



**Secretariat**

Distr.: General  
16 February 2017  
English  
Original: English and French

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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**

**Report of the Committee of Experts on the Transport of  
Dangerous Goods and on the Globally Harmonized System of  
Classification and Labelling of Chemicals on its eighth  
session**

held in Geneva on 9 December 2016

**Addendum**

**Annex I**

**Amendments to the nineteenth revised edition of the Recommendations  
on the Transport of Dangerous Goods, Model Regulations  
(ST/SG/AC.10/1/Rev.19)\***

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\* For technical reasons, the paper version of this document is printed in black and white. For pages 36 to 41 the electronic version should be consulted.

GE.17-02431(E)



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## Recommendations

Paragraph 6 In the first sentence, replace “risk” by “hazard”.

Paragraph 8 After “ST/SG/AC.10/11/Rev.6”, insert “and Amend.1”.

Paragraph 11 In the first sentence, replace “risk” by “hazard”.

Paragraph 12 In the first sentence, replace “potential risk” by “hazard”. The amendment to the second sentence does not apply to the English version.

## Chapter 1.1

In Note 1, after “ST/SG/AC.10/11/Rev.6”, insert “and Amend.1”.

## Chapter 1.2

1.2.1 In the definition of “*Animal material*”, replace “or animal foodstuffs” by “foodstuffs or feedstuffs derived from animals”.

1.2.1 In the definition of “*GHS*”, replace “sixth” by “seventh” and replace “ST/SG/AC.10/30/Rev.6” by “ST/SG/AC.10/30/Rev.7”.

1.2.1 In the definition of “*Liquid*”, in footnote 1, replace “*ECE/TRANS/242 (Sales No. E.14.VIII.1)*” by “*ECE/TRANS/257 (Sales No. E.16.VIII.1)*”.

1.2.1 In the definition of “*Manual of Tests and Criteria*”, after “ST/SG/AC.10/11/Rev.6”, insert “and Amend.1”.

## Chapter 1.3

1.3.2 (iii) The amendment does not apply to the English version.

## Chapter 1.4

1.4.3.1.5 Replace “subsidiary risks” by “subsidiary hazards”.

1.4.3.2.1 At the end, insert the following note:

**“NOTE:** *In addition to the security provisions of these Regulations, competent authorities may implement further security provisions for reasons other than safety of dangerous goods during transport. In order to not impede international and multimodal transport by different explosives security markings, it is recommended that such markings be formatted consistent with an internationally harmonized standard (e.g. European Union Commission Directive 2008/43/EC).”*

## Chapter 1.5

1.5.1.1 The amendment does not apply to the English version.

1.5.1.2 The amendment does not apply to the English version.

Figure 1, 1.5.2 Replace “subsidiary risk(s)” by “subsidiary hazard(s)”.

1.5.5.1 In the first sentence, replace “subsidiary risk” by “subsidiary hazard”.

## Chapter 2.0

2.0.0.2 In the second indent, replace “risk(s)” by “hazard(s)”. The amendment to the second indent does not apply to the English version.

2.0.1.1 The amendment does not apply to the English version.

2.0.1.4 The amendment does not apply to the English version.

2.0.1.5 In the end of the last sentence, replace “risk(s)” by “hazard(s)”.

2.0.1.6 In the end of the last sentence, replace “risk(s)” by “hazard(s)”.

2.0.2.1 The amendment does not apply to the English version.

2.0.2.2 In the second paragraph, replace “risk(s)” by “hazard(s)”.

2.0.2.5 (c) Replace “risk(s)” by “hazard(s)”.

2.0.2.9 At the end, replace “risk(s)” by “hazard(s)”.

2.0.3.1 In the first sentence, replace “one risk” by “one hazard”. At the end of the first sentence, add “or to assign the appropriate entry for articles containing dangerous goods N.O.S (UN Nos. 3537 to 3548, see 2.0.5)”. In the second sentence, replace “multiple risks” by “multiple hazards”.

2.0.3.2 In the first sentence, replace “risk” by “hazard”.

2.0.4 Add the following new sub-section 2.0.4.3:

**“2.0.4.3 *Samples of energetic materials for testing purposes*”**

2.0.4.3.1 Samples of organic substances carrying functional groups listed in tables A6.1 and/or A6.3 in Appendix 6 (Screening Procedures) of the Manual of Tests and Criteria may be transported under UN 3224 (self-reactive solid type C) or UN 3223 (self-reactive liquid type C), as applicable, of Division 4.1 provided that:

- (a) The samples do not contain any:
- Known explosives;
  - Substances showing explosive effects in testing;
  - Compounds designed with the view of producing a practical explosive or pyrotechnic effect; or
  - Components consisting of synthetic precursors of intentional explosives;
- (b) For mixtures, complexes or salts of inorganic oxidizing substances of Division 5.1 with organic material(s), the concentration of the inorganic oxidizing substance is:
- Less than 15%, by mass, if assigned to packing group I (high hazard) or II (medium hazard); or
  - Less than 30%, by mass, if assigned to packing group III (low hazard);
- (c) Available data do not allow a more precise classification;
- (d) The sample is not packed together with other goods; and
- (e) The sample is packed in accordance with packing instruction P520 and special packing provisions PP94 or PP95 of 4.1.4.1, as applicable.”.

2.0.5 Add the following new section 2.0.5:

**“2.0.5 *Transport of articles containing dangerous goods N.O.S.*”**

**NOTE:** For articles which do not have an existing proper shipping name and which contain only dangerous goods within the permitted limited quantity amounts specified in Column 7a of the Dangerous Goods List, see UN No. 3363 and special provision 301 of Chapter 3.3.

2.0.5.1 Articles containing dangerous goods may be transported as otherwise provided by these Regulations under the proper shipping name for the dangerous goods they contain or in accordance with this section. For the purposes of this section “article” means machinery, apparatus or other devices containing one or more dangerous goods (or residues thereof) that are an integral element of the article, necessary for its functioning and that cannot be removed for the purpose of transport. An inner packaging shall not be an article.

2.0.5.2 Such articles may in addition contain batteries. Lithium batteries that are integral to the article shall be of a type proven to meet the testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3, except when otherwise specified by these Regulations (e.g. for pre-production prototype articles containing lithium batteries or for a small production run, consisting of not more than 100 such articles).

2.0.5.3 This section does not apply to articles for which a more specific proper shipping name already exists in the Dangerous Goods List of Chapter 3.2.

2.0.5.4 This section does not apply to dangerous goods of Class 1, Division 6.2, Class 7 or radioactive material contained in articles.

2.0.5.5 Articles containing dangerous goods shall be assigned to the appropriate Class or Division determined by the hazards present using, where applicable, the Precedence of Hazards table in 2.0.3.3 for each of the dangerous goods contained in the article. If dangerous goods classified as Class 9 are contained within the article, all other dangerous goods present in the article shall be considered to present a higher hazard.

2.0.5.6 Subsidiary hazards shall be representative of the primary hazard posed by the other dangerous goods contained within the article or they shall be the subsidiary hazard(s) identified in column 4 of the Dangerous Goods List when only one dangerous good is present in the article. If the article contains more than one dangerous good and these could react dangerously with one another during transport, each of the dangerous goods shall be enclosed separately (see 4.1.1.6).”.

## Chapter 2.1

The amendment to Note 4 after the heading does not apply to the English version.

Figure 2.1.1 The amendment does not apply to the English version.

2.1.1.1 (a) The amendment does not apply to the English version.

2.1.1.1(c) After “producing a practical”, delete the comma.

2.1.1.4 (a) to (f) The amendment does not apply to the English version.

2.1.1.4 (f) In the Note, replace “risk” by “hazard”.

2.1.2.1 The amendment does not apply to the English version.

2.1.2.1.1 In the first column of the table, for Compatibility Group L, replace “risk” by “hazard”.

2.1.2.1.2 The amendment does not apply to the English version.

- 2.1.3.1.2 (c) In the Note, replace “risk” by “hazard” twice.
- 2.1.3.2.1 The amendment does not apply to the English version.
- 2.1.3.3.1 The amendment does not apply to the English version.
- 2.1.3.4 The amendment does not apply to the English version.
- 2.1.3.4.1 The amendment does not apply to the English version.
- 2.1.3.4.2 The amendment does not apply to the English version.
- 2.1.3.5 The amendment does not apply to the English version.
- 2.1.3.5.1 The amendment to the first sentence does not apply to the English version.
- 2.1.3.5.1 (a) Replace “giving a positive result when tested in one of the HSL Flash composition tests in Appendix 7 of the Manual of Tests and Criteria” by “containing flash composition (see Note 2 of 2.1.3.5.5)”.
- 2.1.3.5.2 The amendment to Note 2 does not apply to the English version.
- 2.1.3.5.3 The amendment does not apply to the English version.
- 2.1.3.5.5 Amend Note 2 to read as follows:
- “NOTE 2: “Flash composition” in this table refers to pyrotechnic substances in powder form or as pyrotechnic units as presented in the firework that are used in waterfalls, or to produce an aural effect or used as a bursting charge, or propellant charge unless:*
- (a) *The time taken for the pressure rise in the HSL Flash Composition Test in Appendix 7 of the Manual of Tests and Criteria is demonstrated to be more than 6 ms for 0.5 g of pyrotechnic substance; or*
- (b) *The pyrotechnic substance gives a negative “-” result in the US Flash Composition Test in Appendix 7 of the Manual of Tests and Criteria.”.*
- 2.1.3.5.5 In the table, amend the entry for “waterfall” as follows: For classification 1.1G, amend the entry under “Specification” to read: “containing flash composition regardless of the results of Test Series 6 (see 2.1.3.5.1 (a))”. For classification 1.3G, amend the entry under “Specification” to read: “not containing flash composition”.
- 2.1.3.5.5 The amendment to the entry for “low hazard fireworks and novelties” does not apply to the English version.
- 2.1.3.6.3 In the last sentence, replace “risk(s)” by “hazard(s)”.
- 2.1.3.6.4 In Note 2, at the end of the sentence, replace “risk” by “hazard”.
- 2.1.3.7.4 (f) The amendment does not apply to the English version.

