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Safe Transport of Dangerous Goods by Air

Joseph LE-TONQUEZE – Pascal TATIN
DG Expert/Consultant – DG Referent for France

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Part 6 – Packaging Nomenclature, Marking, Requirements & Tests

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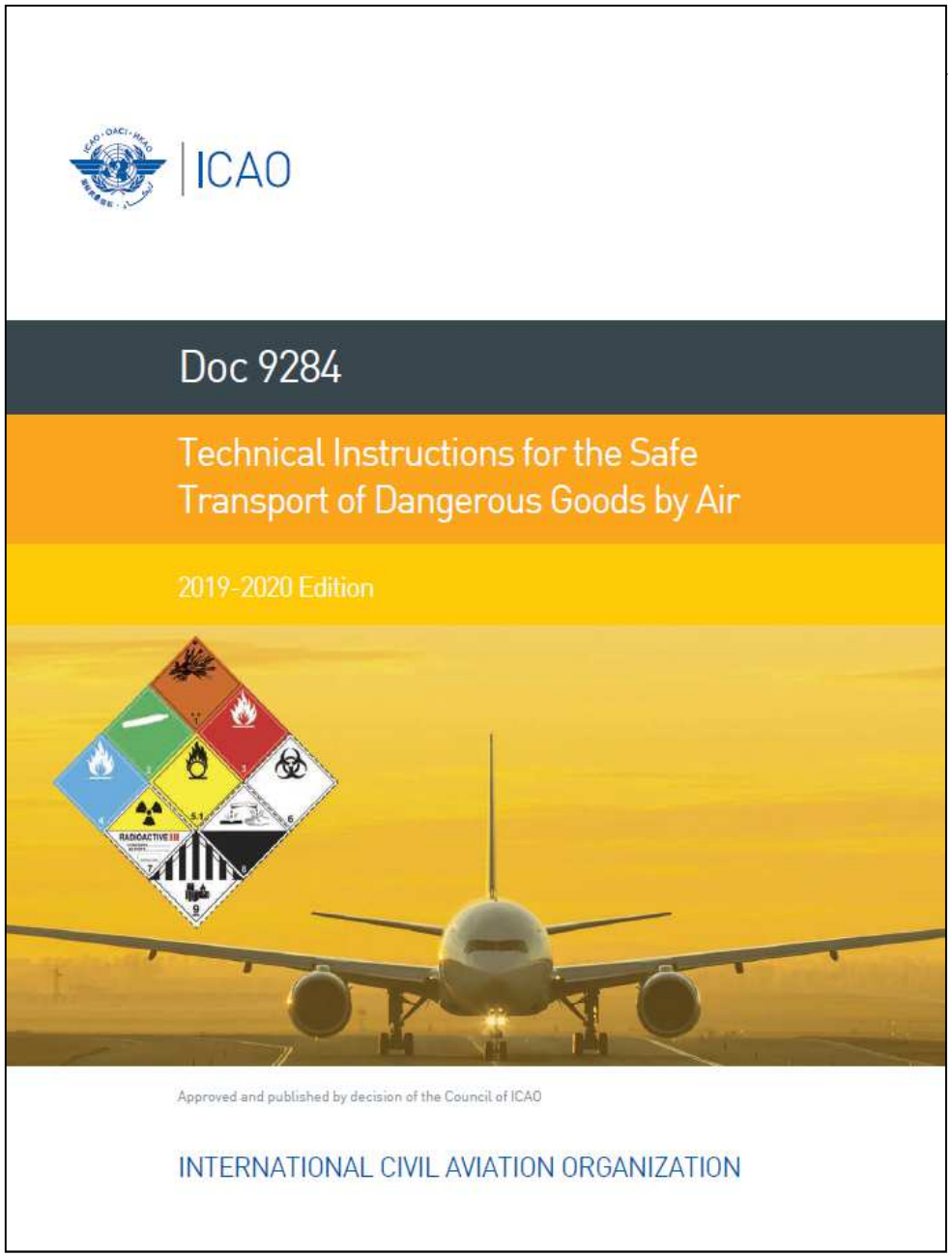


