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## 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

#### Sixty-fifth session

Geneva, 25 November-3 December 2024

Item 2 (a) of the provisional agenda

#### Recommendations made by the Sub-Committee at its sixty-second, sixty-third and sixty-fourth sessions and pending issues:

Review of draft amendments already adopted during the biennium

### Consolidated list of draft amendments

#### Note by the secretariat\*

This document contains a consolidated list of draft amendments adopted by the Sub-Committee of Experts at its sixty-second, sixty-third and sixty-fourth sessions, as follows:

- Part I Draft amendments to the twenty-third revised edition of the Recommendations on the Transport of Dangerous Goods, Model Regulations (ST/SG/AC.10/1/Rev.23)
- Part II Draft amendments to the eighth revised edition of the Manual of Tests and Criteria (ST/SG/AC.10/11/Rev.8)

## I. Draft amendments to the twenty-third revised edition of the Recommendations on the Transport of Dangerous Goods, Model Regulations (ST/SG/AC.10/1/Rev.23)

### Chapter 1.2

- 1.2.1 The amendment to the definition of “*Bulk container*” does not apply to the English version.

In the definition of “*Cylinder*”, at the end, add “with a test pressure volume product not exceeding 1.5 million bar litres”.

In the definition of “*Bundle of cylinders*”, at the end, add “. The test pressure volume product taking into account the total water capacity of all pressure receptacles in the bundle shall not exceed 1.5 million bar litres”.

In the definition of “*Net explosive mass (NEM)*”, after “(NEQ)”, replace the comma by “or” and after “(NEQ)”, delete “, or net explosive weight (NEW)”.

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\* A/78/6 (Sect. 20), table 20.5.



In the definition of “*Salvage pressure receptacle*”, delete “with a water capacity not exceeding 3 000 litres” and, after “pressure receptacle(s)”, add “having a total test pressure volume product not exceeding 1.5 million bar litres”.

In the definition of “*Tube*”, at the end, add “with a test pressure volume product not exceeding 1.5 million bar litres”.

In the definition for *Filling ratio*, replace “a pressure receptacle” by “the means of containment”.

Insert the following new definitions in alphabetical order:

“*Pressure volume product (pV-product)* means the value resulting from multiplying the (usable) water capacity of a containment with its relevant maximum pressure during filling and usage (e.g. test pressure or charging pressure) as referenced for the relevant kind of containment. It is expressed in bar litres.”

“*Usable water capacity* means the water capacity of salvage pressure receptacles remaining after the installation of equipment into a salvage pressure receptacle, which is necessary for e.g., opening or drilling a stored pressure receptacle inside a closed salvage pressure receptacle. The usable water capacity may be lower than the water capacity originally approved and marked. It is expressed in litres.”

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)

1.2.2.1 In the table, in the second row for “Mass”, in column “Acceptable alternative unit”, replace “(ton)” by “(tonne (metric ton))”.

In note <sup>a</sup> to 1.2.2.1:

- Delete the sections for “*Force*” and “*Stress*”;
- In the section for “*Pressure*”:
  - For “1 Pa”, delete “=  $1.02 \times 10^{-5} \text{ kg/cm}^2 = 0.75 \times 10^{-2} \text{ torr}$ ”;
  - For “1 bar”, delete “=  $1.02 \text{ kg/cm}^2 = 750 \text{ torr}$ ”;
  - Delete the lines for “1 kg/cm<sup>2</sup>” and “1 torr”;
- In the section for “*Energy, Work, Quantity of heat*”:
  - For “1 J”, delete “= 0.102 kgm”;
  - For “1 kWh”, delete “=  $367 \times 10^3 \text{ kgm}$ ”;
  - Delete the line for “1 kgm”;
  - For “1 kcal”, delete “= 427 kgm”;
- In the section for “*Power*”:
  - For “1 W”, delete “= 0.102 kgm/s”;
  - Delete the line for “1 kgm/s”;
  - For “1 kcal/h”, delete “= 0.119 kgm/s”;
- In the section for “*Dynamic viscosity*”:
  - For “1 Pa · s”, delete “= 0.102 kgs/m<sup>2</sup>”;
  - For “1 P”, delete “=  $1.02 \times 10^{-2} \text{ kgs/m}^2$ ”;
  - Delete the line for “1 kgs/m<sup>2</sup>”;

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/128, Annex II)

## Chapter 2.0

- 2.0.3.1 In footnote 3, replace “*preparations*” by “*mixtures*”, after “*ingestion*”, replace “*or*”, by “*and*” and, at the end, add “(see note under 2.6.2.2.4.1 and 2.8.2.4)”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

- 2.0.4.3 Add a new 2.0.4.3.2 and a new 2.0.4.3.3 to read as follows:

“2.0.4.3.2 Samples of organic substances carrying functional groups listed in tables A6.1 or A6.3 in appendix 6 of the *Manual of Tests and Criteria* may be assigned to one of the appropriate entries for self-reactive substances type C (UN Nos. 3223, 3224, 3233 or 3234, as applicable) of Division 4.1 and transported under the provisions of 2.4.2.3.2.4 (b) for the transport in amounts of not more than 200 g per outer packaging provided that:

- (a) They fulfil the criteria of 2.0.4.3.1 (a) to (c); and
- (b) Their decomposition energy is:
  - (i) Less than 1 500 J/g for salts or complexes of organic compounds;
  - (ii) Less than 2 000 J/g for other organic substances;
  - (iii) 1 500 J/g or more for salts or complexes of organic compounds, and in test C.1 the result is not “yes, rapidly” and in any one of test series F the result is not “not low”; or
  - (iv) 2 000 J/g or more for other organic substances, and in test C.1 the result is not “yes, rapidly” and in any one of test series F the result is not “not low”.

The assessment in (b) (iii) and (iv) may be based on a single test C.1 and one single test from test series F. If the criteria in (b) are fulfilled, it can be assumed that the sample is not more dangerous than self-reactive substances type B.

An appropriate method to determine temperature control requirements is described in section 20.3.4 of the *Manual of Tests and Criteria*.

Samples not passing the criteria in (b) (iii) or (iv) may be transported by an approval issued by the competent authority of the country of origin. The statement of approval shall be based on the available information and contain the classification and the relevant transport conditions. Alternatively, the sample may be dissolved or diluted with an inert compound to form a homogenous mixture in agreement with the criteria in (b) (i) or (ii), as applicable.

- 2.0.4.3.3 A flow chart describing the classification of energetic samples is shown in figure 2.0.1.

**Note from the secretariat:** Figure 2.0.1 has been edited by the secretariat after the sixty-fourth session of the Sub-Committee, in consultation with the authors of the original proposal.