## Chapter 2.2

- 2.2.2.1 The amendment does not apply to the English version.
- 2.2.2.1 (c) In the first sentence, replace “risk” by “hazard”.
- 2.2.2.1 (c) (i) The amendment does not apply to the English version.
- 2.2.2.2 The amendment does not apply to the English version.
- 2.2.3 (c) In the first sentence, replace “risk” by “hazard”.

## Chapter 2.3

- 2.3.2.1 Replace “risk” by “hazard” (twice).  
 2.3.2.1.1 Replace “risk” by “hazard”.  
 2.3.2.1.2 Replace “risk(s)” by “hazard(s)” twice.

## Chapter 2.4

In the Introductory notes, in Note 3, replace “additional subsidiary risk” by “additional subsidiary hazard”.

2.4.2.3.2.2 At the end of the paragraph, replace “subsidiary risk(s)” by “subsidiary hazard(s)”.

2.4.2.3.2.3 At the end of the first paragraph, add a new sentence to read as follows: “The formulations listed in packing instruction IBC520 of 4.1.4.2 and in portable tank instruction T23 of 4.2.5.2.6 may also be transported packed in accordance with packing method OP8 of packing instruction P520 of 4.1.4.1, with the same control and emergency temperatures, if applicable.”.

2.4.2.3.2.3 In the table, insert a new entry to read as follows:

<i>SELF-REACTIVE SUBSTANCE</i>	<i>Concentration (%)</i>	<i>Packing method</i>	<i>Control temperature (°C)</i>	<i>Emergency temperature (°C)</i>	<i>UN generic entry</i>	<i>Remarks</i>
Phosphorothioic acid, O-[(cyanophenyl methylene) azanyl] O,O-diethyl ester	82-91 (Z isomer)	OP8			3227	(10)

2.4.2.3.2.3 After the table, in remark (1) after the table, replace “7.1.5.3 to 7.1.5.3.1.3” by “7.1.5.3 to 7.1.5.3.6”.

2.4.2.3.2.3 After the table, in remark (2) after the table, replace “risk” by “hazard”.

2.4.2.3.2.3 After the table, add a new remark (10) to read as follows:

“(10) This entry applies to the technical mixture in n-butanol within the specified concentration limits of the (Z) isomer.”.

2.4.2.3.3.2 (b) In the first sentence, replace “risk” by “hazard”.

2.4.2.3.3.2 (c) In the first sentence, replace “risk” by “hazard”.

2.4.2.3.5.4 At the end, replace “7.1.5.3.1” by “7.1.5.3”.

2.4.2.5.2 Add the following Note at the end:

“**NOTE:** *Substances meeting the criteria of a polymerizing substance and also for inclusion in Classes 1 to 8 are subject to the requirements of special provision 386 of Chapter 3.3.*”.

2.4.3.1.1 (a) The amendment does not apply to the English version.

## Chapter 2.5

2.5.2.1.2 Renumber as 2.5.2.1.3 and replace “risks” by “hazards”.

Insert a new 2.5.2.1.2 to read as follows:

“2.5.2.1.2 By exception, solid ammonium nitrate based fertilizers shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39.”.

2.5.3.2.3 In the second sentence, replace “risks” by “hazards”.

2.5.3.2.4 In the Table header, last column, replace “risks” by “hazards”.

2.5.3.2.4 In Table Notes 3, 13, 18 and 27, replace “risk” by “hazard”.

2.5.3.2.4 At the end of the first paragraph, add a new sentence to read as follows: “The formulations listed in packing instruction IBC520 of 4.1.4.2 and in portable tank instruction T23 of 4.2.5.2.6 may also be transported packed in accordance with packing method OP8 of packing instruction P520 of 4.1.4.1, with the same control and emergency temperatures, if applicable.”.

2.5.3.2.4 In the table, insert the following new entries:

<i>Organic peroxide</i>	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
DIISOBUTYRYL PEROXIDE	≤ 42 (as a stable dispersion in water)					OP8	-20	-10	3119	
DI-(4-tert-BUTYLCYCLOHEXYL) PEROXYDICARBONATE	≤ 42 (as a paste)					OP7	35	40	3116	
1-PHENYLETHYL HYDROPEROXIDE	≤ 38		≥ 62			OP8			3109	

2.5.3.3.2 (b) In the first sentence, replace “risk” by “hazard”.

2.5.3.3.2 (c) Replace “risk” by “hazard”.

## Chapter 2.6

2.6.2.2.1 The amendment does not apply to the English version.

2.6.2.2.1 (a), (b) and (c) Replace “risk” by “hazard”.

2.6.2.4.1 In the second sentence, replace “risks” by “hazards”.

2.6.2.4.3 Replace “risks” by “hazards”.

2.6.3.1.4 In the definition of “Patient Specimens”, after “Patient Specimens are” replace “human or animal materials,” by “those”.

2.6.3.6.2 Delete the existing paragraph and add “2.6.3.6.2 Deleted”.

## Chapter 2.8

Amend Chapter 2.8 to read as follows:

### “CHAPTER 2.8

#### CLASS 8 – CORROSIVE SUBSTANCES

##### 2.8.1 Definition and general provisions

2.8.1.1 *Corrosive substances* are substances which, by chemical action, will cause irreversible damage to the skin, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport.

2.8.1.2 For substances and mixtures that are corrosive to skin, general classification provisions are provided in section 2.8.2. Skin corrosion refers to the production of irreversible damage to the skin, namely, visible necrosis through the epidermis and into the dermis occurring after exposure to a substance or mixture.

2.8.1.3 Liquids and solids which may become liquid during transport, which are judged not to be skin corrosive shall still be considered for their potential to cause corrosion to certain metal surfaces in accordance with the criteria in 2.8.3.3 (c) (ii).

## **2.8.2 General classification provisions**

2.8.2.1 Substances and mixtures of Class 8 are divided among the three packing groups according to their degree of danger in transport:

- (a) *Packing group I*: very dangerous substances and mixtures;
- (b) *Packing group II*: substances and mixtures presenting medium danger;
- (c) *Packing group III*: substances and mixtures that present minor danger.

2.8.2.2 Allocation of substances listed in the Dangerous Goods List in Chapter 3.2 to the packing groups in Class 8 has been made on the basis of experience taking into account such additional factors as inhalation risk (see 2.8.2.4) and reactivity with water (including the formation of dangerous decomposition products).

2.8.2.3 New substances and mixtures can be assigned to packing groups on the basis of the length of time of contact necessary to produce irreversible damage of intact skin tissue in accordance with the criteria in 2.8.3. Alternatively, for mixtures, the criteria in 2.8.4 can be used.

2.8.2.4 A substance or mixture meeting the criteria of Class 8 having an inhalation toxicity of dusts and mists (LC<sub>50</sub>) in the range of packing group I, but toxicity through oral ingestion or dermal contact only in the range of packing group III or less, shall be allocated to Class 8 (see Note under 2.6.2.2.4.1).

## **2.8.3 Packing group assignment for substances and mixtures**

2.8.3.1 Existing human and animal data including information from single or repeated exposure shall be the first line of evaluation, as they give information directly relevant to effects on the skin.

2.8.3.2 In assigning the packing group in accordance with 2.8.2.3, account shall be taken of human experience in instances of accidental exposure. In the absence of human experience the grouping shall be based on data obtained from experiments in accordance with OECD Test Guideline 404<sup>1</sup> or 435<sup>2</sup>. A substance or mixture which is determined not to be corrosive in accordance with OECD Test Guideline 430<sup>3</sup> or 431<sup>4</sup> may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.

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<sup>1</sup> OECD Guideline for the testing of chemicals No. 404 "Acute Dermal Irritation/Corrosion" 2015

<sup>2</sup> OECD Guideline for the testing of chemicals No. 435 "In Vitro Membrane Barrier Test Method for Skin Corrosion" 2015

<sup>3</sup> OECD Guideline for the testing of chemicals No. 430 "In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)" 2015



2.8.3.3 Packing groups are assigned to corrosive substances in accordance with the following criteria (see table 2.8.3.4):

- (a) Packing group I is assigned to substances that cause irreversible damage of intact skin tissue within an observation period up to 60 minutes starting after the exposure time of three minutes or less;
- (b) Packing group II is assigned to substances that cause irreversible damage of intact skin tissue within an observation period up to 14 days starting after the exposure time of more than three minutes but not more than 60 minutes;
- (c) Packing group III is assigned to substances that:
  - (i) Cause irreversible damage of intact skin tissue within an observation period up to 14 days starting after the exposure time of more than 60 minutes but not more than 4 hours; or
  - (ii) Are judged not to cause irreversible damage of intact skin tissue but which exhibit a corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55 °C when tested on both materials. For the purposes of testing steel, type S235JR+CR (1.0037 resp. St 37-2), S275J2G3+CR (1.0144 resp. St 44-3), ISO 3574 or Unified Numbering System (UNS) G10200 or a similar type or SAE 1020, and for testing aluminium, non-clad, types 7075-T6 or AZ5GU-T6 shall be used. An acceptable test is prescribed in the Manual of Tests and Criteria, Part III, Section 37.