Part 6 = Packaging nomenclature, marking, requirements and tests

Chapter 1 - Applicability, nomenclature and codes

Chapter 2 - Marking of packagings other than inner packagings

Chapter 3 - Requirements for packagings

Chapter 4 - Packaging performance tests

Chapter 5 - Requirements for the construction and testing of cylinders and closed cryogenic receptacles, aerosol dispensers and small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas

Chapter 6 - Packagings for infectious substances of Category A

Chapter 7 - Requirements for the construction, testing and approval of packages and material of Class 7

PART 6 – APPLICABILITY, NOMEMCLATURE AND CODES

➢ **Applicability of each Chapter of this Part to the packagings for the various Classes and Divisions of DG is as set out:**

Table 6-1. Applicability of Chapters	
Class or Division	**Chapter**
Classes 1, 2, 3, 4, 5, 8, 9 and Division 6.1	**1 to 5**
Division 6.2, infectious substances	**2 & 6**
Class 7, radioactive material	**7**

➢ **Methods of testing other than those described in these Instructions are acceptable, provided they are equivalent**

➢ **Manufacturers and subsequent distributors of packagings must provide information regarding procedures followed to perform the tests**

- **Codes for designating types of packagings:**

✓ **an Arabic numeral indicating the kind of packaging, e.g. box, drum, jerrican, composite, etc …**

✓ **a capital letter(s) in Latin characters indicating the nature of the material, e.g. steel, wood, fibreboard, metal, glass, etc …**

✓ **an Arabic numeral indicating the category of packaging**

- **for combination packagings, only the code number for the outer packaging is used**

- **for 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**

✓ **the second that of the outer packaging**

- **The following numerals must be used for the kinds of packaging:**

  1 = Drum 2 = reserved 3 = Jerrican

  4 = Box 5 = Bag 6 = Composite Packaging

- **and the following capital letters must 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. Plastic material**
- ✓ **L. Textile**
- ✓ **M. Paper multiwall**
- ✓ **N. Metal (other than Steel and Aluminium)**
- ✓ **P. Glass, Porcelain or Stoneware (not used in these Instructions)**

➢ **Table 6-2 contains the index of packagings (other than inner packagings):**

✓ **lists all the packagings (except inner packagings) specified by the United Nations Recommendations**

✓ **notes those not used in these Instructions for air transport**

✓ **includes the maximum capacity (L) or maximum net mass (kg)**

➢ **Table 6-3 contains the index of inner packagings**

➢ **In addition to the listed packagings, intermediate bulk containers are permitted for UN 3077 as shown in Packing Instruction 956**

➢ Table 6-2 - Packagings (other than inner packagings)

Kind	Code	Category
Steel drums	1A1 1A2	non-removable head removable head
Aluminium drums	1B1 1B2	non-removable head removable head
Metal (other than steel or aluminium) drums	1N1 1N2	non-removable head removable head
Steel jerricans	3A1 3A2	non-removable head removable head
Aluminium jerricans	3B1 3B2	non-removable head removable head
Plywood drums	1D	
Fibre drums	1G	
Plastic drums and jerricans	1H1 1H2 3H1 3H2	drums, non-removable head drums, removable head jerricans, non-removable head jerricans, removable head

➢ Table 6-2 (continuous) - Packagings (other than inner packagings)

Kind	Code	Category
Boxes of natural wood	4C1 4C2	ordinary with siftproof walls
Plywood boxes	4D	
Reconstituted wood boxes	4F	
Fibreboard boxes	4G	
Plastic boxes	4H1 4H2	expanded plastic boxes solid plastic boxes
Steel, aluminium or other metal boxes	4A 4B 4N	steel aluminium metal, other than steel or aluminium
Textile bags	~~5L1~~ 5L2 5L3	without inner liner or coating (not used in TI) siftproof water-resistant
Woven plastic bags	~~5H1~~ 5H2 5H3	without inner liner or coating (not used in TI) siftproof water-resistant
Plastic film bags	5H4	
Paper bags	5M1 5M2	multiwall multiwall, water-resistant