Figure 2.0.1: Classification of energetic samples

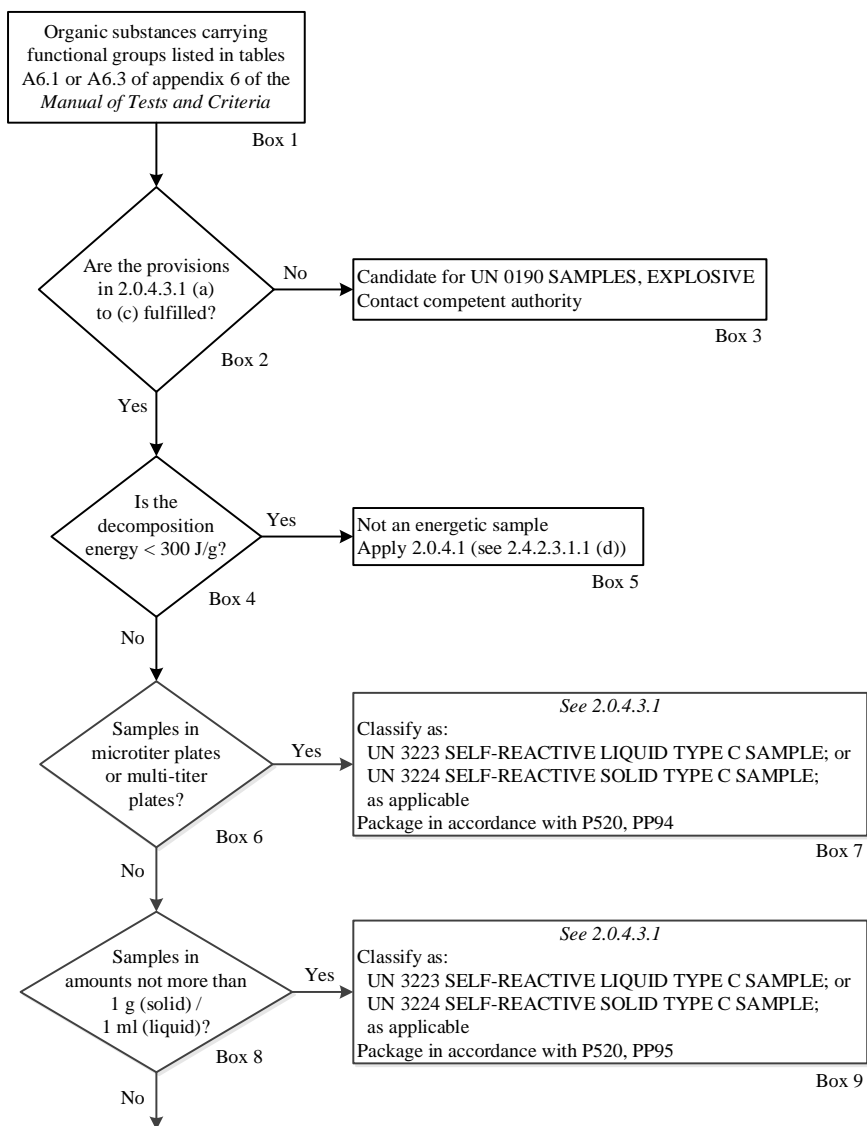
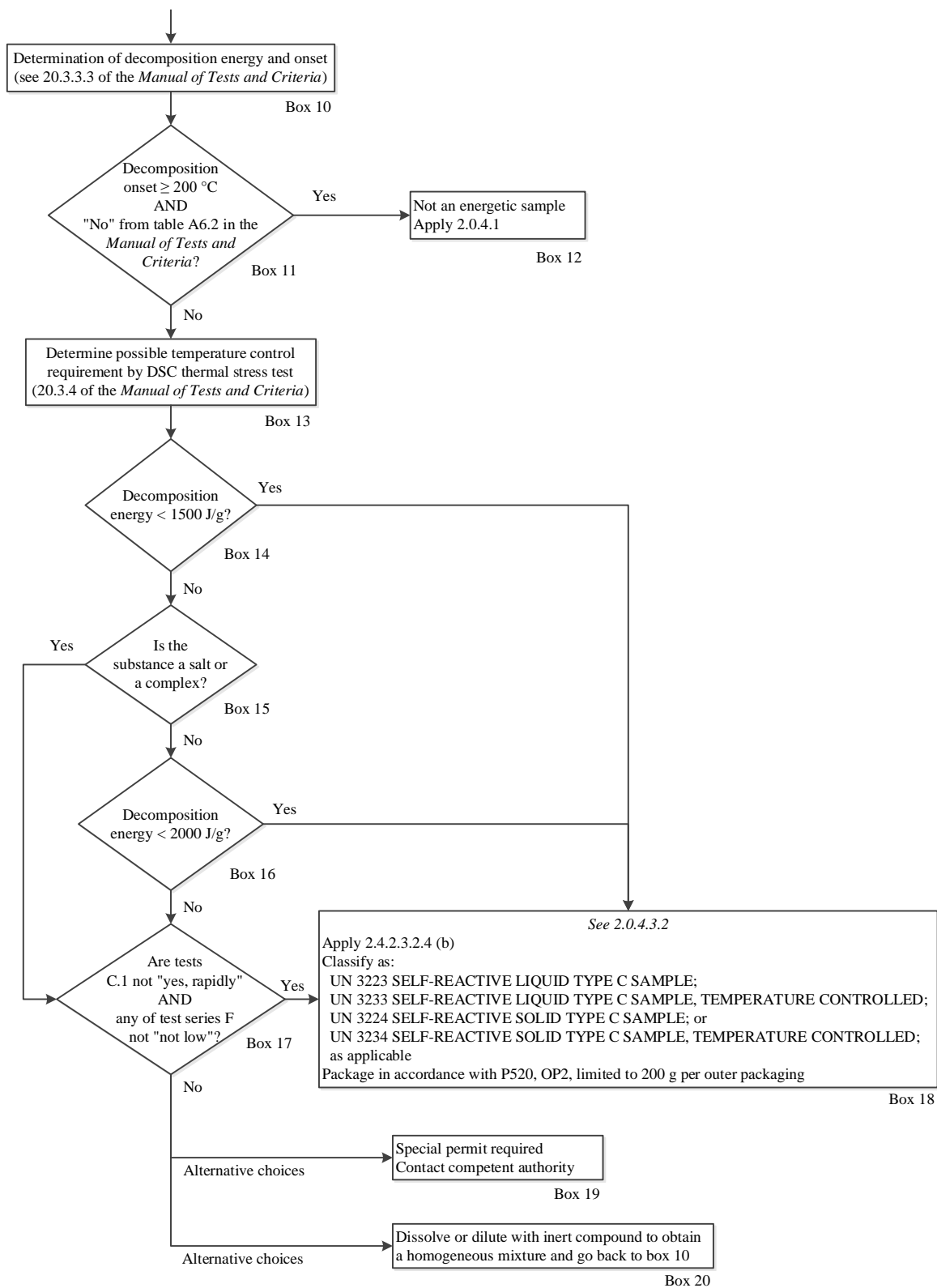


Figure 2.0.1: Classification of energetic samples (cont'd)



(Reference document: ST/SG/AC.10/C.3/128, Annex II)

- 2.0.5.2 In the second sentence, replace “Lithium cells and batteries” by “Lithium metal, lithium ion and sodium ion cells and batteries”. In the third sentence, replace “Lithium cells or batteries” by “Lithium metal, lithium ion or sodium ion cells or batteries” (twice).

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

## Chapter 2.1

- [2.1.1.1 In (b), after “except”, add “those that are too dangerous to transport or”.]

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

- [2.1.1.3 In (e), delete “, in the context of 2.1.1.1 (c),”.]

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

- 2.1.3.2.2 In the first sentence, replace “seven” by “eight”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

## Chapter 2.5

- 2.5.3.2.4 In the table, add the following new entries:

tert-AMYL PEROXYPIVALATE	≤ 72	≥ 28				OP7	+10 °C	+15 °C	3115	
1,2,4,5,7,8-HEXOXONANE, 3,6,9-TRIMETHYL-3,6,9-tris (Ethyl and Propyl) derivatives	≤ 41	≥ 59				OP7			3105	35)

The amendment to note 34) does not apply to the English version.

After the table, add the following new remark:

“35) Available oxygen ≤ 7.3 %.”

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)

## Chapter 2.6

- 2.6.2.2.4.1 In the note, after “Substances” add “or mixtures” and replace “(see 2.8.2.4)” “(see footnote 3 in 2.0.3.1 and 2.8.2.4)”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

- [2.6.3.2.2 Replace “the following categories:” by “categories A and B.”.]

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

- [2.6.3.2.2.1 Amend the text before the table to read as follows:

“2.6.3.2.2.1 Category A

An infectious substance which is transported in a form that, when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals is assigned to Category A. Indicative examples of substances that meet these criteria are given in the table in this paragraph.

Infectious substances meeting these criteria which cause disease in humans or both in humans and animals shall be assigned to UN 2814. Infectious substances which cause disease only in animals shall be assigned to UN 2900.

Assignment to UN Nos. 2814 or 2900 shall be based on the known medical history and symptoms of the source human or animal, endemic local conditions, or professional judgement concerning individual circumstances of the source human or animal.

The following table is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in the table but which meet the same criteria shall be assigned to Category A. In addition, if there is doubt as to whether or not a substance meets the criteria it shall be included in Category A. To address emerging health situations, more up-to-date information on the applicable categories can be obtained from human and animal health inter-governmental organizations and national authorities.

**NOTE 1:** *An exposure occurs when an infectious substance is released outside of the protective packaging, resulting in physical contact with humans or animals.*

**NOTE 2:** *The proper shipping name for UN 2814 is INFECTIOUS SUBSTANCE, AFFECTING HUMANS. The proper shipping name for UN 2900 is INFECTIOUS SUBSTANCE, AFFECTING ANIMALS only.*

**NOTE 3:** *The microorganisms written in italics in the following table are bacteria or fungi.”*

In the heading of the table, delete “(2.6.3.2.2.1 (a))”.]

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

**Note from the secretariat:** *the square brackets apply only to the editorial amendments from informal document INF.68/Rev.1 of the sixty-fourth session. They do not apply to the amendments from informal document INF.58/Rev.1 of the sixty-fourth session.*

[2.6.3.2.2.2 Amend the text before the note to read as follows:

“2.6.3.2.2.2 Category B

An infectious substance which does not meet the criteria for inclusion in Category A is assigned to Category B. Infectious substances in Category B shall be assigned to UN 3373.”]

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

## Chapter 2.8

2.8.2.4 Replace “A substance or mixture” by “Substances or mixtures”. After “ingestion”, replace “or”, by “and”. At the end, replace “(see note under 2.6.2.2.4.1)” “(see footnote 3 in 2.0.3.1 and note under 2.6.2.2.4.1)”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

## Chapter 2.9

2.9.2 Under “**Sodium ion batteries**”, split the entry of UN 3552 into two lines as follows:

“3552 SODIUM ION BATTERIES CONTAINED IN EQUIPMENT or

3552 SODIUM ION BATTERIES PACKED WITH EQUIPMENT, with organic electrolyte”

After the lines for UN 3552 add a new entry to read as follows:

“3536 SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT”

(Reference document: ST/SG/AC.10/C.3/128, Annex II and additional editorial modification)

2.9.4 In the first paragraph, replace “contained in equipment” by “contained in articles, engines, equipment or vehicles” and amend the end to read “... in any form may be transported under the appropriate entry if they meet the following provisions:”.

In the note in (g), delete “for lithium cells or batteries or equipment with installed lithium cells or batteries”.

Add a new (h) to read as follows:

- “(h) Hybrid batteries, containing both lithium ion cells and sodium ion cells (see special provision 410 of chapter 3.3), shall meet the following conditions:
- (i) The lithium ion cells and sodium ion cells are electrically connected;
  - (ii) The battery has been tested as a lithium ion battery in accordance with 2.9.4 (a);
  - (iii) Each component lithium ion and sodium ion cell of the battery shall be of a type proved to meet the respective testing requirements of the *Manual of Tests and Criteria*, part III, sub-section 38.3.”

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)

2.9.5 In the first paragraph, replace “contained in equipment” by “contained in articles, engines, equipment or vehicles” and amend the end to read “... as electrolyte, may be transported under the appropriate entry if they meet the following provisions:”. Delete the introductory sentence before the subparagraphs.

In (a), at the end, add the following new note:

“**NOTE:** Batteries shall be of a type proved to meet the testing requirements of the *Manual of Tests and Criteria*, part III, sub-section 38.3, irrespective of whether the cells of which they are composed are of a tested type.”

In (f), at the end, add the following new note:

“**NOTE:** The term “make available” means that manufacturers and subsequent distributors ensure that the test summary is accessible so that the consignor or other persons in the supply chain can confirm compliance.”

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)

### **Chapter 3.2, dangerous goods list**

For UN Nos. 0012 and 0014, in column (9), add “PP98” against P130.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

For UN Nos. 1040, 1041 and 3300, in column (4), add “8”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For UN Nos. 1075 and 1965, in column (6), add “412”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

For UN 1727, in column (4), add “6.1”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For UN 2020, amend column (2) to read “CHLOROPHENOLS, TOXIC, SOLID, N.O.S.” [and in column (6), add “274”].