*NOTE: Where an initial test on either steel or aluminium indicates the substance being tested is corrosive the follow up test on the other metal is not required.*

**Table 2.8.3.4: Table summarizing the criteria in 2.8.3.3**

Packing Group	Exposure Time	Observation Period	Effect
I	≤ 3 min	≤ 60 min	Irreversible damage of intact skin
II	> 3 min ≤ 1 h	≤ 14 d	Irreversible damage of intact skin
III	> 1 h ≤ 4 h	≤ 14 d	Irreversible damage of intact skin
III	-	-	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at a test temperature of 55 °C when tested on both materials

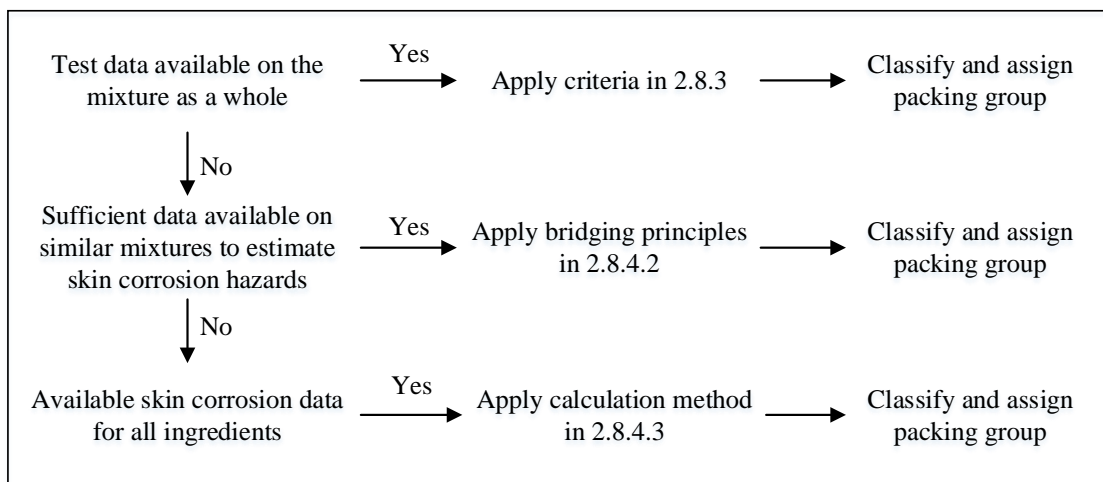
#### 2.8.4 Alternative packing group assignment methods for mixtures: Step-wise approach

<sup>4</sup> OECD Guideline for the testing of chemicals No. 431 "In Vitro Skin Corrosion: Human Skin Model Test" 2015

**2.8.4.1**      *General provisions*

2.8.4.1.1      For mixtures it is necessary to obtain or derive information that allows the criteria to be applied to the mixture for the purpose of classification and assignment of packing groups. The approach to classification and assignment of packing groups is tiered, and is dependent upon the amount of information available for the mixture itself, for similar mixtures and/or for its ingredients. The flow chart of Figure 2.8.4.1 below outlines the process to be followed:

**Figure 2.8.4.1: Step-wise approach to classify and assign packing group of corrosive mixtures**



### 2.8.4.2 *Bridging principles*

2.8.4.2.1 Where a mixture has not been tested to determine its skin corrosion potential, but there are sufficient data on both the individual ingredients and similar tested mixtures to adequately classify and assign a packing group for the mixture, these data will be used in accordance with the following bridging principles. This ensures that the classification process uses the available data to the greatest extent possible in characterizing the hazards of the mixture.

(a) **Dilution:** If a tested mixture is diluted with a diluent which does not meet the criteria for Class 8 and does not affect the packing group of other ingredients, then the new diluted mixture may be assigned to the same packing group as the original tested mixture.

*NOTE: in certain cases, diluting a mixture or substance may lead to an increase in the corrosive properties. If this is the case, this bridging principle cannot be used.*

(b) **Batching:** The skin corrosion potential of a tested production batch of a mixture can be assumed to be substantially equivalent to that of another untested production batch of the same commercial product when produced by or under the control of the same manufacturer, unless there is reason to believe there is significant variation such that the skin corrosion potential of the untested batch has changed. If the latter occurs, a new classification is necessary.

(c) **Concentration of mixtures of packing group I:** If a tested mixture meeting the criteria for inclusion in packing group I is concentrated, the more concentrated untested mixture may be assigned to packing group I without additional testing.

(d) **Interpolation within one packing group:** For three mixtures (A, B and C) with identical ingredients, where mixtures A and B have been tested and are in the same skin corrosion packing group, and where untested mixture C has the same Class 8 ingredients as mixtures A and B but has concentrations of Class 8 ingredients intermediate to the concentrations in

mixtures A and B, then mixture C is assumed to be in the same skin corrosion packing group as A and B.

- (e) **Substantially similar mixtures:** Given the following:
- (i) Two mixtures: (A+B) and (C+B);
  - (ii) The concentration of ingredient B is the same in both mixtures;
  - (iii) The concentration of ingredient A in mixture (A+B) equals the concentration of ingredient C in mixture (C+B);
  - (iv) Data on skin corrosion for ingredients A and C are available and substantially equivalent, i.e. they are the same skin corrosion packing group and do not affect the skin corrosion potential of B.

If mixture (A+B) or (C+B) is already classified based on test data, then the other mixture may be assigned to the same packing group.

### 2.8.4.3 *Calculation method based on the classification of the substances*

2.8.4.3.1 Where a mixture has not been tested to determine its skin corrosion potential, nor is sufficient data available on similar mixtures, the corrosive properties of the substances in the mixture shall be considered to classify and assign a packing group.

Applying the calculation method is only allowed if there are no synergistic effects that make the mixture more corrosive than the sum of its substances. This restriction applies only if packing group II or III would be assigned to the mixture.

2.8.4.3.2 When using the calculation method, all Class 8 ingredients present at a concentration of  $\geq 1\%$  shall be taken into account, or  $< 1\%$  if these ingredients are still relevant for classifying the mixture to be corrosive to skin.

2.8.4.3.3 To determine whether a mixture containing corrosive substances shall be considered a corrosive mixture and to assign a packing group, the calculation method in the flow chart in Figure 2.8.4.3 shall be applied.

2.8.4.3.4 When a specific concentration limit (SCL) is assigned to a substance following its entry in the Dangerous Goods List or in a Special Provision, this limit shall be used instead of the generic concentration limits (GCL). This appears where 1% is used in the first step for the assessment of the packing group I substances, and where 5% is used for the other steps respectively in Figure 2.8.4.3.

2.8.4.3.5 For this purpose, the summation formula for each step of the calculation method shall be adapted. This means that, where applicable, the generic concentration limit shall be substituted by the specific concentration limit assigned to the substance(s) (SCL<sub>i</sub>), and the adapted formula is a weighted average of the different concentration limits assigned to the different substances in the mixture:

$$\frac{PGx1}{GCL} + \frac{PGx2}{SCL2} + \dots + \frac{PGxi}{SCLi} \geq 1$$

Where:

PG xi = concentration of substance 1, 2 ...i in the mixture, assigned to packing group x (I, II or III)

GCL = generic concentration limit

SCL<sub>i</sub> = specific concentration limit assigned to substance i

The criterion for a packing group is fulfilled when the result of the calculation is  $\geq 1$ .  
The generic concentration limits to be used for the evaluation in each step of the calculation method are those found in Figure 2.8.4.3.

Examples for the application of the above formula can be found in the note below.

**NOTE:** *Examples for the application of the above formula*

*Example 1: A mixture contains one corrosive substance in a concentration of 5% assigned to packing group I without a specific concentration limit:*

*Calculation for packing group I:  $\frac{5}{5 (GCL)} = 1 \rightarrow$  assign to class 8, packing group I:*

*Example 2: A mixture contains three substances corrosive to skin; two of them (A and B) have specific concentration limits; for the third one (C) the generic concentration limits applies. The rest of the mixture needs not to be taken into consideration:*

Substance X in the mixture and its packing group assignment within class 8	Concentration (conc) in the mixture in %	Specific concentration limit (SCL) for packing group I	Specific concentration limit (SCL) for packing group II	Specific concentration limit (SCL) for packing group III
A, assigned to packing group I	3	30%	none	none
B, assigned to packing group I	2	20%	10%	none
C, assigned to packing group III	10	none	none	none

*Calculation for packing group I:  $\frac{3 (conc A)}{30 (SCL PG I)} + \frac{2 (conc B)}{20 (SCL PG I)} = 0,2 < 1$*

*The criterion for packing group I is not fulfilled.*

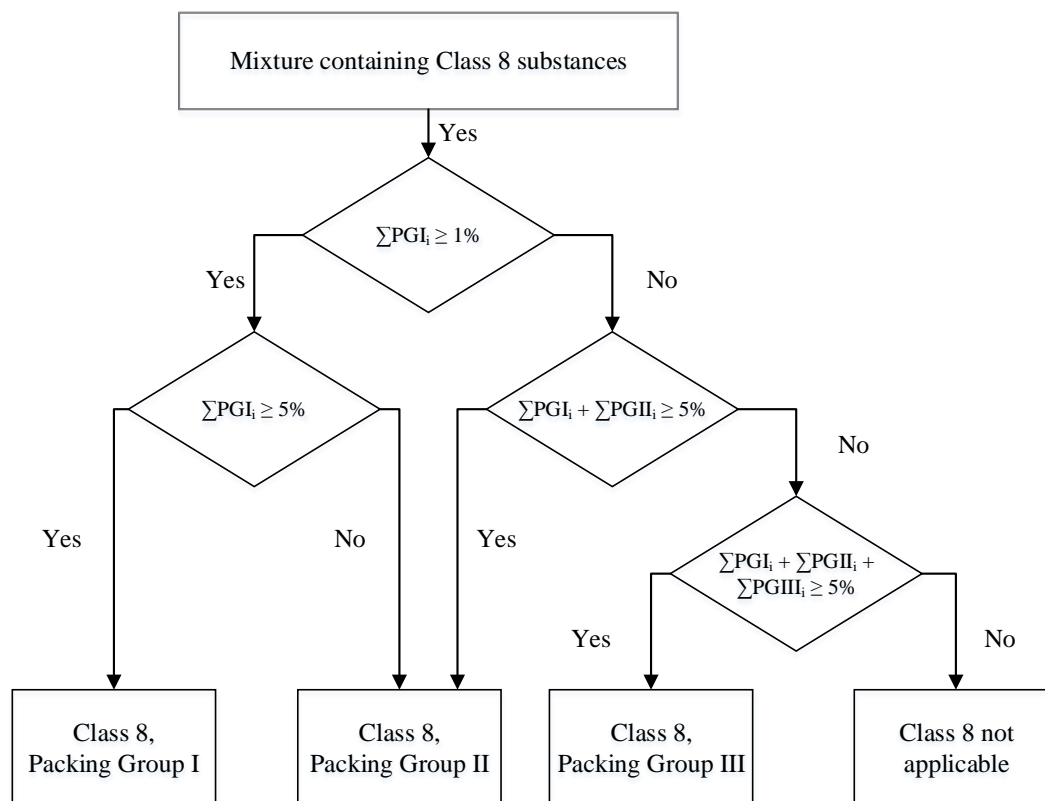
*Calculation for packing group II:  $\frac{3 (conc A)}{5 (GCL PG II)} + \frac{2 (conc B)}{10 (SCL PG II)} = 0,8 < 1$*

*The criterion for packing group II is not fulfilled.*

*Calculation for packing group III:  $\frac{3 (conc A)}{5 (GCL PG III)} + \frac{2 (conc B)}{5 (GCL PG III)} + \frac{10 (conc C)}{5 GCL PG III} = 3 \geq 1$*

*The criterion for packing group III is fulfilled, the mixture shall be assigned to class 8, packing group III.*

Figure 2.8.4.3: Calculation method



### 2.8.5 Substances not accepted for transport

Chemically unstable substances of Class 8 shall not be accepted for transport unless the necessary precautions have been taken to prevent the possibility of a dangerous decomposition or polymerization under normal conditions of transport. For the precautions necessary to prevent polymerization, see special provision 386 of Chapter 3.3. To this end particular care shall be taken to ensure that receptacles and tanks do not contain any substances liable to promote these reactions.”

