



WORKING PAPER

**DANGEROUS GOODS PANEL (DGP)
WORKING GROUP MEETING (DGP-WG/23)**

Rio de Janeiro, Brazil, 15 to 19 May 2023

- Agenda Item 1: Harmonizing ICAO dangerous goods provisions with UN Recommendations on the Transport of Dangerous Goods (REC-A-DGS-2025)**
1.2: Develop proposals, if necessary, for amendments to the *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (Doc 9284) for incorporation in the 2025-2026 Edition

DRAFT AMENDMENTS TO PART 6 OF THE TECHNICAL INSTRUCTIONS TO ALIGN WITH THE UN RECOMMENDATIONS

(Presented by the DGP Working Group on UN Harmonization)

SUMMARY

This working paper contains draft amendments to Part 6 of the Technical Instructions to reflect the decisions taken by the UN Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals at its ninth session (Geneva, 9 December 2022).

Action by the DGP-WG: The DGP-WG is invited to agree to the draft amendments in this working paper.

Part 6

PACKAGING NOMENCLATURE, MARKING, REQUIREMENTS AND TESTS

...

Chapter 2

MARKING OF PACKAGINGS OTHER THAN INNER PACKAGINGS

...

UN Model Regulations, Chapter 6.1, 6.1.3.1 (see ST/SG/AC.10/50/Add.1)

2.1 MARKING REQUIREMENTS FOR PACKAGINGS OTHER THAN INNER PACKAGINGS

2.1.1 Each packaging intended for use according to these Instructions must bear marks on a non-removable component 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 marks, or a duplicate thereof, must appear on the top or on a side of the packaging. Letters, numerals and symbols must be at least 12 mm high, except for packagings of 30 L capacity or less or of 30 kg maximum net mass, when they must be at least 6 mm in height and except for packagings of 5 L capacity or less or of 5 kg maximum net mass when they must be of an appropriate size.

Note.— The provisions of 2.1.1 of the 2023-2024 Edition of these Instructions may continue to be applied until 31 December 2026. Packagings manufactured before 1 January 2027 according to the provisions applicable at the date of manufacture may continue to be used.

The marks must show:

...

Chapter 3

REQUIREMENTS FOR PACKAGINGS

3.1 REQUIREMENTS FOR PACKAGINGS OTHER THAN INNER PACKAGINGS

GENERAL REQUIREMENTS

...

3.1.1 Steel drums 1A1 non-removable head 1A2 removable head

...

UN Model Regulations, Chapter 6.1, 6.1.4.1.4 (see ST/SG/AC.10/50/Add.1)

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

...

3.1.2 Aluminium drums

1B1 non-removable head
1B2 removable head

...

UN Model Regulations, Chapter 6.1, 6.1.4.2.3 (see ST/SG/AC.10/50/Add.1)

3.1.2.3 ~~The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops.~~ **Drums may have rolling hoops, either expanded or separate.** If there are separate rolling hoops they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

...

UN Model Regulations, Chapter 6.1, 6.1.4.3.3 (see ST/SG/AC.10/50/Add.1)

...

3.1.3 Drums of metal other than aluminium or steel

1N1 non-removable head
1N2 removable head

...

3.1.3.3 ~~The body of a drum of a capacity greater than 60 L must, in general, have at least two expanded rolling hoops or, alternatively, at least two separate rolling hoops.~~ **Drums may have rolling hoops, either expanded or separate.** If there are separate rolling hoops, they must be fitted tightly on the body and so secured that they cannot shift. Rolling hoops must not be spot welded.

...

UN Model Regulations, Chapter 6.1, 6.1.4.12 (see ST/SG/AC.10/50/Add.1)

3.1.11 Fibreboard boxes (including corrugated fibreboard boxes)

4G

3.1.11.1 Strong and good quality solid or double-faced corrugated fibreboard (single or multiwall) must be used, appropriate to the capacity of the box and to its intended use. The water resistance of the outer surface must 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/m² — see ISO 535:4994**2014**. It must have proper bending qualities. Fibreboard must be cut, creased without scoring, and slotted so as to permit assembly without cracking, surface breaks or undue bending. The fluting of corrugated fibreboard must be firmly glued to the facings.