➢ Table 6-2 (continuous) - Packagings (other than inner packagings)

Kind	Code	Category
Composite packaging (plastic material)	6HA1	plastic receptacle with outer steel drum
	6HA2	plastic receptacle with outer steel crate*/or box
	6HB1	plastic receptacle with outer aluminium drum plastic
	6HB2	plastic receptacle with outer aluminium crate*/or box
	6HC	plastic receptacle with outer wooden box
	6HD1	plastic receptacle with outer plywood drum
	6HD2	plastic receptacle with outer plywood box
	6HG1	plastic receptacle with outer fibre drum
	6HG2	plastic receptacle with outer fibreboard box
	6HH1	plastic receptacle with outer plastic drum
	6HH2	plastic receptacle with outer solid plastic box
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 plastic
	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
Not used in these Instructions	6PG1	receptacle with outer fibre drum
	6PG2	receptacle with outer fibreboard box
	6PH1	receptacle with outer expanded plastic packaging
	6PH2	receptacle with outer solid plastic packaging

* Crates are outer packagings with incomplete surfaces. For air transport, crates may not be used as outer packagings of composite packagings

- **Codes for designating types of packagings:**

✓ **letters "T" or "U" or "V" or "W" may follow the packaging code:**

– **"T" signifies a salvage packaging**

– **"U" signifies a special packaging (provision regarding requirements for performance and frequency of tests for certain packagings)**

– **"V" signifies a special packaging (provisions regarding performance and tests criteria for certain outer packagings to contain articles or inner packagings)**

– **"W" signifies that the packaging, although of the same type indicated by the code, is manufactured to a different specification (considered as an equivalent)**

➢ Table 6-3 – Inner Packagings

Kind	Code
Glass	
Plastic	
Metal cans, tins or tubes	
Paper bags	
Plastic bags	
Fibre cans or boxes	
Metal receptacles (aerosols), non-refillable	IP.7
Metal receptacles (aerosols), non-refillable	IP.7A
Metal receptacles (aerosols), non-refillable	IP.7B
Plastic receptacle (aerosols), non-refillable	IP.7C
Metal or plastic flexible tubes	

PART 6 – MARKING

➢ **Packagings (other than inner packagings)**

✓ **must bear durable, legible markings, placed in a location and of such a size relative to the packaging as to be readily visible, and must show:**

→ **UN symbol**

→ **a code in two parts:**

– **letter designating the packing group(s)**

X for Packing Groups I, II and III

Y for Packing Groups II and III

Z for Packing Group III only

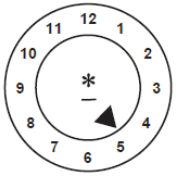
– **for packagings intended to contain solids or inner packagings: the maximum gross mass, in kilograms, followed by letter “”S”**

for single packagings intended to contain liquids: the relative density, followed by the hydraulic test pressure in kPa

– **the last two digits of the year of manufacture**

plastic drums (1H& & 1H2) and plastic jerricans (3H& & 3H2) must also be appropriately marked with the month of manufacture

appropriate method proposed



PART 6 – MARKING

➢ **Packagings (other than inner packagings)**

✓ **must bear durable, legible markings, placed in a location and of such a size relative to the packaging as to be readily visible, and must show:**

→ **State authorizing the allocation of the mark**

→ **name of the manufacturer or other identification of the packaging specified by the appropriate national authority**

✓ **Marking must be applied as previously described, and clearly separated, e.g. by a slash or space, so as to be easily identified**

✓ *Special packaging provisions:*

– *for infectious substances (text "CLASS 6.2")*

– *manufactured with recycled plastic material (mark "REC")*

– *for reconditioning ones, State in which the reconditioning was carried out, name of the reconditioner, year of reconditioning, letter "R" (letter "L" if leakproofness test needed)*