## Chapter 2.9

2.9.2 Under the heading “*Lithium batteries*”, add the following new entry:

“3536 LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT”.

2.9.2 Before “Other substances or articles presenting a danger during transport, but not meeting the definitions of another class”, insert the following new subdivision:

“*Ammonium nitrate based fertilizers*

2071 AMMONIUM NITRATE BASED FERTILIZERS

Solid ammonium nitrate based fertilizers shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39.”.

2.9.2 The amendment to the heading of the last subdivision (Other substances or articles presenting a danger during transport, but not meeting the definitions of another

class) does not apply to the English version. Under this heading, delete the entry “2071 AMMONIUM NITRATE BASED FERTILIZERS” and add the following new entry:

“3548 ARTICLES CONTAINING MISCELLANEOUS DANGEROUS GOODS N.O.S.”.

2.9.3.4.6.5.1 At the end, delete “with the additional statement that: "x percent of the mixture consists of ingredients(s) of unknown hazards to the aquatic environment””.

2.9.4 Add the following new sub-paragraphs (f) and (g):

“(f) Lithium batteries, containing both primary lithium metal cells and rechargeable lithium ion cells, that are not designed to be externally charged (see special provision 387 of Chapter 3.3) shall meet the following conditions:

- (i) The rechargeable lithium ion cells can only be charged from the primary lithium metal cells;
- (ii) Overcharge of the rechargeable lithium ion cells is precluded by design;
- (iii) The battery has been tested as a lithium primary battery;
- (iv) Component cells 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.

(g) Manufacturers and subsequent distributors of cells or batteries shall make available the test summary as specified in the Manual of Tests and Criteria, Part III, sub-section 38.3, paragraph 38.3.5.”.

## Chapter 3.1

3.1.1.2 At the end of the last sentence, replace “risks” by “hazards”.

3.1.2.2 Amend the first sentence to read as follows: “When a combination of several distinct proper shipping names are listed under a single UN number, and these are separated by “and” or ”or” in lower case or are punctuated by commas, only the most appropriate shall be shown in the transport document and package marks.”. Delete the second sentence.

3.1.2.6 (a) Replace “7.1.6” by “7.1.5”.

3.1.2.6 Sub-paragraph (b) becomes sub-paragraph (c). Add the following new sub-paragraph (b):

“(b) Unless it is already included in capital letters in the name indicated in the Dangerous Goods List, the words “TEMPERATURE CONTROLLED” shall be added as part of the proper shipping name.”.

3.1.2.8.1.1 The amendment does not apply to the English version.

3.1.2.8.1.2 Amend the first sentence to read as follows: When a mixture of dangerous goods or articles containing dangerous goods are described by one of the “N.O.S.” or “generic” entries to which special provision 274 has been allocated in the Dangerous Goods List, not more than the two constituents which most predominantly contribute to the hazard or hazards of the mixture or of the articles need to be shown, excluding controlled substances when their disclosure is prohibited by national law or international convention.”. In the second sentence, replace “risk” by “hazard” (twice).

3.1.2.8.1.3 Add the following new example at the end:

“UN 3540 ARTICLES CONTAINING FLAMMABLE LIQUIDS N.O.S. (pyrrolidine)”.

3.1.3.2 (c) Replace “risk(s)” by “hazard(s)”.

3.1.3.3 Replace “subsidiary risk(s)” by “subsidiary hazard(s)”.

## Chapter 3.2

3.2.1 In the description of Column 4, replace “risk” by “hazard” and “risks” by “hazards”.

### Dangerous goods list

For the heading of column 4, replace “risk” by “hazard”.

For UN Nos. 0349, 0367, 0384 and 0481, insert “347” in column 6.

For UN Nos. 1011, 1049, 1075, 1954, 1965, 1969, 1971, 1978, insert “392” in column (6).

For UN Nos. 1363, 1386, 1398, 1435, 2071, 2216, 2217 and 2793, in column (10), insert “BK2”

For UN 1945, in column (6), add “293”.

For UN Nos. 2067 and 2071, in column (6) delete “186”.

For UN Nos. 3090, 3091, 3480 and 3481, in column (6) insert “387”.

For UN 3166, delete “312”, “380” and “385” in column (6).

For UN Nos. 3166 and 3171, insert “388” in column (6).

For UN 3171, delete “240” in column (6).

For UN Nos. 3223 and 3224, in column (9), add “PP94 PP95”.

For UN 3302 in column (2) add at the end of the designation “, STABILIZED” and in column (6), add “386”.

For UN 3316, delete the second entry corresponding to packing group III. In the remaining entry, in column (5), delete “II”.

Add the following new entries:

(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
3535	TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.	6.1	4.1	I	274	0	E5	P002 IBC99		T6	TP33
3535	TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.	6.1	4.1	II	274	500 g	E4	P002 IBC08	B2, B4	T3	TP33
3536	LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries	9			389	0	E0				
3537	ARTICLES CONTAINING FLAMMABLE GAS, N.O.S.	2.1	See 2.0.5.6		274 391	0	E0	P006 LP03			
3538	ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.	2.2	See 2.0.5.6		274 391	0	E0	P006 LP03			



(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
3539	ARTICLES CONTAINING TOXIC GAS, N.O.S.	2.3	See 2.0.5.6		274 391	0	E0				
3540	ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S.	3	See 2.0.5.6		274 391	0	E0	P006 LP03			
3541	ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S.	4.1	See 2.0.5.6		274 391	0	E0	P006 LP03			
3542	ARTICLES CONTAINING A SUBSTANCE LIABLE TO SPONTANEOUS COMBUSTION, N.O.S.	4.2	See 2.0.5.6		274 391	0	E0				
3543	ARTICLES CONTAINING A SUBSTANCE WHICH EMITS FLAMMABLE GAS IN CONTACT WITH WATER, N.O.S.	4.3	See 2.0.5.6		274 391	0	E0				
3544	ARTICLES CONTAINING OXIDIZING SUBSTANCE, N.O.S.	5.1	See 2.0.5.6		274 391	0	E0				
3545	ARTICLES CONTAINING ORGANIC PEROXIDE, N.O.S.	5.2	See 2.0.5.6		274 391	0	E0				
3546	ARTICLES CONTAINING TOXIC SUBSTANCE, N.O.S.	6.1	See 2.0.5.6		274 391	0	E0	P006 LP03			
3547	ARTICLES CONTAINING CORROSIVE SUBSTANCE, N.O.S.	8	See 2.0.5.6		274 391	0	E0	P006 LP03			
3548	ARTICLES CONTAINING MISCELLANEOUS DANGEROUS GOODS, N.O.S.	9	See 2.0.5.6		274 391	0	E0	P006 LP03			

### Alphabetical Index

In column "Name and description" of the Alphabetical Index of Substances and Articles for the entry "2-DIMETHYLAMINOETHYL ACRYLATE" add at the end ", STABILIZED".

Add the following new entries in alphabetical order:

ARTICLES CONTAINING FLAMMABLE GAS, N.O.S.	2.1	3537
ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.	2.2	3538
ARTICLES CONTAINING TOXIC GAS, N.O.S.	2.3	3539
ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S.	3	3540
ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S.	4.1	3541
ARTICLES CONTAINING A SUBSTANCE LIABLE TO SPONTANEOUS COMBUSTION, N.O.S.	4.2	3542

ARTICLES CONTAINING A SUBSTANCE WHICH EMITS FLAMMABLE GAS IN CONTACT WITH WATER, N.O.S.	4.3	3543
ARTICLES CONTAINING OXIDIZING SUBSTANCE, N.O.S.	5.1	3544
ARTICLES CONTAINING ORGANIC PEROXIDE, N.O.S.	5.2	3545
ARTICLES CONTAINING TOXIC SUBSTANCE, N.O.S.	6.1	3546
ARTICLES CONTAINING CORROSIVE SUBSTANCE, N.O.S.	8	3547
ARTICLES CONTAINING MISCELLANEOUS DANGEROUS GOODS, N.O.S.	9	3548
LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries	9	3536
TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.	6.1	3535

### Chapter 3.3

3.3.1 In the third sentence, replace “such as “Damaged Lithium Batteries”” by “such as “LITHIUM BATTERIES FOR DISPOSAL””.

Special provision 23 The amendment does not apply to the English version.

Special provision 61 The amendment does not apply to the English version.

Special provision 63 In the introductory text, replace “risk(s)” by “hazard(s)”. In (e) and (g), replace “risk” by “hazard”.

Special provision 122 Replace “risk(s)” by “hazard(s)”.

Special provision 133 Replace “risk” by “hazard”.

Special provision 172 In (a) and (b), replace “risk” by “hazard” 3 times. In (c), replace “risk(s)” by “hazard(s)”.

Special provision 181 Replace “risk” by “hazard”.

Delete special provision 186 and add: “186 (Deleted)”.