...

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

...

5.1 GENERAL REQUIREMENTS

...

5.1.5 Initial inspection and testing

...

5.1.5.2 Closed cryogenic receptacles must be subjected to testing and inspection during and after manufacture in accordance with the applicable design standards or recognized technical codes, including the following:

...

UN Model Regulations, Chapter 6.2, 6.2.1.5.2 (see ST/SG/AC.10/50/Add.1)

For all completed closed cryogenic ~~pressure~~ receptacles:

- q) testing for leakproofness.

Note.— Closed cryogenic receptacles which were constructed in accordance with the initial inspection and test requirements of 5.1.5.2 applicable in the 2021-2022 Edition of these Instructions but which do not however conform to the requirements of 5.1.5.2 relating to the initial inspection and test applicable in the 2023-2024 Edition of these Instructions may continue to be used.

...

5.1.6 Periodic inspection and testing

5.1.6.1 Refillable cylinders other than cryogenic receptacles must be subjected to periodic inspections and tests by a body authorized by the appropriate national authority, in accordance with the following:

- a) check of the external conditions of the cylinder and verification of the equipment and the external marks;
- b) check of the internal conditions of the cylinder (e.g. internal inspection, verification of minimum wall thickness);
- c) check of the threads either:
 - i) if there is evidence of corrosion; or
 - ii) if the closures or other service equipment are removed;
- d) a hydraulic pressure test of the cylinder shell and, if necessary, verification of the characteristics of the material by suitable tests;

Note 1.— With the agreement of the appropriate national authority, the hydraulic pressure test may be replaced by a test using a gas, where such an operation does not entail any danger.

UN Model Regulations, Chapter 6.2, 6.2.1.6.1 (d) (see ST/SG/AC.10/50/Add.1)

Note 2.— For seamless steel cylinder shells the check of 5.1.6.1 b) and hydraulic pressure test of 5.1.6.1 d) may be replaced by a procedure conforming to ISO 16148:2016 + Amd 1:2020 "Gas cylinders — Refillable seamless

steel gas cylinders and tubes — Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing”.

Note 3.— The check of internal conditions of 5.1.6.1 b) and the hydraulic pressure test of 5.1.6.1.d) may be replaced by ultrasonic examination carried out in accordance with ISO 18119:2018 + Amd 1:2021 for seamless steel and seamless aluminium alloy cylinder shells. For a transitional period until 31 December 2026, the standard ISO 18119:2018 may be used for this same purpose. For a transitional period until 31 December 2024, the standard ISO 10461:2005 +Amd 1:2006 may be used for seamless aluminium alloy cylinders and ISO 6406:2005 may be used for seamless steel cylinder shells for this same purpose.

- e) check of service equipment if to be reintroduced into service. This check may be carried out separately from the inspection of the cylinder shell.

Note.— For the periodic inspection and test frequencies, see Packing Instruction 200 or, for a chemical under pressure, Packing Instruction 218.

...

5.2 REQUIREMENTS FOR UN CYLINDERS AND CLOSED CRYOGENIC RECEPTACLES

...

5.2.1 Design, construction and initial inspection and testing

5.2.1.1 The following standards apply for the design, construction and initial inspection and test of refillable UN cylinder shells, except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5:

UN Model Regulations, Chapter 6.2, 6.2.2.1.1 and 6.2.2.1.2 (see ST/SG/AC.10/50/Add.1)

Reference	Title	Applicable for manufacture
ISO 9809-1:1999	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa. <i>Note.— The note concerning the F factor in section 7.3 of this standard must not be applied for UN cylinders.</i>	Until 31 December 2018
ISO 9809-1:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa.	Until 31 December 2026
ISO 9809-1:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1 100 MPa.	Until further notice
ISO 9809-2:2000	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa.	Until 31 December 2018
ISO 9809-2:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 2: Quenched and tempered steel cylinders with tensile strength greater than or equal to 1 100 MPa.	Until 31 December 2026
ISO 9809-2:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 2: Quenched and tempered steel cylinders and tubes with tensile strength greater than or equal to 1 100 MPa.	Until further notice
ISO 9809-3:2000	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.	Until 31 December 2018
ISO 9809-3:2010	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 3: Normalized steel cylinders.	Until 31 December 2026
ISO 9809-3:2019	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 3: Normalized steel cylinders and tubes.	Until further notice
ISO 9809-4:2014	Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa	Until further notice <u>Until 31 December 2028</u>