– *for salvage packagings*

➢ **Packagings (other than inner packagings)**

✓ **examples:**

→ *for a new fibreboard box*

4G/Y45/S/12

NL/AB1233

→ *for a new steel drum to contain solids, or inner packagings*

1A2/X150/S/11

USA/EF789

→ *for a fibreboard box to contain infectious substances*

4G/CLASS 6.2/10
F/BVT654

→ *for a new steel drum to contain liquids*

1A1/Y1.4/150/09

GB/CD456

→ *for a new plastic box or equivalent specs.*

4HW/Y112/S/14

DK/GH321

→ *for a reconditioned packaging*

1A1/Y1.2/85/07
SP/RB/12/RL

→ *for a salvage packaging*

1A2T/Y200/S/12
BE/abcd

PART 6 - REQUIREMENTS FOR PACKAGINGS

➢ **All general requirements for packagings, other than inner packagings, are found in chapter 3.1 (material for construction, opening/closing, thickness/strength, coating/treatment, protection, sealing, resistance, maximum net mass or maximum net capacity, etc …**

✓ **packing performance tests are developed in chapter 4**

➢ **Chapter 5 is dedicated for construction and testing of cylinders and closed cryogenic receptacles, aerosols dispensers and small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas**

➢ **Chapter 6 is dedicated for Infectious Substances of Category A**

➢ **Chapter 7 is dedicated for construction, testing & approval of packages for Radioactive Material**

➢ **Requirements for inner packaging are found in chapter 3.2**

✓ **they have to comply with construction requirements**

✓ **only aerosols (IP.7, IP.7A, IP.7B, IP.7C) must comply with test requirements**

PART 6 – PACKAGINGS PERFORMANCE TESTS

- **All (or a part of) these tests apply to:**
  - ✓ **single packagings**
  - ✓ **composite packagings, including their inner receptacle**
  - ✓ **combination packagings, including inner packaging used in**
  - ✓ **salvage packagings**
- **They must be carried on production samples packagings prepared as for transport**
- **4 types of tests :**
  - ✓ **Drop test**
  - ✓ **Leakproofness tests**
  - ✓ **Internal pressure (hydraulic) tests**
  - ✓ **Stacking tests**

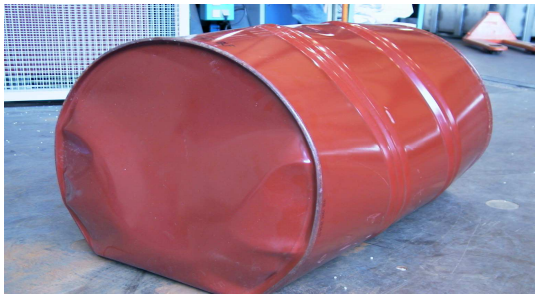
- **Drop Test**
- **Each packaging tested must comply with fixed criteria (number of test samples, drop orientation, leakproof, damage, discharge, rupture, …)**

✓ **drop height**

1 **- for solids and liquids, test is performed with the solid or liquid to be transported or with another substance having essentially the same physical characteristics, and**

2 **- for liquids in single packagings and for inner packagings of combination packagings, test is performed with water, and where the substances 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



- **Drop Test**
- **Each packaging tested must comply with fixed criteria (number of test samples, drop orientation, leakproof, damage, discharge, rupture, ...)**

✓ **drop height**

2 **- for liquids in single packagings and for inner packagings of combination packagings, test is performed with water, and where the substances have a relative density exceeding 1.2, the drop height must be calculated on the basis of the relative density (d) of the substance to be carried, rounded up to the first decimal**

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

PART 6 – PACKAGINGS PERFORMANCE TESTS

- **Drop Test**
- **Criteria for passing the test (non-exhaustive list)**

✓ **each packaging containing liquid must be leakproof …**

✓ **a packaging for solids shall retain the entire contents …**

✓ **the packaging or outer packaging of a composite or combination packaging must not exhibit any damage liable to affect safety during transport, and inner receptacles/packagings or articles must remain completely within the outer packaging and there must be no leakage of the filling substance …**

✓ **the outermost ply of a bag nor an outer packaging may exhibit any damage liable to affect safety during transport …**