Special provision 188 (d) Replace “protection against contact with conductive materials” by “protection against contact with electrically conductive material”.

Special provision 188 (f) At the end, add the following two new sentences: “When packages are placed in an overpack, the lithium battery mark shall either be clearly visible or be reproduced on the outside of the overpack and the overpack shall be marked with the word “OVERPACK”. The lettering of the “OVERPACK” mark shall be at least 12 mm high.”.

Existing note becomes Note 1. Add the following new Note 2:

**NOTE 2:** Packages containing lithium batteries packed in conformity with the provisions of Part 4, Chapter 11, packing instructions 965 or 968, Section IB of the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air that bear the

*mark as shown in 5.2.1.9 (lithium battery mark) and the label shown in 5.2.2.2.2, Model No. 9A shall be deemed to meet the provisions of this special provision.”.*

Special provision 188, in the first paragraph after (h) At the end of the second paragraph, add the following sentence: “As used in this special provision “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.”.

Special provision 193 Amend to read as follows:

“193 This entry may only be used for ammonium nitrate based compound fertilizers. They shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39. Fertilizers meeting the criteria for this UN number are only subject to these Regulations when transported by air or sea.”.

Special provision 199 The amendment does not apply to the English version.

Special provision 204 Replace “risk” by “hazard” three times.

Delete special provision 240 and add: “240 (Deleted)”

Special provision 251 In the first paragraph, replace the last sentence by:

“Such kits shall only contain dangerous goods that are permitted as:

(a) Excepted quantities not exceeding the quantity indicated by the code in column (7b) of the Dangerous Goods List of Chapter 3.2, provided that the net quantity per inner packaging and net quantity per package are as prescribed in 3.5.1.2 and 3.5.1.3; or;

(b) Limited quantities as indicated in column (7a) of the Dangerous Goods List of Chapter 3.2, provided that the net quantity per inner packaging does not exceed 250 ml or 250 g.”.

In the second paragraph, delete the last sentence.

In the third paragraph, insert a new first sentence to read as follows: “For the purposes of completion of the dangerous goods transport document as set out in 5.4.1.4.1, the packing group shown on the document shall be the most stringent packing group assigned to any individual substance in the kit.”.

Special provision 271 Replace “risk” by “hazard”.

Special provision 280 The amendment does not apply to the English version.

Special provision 290 (b) In (a) and (b), replace “risk” by “hazard”.

Special provision 293 (b) After “Safety matches are”, insert “matches that”.

Special provision 296 The amendment does not apply to the English version.

Special provision 301 At the beginning, replace “substance” by “goods”. Amend the fifth sentence to read as follows: “If the machinery or apparatus contains more than one item of dangerous goods, the individual dangerous goods shall be enclosed to prevent them reacting dangerously with one another during transport (see 4.1.1.6).”. Delete the last sentence.

Special provision 303 The amendment does not apply to the English version.

Special provision 307 Amend to read as follows:

“307 This entry may only be used for ammonium nitrate based fertilizers. They shall be classified in accordance with the procedure as set out in the Manual of Tests and Criteria, Part III, Section 39.”.

Special Provision 308 Amend to read as follows:

“308 Stabilization of fishmeal shall be achieved to prevent spontaneous combustion by effective application of ethoxyquin, BHT (butylated hydroxytoluene) or tocopherols (also used in a blend with rosemary extract) at the time of production. The said application shall occur within twelve months prior to shipment. Fish scrap or fish meal shall contain at least 50 ppm (mg/kg) of ethoxyquin, 100 ppm (mg/kg) of BHT or 250 ppm (mg/kg) of tocopherol based antioxidant at the time of consignment.”.

Special provision 310 In the first paragraph, replace “cells and batteries” by “cells or batteries”, twice, and add “or LP905 of 4.1.4.3, as applicable” at the end.

Delete special provision 312 and add: “312 (Deleted)”

Special provision 339 (b) The amendment does not apply to the English version.

Special provision 361 (b) The amendment does not apply to the English version.

Special provision 362 (b) Replace “risk” by “hazard”.

Special provision 362 (c) Replace “risk” by “hazard”.

Special provision 363 Add the following new introductory sentence: “This entry may only be used when the conditions of this special provision are met. No other requirements of these Regulations apply.”.

Special provision 363 (f) Replace the last sentence by the following text:

“However, lithium batteries shall meet the provisions of 2.9.4, except that 2.9.4 (a) does not apply when pre-production prototype batteries or batteries of a small production run, consisting of not more than 100 batteries, are installed in machinery or engines.

Where a lithium battery installed in a machinery or an engine is damaged or defective, the machinery or engine shall be transported as defined by the competent authority.”.

Special provision 363 Delete the first sub-paragraph under (g). Renumber existing (i) to (vi) under current (g) as (g) to (l). Add a new sub-paragraph (m) to read as follows:

“(m) The requirements specified in packing instruction P005 of 4.1.4.1 shall be met.”.

Special provision 369 In the first paragraph, replace “risks” by “hazards”. In the third paragraph, replace “risk” by “hazard”.

Special provision 376 Amend the text after the third paragraph to read as follows:

“Cells and batteries shall be packed in accordance with packing instructions P908 of 4.1.4.1 or LP904 of 4.1.4.3, as applicable.

Cells and batteries identified as damaged or defective and liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport shall be packed and transported in accordance with packing instruction P911 of 4.1.4.1 or LP906 of 4.1.4.3, as applicable. Alternative packing and/or transport conditions may be authorized by the competent authority.

Packages shall be marked “DAMAGED/DEFECTIVE” in addition to the proper shipping name, as stated in 5.2.1.

The transport document shall include the following statement “Transport in accordance with special provision 376”.

If applicable, a copy of the competent authority approval shall accompany the transport.”.

Delete special provisions 380 and 385 and add:

“380 *(Deleted)*”

“385 *(Deleted)*”

Special provision 386 In the first sentence, replace “7.1.6” by “7.1.5”.

3.3.1 Add the following new special provisions:

“387 Lithium batteries in conformity with 2.9.4 (f) containing both primary lithium metal cells and rechargeable lithium ion cells shall be assigned to UN Nos. 3090 or 3091 as appropriate. When such batteries are transported in accordance with special provision 188, the total lithium content of all lithium metal cells contained in the battery shall not exceed 1.5 g and the total capacity of all lithium ion cells contained in the battery shall not exceed 10 Wh.”.

“388 UN No. 3166 entries apply to vehicles powered by flammable liquid or gas internal combustion engines or fuel cells.

Vehicles powered by a fuel cell engine shall be consigned under the entries UN 3166 VEHICLE, FUEL CELL, FLAMMABLE GAS POWERED or UN 3166 VEHICLE, FUEL CELL, FLAMMABLE LIQUID POWERED, as appropriate. These entries include hybrid electric vehicles powered by both a fuel cell and an internal combustion engine with wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed.

Other vehicles which contain an internal combustion engine shall be consigned under the entries UN 3166 VEHICLE, FLAMMABLE GAS POWERED or UN 3166 VEHICLE, FLAMMABLE LIQUID POWERED, as appropriate. These entries include hybrid electric vehicles powered by both an internal combustion engine and wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries, transported with the battery(ies) installed.

If a vehicle is powered by a flammable liquid and a flammable gas internal combustion engine, it shall be assigned to UN 3166 VEHICLE, FLAMMABLE GAS POWERED.

Entry UN 3171 only applies to vehicles powered by wet batteries, sodium batteries, lithium metal batteries or lithium ion batteries and equipment powered by wet batteries or sodium batteries transported with these batteries installed.

For the purpose of this special provision, vehicles are self-propelled apparatus designed to carry one or more persons or goods. Examples of such vehicles are cars, motorcycles, scooters, three- and four-wheeled vehicles or motorcycles, trucks, locomotives, bicycles (pedal cycles with a motor) and other vehicles of this type (e.g. self-balancing vehicles or vehicles not equipped with at least one seating position), wheelchairs, lawn tractors, self-propelled farming and construction equipment, boats and aircraft. This includes vehicles transported in a packaging. In this case some parts of the vehicle may be detached from its frame to fit into the packaging.

Examples of equipment are lawnmowers, cleaning machines or model boats and model aircraft. Equipment powered by lithium metal batteries or lithium ion batteries shall be consigned under the entries UN 3091 LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or UN 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT or UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT or UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT, as appropriate.

Dangerous goods, such as batteries, airbags, fire extinguishers, compressed gas accumulators, safety devices and other integral components of the vehicle that are necessary for the operation of the vehicle or for the safety of its operator or passengers, shall be securely installed in the vehicle and are not otherwise subject to these Regulations.

However, lithium batteries shall meet the provisions of 2.9.4, except that 2.9.4 (a) does not apply when pre-production prototype batteries or batteries of a small production run, consisting of not more than 100 batteries, are installed in vehicles or equipment.

Where a lithium battery installed in a vehicle or equipment is damaged or defective, the vehicle or equipment shall be transported as defined by the competent authority.”.

“389 This entry only applies to lithium ion batteries or lithium metal batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. The lithium batteries shall meet the requirements of 2.9.4 (a) to (e) and contain the necessary systems to prevent overcharge and over discharge between the batteries.

The batteries shall be securely attached to the interior structure of the cargo transport unit (e.g., by means of placement in racks, cabinets, etc.) in such a manner as to prevent short circuits, accidental operation, and significant movement relative to the cargo transport unit under the shocks, loadings and vibrations normally incident to transport. Dangerous goods necessary for the safe and proper operation of the cargo transport unit (e.g., fire extinguishing systems and air conditioning systems), shall be properly secured to or installed in the cargo transport unit and are not otherwise subject to these Regulations. Dangerous goods not necessary for the safe and proper operation of the cargo transport unit shall not be transported within the cargo transport unit.

The batteries inside the cargo transport unit are not subject to marking or labelling requirements. The cargo transport unit shall display the UN number in accordance with 5.3.2.1.2 and be placarded on two opposing sides in accordance with 5.3.1.1.2.”.