Reference	Title	Applicable for manufacture
ISO 9809-4:2021	Gas cylinders — Design, construction and testing of refillable seamless steel gas cylinders and tubes — Part 4: Stainless steel cylinders with an Rm value of less than 1 100 MPa <i>Note.— Small quantities are a batch of cylinders not exceeding 200.</i>	Until further notice
ISO 7866:1999	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing. <i>Note.— The note concerning the F factor in section 7.2 of this standard must not be applied for UN cylinders. Aluminium alloy 6351A — T6 or equivalent must not be authorized.</i>	Until 31 December 2020
ISO 7866: 2012+ Cor 1:2014	Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing <i>Note.— Aluminium alloy 6351A or equivalent must not be used.</i>	Until further notice
ISO 4706:2008	Gas cylinders — Refillable welded steel cylinders — Test pressure 60 bar and below.	Until further notice
ISO 18172-1:2007	Gas cylinders — Refillable welded stainless steel cylinders — Part 1: Test pressure 6 MPa and below.	Until further notice
ISO 20703:2006	Gas cylinders — Refillable welded aluminium-alloy cylinders — Design, construction and testing.	Until further notice
ISO 11119-1:2002	Gas cylinders of composite construction — Specification and test methods — Part 1: Hoop wrapped composite gas cylinders.	Until 31 December 2020
ISO 11119-1:2012	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 L.	Until further notice Until 31 December 2028
ISO 11119-1:2020	Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 L	Until further notice
ISO 11119-2:2002	Gas cylinders of composite construction — Specification and test methods — Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners.	Until 31 December 2020
ISO 11119-2:2012 + Amd 1:2014	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with load-sharing metal liners.	Until further notice Until 31 December 2028
ISO 11119-2:2020	Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with load-sharing metal liners.	Until further notice
ISO 11119-3:2002	Gas cylinders of composite construction — Specification and test methods — Part 3: Fully wrapped fibre reinforced composite gas cylinders with non-load-sharing metallic or non-metallic liners. <i>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</i>	Until 31 December 2020
ISO 11119-3:2013	Gas cylinders — Refillable composite gas cylinders and tubes — Design, construction and testing — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with non-load-sharing metallic or non-metallic liners. <i>Note.— This standard must not be used for linerless cylinders manufactured from two parts joined together.</i>	Until further notice Until 31 December 2028
ISO 11119-3:2020	Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 L with non-load-sharing metallic or non-metallic liners.	Until further notice
ISO 11119-4: 2016	Gas cylinders — Refillable composite gas cylinders — Design, construction and testing — Part 4: Fully wrapped fibre reinforced composite gas cylinders up to 150 L with load-sharing welded metallic liners.	Until further notice

Note 1.— In the above-referenced standards, composite cylinder shells must be designed for a design life of not less than fifteen years.

Note 2.— Composite cylinder shells with a design life longer than fifteen years must not be filled after fifteen years from the date of manufacture, unless the design has successfully passed a service life test programme. The programme must be part of the initial design type approval and must specify inspections and tests to demonstrate that composite cylinder shells manufactured accordingly remain safe to the end of their design life. The service life test programme and the results must be approved by the appropriate national authority of the country of approval that is responsible for the initial approval of the cylinder design. The service life of a composite cylinder shell must not be extended beyond its initial approved design life.

...

UN Model Regulations, Chapter 6.2, 6.2.2.1.4 (see ST/SG/AC.10/50/Add.1)

5.2.1.4 The following standard applies for the design, construction and initial inspection and test of UN closed cryogenic receptacles, except that inspection requirements related to the conformity assessment system and approval must be in accordance with 5.2.5:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 21029-1:2004	Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 L volume — Part 1: Design, fabrication, inspection and tests.	Until 31 December 2026
ISO 21029-1:2018 + Amd.1 Amd.1 :2019	Cryogenic vessels — Transportable vacuum insulated vessels of not more than 1 000 L volume — Part 1: Design, fabrication, inspection and tests.	Until further notice

...