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For UN 2021, amend column (2) to read “CHLOROPHENOLS, TOXIC, LIQUID, N.O.S.” [and in column (6), add “274”].

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For UN 2029, in column (6), add “132” and in column (9), add “PP5” against “P001”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For UN 2735, packing group II, in column (11), replace “TP1” by “TP2”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)



For UN Nos. 2857 and 3358, in column (2), after “REFRIGERATING MACHINES”, add “or HEATING MACHINES”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

For UN 2956, in column (7a), replace “5 kg” by “0”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

For UN 3536, in column (2), replace the existing text by “LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT or SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, lithium ion batteries, lithium metal batteries or sodium ion batteries”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

For UN Nos. 3480, 3481, 3551 and 3552, in column (6), add “410”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For UN 3538, in column (6), add “411”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

Add the following new entries:

(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
2348	BUTYL ACRYLATES, STABILIZED	3		II	386	1 L	E2	P001 IBC02		T4	TP1
3561	CHLOROPHENOLS, CORROSIVE, TOXIC, SOLID, N.O.S.	8	6.1	II	[274]	1 kg	E2	P002 IBC08	B2, B4	T3	TP33
3562	CHLOROPHENOLS, CORROSIVE, SOLID, N.O.S.	8		II		1 kg	E2	P002 IBC08	B2, B4	T3	TP33

(Reference document: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)

### Chapter 3.3

SP 119 After the first sentence add a new sentence to read: “Heating machines include machines or other appliances which have been designed for the specific purpose of heating.”.

In the now third sentence (previously second sentence), replace “Refrigerating machines and refrigerating machine components” by “Refrigerating or heating machines and their components”.

At the end, add a new sentence to read: “Machines or other appliances that are used to perform heating and cooling functions may be transported either as “REFRIGERATING MACHINES” or “HEATING MACHINES”.”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

SP 145 Replace “packing group III” by “with more than 24 % but not more than 70 % alcohol by volume”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

SP 146 Replace “packing group II” by “with more than 70 % alcohol by volume”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

SP 188 In (c), replace “and (g)” by “, (g) and (h) if applicable”.

In (f):

- In the first sentence, replace “with the appropriate lithium or sodium battery mark, as illustrated at” by “according to”.

- In the note, replace “(lithium battery mark)” by “(battery mark)”.

- In the last paragraph, first sentence, replace “lithium or sodium battery mark” by “battery mark”.

- In (ii), at the end, add “Where equipment contains a button cell in addition to cells or batteries, the button cell does not count toward package or consignment limits.”

*(Reference documents: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)*

SP 252 The amendment does not apply to the English version.

*(Reference document: ST/SG/AC.10/C.3/124, Annex I)*

SP 277 In the first sentence, after “value”, add “for the purposes of exemptions in chapter 3.4”.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

SP 291 In the first sentence, after “refrigerating”, add “or heating”.

In the third sentence, replace “The refrigerating machines” by “Refrigerating or heating machines”.

In the fourth sentence, replace “Refrigerating machines and refrigerating-machine components” by “Refrigerating or heating machines and their components”.

At the end, add a new sentence to read: “Machines that are used to perform heating and cooling functions may be transported either as “REFRIGERATING MACHINES” or “HEATING MACHINES”.”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

SP 296 In (d), replace “lithium or sodium ion batteries” by “lithium batteries or sodium ion batteries”.

*(Reference document: ST/SG/AC.10/C.3/124, Annex I)*

SP 301 Amend the fifth sentence to read “If the articles contain more than one item of dangerous goods and these could react dangerously with one another during transport, each of the dangerous goods shall be enclosed separately (see 4.1.1.6).”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

SP 310 At the end of the first paragraph, replace “and (g)” by “, (g), (h) (ii) if applicable and (h) (iii) if applicable for lithium cells or batteries, and shall meet the provisions of 2.9.5 with the exception of 2.9.5 (a) and 2.9.4 (e) (vii) (as referred to in 2.9.5 (e)) for sodium ion cells or batteries”.

The second amendment does not apply to the English version.

*(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)*

SP 328 The amendment does not apply to the English version.

*(Reference document: ST/SG/AC.10/C.3/124, Annex I)*

SP 360 Before the last sentence, add the following new sentence: “Vehicles powered only by hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4 (h) shall be assigned to the entry UN 3556 VEHICLE, LITHIUM ION BATTERY POWERED.”.

Amend the last sentence to read: “Lithium batteries, sodium ion batteries or hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4 (h) installed in cargo transport units, designed only to provide power external to the transport unit shall be assigned to entries UN 3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT

UNIT or UN 3536 SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, as applicable.”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II*)

SP 363 In (f), second sentence, replace “and (g)” by “, (g), (h) (ii) if applicable and (h) (iii) if applicable”.

In (f), add a new third sentence to read: “Furthermore, sodium ion batteries shall meet the provisions of 2.9.5, except that 2.9.5 (a), (e) and (f) do not apply when batteries of a production run of not more than 100 cells or batteries, or pre-production prototypes of cells or batteries when these prototypes are transported for testing, are installed in machinery or engines.”.

The last amendment does not apply to the English version.

(Reference documents: *ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I*)

SP 379 In (d) (i), after “ISO 11114-1:2020”, add “+ Amd 1:2023”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

SP 387 In the second sentence, replace “capacity” by watt-hour rating”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

SP 388 In the second and third paragraphs, in the second sentence, replace “sodium batteries, lithium metal batteries or lithium ion batteries” by “metallic sodium batteries, sodium alloy batteries, lithium metal batteries, lithium ion batteries, hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4 (h) or sodium ion batteries”.

In the sixth paragraph, add a new second sentence to read “Vehicles powered only by hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4 (h) shall be assigned to the entry UN 3556 VEHICLE, LITHIUM ION BATTERY POWERED.”.

In the eighth paragraph, amend the last sentence to read: “Lithium ion batteries, lithium metal batteries or sodium ion batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit shall be assigned to the entries UN 3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT or UN 3536 SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, as appropriate.”.

In the ninth paragraph, second sentence, replace “and (g)” by “, (g), (h) (ii) if applicable and (h) (iii) if applicable”.

In the ninth paragraph, add a new third sentence to read: “Furthermore, sodium ion batteries shall meet the provisions of 2.9.5, except that 2.9.5 (a), (e) and (f) do not apply when batteries of a production run of not more than 100 cells or batteries, or pre-production prototypes of cells or batteries when these prototypes are transported for testing, are installed in machinery or engines.”.

(Reference documents: *ST/SG/AC.10/C.3/124, Annex I, ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II*)

SP 389 Amend the first paragraph to read:

“This entry only applies to lithium ion batteries, lithium metal batteries, sodium ion batteries or hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4 (h) installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. The batteries shall meet the requirements of 2.9.4 (a) to (h) for lithium or 2.9.5 (a) to (f) for sodium and contain the necessary systems to prevent overcharge and over discharge between the batteries.”.

(Reference document: *ST/SG/AC.10/C.3/128, Annex II*)

*Note by the secretariat:* The amendment as reflected above, which is the result of merging amendments adopted in the sixty-third and sixty-fourth sessions, seems to include an inconsistency in the second sentence, which calls for the application of 2.9.4 (a) to (h) to lithium batteries. The secretariat understands that lithium batteries should only comply with 2.9.4 (a) to (g), as (h) is for hybrid batteries. On the other hand, the amendment as reflected above is ambiguous in this point regarding hybrid batteries. Taking all this into account, the secretariat would like to propose the following alternative amendment, which breaks the second sentence into 4 distinct and more explicit sentences:

SP 389 Amend the first paragraph to read “This entry only applies to lithium ion batteries, lithium metal batteries, sodium ion batteries or hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4 (h) installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. Lithium batteries shall meet the requirements of 2.9.4 (a) to (g). Hybrid batteries shall meet the requirements of 2.9.4 (a) to (h). Sodium batteries shall meet the requirements of 2.9.5 (a) to (f). All batteries shall contain the necessary systems to prevent overcharge and over discharge between the batteries.”

SP 400 In (a), replace “shall be” by “is”. In (c), replace “shall be” by “is”. In (d), replace “shall be” by “is”. In (e), first sentence, replace “shall be” by “are”. In (e), second sentence, replace “shall be” by “is”. In (f), replace “shall only contain” by “only contains”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

SP 401 In the last sentence, after “UN 2795”, delete “BATTERIES, WET, FILLED WITH ALKALI, electric storage”. At the end, add a new sentence to read: “Batteries containing metallic sodium or sodium alloy shall be carried as UN 3292.”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

SP 403 In (b) (i) and (b) (ii), replace “according to” by “in accordance with”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

SP 405 Amend to read as follows:

“405 Vehicles that are fully enclosed by packagings, crates or other means that prevent ready identification are subject to the marking and labelling requirements of chapter 5.2.”

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

SP 406 Replace “This entry” by “Substances under this entry”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

SP 407 The first amendment does not apply to the English version.

In (b), replace “shall be” by “is”. In (c), replace “shall be” by “is” and “shall not” by “do not”. In (d), replace “shall be” by “is”.

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)

SP 408 In the first paragraph, in (a) and in (b), replace “must” by “shall”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

Add the following new special provisions:

“410 Hybrid batteries in conformity with 2.9.4 (h) containing both lithium ion cells and sodium ion cells shall be assigned to UN Nos. 3480 or 3481, as appropriate. When such batteries are transported in accordance with special provision 188, the watt-hour rating of all batteries shall not exceed 100 Wh and shall be marked on the outside case.”

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

“411 Articles transported under this entry include magnetic resonance imaging (MRI) scanners containing non-flammable, non-toxic gas. The non-flammable, non-toxic gas shall be contained within MRI scanner components. The MRI scanners shall be designed and constructed to contain the gas and preclude the risk of bursting or cracking of the gas retaining components during normal conditions of transport. MRI scanners are not subject to these Regulations if they contain less than 12 kg of gas in Division 2.2.”