“391 Articles containing dangerous goods of Division 2.3, or Division 4.2, or Division 4.3, or Division 5.1, or Division 5.2 or Division 6.1 for substances of inhalation toxicity requiring Packing Group I and articles containing more than one of the hazards listed in 2.0.3.1 (b), (c), or (d) shall be transported under conditions approved by the competent authority.”.

“392 For the transport of fuel gas containment systems designed and approved to be fitted in motor vehicles containing this gas the provisions of sub-section 4.1.4.1 and Chapter 6.2 of these Regulations need not be applied when transported for disposal, recycling, repair, inspection, maintenance or from where they are manufactured to a vehicle assembly plant, provided the following conditions are met:

(a) The fuel gas containment systems shall meet the requirements of the standards or regulations for fuel tanks for vehicles, as applicable. Examples of applicable standards and regulations are:

<b>LPG tanks</b>	
ECE Regulation No. 67 Revision 2	Uniform provisions concerning: I. Approval of specific equipment of vehicles of category M and N using liquefied petroleum gases in their propulsion system; II. Approval of vehicles of category M and N fitted with specific equipment for the use of liquefied petroleum gases in their propulsion system with regard to the installation of such equipment
ECE Regulation No. 115	Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system

<b>CNG tanks</b>	
ECE Regulation No. 110	Uniform provisions concerning: I. Specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system; II. Vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) in their propulsion system
ECE Regulation No. 115	(Uniform provisions concerning the approval of: I. Specific LPG (liquefied petroleum gases) retrofit systems to be installed in motor vehicles for the use of LPG in their propulsion systems; II Specific CNG (compressed natural gas) retrofit systems to be installed in motor vehicles for the use of CNG in their propulsion system)
ISO 11439:2013	Gas cylinders — High pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles
ISO 15500-Series	ISO 15500: Road vehicles -- Compressed natural gas (CNG) fuel system components – several parts as applicable
ANSI NGV 2	Compressed natural gas vehicle fuel containers
CSA B51 Part 2: 2014	Boiler, pressure vessel, and pressure piping code Part 2 Requirements for high-pressure cylinders for on-board storage of fuels for automotive vehicles
<b>Hydrogen pressure tanks</b>	
Global Technical Regulation (GTR) No. 13	Global technical regulation on hydrogen and fuel cell vehicles (ECE/TRANS/180/Add.13).
ISO/TS 15869:2009	Gaseous hydrogen and hydrogen blends - Land vehicle fuel tanks
Regulation (EC) No.79/2009	Regulation (EC) No. 79/2009 of the European Parliament and of the Council of 14 January 2009 on type approval of hydrogen-powered motor vehicles, and amending Directive 2007/46/EC
Regulation (EU) No. 406/2010	Commission Regulation (EU) No 406/2010 of 26 April 2010 implementing Regulation (EC) No 79/2009 of the European Parliament and of the Council on type-approval of hydrogen-powered motor vehicles.
ECE Regulation No. 134	Hydrogen and fuel cell vehicles (HFCV)
CSA B51 Part 2: 2014	Boiler, pressure vessel, and pressure piping code Part 2 Requirements for high-pressure cylinders for on-board storage of fuels for automotive vehicles

Gas tanks designed and constructed in accordance with previous versions of relevant standards or regulations for gas tanks for motor vehicles, which were applicable at the time of the certification of the vehicles for which the gas tanks were designed and constructed may continue to be transported;

(b) The fuel gas containment systems shall be leakproof and shall not exhibit any signs of external damage which may affect their safety;

**NOTE 1:** Criteria may be found in standard ISO 11623:2015 *Transportable gas cylinders – Periodic inspection and testing of composite gas cylinders (or ISO 19078:2013 Gas cylinders – Inspection of the cylinder installation, and requalification of high pressure cylinders for the on-board storage of natural gas as a fuel for automotive vehicles)*.

**NOTE 2:** If the fuel gas containment systems are not leakproof or are overfilled or if they exhibit damage that could affect their safety (e.g. in case of a safety related recall), they shall only be carried in salvage pressure receptacles in conformity with these Regulations.

(c) If a fuel gas containment system is equipped with two valves or more integrated in line, the two valves shall be closed as to be gastight under normal conditions of transport. If only one valve exists or only one valve works all openings with the exception of the opening of the pressure relief device, it shall be closed as to be gastight under normal conditions of transport;

(d) Fuel gas containment systems shall be transported in such a way as to prevent obstruction of the pressure relief device or any damage to the valves and any other pressurised part of the fuel gas containment systems and unintentional release of the gas under normal conditions of transport. The fuel gas containment system shall be secured in order to prevent slipping, rolling or vertical movement;

(e) Valves shall be protected by one of the methods described in 4.1.6.1.8 (a) to (e);

(f) Except for the case of fuel gas containment systems removed for disposal, recycling, repair, inspection or maintenance, they shall be filled with not more than 20% of their nominal filling ratio or nominal working pressure, as applicable;

(g) Notwithstanding the provisions of Chapter 5.2, when fuel gas containment systems are consigned in a handling device, markings and labels may be affixed to the handling device; and

(h) Notwithstanding the provisions of 5.4.1.5 the information on the total quantity of dangerous goods may be replaced by the following information:

(i) The number of fuel gas containment systems; and

(ii) In the case of liquefied gases the total net mass (kg) of gas of each fuel gas containment system and, in the case of compressed gases, the total water capacity (l) of each fuel gas containment system followed by the nominal working pressure.

Examples for information in the transport document:

Example 1: “UN 1971 natural gas, compressed, 2.1, 1 fuel gas containment system of 50 l in total, 200 bar”.

Example 2: “UN 1965 hydrocarbon gas mixture, liquefied, n.o.s., 2.1, 3 fuel gas containment systems, each of 15 kg net mass of gas”.

## Chapter 3.5

3.5.4.1 The amendment does not apply to the English version.

## Appendix A

In the List of generic and N.O.S. proper shipping names, header, column 2, replace “risk” by “hazard”.

In the table, for Class 2, division 2.1, under “General entries”, add the following new entry:



2.1	See 2.0.5.6	3537	ARTICLES CONTAINING FLAMMABLE GAZ, N.O.S.
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In the table, for Class 2, division 2.2, under “General entries”, add the following new entry:

2.2	See 2.0.5.6	3538	ARTICLES CONTAINING NON-FLAMMABLE, NON TOXIC GAS, N.O.S.
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In the table, for Class 2, division 2.3, under “General entries”, add the following new entry:

2.3	See 2.0.5.6	3539	ARTICLES CONTAINING TOXIC GAS, N.O.S.
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In the table, for Class 3, under “General entries”, add the following new entry:

3	See 2.0.5.6	3540	ARTICLES CONTAINING FLAMMABLE LIQUID, N.O.S.
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In the table, for Class 4, division 4.1, under “General entries”, add the following new entry:

4.1	See 2.0.5.6	3541	ARTICLES CONTAINING FLAMMABLE SOLID, N.O.S
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In the table, for Class 4, division 4.2, under “General entries”, add the following new entry:

4.2	See 2.0.5.6	3542	ARTICLES CONTAINING A SUBSTANCE LIABLE TO SPONTANEOUS COMBUSTION, N.O.S.
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In the table, for Class 4, division 4.3, under “General entries”, add the following new entry:

4.3	See 2.0.5.6	3543	ARTICLES CONTAINING A SUBSTANCE WHICH EMITS FLAMMABLE GAS IN CONTACT WITH WATER, N.O.S.
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In the table, for Class 5, division 5.1, under “General entries”, add the following new entry:

5.1	See 2.0.5.6	3544	ARTICLES CONTAINING OXIDIZING SUBSTANCE, N.O.S.
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In the table, for Class 5, division 5.2, after “Specific entries” add a new section “General entries” with the following new entry:

5.2	See 2.0.5.6	3545	ARTICLES CONTAINING ORGANIC PEROXIDE, N.O.S.
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In the table, for Class 6, division 6.1, under “General entries”, add the following new entries:

6.1	4.1	3535	TOXIC SOLID, FLAMMABLE, INORGANIC, N.O.S.
6.1	See 2.0.5.6	3546	ARTICLES CONTAINING TOXIC SUBSTANCE, N.O.S.

In the table, for Class 8, under “General entries”, add the following new entry:

8	See 2.0.5.6	3547	ARTICLES CONTAINING CORROSIVE SUBSTANCE, N.O.S.
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In the table, for Class 9, under “General entries”, add the following new entry:

9	See 2.0.5.6	3548	ARTICLES CONTAINING MISCELLANEOUS DANGEROUS GOODS, N.O.S
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## Appendix B

In the definition of “Initiation, means of”, in (2), replace “significant risk” by “significant hazard”.

The other amendments do not apply to the English text.

## Chapter 4.1

4.1.1.11 The amendment does not apply to the English version.

4.1.3.8.1 Replace “carried” by “transported” and “carriage” by “transport”.

4.1.4.1, packing instruction P001 Under “Composite packagings”, in the first line, add “or plastics drum” after “Plastics receptacle in steel, aluminium” and add “, 6HH1” after “6HB1”.

4.1.4.1, packing instruction, P001 Under “Composite packagings”, in the second line, delete “, plastics” after “fibre”. Delete “6HH1,” after “6HG1”.

4.1.4.1, packing instruction P101 Replace “The State’s distinguishing sign for motor vehicles in international traffic” by “The distinguishing sign used on vehicles in international road traffic<sup>a</sup>”.

Table note a reads as follows:

<sup>a</sup> *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*”.

4.1.4.1, packing instruction P200 In the header of column 4 of tables 1, 2 and 3, replace “risk” by “hazard”.

4.1.4.1, packing instruction P200, paragraph (3) (e) Amend as follows:

In the first paragraph, replace “liquid phase” by “liquefied gas”.

In subparagraph (i), replace “liquid component” by “liquefied gas”.

In subparagraph (iv), replace “liquid component” by “liquefied gas”.

In subparagraph (v), replace “liquid component” by “liquefied gas”.

In the last paragraph, replace “liquid component” by “liquid phase”.

4.1.4.1, packing instruction P203 (7) Replace “risk” by “hazard”.