UN Model Regulations, Chapter 6.2, 6.2.2.1.9 (see ST/SG/AC.10/50/Add.1)

5.2.1.9 The following standards apply for the design, construction and initial inspection and test of non-refillable UN cylinders except that the inspection requirements related to the conformity assessment system and approval must be in accordance with 6.5.2.5.

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 11118:1999	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until 31 December 2020
ISO 13340:2001	Transportable gas cylinders — Cylinder valves for non-refillable cylinders — Specification and prototype testing.	Until 31 December 2020
ISO 11118:2015	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until 31 December 2026
ISO 11118:2015 + Amd.1 Amd.1 :2019	Gas cylinders — Non-refillable metallic gas cylinders — Specification and test methods.	Until further notice

5.2.2 Materials

In addition to the material requirements specified in the design and construction standards, and any restrictions specified in the applicable Packing Instruction for the gas(es) to be transported (e.g. Packing Instruction 200, Packing Instruction 202 or Packing Instruction 214), the following standards apply to material compatibility:

UN Model Regulations, Chapter 6.2, 6.2.2.2 (see ST/SG/AC.10/50/Add.1)

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 11114-1:2012 + A1:2017 11114-1:2020	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 1: Metallic materials.	Until further notice
ISO 11114-2:2013 11114-2:2021	Gas cylinders — Compatibility of cylinder and valve materials with gas contents — Part 2: Non-metallic materials.	Until further notice

5.2.3 Closures and their protection

The following standards apply to the design, construction, and initial inspection and test of closures and their protection:

UN Model Regulations, Chapter 6.2, 6.2.2.3 (see ST/SG/AC.10/50/Add.1)

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 11117:1998	Gas cylinders — Valve protection caps and valve guards for industrial and medical gas cylinders — Design, construction and tests.	Until 31 December 2014
ISO 11117:2008+ Cor 1:2009	Gas cylinders — Valve protection caps and valve guards — Design, construction and tests.	Until 31 December 2026
ISO 11117:2019	Gas cylinders — Valve protection caps and guards — Design, construction and tests.	Until further notice
ISO 10297:1999	Gas cylinders – Refillable gas cylinder valves – Specification and type testing.	Until 31 December 2008
ISO 10297:2006	Gas cylinders — Refillable gas cylinder valves — Specification and type testing.	Until 31 December 2020
ISO 10297:2014	Gas cylinders — Cylinder valves — Specification and type testing	Until 31 December 2022
ISO 10297:2014 + Amd 1:2017	Gas cylinders — Cylinder valves — Specification and type testing	Until further notice
ISO 14246:2014	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until 31 December 2024
ISO 14246:2014 + Amd 1:2017	Gas cylinders — Cylinder valves — Manufacturing tests and examination	Until further notice
ISO 17871:2015	Gas cylinders — Quick-release cylinders valves — Specification and type testing <i>Note.— This standard must not be used for flammable gases.</i>	Until 31 December 2026
ISO 17871:2020	Gas cylinders — Quick-release cylinder valves — Specification and type testing.	Until further notice
ISO 17879:2017	Gas cylinders — Self-closing cylinder valves — Specification and type testing <i>Note.— This standard must not be applied to self-closing valves in acetylene cylinders.</i>	Until further notice
ISO 23826:2021	Gas cylinders — Ball valves — Specification and testing	Until further notice

For UN metal hydride storage systems, the requirements specified in the following standard apply to closures and their protection:

<i>Reference</i>	<i>Title</i>	<i>Applicable for manufacture</i>
ISO 16111:2008	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride	Until 31 December 2026
ISO 16111:2018	Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride.	Until further notice

5.2.4 Periodic inspection and test

5.2.4.1 The following standards apply to the periodic inspection and testing of UN cylinders:

UN Model Regulations, Chapter 6.2, 6.2.2.4 (see ST/SG/AC.10/50/Add.1)