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

“412 This entry may contain not more than 12 % by mass of dimethyl ether.”

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

## Alphabetical index

Delete the entries for “Dichlorophenol” and “Fluoric acid”.

(Reference documents: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)

For “CHLOROPHENOLS, LIQUID”, amend column “Name and description” to read “CHLOROPHENOLS, TOXIC, LIQUID, N.O.S.”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

For “CHLOROPHENOLS, SOLID”, amend column “Name and description” to read “CHLOROPHENOLS, TOXIC, SOLID, N.O.S.”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

Add the following new entries in alphabetical order:

CHLOROPHENOLS, CORROSIVE, TOXIC, SOLID, N.O.S.	8	3561
CHLOROPHENOLS, CORROSIVE, SOLID, N.O.S.	8	3562
Heat pumps, see	2.2 2.1	2857 3358
HEATING MACHINES containing non-flammable, non-toxic, gases or ammonia solutions (UN 2672)	2.2	2857
HEATING MACHINES containing flammable, non-toxic, liquefied gas	2.1	3358
Magnetic resonance imaging (MRI) scanners containing non-flammable, non-toxic gas, see	2.2	3538
SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT	9	3536

The addition of a new entry to the alphabetical index associated with UN 1790 does not apply to the English version.

(Reference documents: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)

## Chapter 4.1

4.1.1.19.3 In (c), first sentence, replace “and volume” by “, in usable water capacity and in pressure volume product”. The second amendment does not apply to the English text.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

4.1.3.6.5 In the first sentence, replace “level of filling” by “degree of filling”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

4.1.4.1, P001 In PP5, replace “UN 1204” by “UN Nos. 1204 and 2029”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

4.1.4.1, P006 In (5), first sentence, after “lithium cells or batteries”, add “or sodium ion cells or batteries” (twice) and replace “have not met” by “has not met”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

4.1.4.1, P130 Add the following new special packing provision:

“PP98 For UN Nos. 0012 and 0014, despite the requirements of 4.1.5.11, articles may be packed without internal cushioning, fittings, coating or liner in metal outer packagings.”

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

4.1.4.1, P200 In (4) (d), replace “degree or pressure of filling” by “filling ratio or pressure of filling”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

4.1.4.1, P520 The amendment does not apply to the English text.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

4.1.4.1, P912 In (c), at the beginning, replace “where the vehicles” by “where they”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

4.1.4.2, IBC520 For UN 3119, add a new entry to read as follows:

	tert-Butyl peroxy-2-ethylhexanoate, not more than 52 %, in diluent type A	31HA1 31A	1 000 1 250	+30 °C +30 °C	+35 °C +35 °C
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(Reference document: ST/SG/AC.10/C.3/126, Annex I)

4.1.4.3, LP03 In (4), first sentence, after “lithium cells or batteries”, add “or sodium ion cells or batteries” (twice).

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

4.1.6.1.2 In the second sentence, after “ISO 11114-1:2020”, add “+ Amd 1:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

[4.1.6.1.8 In the paragraph after (e), third sentence, after “ISO 10297:2014 + Amd 1:2017”, add “or clause 5.4.2 of ISO 10297:2024”.]

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

## Chapter 4.2

4.2.1.9 The amendment does not apply to the English version.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

4.2.2.8 In (a), replace “an ullage condition” by “a filling condition”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

4.2.3.8 In (a), replace “an ullage condition” by “a filling condition”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

4.2.6 At the end, add the following new paragraph:

“Portable tanks manufactured prior to 1 January 2027 which were marked in accordance with the requirements of 6.7.4.15.1 (i) (iv) applicable in the twenty second revised edition of the Model Regulations may continue to be used.”

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

## Chapter 5.2

5.2.1.9 Amend the heading to read “**Battery mark**”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

5.2.1.9.1 Replace “lithium or sodium ion cells or batteries” by “lithium cells or batteries or sodium ion cells or batteries” and replace “provision 188” by “provisions 188 or 400”.

(Reference documents: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I)

5.2.1.9.2 At the end of the first paragraph add the following new sentence: “However, where equipment contains a button cell in addition to cells or batteries there is no requirement for the UN number indicating the button cell to be included on the mark.”.

In figure 5.2.5, amend the heading to read “**Battery mark**”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)

5.2.1.9 Add a new 5.2.1.9.3 to read as follows:

“5.2.1.9.3 When both the battery mark and labels in accordance with 5.2.2.2 other than model No. 9A are required, the battery mark shall be located on the same surface as the labels if the package dimensions are adequate.”

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

5.2.2.1.13.1 In the second sentence, replace “lithium or sodium ion batteries” by “lithium batteries or sodium ion batteries” and replace “lithium or sodium ion battery mark” by “battery mark”. In the third sentence, replace “lithium or sodium ion batteries” by “lithium batteries or sodium ion batteries”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

## Chapter 5.5

5.5.4 In the heading, replace “**Dangerous goods in equipment in use**” by “**Devices containing dangerous goods, which are in use**”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

5.5.4.1 In the first sentence, at the beginning, replace “Dangerous goods (e.g. lithium batteries, fuel cell cartridges) contained in equipment” by “Devices in use or intended for use during transport containing dangerous goods,”, after “data loggers”, insert “, sensors” and replace “containers or load compartments” by “bulk containers, freight containers or other types of cargo transport units”.

In (a), replace “equipment” by “device”.

In (c), replace “equipment” by “device” and, at the end, add “and shall be safe for use in the dangerous environments to which it may be exposed”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

5.5.4.2 Replace “equipment” by “a device”.

(Reference document: ST/SG/AC.10/C.3/124, Annex I)

## Chapter 6.1

6.1.4.12.1 In the second sentence, replace “ISO 535:2014” by “ISO 535:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.1.5.1.3 Replace “Tests” by “Appropriate tests”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

## Chapter 6.2

6.2.1.5.1 In (g), before “technical code”, add “recognized”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.2.1.5.2 In (d), (e) and (f), before “technical code”, add “recognized”. In (p), before “code”, add “recognized technical”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.2.2.1.1 In the table, in the row for ISO 4706:2008, in column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2030”.

Add a new row beneath this row as follows:

ISO 4706:2023	Gas cylinders – Refillable welded steel cylinders – Test pressure 60 bar and below	Until further notice
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(Reference document: ST/SG/AC.10/C.3/128, Annex II)

6.2.2.1.2 In the table, in the row for ISO 11515:2013 + Amd 1:2018, in column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2030”. Add a new row beneath this row as follows:

ISO 11515:2022	Gas cylinders – Refillable composite reinforced tubes of water capacity between 450 l and 3000 l – Design, construction and testing	Until further notice
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(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.2.2.1.3 In the first table, in the row for ISO 4706:2008, in column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2030”.

Add a new row beneath this row as follows:

ISO 4706:2023	Gas cylinders – Refillable welded steel cylinders – Test pressure 60 bar and below	Until further notice
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(Reference document: ST/SG/AC.10/C.3/128, Annex II)



- 6.2.2.1.8 In the table, in the row for ISO 4706:2008, in column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2030”. Add a new row beneath this row as follows:

ISO 4706:2023	Gas cylinders – Refillable welded steel cylinders – Test pressure 60 bar and below	Until further notice
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(Reference document: ST/SG/AC.10/C.3/128, Annex II)

- 6.2.2.2 In the table, in the row for ISO 11114-1:2020, in the first column, after “ISO 11114-1:2020”, add “+ Amd 1:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

- 6.2.2.3 [In the first table, in the row for ISO 10297:2014 + Amd 1:2017, in column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2028”. Add a new row beneath this row as follows:

ISO 10297:2024	Gas cylinders - Cylinder valves - Specification and type testing	Until further notice
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]

- In the first table, in the row for ISO 14246:2014 + Amd 1:2017, in column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2030”. Add a new row beneath this row as follows:

ISO 14246:2022	Gas cylinders — Cylinder valves — Manufacturing tests and examinations	Until further notice
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(Reference document: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)

- 6.2.2.4 In the first table, in the row for ISO 11623:2015, in column “Applicable”, replace “Until further notice” by “Until 31 December 2028”. Add a new row beneath this row as follows:

ISO 11623:2023	Gas cylinders – Composite cylinders and tubes – Periodic inspection and testing <i>NOTE: The pressure test shall not be replaced by a non-destructive examination (NDE) technique, though such techniques can be used for monitoring purposes.</i>	Until further notice
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- In the first table, in the row for ISO 22434:2006, in column “Applicable”, replace “Until further notice” by “Until 31 December 2028”. Add a new row beneath this row as follows:

ISO 22434:2022	Gas cylinders - Inspection and maintenance of valves <i>NOTE: These requirements may be met at times other than at the periodic inspection and test of UN cylinders</i>	Until further notice
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(Reference document: ST/SG/AC.10/C.3/126, Annex I and ST/SG/AC.10/C.3/128, Annex II)

- 6.2.2.7.4 In (p), after “ISO 11114-1:2020”, add “+ Amd 1:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

- 6.2.2.9.2 In (j), after “ISO 11114-1:2020”, add “+ Amd 1:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

- 6.2.3.5 In the second paragraph, before the last sentence, add the following:

“This indication of authorized pressure receptacles shall contain the following information:

- (a) The test pressure to which the salvage pressure receptacle can be loaded at maximum temperature, which limits the storage of pressure receptacles filled with liquified gases.
- (b) The usable water capacity and the maximum pV-product authorized for stored pressure receptacles, which limits the storage of pressure receptacles filled with compressed gases. The value of this maximum pV-product is the lowest value of either of the following:
  - (i) the general limit of the pV-product of 1.5 million bar litres; or
  - (ii) the pV-product of the salvage pressure receptacle based on the test pressure to which it is allowed to be loaded at maximum temperature and its usable water capacity.”