4.1.4.1, packing instruction P206 (3) Amend as follows:

In the first paragraph, replace “liquid phase” by “liquefied gas”.

In subparagraph (i), replace “liquid component” by “liquefied gas”.

In subparagraph (iv), replace “liquid component” by “liquefied gas”.

In subparagraph (v), replace “liquid component” by “liquefied gas”.

In the last paragraph, replace “liquid component” by “liquid phase”.

4.1.4.1, packing instruction P208 In Table 1, header, column 4, replace “risk” by “hazard”.

4.1.4.1, packing instruction P520, additional requirement 4 Replace “risk” by “hazard”.

4.1.4.1, packing instruction P520 Add the following new special packing provisions PP94 and PP95:

“PP94 Very small amounts of energetic samples of section 2.0.4.3 may be carried under UN 3223 or UN 3224, as appropriate, provided that:

1. Only combination packaging with outer packaging comprising boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1 and 4H2) are used;

2. The samples are carried in microtiter plates or multi-titer plates made of plastics, glass, porcelain or stoneware as inner packaging;
3. The maximum amount per individual inner cavity does not exceed 0.01 g for solids or 0.01 ml for liquids;
4. The maximum net quantity per outer packaging is 20 g for solids or 20 ml for liquids, or in the case of mixed packing the sum of grammes and millilitres does not exceed 20; and
5. When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, the requirements of 5.5.3 are complied with. Interior supports shall be provided to secure the inner packagings in their original position. The inner and outer packagings shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

PP95 Small amounts of energetic samples of section 2.0.4.3 may be carried under UN 3223 or UN 3224, as appropriate, provided that:

1. The outer packaging consist only of corrugated fibreboard of type 4G having minimum dimensions of 60 cm (length) by 40.5 cm (width) by 30 cm (height) and minimum wall thickness of 1.3 cm;
2. The individual substance is contained in an inner packaging of glass or plastics of maximum capacity 30 ml placed in an expandable polyethylene foam matrix of at least 130 mm thickness having a density of  $18 \pm 1$  g/l;
3. Within the foam carrier, inner packagings are segregated from each other by a minimum distance of 40 mm and from the wall of the outer packaging by a minimum distance of 70 mm. The package may contain up to two layers of such foam matrices, each carrying up to 28 inner packagings;
4. The maximum content of each inner packaging does not exceed 1 g for solids or 1 ml for liquids;
5. The maximum net quantity per outer packaging is 56 g for solids or 56 ml for liquids, or in the case of mixed packing the sum of grammes and millilitres does not exceed 56; and
6. When dry ice or liquid nitrogen is optionally used as a coolant for quality control measures, the requirements of 5.5.3 are complied with. Interior supports shall be provided to secure the inner packagings in their original position. The inner and outer packagings shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.”.

4.1.4.1, packing instruction P620 In additional requirement 3., at the end, delete “and temperatures in the range -40°C to +55°C” and add the following new sentence: “This primary receptacle or secondary packaging shall also be capable of withstanding temperatures in the range -40 °C to +55 °C.”.

4.1.4.1, packing instruction P801, additional requirement 2 Replace “non-conductive” by “electrically non-conductive”.

4.1.4.1, packing instruction P901 Under “Additional requirements”, delete “not exceed either 250 ml or 250 g and shall”.

4.1.4.1, packing instruction P902 In the paragraph under “**Unpackaged articles:**”, amend the end of the sentence to read: “when moved to, from, or between where they are manufactured and an assembly plant including intermediate handling locations.”.

4.1.4.1, packing instruction P903 Before the introductory sentence that starts “The following packagings...”, insert a new sentence to read as follows: “For the purpose of this packing instruction, “equipment” means apparatus for which the lithium cells or batteries will provide electrical power for its operation.”.

4.1.4.1, packing instruction P903 (3) Delete the last sentence.

4.1.4.1, packing instruction P906 (2) In the introductory sentence and in paragraph (b), replace “devices” by “articles” (three times).

4.1.4.1, packing instruction P908 In paragraphs 2 and 4, replace “non-conductive” by “electrically non-conductive”.

4.1.4.1, packing instruction P909 In paragraphs 1 (c) and 2 (b), in the fourth indent of additional requirement 2 and in additional requirement 3, replace “non-conductive” by “electrically non-conductive”.

4.1.4.1, packing instruction P910 In the introductory sentence, replace “cells and batteries” by “cells or batteries”, twice.

4.1.4.1, packing instruction P910 In paragraphs (1) (c), (1) (d), (2) (c), and fourth indent of the additional requirements, replace “non-conductive” by “electrically non-conductive”.

4.1.4.1 Add the following new packing instruction P006:

P006	PACKING INSTRUCTION	P006
This instruction applies to UN Nos. 3537, 3538, 3540, 3541, 3546, 3547 and 3548.		
<p>(1) The following packagings are authorized, provided that the general provisions of <b>4.1.1</b> and <b>4.1.3</b> are met:</p> <p>Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);</p> <p>Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);</p> <p>Jerricans (3A2, 3B2, 3H2)</p> <p>Packagings shall conform to the packing group II performance level.</p> <p>(2) In addition, for robust articles the following packagings are authorized:</p> <p>Strong outer packagings constructed of suitable material and of adequate strength and design in relation to the packaging capacity and its intended use. The packagings shall meet the provisions of 4.1.1.1, 4.1.1.2, 4.1.1.8 and 4.1.3 in order to achieve a level of protection that is at least equivalent to that provided by Chapter 6.1. Articles may be transported unpackaged or on pallets when the dangerous goods are afforded equivalent protection by the article in which they are contained.</p> <p>(3) Additionally, the following conditions shall be met:</p> <p>(a) Receptacles within articles containing liquids or solids shall be constructed of suitable materials and secured in the article in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the article itself or the outer packaging;</p> <p>(b) Receptacles containing liquids with closures shall be packed with their closures correctly oriented. The receptacles shall in addition conform to the internal pressure test provisions of 6.1.5.5;</p> <p>(c) Receptacles that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials shall be properly secured. Any leakage of the contents shall not substantially impair the protective properties of the article or of the outer packaging;</p> <p>(d) Receptacles within articles containing gases shall meet the requirements of Section 4.1.6 and Chapter 6.2 as appropriate or be capable of providing an equivalent level of protection as packing instructions P200 or P208;</p> <p>(e) Where there is no receptacle within the article, the article shall fully enclose the dangerous substances and prevent their release under normal conditions of transport.</p> <p>(4) Articles shall be packed to prevent movement and inadvertent operation during normal conditions of transport.</p>		

## 4.1.4.1 Add the following new packing instruction P911:

P911	PACKING INSTRUCTION	P911
<p>This instruction applies to damaged or defective cells and batteries of UN Nos. 3090, 3091, 3480 and 3481 liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport.</p>		
<p>The following packagings are authorized, provided that the general provisions of <b>4.1.1</b> and <b>4.1.3</b> are met:</p> <p>For cells and batteries and equipment containing cells and batteries:</p> <p style="padding-left: 40px;">Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);</p> <p style="padding-left: 40px;">Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2);</p> <p style="padding-left: 40px;">Jerricans (3A2, 3B2, 3H2)</p> <p>The packagings shall conform to the packing group I performance level.</p> <p>(1) The packaging has to be capable of meeting the following additional performance requirements in case of rapid disassembly, dangerous reaction, production of a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours of the cells or batteries:</p> <p style="padding-left: 40px;">(a) The outside surface temperature of the completed package shall not have a temperature of more than 100°C. A momentary spike in temperature up to 200°C is acceptable;</p> <p style="padding-left: 40px;">(b) No flame will occur outside the package;</p> <p style="padding-left: 40px;">(c) No projectiles will exit the package;</p> <p style="padding-left: 40px;">(d) The structural integrity of the package shall be maintained</p> <p style="padding-left: 40px;">(e) The packagings shall have a gas management system (e.g. filter system, air circulation, containment for gas, gas tight packaging etc.), as appropriate.</p> <p>(2) The additional packaging performance requirements shall be verified by a test as specified by the competent authority<sup>a</sup>.</p> <p style="padding-left: 40px;">A verification report shall be available on request. As a minimum requirement, the cell or battery name, the cell or battery number, the mass, type, energy content of the cells or batteries, the packaging identification and the test data according to the verification method as specified by the competent authority shall be listed in the verification report</p> <p>(3) When dry ice or liquid nitrogen is used as a coolant, the requirements of section 5.5.3 shall apply. The inner packaging and outer packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.</p>		
<p>Additional requirement:</p> <p style="padding-left: 40px;">Cells or batteries shall be protected against short circuit.</p>		
<p><sup>a</sup> <i>The following criteria, as relevant, may be considered to assess the performance of the packaging:</i></p> <p style="padding-left: 40px;">(a) <i>The assessment shall be done under a quality management system (as described e.g. in section 2.9.4. (e)) allowing for the traceability of tests results, reference data and characterization models used;</i></p> <p style="padding-left: 40px;">(b) <i>The list of hazards expected in case of thermal runaway for the cell or battery type, in the condition it is transported (e.g. usage of an inner packaging, state of charge (SOC), use of sufficient non-combustible, electrically non-conductive and absorbent cushioning material etc.), shall be clearly identified and quantified; the reference list of possible hazards for lithium cells or batteries (rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours) can be used for this purpose. The quantification of this hazards shall rely on available scientific literature;</i></p> <p style="padding-left: 40px;">(c) <i>The mitigations effects of the packaging shall be identified and characterized, based on the nature of the protections provided and the construction material properties. A list of technical characteristics and drawings shall be used to support this assessment (Density [<math>\text{kg}\cdot\text{m}^{-3}</math>], specific heat capacity [<math>\text{J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}</math>], heating value [<math>\text{kJ}\cdot\text{kg}^{-1}</math>], thermal conductivity [<math>\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}</math>], melting temperature and flammability temperature [<math>\text{K}</math>], heat transfer coefficient of the outer packaging [<math>\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}</math>], ...);</i></p>		

- (d) The test and any supporting calculations shall assess the result of a thermal run-away of the cell or battery inside the packaging in the normal conditions of transport;
- (e) In case the SOC of the cell or battery is not known, the assessment used, shall be done with the higher possible SOC corresponding to the cell or battery use conditions;
- (f) The surrounding conditions in which the packaging may be used and transported shall be described (including for possible consequences of gas or smoke emissions on the environment, such as ventilation or other methods) according to the gas management system of the packaging;
- (g) The tests or the model calculation shall consider the worst case scenario for the thermal runaway triggering and propagation inside the cell or battery: this scenario includes the worst possible failure in the normal transport condition, the maximum heat and flame emissions for the possible propagation of the reaction;
- (h) The scenario consequences shall be assessed over a period covering all possible consequences (i.e. a period of 24 hours)

4.1.4.2, packing instruction IBC520 In the second line, after “4.1.7.2.”, insert a new sentence to read as follows: “The formulations listed below may also be transported packed in accordance with packing method OP8 of packing instruction P520 of 4.1.4.1, with the same control and emergency temperatures, if applicable.”.

