shall containing statements that the packaging prepared as for transport was tested in accordance with the appropriate requirements of this section and that the use of other packaging methods or components may render it invalid shall be drawn up.

~~A copy of the test report shall be available to the competent authority~~ -and to the users of the packaging.

2.) Consequential amendments

4.1.1.10

Table Column 8

delete “6.1.5.5.4.(c)” replace with “ISO 16104, 7.4.3 (c)”

NOTE 2

delete “6.1.5.5.4 (a)” replace with “ISO16104: 7.4.3 (a)”

NOTE 3

delete “6.1.5.5.5” replace with “ISO 16104, 7.4.3”

4.1.1.12

Amend the first sentence as follows:

“Every packaging, including IBCs, intended to contain liquids shall successfully undergo a suitable leakproofness test, (for packagings this test shall be at least as effective as the leakproofness test in ISO 16104 7.3.4.), and be capable of meeting the appropriate test level indicated in 6.1.5.4. or 6.5.4.7. for the various types of IBCs

6.1.3.

Insert a new paragraph 6.1.3.8.:

“6.1.3.8. *Packaging designed to be used part full*

When the packaging has been tested in accordance with ISO 16104 5.3.6 (packaging designed to be used part full)”, the marking shall show:

(k) The degree of filling in percentage followed by the sign%”

Renumber existing 6.1.3.8 to 6.1.3.11 accordingly

6.1.3.2.

After “6.1.3.1 (a) to (e)” add “and in 6.1.3.8. (k)”

6.1.3.3.

After “6.1.3.1 (a) to (e)” add “and in 6.1.3.8. (k)”

6.1.3.6.

After “6.1.3.7.” add “and (k) of 6.1.3.8.”

6.1.3.9 (new)

After “6.1.3.1. (a) to (d)” add “and by 6.1.3.8. (k)”