The last sentence of the second paragraph becomes a new paragraph. At the end of this sentence, add “in the approval certificate”.

In the last paragraph, amend the last sentence to read as follows:

“The marking of the salvage pressure receptacle shall include the usable water capacity, the test pressure and the maximum pressure volume product. This mark shall start with the letters "PVP", followed by the pV-product and the units. The pV-product shall include a space in front of the last 3 digits of the value. The units "BAR" and "L" shall be separated by a dot. For harmonised readability and to avoid subsequent manipulation, the mark shall not contain more spaces. An example of the PVP mark is given below:

PVP1500 000BAR.L”

At the end, replace the existing note by the following note:

**NOTE:** *Salvage pressure receptacles with a water capacity of not more than 3000 litres may continue to be used without bearing the additional PVP mark until 31 December 2030.”*

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

## **Chapter 6.3**

6.3.5.1.3 Replace “Tests” by “Appropriate tests”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

## **Chapter 6.4**

6.4.11.2 In (d), second sentence, replace “weight” by “mass”.

*(Reference document: ST/SG/AC.10/C.3/124, Annex I)*

## **Chapter 6.5**

6.5.2.1.1 In (g), first sentence, replace “stacking test load” by “superimposed stacking test mass”.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

6.5.2.1.3 In the first example, first sentence, replace “stacking test load” by “superimposed stacking test mass”.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

6.5.2.2.2 In the first sentence, replace “stacking load” by “superimposed stacking mass”.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

6.5.5.4.16 In the second sentence, replace “ISO 535:2014” by “ISO 535:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.5.5.5.3 In the second sentence, replace “ISO 535:2014” by “ISO 535:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.5.6.6.4 Replace “load to be placed on the IBC” by “mass placed on the IBC surface to create the superimposed test load”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

## Chapter 6.6

6.6.3.1 In (g), first sentence, replace “stacking test load” by “superimposed stacking test mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.6.3.2 In the first and second examples, replace “stacking load” by “superimposed stacking test mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.6.3.3 In the first sentence, replace “stacking load” by “superimposed stacking mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.6.4.4.1 In the second sentence, replace “ISO 535:2014” by “ISO 535:2023”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.6.5.1.3 Replace “Tests” by “Appropriate tests”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

6.6.5.3.3.4 Replace “load to be placed on the large packaging” by “mass placed on the large packaging surface to create the superimposed test load”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

## Chapter 6.7

6.7.2.1 In the definition of “Portable tank”, in the last sentence, delete “, non-metallic tanks”.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

[6.7.2.5.11 After “metals”, add “or fibre reinforced plastic (FRP) in accordance with section 6.9.3”.]

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

6.7.2.17.5 In (d), replace “ISO 1496-3:1995.” by “ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used.”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

6.7.2.18.2 In (a), replace “ISO 1496-3:1995;” by “ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029;”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

6.7.3.13.5 In (d), replace “ISO 1496-3:1995.” by “ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used.”.

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

6.7.3.14.2 In (a), replace “ISO 1496-3:1995;” by “ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029;”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

6.7.4.12.5 In (d), replace “ISO 1496-3:1995.” by “ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used.”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

6.7.4.13.2 In (a), replace “ISO 1496-3:1995;” by “ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029;”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

6.7.5.2.4 In (a), after “ISO 11114-1:2020”, add “+ Amd 1:2023”.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

6.7.5.10.4 In (d), replace “ISO 1496-3:1995.” by “ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used.”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

6.7.5.11.2 In (a), replace “ISO 1496-3:1995;” by “ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029;”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

## **Chapter 6.8**

6.8.3.1.1 Replace “ISO 1496-4:1991” by “ISO 1496-4:2023”. At the end, add the following new sentence: “Bulk container types complying with ISO 1496-4:1991 may continue to be used until 31 December 2034.”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

6.8.3.1.2 Replace “ISO 1496-4:1991” by “ISO 1496-4:2023”. At the end, add the following new sentence: “The test requirement of ISO 1496-4:1991 may continue to be used until 31 December 2034.”.

*(Reference document: ST/SG/AC.10/C.3/128, Annex II)*

6.8.4.1 The amendment does not apply to the English version.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

6.8.5.5.1 In (g), replace “stacking test load” by “superimposed stacking test mass”.

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

## **Chapter 6.9**

[6.9.1 Add a new 6.9.1.5 to read as follows:

“6.9.1.5 The requirements of section 6.9.3 are applied to FRP service equipment for portable tanks with shells made of metallic or FRP materials intended for the carriage of dangerous goods of Classes or Divisions 1, 3, 5.1, 6.1, 6.2, 8 and 9 by all modes of transport.”]

*(Reference document: ST/SG/AC.10/C.3/126, Annex I)*

6.9.2.1 Amend the definition of “FRP shell” to read as follows:

“FRP shell means the part of the portable tank constructed from FRP, which retains the substance intended for transport (tank proper), including openings and their closures, but does not include service equipment or external structural equipment. Openings and their closures may be manufactured from metallic materials or FRP;”

Replace the definition of “*FRP tank*” by the following new definition:

“*FRP portable tank* means a portable tank, as defined in 6.7.2.1, with an FRP shell;”

(Reference documents: *ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.2.3.14.1 Replace “FRP tanks” by “FRP portable tanks”.

(Reference documents: *ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.2.3.16.2 In the first sentence, replace “weight” by “mass”.

(Reference document: *ST/SG/AC.10/C.3/124, Annex I*)

6.9.2.4.6.2 The amendments do not apply to the English version.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.5 In the heading, replace “*portable tanks with FRP shell*” by “*FRP portable tanks*”.

In the text under the heading, in the first sentence, [delete “bottom openings, pressure relief devices, gauging devices,”] and replace “portable tanks” by “FRP portable tanks”.

[At the end, add anew sentence to read: “FRP service equipment in accordance with section 6.9.3 may be used.”.]

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.6.4 Replace “tank” with “FRP portable tank”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.6.4.2 The amendments do not apply to the English version.

(Reference document: *ST/SG/AC.10/C.3/124, Annex I*)

6.9.2.8.1 In the first sentence, replace “portable FRP tanks” by “FRP portable tanks”.

(Reference documents: *ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.8.3 Replace “tank” with “FRP portable tank”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.8.4 Replace “shell” with “FRP shell” (twice).

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.9 Replace “shell” by “FRP shell” (twice) and “tank” by “FRP portable tank”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

6.9.2.10.2 Replace “Shell” with “FRP shell”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex I*)

[Add a new 6.9.3 to read as follows:

**6.9.3 Requirements for design, construction, inspection and testing of FRP service equipment for portables tanks**

**6.9.3.1 Definitions**

For the purposes of this section, the definitions in 6.7.2.1 and 6.9.2.1 apply except for definitions related to metal materials for the construction of the service equipment of portable tanks.

Additionally, the following definitions apply to FRP service equipment.

*FRP service equipment* means service equipment as defined in 6.7.2.1 made of FRP materials including parts fabricated from other materials, as gate and seal assemblies, metallic parts, e.g. springs, fixings, applicable to both metallic and FRP shells of the portable tanks.

*Injection moulding* means a process of melting plastic pellets (thermosetting/thermoplastic polymers) and mixing with reinforcement agents like chopped glass fibres. Then, the mixture is metered into a mould with the help of high-pressure pumps or injection cylinders, which fills and solidifies to produce the final product.

*Compression moulding* means a process for producing composite parts in a wide range of volumes typically employing a matched metal tool in a heated (normally hydraulic) press to consolidate sheet materials or moulding compounds under pressure.

*Reinforced reaction injection moulding (RRIM)* means a process of mixing of two or more resins together in the mixing chamber to form a thermosetting polymer under high pressure. Reinforcement agents like glass fibres are added to the mixture. Then, the resin mixture is metered into a mould with the help of high-pressure pumps or injection cylinders.

*Coupon-sample* means an FRP sample fabricated and tested in accordance with national or international standards to determine design allowables.

*Inspection-sample* means a sample cut out from the FRP service equipment to establish the conformity of the serial FRP device to the prototype.

*FRP constituents* means reinforcement fibres or particles, thermoset or thermoplastic polymer (matrix), adhesives, and additives.

### **6.9.3.2 General design and construction requirements**

6.9.3.2.1 For the purposes of this section, the requirements of 6.7.2.2.11, 6.7.2.5.1 to 6.7.2.5.6, 6.7.2.5.10, 6.7.2.6.3, 6.7.2.8.2, 6.7.2.8.3, 6.7.2.9, 6.7.2.12, 6.7.2.14 and 6.7.2.15 shall be applied to FRP service equipment including metallic parts (springs, fixings, etc.). FRP service equipment shall be designed and constructed in accordance with the requirements of a pressure vessel code and national and international standards, applicable to FRP materials and recognized by the competent authority.

#### **6.9.3.2.2 Manufacturer's quality system**

6.9.3.2.2.1 FRP service equipment manufacturers shall have a documented quality system ensuring conformity of every item of the serial production of FRP service equipment to the approved prototype. The quality assurance program shall be submitted to the competent authority for approval. All manufacturer's suppliers of material and components for FRP service equipment shall have a documented quality system. The quality system shall be developed in compliance with the general principles of international and national quality standards.

6.9.3.2.2.2 The applicable provisions of 6.9.2.2.2 shall apply to FRP service equipment manufacturer's quality system.

#### **6.9.3.2.3 FRP service equipment**

6.9.3.2.3.1 FRP service equipment shall have appropriate rigid joints to the portable tank shell. The connections shall cause no local stress concentrations exceeding the design allowables for all operating and test conditions.

6.9.3.2.3.2 FRP service equipment shall be made of suitable materials, capable of operating within a minimum design temperature range of -40 °C to +50 °C, unless temperature ranges are specified for specific more severe climatic or operating conditions (e.g. heating elements), by the competent authority of the country where the transport operation is being performed.