Reference	Title	Applicable for manufacture
ISO 6406:2005	Seamless steel gas cylinders — Periodic inspection and testing.	Until 31 December 2024
ISO 18119:2018	Gas cylinders — Seamless steel and seamless aluminium-alloy gas cylinders and tubes — Periodic inspection and testing.	Until further notice Until 31 December 2026
ISO 18119:2018 + Amd 1:2021	Gas cylinders — Seamless steel and seamless aluminium-alloy gas cylinders and tubes — Periodic inspection and testing.	Until further notice
ISO 10460:2005	Gas cylinders – Welded carbon-steel gas cylinders – Periodic inspection and testing. <i>Note.— The repair of welds described in clause 12.1 of this standard must not be permitted. Repairs described in clause 12.2 require the approval of the appropriate national authority which approved the periodic inspection and test body in accordance with 5.2.6.</i>	Until 31 December 2024
ISO 10460:2018	Gas cylinders — Welded aluminium-alloy, carbon and stainless steel gas cylinders — Periodic inspection and testing.	Until further notice
ISO 10461:2005/ — + Amd 1:2006	Seamless aluminium-alloy gas cylinders — Periodic inspection and testing.	Until 31 December 2024
ISO 10462:2013	Gas cylinders — Acetylene cylinders — Periodic inspection and maintenance.	Until 31 December 2024

...

5.2.7 Marking of UN refillable cylinders and closed cryogenic receptacles

5.2.7.2 The following certification marks must be applied:

...

UN Model Regulations, Chapter 6.2, 6.2.2.7.3 (see ST/SG/AC.10/50/Add.1)

- l) In the case of cylinders for UN 3374 **Acetylene, solvent free**:
- i) the tare in kilograms consisting of the total of the mass of the empty cylinder shell, the service equipment (including porous material) not removed during filling and any coating expressed to three significant figures rounded down to the last digit followed by the letters “KG”. At least one decimal must be shown after the decimal point. For cylinders of less than 1 kg, the mass must be expressed to two significant figures rounded down to the last digit;
 - ii) the identity of the porous material (e.g. name or trademark); and
 - iii) the total mass of the filled acetylene cylinder in kilograms followed by the letters “KG”.

Note.— Acetylene cylinders constructed in accordance with the 2021-2022 Edition of these Instructions which are not marked in accordance with 6.5.2.7.2 k) or l) applicable in the 2023-2024 Edition of these Instructions may continue to be used until the next periodic inspection and test two years after the coming into force of this edition of these Instructions where they must be marked according to the provisions above or be taken out of operation.

...

5.2.7.4 The following manufacturing marks must be applied:

...

UN Model Regulations, Chapter 6.2, 6.2.2.7.4 (p) (see ST/SG/AC.10/50/Add.1)

- p) In the case of steel cylinders and closed cryogenic receptacles and composite cylinders and closed cryogenic receptacles with steel liner intended for the transport of gases with a risk of hydrogen embrittlement, the letter "H" showing compatibility of the steel (see ISO 11114-1:2012~~2012~~2020);

...

5.2.9 Marking of UN metal hydride storage systems

...

5.2.9.2 The following marks must be applied:

...

UN Model Regulations, Chapter 6.2, 6.2.2.9.2 (j) (see ST/SG/AC.10/50/Add.1)

- j) In the case of steel cylinders and composite cylinders with steel liner, the letter "H" showing compatibility of the steel (see ISO 11114-1:2012~~2012~~2020); and

...

5.2.11 Marking of closures for refillable UN cylinders and closed cryogenic receptacles

...

UN Model Regulations, Chapter 6.2, 6.2.2.11 (see ST/SG/AC.10/50/Add.1)

5.2.11.2 The valve test pressure must be marked when it is less than the test pressure which is indicated by the rating of the valve filling connection.

Note.— Closures of refillable cylinders manufactured before 1 January 2027 in accordance with the requirements applicable in the 2021-2022 Edition of these Instructions which are not marked in accordance with the requirements of 5.2.11 applicable in the 2023-2024 Edition of these Instructions may continue to be used.

— END —