✓ **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**

✓ **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**

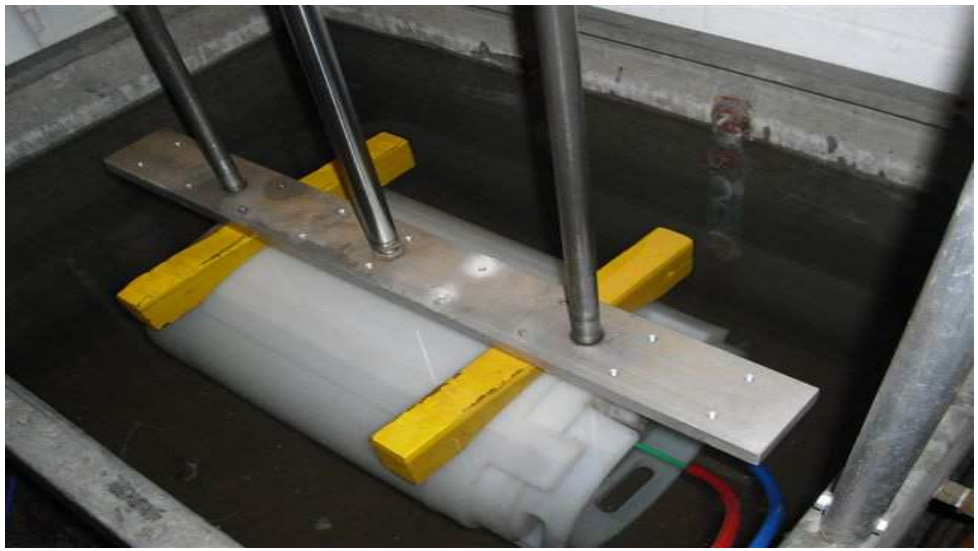
➢ Leakproofness Test

✓ must be performed on all design types of packagings intended to contain liquids (not required for the inner packagings of combination packagings)

✓ duration 5 minutes while an internal air pressure is applied

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)

→ Criterion for passing the test: there must be no leakage



➢ Internal Pressure (Hydraulic) Test

✓ must be carried out on all design types of metal, plastic and composite packagings intended to contain liquids (not required for the inner packagings of combination packagings)

✓ duration: - metal packagings for 5 minutes

- plastic and composite packagings (plastic material) for 30 minutes

➢ Hydraulic pressure (gauge) applied, must be not less than:

✓ PT = (PM55 × 1.5) kPa with minima of 95 or 75 kPa

✓ PT = (Vp50 × 1.75) – 100 kPa with a minimum of 100 kPa

✓ PT = (Vp55 × 1.5) – 100 kPa with a minimum of 100 kPa

where "PT" = Test pressure in kPa (gauge),
"PM55" = Pressure measured in the filled packaging at a temperature of 55°C,
"Vp50" = Vapour pressure at 50°C,
"Vp55" = Vapour pressure at 55°C

➢ In addition, packagings intended to contain liquids of Packing Group I must be tested to a minimum test pressure of 250 kPa for a test period of 5 or 30 minutes depending upon the material of construction of the packaging

→ Criteria for passing the test: no packaging may leak

➢ **Stacking Test**

✓ **carried on all design types of packagings other than bags**

✓ **a force is applied to the top surface of the test sample equivalent to the total weight of identical packages**

✓ **minimum height of the stack including the test sample must be 3 m**

✓ **duration of the test must be 24 hours**

(except plastic drums, jerricans and composite packagings (6HH1 and 6HH2) intended for liquids, test period is 28 days at a temperature of not less than 40°C)

→ **Criteria for passing the test: no test sample may leak, or show any deterioration**

➢ **Test Report**

✓ **A test report must be drawn up and must be available to the users of the packaging (see chapter 4.7 for details to be include in)**

✓ **The test report must contain statements that the packaging prepared as for transport was tested in accordance with the appropriate provisions of these Instructions or the equivalent provisions of Chapter 6 of the United Nations Recommendations on the Transport of Dangerous Goods**

✓ **A copy of the test report must be made available to the appropriate national authority**

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