6.9.3.2.3.3 FRP service equipment shall be designed and manufactured to withstand a test pressure that is not less than 1.5 times MAWP. Stop valves, piping devices and pipefittings intended for filling or discharging shall be designed and manufactured to withstand a pressure that is not less than 4 times MAWP. Specific provisions are stated substances in the applicable portable tank instruction indicated in column 10 of the Dangerous Goods List and described in 4.2.5, or by the portable tank special provision indicated in column 11 of the Dangerous Goods List and described in 4.2.5.3.

6.9.3.2.3.4 FRP service equipment shall withstand vibration, service impacts, exposure to substance temperature and environmental effects.

6.9.3.2.3.5 Design calculations for FRP service equipment and its joints to the portable tank shell shall be performed by the finite element method or another method recognized by the competent authority.

6.9.3.2.3.6 FRP service equipment shall meet the same requirements as given in 6.9.2.2.3.14 for the carriage of substances with a flash point of not more than 60 °C.

#### 6.9.3.2.4 *Materials*

##### 6.9.3.2.4.1 Resins

The processing of the resin mixture shall be carried out in strict compliance with the recommendations of the supplier. This concerns mainly the use of hardeners, initiators and accelerators. The resins can be:

- (a) Unsaturated polyester resins;
- (b) Vinyl ester resins;
- (c) Epoxy resins;
- (d) Phenolic resins; or
- (e) Thermoplastic resins.

The heat distortion temperature (HDT) of the resin and FRP, determined in accordance with standard ISO 75-1:2020 shall be at least 20°C higher than the maximum service temperature of the tank, but shall in any case not be lower than 70°C.

##### 6.9.3.2.4.2 Additives

Additives necessary for the treatment of the resin, such as catalysts, accelerators, hardeners and thixotropic substances as well as materials used to improve the FRP service equipment, such as fillers, colours, pigments, etc. shall not cause weakening of the material, taking into account lifetime and temperature expectancy of the design.

##### 6.9.3.2.4.3 Reinforcement fibres

Reinforcement fibres shall be chopped or continuous fibres of several types.

6.9.3.2.4.4 FRP service equipment shall be manufactured by compression moulding, injection moulding, reinforced reaction injection moulding or hand lay-up. Other manufacturing technologies may be applied with the agreement of the competent authority.

### 6.9.3.3 *Design criteria*

6.9.3.3.1 FRP service equipment shall be of a design capable of being stress-analyzed mathematically or experimentally by resistance strain gauges, or by other methods approved by the competent authority.

6.9.3.3.2 FRP service equipment shall be designed and manufactured to withstand the test pressures specified in 6.9.3.2.3.3.

6.9.3.3.3 At the specified test pressure, the maximum tensile relative deformation measured in mm/mm in the FRP service equipment shall not result in the formation of microcracks, and therefore not be greater than the first measured point of elongation-based fracture or damage of the resin, measured during the tensile tests prescribed under 6.9.2.7.1.2 (c) and 6.9.3.4.1.1.

6.9.3.3.4 For the internal test pressure specified in 6.9.3.2.3.3, the failure criterion (*FC*) shall not exceed the following value:

$$FC \leq \frac{1}{K}$$

where:

$$K = K_0 \times K_1 \times K_2 \times K_3 \times K_4 \times K_5$$

where:

*K* shall have a minimum value of 4.

$K_0, K_1, K_2, K_3, K_4$  are given in 6.9.2.3.4.

$K_5$  is a factor related to the deterioration in the material properties due to effects of salt fog spray and ultraviolet exposure. It shall be determined by the formula:

$$K_5 = \frac{\sigma_n}{\sigma_{eff}}$$

where:

$\sigma_n$  is the nominal (under normal conditions) tensile strength of the FRP material and  $\sigma_{eff}$  is the tensile strength of the material after consecutive salt fog exposure in accordance with ISO 12944-2:2017, ISO 12944-6:2018, 168 hours at  $(35 \pm 2)$  °C and ultraviolet exposure in accordance with ISO 4892-2, 168 hours at  $(23 \pm 2)$  °C.

$\sigma_{eff}$  is the minimum of  $(\sigma_{eff1}, \sigma_{eff2}, \dots, \sigma_{effk})$ , where 1, 2, ... k are identifiers of substances approved for transportation by the given portable tank. If a protective coating is used, the samples with the coating shall be fabricated and tested.

A design validation exercise using numerical analysis and a suitable composite failure criterion is to be undertaken to verify that stresses in the FRP service equipment are below the allowables. Suitable composite failure criteria include, but are not limited to strain invariant failure theory, maximum strain, or maximum stress. Other relations for the strength criterion are allowed upon agreement with the competent authority. The method, a proof of suitability for the chosen failure criterion with a list of relevant experiments for all parameters used in the chosen failure criterion, and results of this design validation exercise are to be submitted to the competent authority.

The parameters used in the chosen failure criterion are to be determined using the relevant experiments and the maximum strain in tension prescribed in 6.9.2.3.5, combined with factor of safety  $K$ . At least all experiments defined in 6.9.3.4.2 shall be performed.

6.9.3.3.5 Check calculations of the strength for FRP service equipment and its joints to the portable tank shell shall be performed by finite element method. Treatment of singularities shall be undertaken using an appropriate method according to the applicable pressure vessel code.

#### **6.9.3.4 Material testing**

##### **6.9.3.4.1 Resins**

Where neat resin specimens are used for the materials testing set out in 6.9.3.4.1.1 and 6.9.3.4.1.2, the resin shall be processed in the same manner as when it is used in a composite material, taking into account mix ratios, resin additives, post-cure, and any other parameters deemed relevant to cure.

6.9.3.4.1.1 Resin tensile elongation shall be tested according to ISO 527-2:2012.

6.9.3.4.1.2 Heat distortion temperature shall be tested according to ISO 75-1:2020.

##### **6.9.3.4.2 Coupon-samples**

Coupon-samples shall be manufactured by the same technology as the appropriate FRP service equipment.

6.9.3.4.2.1 Ultimate tensile strength and elongation shall be tested according to ISO 527-4:2021 or ISO 527-5:2021 according to reinforcing fibres and layups.

6.9.3.4.2.2 Determination of compressive properties shall be tested in the in-plane direction according to ISO 14126:1999 + Cor 1:2001.

6.9.3.4.2.3 Determination of the in-plane shear stress/strain response and shear modulus shall be tested according to ISO 20337:2018.

6.9.3.4.2.4 Mass density shall be tested according to ISO 1183-1:2019.



6.9.3.4.2.5 Mass content and composition of the reinforcement fibres shall be tested according to ISO 1172:1996 or ISO 14127:2008. The fibre mass content of the coupon-samples shall be between 90 % and 100 % of the minimum fibre mass content specified for the appropriate FRP service equipment and obtained from testing of the inspection-samples.

6.9.3.4.2.6 Heat distortion temperature shall be tested according to ISO 75-1:2020, ISO 75-2:2013, ISO 75-3:2004 according to reinforcing fibres and layups.

6.9.3.4.2.7 Hardness shall be tested according to ISO 868:2003.

6.9.3.4.2.8 Creep factor  $\alpha$  shall be measured according to procedure prescribed by 6.9.2.7.1.2 (e). The test samples shall be taken according to ISO 14125:1998.

6.9.3.4.2.9 Aging factor  $\beta$  shall be determined according to the procedure prescribed by 6.9.2.7.1.2 (f). The test samples shall be taken according to ISO 14125:1998. This testing may be undertaken on either pristine samples or on samples pre-subjected to salt fog spray exposure conditioning as outlined in 6.9.3.2.4.10.

6.9.3.4.2.10 Salt fog exposure test shall be determined in accordance with ISO 12944-2:2017, ISO 12944-6:2018, 168 hours at  $+(35 \pm 2)^\circ\text{C}$ .

6.9.3.4.2.11 Ultraviolet exposure test shall be determined in accordance with ISO 4892-2:2013, 168 hours at  $+(23 \pm 2)^\circ\text{C}$ .

6.9.3.4.2.12 The chemical compatibility with the transported substances shall be tested according to 6.9.2.7.1.3.

#### 6.9.3.4.3 *Additional material tests*

The additional material tests shall be carried out for determination of material properties required for design calculation.

6.9.3.4.3.1 Flexural strength shall be measured according to ISO 14125:1998.

6.9.3.4.3.2 Bearing test shall be determined according to ISO 12815:2013.

#### 6.9.3.4.4 *Inspection-samples*

Prior to testing all coatings shall be removed from the samples. The tests shall cover 6.9.3.4.2.1 to 6.9.3.4.2.8.

### 6.9.3.5 *Design approval*

6.9.3.5.1 The competent authority or its authorized body shall issue the type approval certificate for FRP service equipment. This certificate shall attest that the design has been surveyed by the authority and is suitable for its intended purpose and meets the requirements of this chapter. The certificate shall have a reference that prototype testing was carried out according to 6.9.3.5.2, the information on the substances allowed for transportation, body and seal materials and certificate number.

6.9.3.5.2 The FRP service equipment prototype test report shall include at least the following:

- (a) Results of the material tests used for fabrication of FRP service equipment in accordance with 6.9.3.4.1 to 6.9.3.4.3.
- (b) Results of tests according to ISO 4126-1:2013 for the appropriate relief devices.
- (c) Results of the pressure tests carried out in accordance with relevant ISO standards, where applicable, or according to procedure approved by the competent authority. The test pressure shall not be less than the pressure defined in 6.9.3.2.3.3.
- (d) A representative prototype of FRP service equipment shall be subjected to the fire test prescribed in the *Manual of Tests and Criteria*, part IV, section 42.
- (e) Results of the electrical resistance tests according to a procedure recognized by the competent authority.

- (f) Results of the other tests prescribed in applicable pressure equipment standards or codes in agreement with the competent authority.

6.9.3.5.3 A service life inspection program shall be established, which shall be a part of the operation manual, to monitor the condition of the FRP service equipment at periodic inspections. The service life inspection program shall be approved by the competent authority.

#### **6.9.3.6 Inspection and testing**

6.9.3.6.1 FRP service equipment shall be inspected and tested before being put into service. The initial inspection and test after manufacture shall include a check of the design characteristics and an external examination of FRP service equipment with due regard to the substances to be transported, and a pressure test. Before putting the FRP service equipment into service, a leakproofness test and a test of the satisfactory operation shall also be performed. Relief valves shall be tested for opening/closing pressure before installation. The initial inspection and testing program shall be approved by the competent authority.

6.9.3.6.2 Periodic inspection and testing of FRP service equipment shall be carried out during inspection of the portable tank according to 6.7.2.19.2, 6.7.2.19.4, and 6.7.2.19.5 or 6.9.2.8.1 according to the service life inspection program approved by the competent authority.

6.9.3.6.3 The inspections and tests in 6.9.3.6.1 and 6.9.3.6.2 shall be performed or witnessed by an expert approved by the competent authority.

6.9.3.6.4 Repair work of FRP service equipment shall be limited to replacement of damaged components by components covered by the type approval of the service equipment.

#### **6.9.3.7 Marking**

##### *6.9.3.7.1 Marking of relief devices*

Each relief device shall be marked as follows:

- (a) name of the manufacturer and the serial number of the equipment;
- (b) name of body and seal materials;
- (c) type approval certificate number;
- (d) the pressure at which the device is set to discharge (MPa or bar);
- (e) the allowable tolerance at the discharge pressure for spring-loaded devices;
- (f) the rated flow capacity of spring-loaded pressure relief devices under normal conditions (external pressure is 1 bar and ambient temperature is 0 °C) in standard (normal) cubic meters of air per second, m<sup>3</sup>/s (determined according to 6.7.2.13.2);
- (g) cross-sectional area of spring-loaded pressure relief devices, mm<sup>2</sup>;
- (h) maximum allowable working pressure (MAWP), MPa or bar;
- (i) external design pressure (if relevant), MPa or bar; and
- (j) design temperature range.

##### *6.9.3.7.2 Marking of stop valves*

Each stop valves shall be marked as follows:

- (a) name of the manufacturer and the serial number of the equipment;
- (b) name of body and seal materials;
- (c) type approval certificate number;
- (d) designation of the stop device;
- (e) nominal diameter, mm;
- (f) maximum allowable working pressure (MAWP), MPa or bar;

- (g) test pressure, MPa or bar;
- (h) direction of medium flow; and
- (i) design temperature range.”]

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

## Chapter 7.1

7.1.1.9 Add a new second sentence to read “Unless otherwise indicated, packagings that have had a stacking test shall be loaded in the same orientation as the samples were tested.”

At the end, add the following new note:

“**NOTE:** The stacking test is generally carried out on the top surface of the packaging. Packages, other than bags, should therefore be stacked on the top surface of the packages unless indicated otherwise.”

(Reference document: ST/SG/AC.10/C.3/128, Annex II)

7.1.7.2.3 The amendment does not apply to the English version.

(Reference document: ST/SG/AC.10/C.3/126, Annex I)

**Documents ST/SG/AC.10/C.3/2023/3, ST/SG/AC.10/C.3/2023/4, ST/SG/AC.10/C.3/2024/9 and ST/SG/AC.10/C.3/2024/30 (with an additional amendment to the alphabetical index) and informal documents INF.7 of the sixty-second session and INF.17 of the sixty-fourth session with amendments to the Spanish version were adopted.**

(Reference document: ST/SG/AC.10/C.3/124, Annex I and ST/SG/AC.10/C.3/128, Annex II)

## II. Draft amendments to the eighth revised edition of the Manual of Tests and Criteria (ST/SG/AC.10/11/Rev.8)

### Section 10

The amendments do not apply to the English text.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

### Section 11

11.1.1 In the first sentence, replace ““Is it an explosive substance?”” by ““Does the substance have explosive properties?””.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

11.6.1.3.1 In the fifth sentence, replace “weight” by “mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

### Section 12

12.1.1 In the first sentence, replace “inclusion” by “acceptance”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

12.6.1.3.1 In the fifth sentence, replace “weight” by “mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

### **Section 13**

13.4.1.3.1 The amendment does not apply to the English version.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

13.4.2.2.2 The amendment does not apply to the English version.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

### **Section 18**

18.8.1.2.1 In the fourth sentence, at the end, add “e.g. by use of a syringe, piping bag, or pastry bag where the viscosity of the sample allows”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

18.8.1.2.2 In the first sentence, replace “0.51 mm” by “0.50 to 0.51 mm” and replace “5.5  $\Omega \text{ m}^{-1}$ ” by “5.50 to 5.75  $\Omega \cdot \text{m}^{-1}$ ”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

18.8.1.2.3 At the end, add “and a Type-K thermocouple to measure the gas temperature”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

18.8.1.3.3 At the end, add the following two new sentences: “The test should be started after the gas temperature drops to room temperature or the gas pressure has stabilised. The value of the pressure transducer is then recorded as the initial pressure.”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

### **Section 23**

23.4.1.3.1 The first amendment does not apply to the English version. In the fifth sentence, replace “weight” by “mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

### **Section 26**

26.4.1.2.1 In the third sentence, replace “weight” by “mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

### **Section 28**

28.4.2.2.2.3 In the second sentence, replace “weight” by “mass”.

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

### **Section 32**

32.3.2.1 In the first sentence, replace “note 2 to paragraph 2.1.1 of the GHS” by “2.17.1.2 (b) of the GHS”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

**Note by the secretariat:** At its forty-sixth session, the Sub-Committee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS Sub-Committee) considered the proposals in the document from AEISG and the recommendations from the Sub-Committee. After discussion, the GHS Sub-Committee proposed the following alternative amendment for consideration by the Sub-Committee at its sixty-fifth session (for additional background refer to the report of the GHS Sub-Committee, document ST/SG/AC.10/C.4/92, paragraph 12 and annex II):

- 32.3.2.1 Amend the first sentence to read as follows: “This subsection presents the *Model Regulations* scheme for the classification of liquid desensitized explosives as flammable liquids (see paragraph 2.3.1.4 of the *Model Regulations*; for the *GHS* see sub-paragraph 2.17.1.2 (b) of the *GHS*).”.

### Section 33

- 33.3.1 In the first sentence, replace “note 2 to paragraph 2.1.2.2 of the *GHS*” by “2.17.1.2 (a) of the *GHS*”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

**Note by the secretariat:** At its forty-sixth session, the GHS Sub-Committee considered the proposals in the document from AEISG and the recommendations from the Sub-Committee. After discussion, the GHS Sub-Committee proposed the following alternative amendment for consideration by the Sub-Committee at its sixty-fifth session (for additional background refer to the report of the GHS Sub-Committee, document ST/SG/AC.10/C.4/92, paragraph 12 and annex II):

- 33.3.1 Amend the first sentence to read as follows: “This subsection presents the *Model Regulations* scheme for the classification of desensitized explosives as flammable solids of Division 4.1 (see subsection 2.4.2.4 of the *Model Regulations*; for the *GHS* see sub-paragraph 2.17.1.2 (a) of the *GHS*).”

### Section 38

- 38.3.4.5.2 In the first paragraph, first sentence, replace “on external case” by “on the external case or on an internal cell”. In the second paragraph, replace “the cell or battery external case temperature” by “the measured temperature”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

- 38.3.4.5.3 Replace “external” by “measured”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

- 38.3.4.6.3 In the first paragraph under the note, at the end of the first sentence, add “, each having sufficient surface area to ensure the crushing force is applied evenly across the entire surface of the cell”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

### Section 40

- [40.1.1 After “schemes for”, add a colon, transfer the rest of the text to a new indent (a) and, at the end, replace the full stop with “; and”. Add a new (b) as follows:

“(b) the requirements to the fire resistance test of service equipment made from fibre reinforced plastic (FRP) for portable tanks (see section 42 of this *Manual* and 6.9.2.7.1.5 and 6.9.3.5.2 (d) of the *Model Regulations*).”]

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

## Section 42

[Add a new section 42 to read as follows:

“

### SECTION 42

#### FIRE RESISTANCE TEST OF FIBRE REINFORCED PLASTICS (FRP) SERVICE EQUIPMENT FOR PORTABLE TANKS

##### 42.1 General

42.1.1 This test method is intended to prove the fire resistance of FRP service equipment for portable tanks which meet the requirements of 6.7.2 or 6.9.2 of the *Model Regulations*.

42.1.2 The representative prototype of FRP service equipment meeting the definition of 6.9.3.1 of the *Model Regulations* shall be subjected to and satisfy the requirements of the fire resistance test. The fire resistance test shall be conducted by test facilities approved by the competent authorities.

##### 42.2 Definitions

*Test specimen* means an instance of FRP service equipment including gate and seal assemblies subjected to the fire resistance test.

Relevant definitions of standard ISO 21843:2018 and chapters 6.7.2, 6.9.2 and 6.9.3 of the *Model Regulations* are applicable to this section.

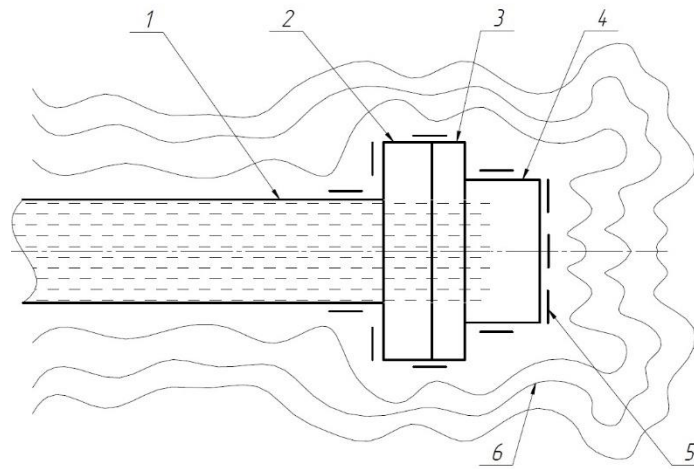
##### 42.3 Test method

42.3.1 The fire resistance test is carried out for the test specimen installed in a closed position, filled with water with initial temperature of  $20 \pm 5^\circ\text{C}$  under maximum allowable working pressure (MAWP, 6.7.2.1 of the *Model Regulations*), and exposures to flame for at least 30 minutes. Pressure relief devices are subjected to pressure, which is 10% below nominal pressure set to discharge (6.7.2.9.2 of the *Model Regulations*). The test specimen shall be completely engulfed in the flame including the gate and seal assemblies. The general test scheme is given in figure 42.3.1. If the test specimen is a part of equipment which is not intended to be the outermost closure in a multi-closure system (such as a valve), then the test specimen may be equipped with a blind flange, at its outermost interface which would otherwise be exposed to flame during the test.

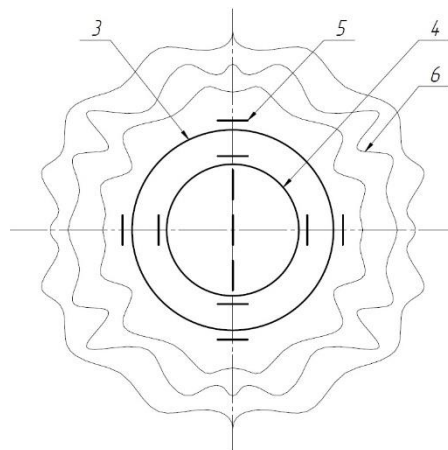
42.3.2 The fire exposure parameters shall comply with paragraph 6.9.2.7.1.5.1 of the *Model Regulations*. The fire shall be equivalent to a theoretical fire with a flame temperature of  $800^\circ\text{C}$ , emissivity of 0.9 and a minimum net heat flux of  $75 \text{ kW/m}^2$  calibrated according to ISO 21843:2018.

42.3.3 The intensity of heat exposure shall be measured using temperature and heat flux sensors in accordance with the requirements of ISO 21843-2018.

42.3.4 After the fire exposure and cooling the test specimen is subjected to leakproofness test under MAWP.

**Figure 42.3.1: Fire resistance test scheme**

A



B

(A) Side view	(B) End-face view
(1) Pressure system with water supply	(2) Fixture to join the test specimen to the pressure system
(3) Flange of the test specimen	(4) Test specimen
(5) Temperature and heat flow measuring system	(6) Flame

## **42.4 Test apparatus**

### **42.4.1 General requirements**

42.4.1.1 The fire resistance test bed shall include:

- (a) a fire chamber with dimensions sufficient to accommodate the test specimen and the temperature and heat flux measuring system;
- (b) a fuel supply and combustion system;
- (c) a pressure system with water supply ((1) in figure 42.3.1);
- (d) a fixture to join the test specimen to the test bed ((2) in figure 42.3.1); and
- (e) a temperature and heat flux measuring system ((5) in figure 42.3.1) according to ISO 21843:2018.

42.4.1.2 The specific types of testing equipment can be modified and supplemented in accordance with the requirements of the testing laboratory.

42.4.1.3 The test bed facilities shall not expose the test specimen to external influences that can affect the test results.

42.4.1.4 The heat regime shall be provided by burning liquid fuel or gas.

42.4.1.5 The test bed shall ensure uniform flame coverage of the test specimen.

42.4.1.6 The firing chamber shall provide a horizontal gap between any part of the test specimen and its own shell of at least 150 mm.

42.4.1.7 The fire source (nozzles) shall be at least 150 mm away from the test specimen and temperature sensors and shall provide sufficient power to ensure that the test specimen is completely engulfed in flame.

42.4.1.8 The fuel supply and combustion system shall be controlled.

### **42.4.2 Requirements of the measuring system**

42.4.2.1 During the test the following parameters shall be measured:

- (a) temperature and heat flux on the surface of the test specimen;
- (b) internal pressure during fire and cooling (pressure gauge records);
- (c) leakproofness of the test specimen.

42.4.2.2 The general scheme of installation of the test specimen and temperature and heat flow sensors is shown in figure 42.3.1. Measurement errors shall not be more than:

- ± 3 % when measuring pressures;
- ± 5 % when measuring temperature and heat flux;
- ± 2 % when measuring time.

## **42.5 Test procedure**

42.5.1 The temperature and heat flux sensors shall be installed and calibrated according to ISO 21843:2018.

42.5.2 Before the test, the test specimen and attachments shall be completely filled with water.

42.5.3 After the system is completely filled with water, the system shall be loaded with MAWP at a temperature of 20 °C. Then the leakproofness of the test specimen and pipelines shall be checked.

42.5.4 The fuel supply to the burners shall be opened, ignited and the flame be adjusted with a control valve. The fire parameters shall be maintained in accordance with 42.3.2 at least for 30 minutes. The temperature and heat flux are recorded every 30 seconds with separate records for each sensor during the test.



- 42.5.5 The fuel supply shall be turned off after the test (at least 30 minutes).
- 42.5.6 The test specimen shall be removed after complete cooling (wall temperature less than 50 °C). Then the test specimen shall be subjected to leakproofness test at MAWP.
- 42.5.7 At least 3 "open-closed" cycles (if any) shall be performed for pressure relief devices.

#### **42.6 Performance criteria**

42.6.1 The test specimen shall demonstrate leakproofness under MAWP after fire exposure. At least 3 "open-closed" cycles (if any) shall be performed for pressure relief devices. If this condition is met, the test specimen is considered to have passed the fire resistance test.

#### **42.7 Test report**

The test report shall contain:

- (a) the name of the organization conducting the tests;
- (b) the name of the manufacturer of the FRP service equipment;
- (c) the date of the fire resistance tests;
- (d) a description of the FRP service equipment, including dimensions, weight, diameter of the gate section, body and lid materials, seal material, marking;
- (e) a recording of the controlled parameters according to 42.4.2.1 and the results of their processing and analysis;
- (f) the results of visual observations;
- (g) a description of the damage or failure (if any);
- (h) the start time of the test (i.e., the ignition of the burners);
- (i) the conclusion on the compliance or non-compliance of the FRP service equipment with the requirements of 42.6.

#### **42.8 Safety requirements**

*As the fire resistance test of the FRP service equipment is potentially dangerous, the safety of personnel shall be assured. Considering the possibility of damage and failure of the test, protective screens and other appropriate means to protect personnel shall be used.*”]

(Reference document: ST/SG/AC.10/C.3/126, Annex IV)

## **Section 51**

51.4.1.2 In (b), delete “Division 1.1”.

(Reference document: ST/SG/AC.10/C.3/124, Annex II)

[51.4.4.2 Amend (e) to read as follows:

“(e)  $I_{\text{relevant}}$  is obtained from the maximum of the smoothed and corrected curve of the measured heat radiation.  $I_{\text{calculated}}$  is the average value of the radiation obtained by converting the integrated area in a rectangle of equal area during the same total burning time (see figure 51.4.1).”]

(Reference document: ST/SG/AC.10/C.3/124, Annex II)

51.4.4.3 Replace “is classified in the hazard class "explosives"” by “is not classified as a desensitized explosive and should be classified as an explosive in accordance with chapter 2.1 of the GHS”.

(Reference document: ST/SG/AC.10/C.3/128, Annex I)

- 51.4.4.5 In the last sentence, replace “is classified as an explosive (See chapter 2.1 of the GHS).” by “is not classified as a desensitized explosive and should be classified as an explosive in accordance with chapter 2.1 of the *GHS*”.

(Reference document: *ST/SG/AC.10/C.3/128, Annex I*)

## Appendix 6

- A6.5.1 Amend (b) to read as follows:

“(b) For a single organic substance or a homogeneous mixture of organic substances, the estimated SADT for a 50 kg package is greater than 75 °C or the exothermic decomposition energy is less than 300 J/g. A suitable method to estimate whether the SADT for a 50 kg package is greater than 75 °C is if:

- (i) The first detected exothermic reaction (onset, detection limit maximum: 20 W·kg<sup>-1</sup>) in a screening DSC is not less than 175 °C for liquids or 200 °C for solids; or
- (ii) The measured isothermal maximum heat flow at 75 °C is not greater than 100 mW·kg<sup>-1</sup> for liquids or 50 mW·kg<sup>-1</sup> for solids.

Calorimetric data should be obtained following the guidelines in section 20.3.3.3.

*NOTE: These screening rules can fail for substances showing strong autocatalytic behaviour in the decomposition. For such substances, further information is needed to determine if these simple screening rules apply to the particular substance (e.g., the effect of sample aging on the decomposition). Information concerning potential autocatalytic behaviour may be obtained from further calorimetric measurements (e.g., comparison of DSC measurements of tempered samples with fresh samples, or DSC scans with different scan rates). The onset temperature criteria or heat flow criteria should always be met for fresh and aged samples representing the anticipated duration of transport.*

(Reference document: *ST/SG/AC.10/C.3/128, Annex I*)

## Appendix 7

- A7.2.2 The first amendment does not apply to the English version. In (d), replace “weighing” by “with a mass”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex IV*)

## Appendix 10

- A10.3.2.2.1 In the first sentence, replace “weighing” by “with a mass”.

(Reference document: *ST/SG/AC.10/C.3/126, Annex IV*)

- A10.3.4.4 In the first sentence, replace “less than 30 min” by “30 min or less”.

(Reference document: *ST/SG/AC.10/C.3/128, Annex I*)

- A10.3.5 Amend the table to read as follows:

Test time (min)	Result
25	+
30	+
35	-

(Reference document: *ST/SG/AC.10/C.3/128, Annex I*)

**Documents ST/SG/AC.10/C.3/2023/44 and informal document INF.7 of the sixty-second session with amendments to the Spanish version were adopted.**

*(Reference document: ST/SG/AC.10/C.3/124, Annex II and ST/SG/AC.10/C.3/126, Annex IV)*

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