4.1.4.2, packing instruction IBC520 For UN No. 3109, under the entry «tert-Butyl hydroperoxide, not more than 72% solution with water», add a new line to read:

Type of IBC	Maximum quantity (litres)	Control temperature	Emergency Temperature
31HA1	1 000		

4.1.4.2, packing instruction IBC 520 Add the following new entries:

UN No.	Organic peroxide	Type of IBC	Maximum quantity (litres)	Control temperature	Emergency Temperature
3109	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane, not more than 52% in diluent type A	31HA1	1000		
3109	3,6,9-Triethyl-3,6,9-trimethyl-1,4,7-triperoxonane not more than 27% in diluent type A	31HA1	1000		
3119	tert-Amyl peroxy-2-ethylhexanoate, not more than 62% in diluent type A	31HA1	1000	+15 °C	+20 °C

4.1.4.3, packing instruction LP902 Under “**Packaged articles**”, replace “Packagings conforming to the packing group III performance level.” by:

“Rigid large packagings conforming to the packing group III performance level, made of:

- steel (50A)
- aluminium (50B)
- metal other than steel or aluminium (50N)
- rigid plastics (50H)
- natural wood (50C)

plywood (50D)  
reconstituted wood (50F)  
rigid fibreboard (50G)".

4.1.4.3, packing instruction LP902 In the paragraph under "**Unpackaged articles:**", amend the end of the sentence to read: "when moved to, from, or between where they are manufactured and an assembly plant including intermediate handling locations."

4.1.4.3, packing instruction LP903 In the second sentence, replace ", including for a battery contained in equipment" by "and for batteries contained in a single item of equipment,". Amend the last sentence before the additional requirements to read as follows: "The battery or the equipment shall be packed so that the battery or the equipment is protected against damage that may be caused by its movement or placement within the large packaging."

4.1.4.3, packing instruction LP904 Amend as follows:

In the first sentence, after "or defective batteries", add "and to damaged or defective cells and batteries contained in a single item of equipment". At the end of the first sentence, delete ", including those contained in equipment".

Amend the second sentence to read as follows: "The following large packagings are authorized for a single damaged or defective battery and for damaged or defective cells and batteries contained in a single item of equipment, provided the general provisions of **4.1.1** and **4.1.3** are met."

In the third sentence, replace "containing batteries" by "containing cells and batteries".

Before "steel (50A)", insert the following new line:

"Rigid large packagings conforming to the packing group II performance level, made of:".

After "plywood (50D)", delete "Packagings shall conform to the packing group II performance level."

In 1., amend the beginning of the first sentence to read as follows: "The damaged or defective battery or equipment containing such cells or batteries shall be ...".

In 2., amend the beginning of the sentence to read "The inner packaging". Replace "non-conductive" by "electrically non-conductive".

In 4., after "movement of the battery" add "or the equipment". Replace "non-conductive" by "electrically non-conductive".

In the last sentence, after "For leaking batteries", add "and cells,".

In the additional requirements, after "Batteries" add "and cells".

4.1.4.3 Add the following new packing instruction LP03:

LP03	PACKING INSTRUCTION	LP03
This instruction applies to UN Nos. 3537, 3538, 3540, 3541, 3546, 3547 and 3548.		
(1) The following large packagings are authorized, provided that the general provisions of <b>4.1.1</b> and <b>4.1.3</b> are met: Rigid large packagings conforming to the packing group II performance level made of: steel (50A); aluminium (50B); metal other than steel or aluminium (50N);		

rigid plastics (50H);  
 natural wood (50C);  
 plywood (50D);  
 reconstituted wood (50F);  
 rigid fibreboard (50G).

- (2) Additionally, the following conditions shall be met:
- (a) Receptacles within articles containing liquids or solids shall be constructed of suitable materials and secured in the article in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the article itself or the outer packaging;
  - (b) Receptacles containing liquids with closures shall be packed with their closures correctly oriented. The receptacles shall in addition conform to the internal pressure test provisions of 6.1.5.5;
  - (c) Receptacles that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials shall be properly secured. Any leakage of the contents shall not substantially impair the protective properties of the article or of the outer packaging;
  - (d) Receptacles within articles containing gases shall meet the requirements of Section 4.1.6 and Chapter 6.2 as appropriate or be capable of providing an equivalent level of protection as packing instructions P200 or P208; and
  - (e) Where there is no receptacle within the article, the article shall fully enclose the dangerous substances and prevent their release under normal conditions of transport.
- (3) Articles shall be packed to prevent movement and inadvertent operation during normal conditions of transport.

4.1.4.3 Add the new following packing instruction LP905:

LP905	PACKING INSTRUCTION	LP905
This instruction applies to UN Nos. 3090, 3091, 3480 and 3481 production runs consisting of not more than 100 cells and batteries and to pre-production prototypes of cells and batteries when these prototypes are transported for testing.		
The following large packagings are authorized for a single battery and for cells and batteries contained in a single item of equipment, provided that the general provisions of 4.1.1 and 4.1.3 are met:		
(1) For a single battery:		
Rigid large packagings conforming to the packing group II performance level, made of:		
steel (50A);		
aluminium (50B);		
metal other than steel or aluminium (50N);		
rigid plastics (50H);		
natural wood (50C);		
plywood (50D);		
reconstituted wood (50F);		
rigid fibreboard (50G).		
Large packagings shall also meet the following requirements:		
(a) A battery of different size, shape or mass may be packed in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested;		
(b) The battery shall be packed in an inner packaging and placed inside the outer packaging;		
(c) The inner packaging shall be completely surrounded by sufficient non-combustible and electrically non-conductive thermal insulation material to protect against a dangerous evolution of heat;		
(d) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the battery within the package that may lead to damage and a dangerous condition during transport. When cushioning material is used to meet this requirement it shall be non-combustible and electrically non-conductive; and		



- (e) Non-combustibility shall be assessed according to a standard recognized in the country where the large packaging is designed or manufactured.
- (2) For cells or batteries contained in a single item of equipment:  
Rigid large packagings conforming to the packing group II performance level, made of:
- Steel (50A);
  - Aluminium (50B);
  - Metal other than steel or aluminium (50N);
  - Rigid plastics (50H);
  - Natural wood (50C);
  - Plywood (50D);
  - Reconstituted wood (50F);
  - Rigid fibreboard (50G).
- Large packagings shall also meet the following requirements:
- (a) A single item of equipment of different size, shape or mass may be packed in an outer packaging of a tested design type listed above provided the total gross mass of the package does not exceed the gross mass for which the design type has been tested;
  - (b) The equipment shall be constructed or packed in such a manner as to prevent accidental operation during transport;
  - (c) Appropriate measures shall be taken to minimize the effects of vibration and shocks and prevent movement of the equipment within the package that may lead to damage and a dangerous condition during transport. When cushioning material is used to meet this requirement, it shall be non-combustible and electrically non-conductive; and
  - (d) Non-combustibility shall be assessed according to a standard recognized in the country where the large packaging is designed or manufactured.

**Additional requirement:**

Cells and batteries shall be protected against short circuit.

## 4.1.4.3 Add the following new packing instruction LP906:

LP906	PACKING INSTRUCTION	LP906
This instruction applies to single damaged or defective batteries of UN Nos. 3090, 3091, 3480 and 3481 liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport.		
The following large packagings are authorized, provided that the general provisions of 4.1.1 and 4.1.3 are met: For a single battery and batteries contained in a single item of equipment: Rigid large packagings conforming to the packing group I performance level, made of:		
<ul style="list-style-type: none"> <li>steel (50A);</li> <li>aluminium (50B);</li> <li>metal other than steel or aluminium (50N);</li> <li>rigid plastics (50H);</li> <li>plywood (50D);</li> <li>rigid fibreboard (50G)</li> </ul>		
(1) The large packaging has to be capable of meeting the following additional performance requirements in case of rapid disassembly, dangerous reaction, production of a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours of the battery:		
<ul style="list-style-type: none"> <li>(a) The outside surface temperature of the completed package shall not have a temperature of more than 100 °C. A momentary spike in temperature up to 200 °C is acceptable;</li> </ul>		

- (b) No flame shall occur outside the package;
  - (c) No projectiles shall exit the package;
  - (d) The structural integrity of the package shall be maintained; and
  - (e) The large packagings shall have a gas management system (e.g. filter system, air circulation, containment for gas, gas tight packaging etc.), as appropriate.
- (2) The additional large packaging performance requirements shall be verified by a test as specified by the competent authority<sup>a</sup>.
- A verification report shall be available on request. As a minimum requirement, the battery name, the battery number, the mass, type, energy content of the batteries, the large packaging identification and the test data according to the verification method as specified by the competent authority shall be listed in the verification report.
- (3) When dry ice or liquid nitrogen is used as a coolant, the requirements of section 5.5.3 shall apply. The inner packaging and outer packaging shall maintain their integrity at the temperature of the refrigerant used as well as the temperatures and the pressures which could result if refrigeration were lost.

**Additional requirement:**

Batteries shall be protected against short circuit.

- <sup>a</sup> *The following criteria, as relevant, may be considered to assess the performance of the large packaging:*
- (a) *The assessment shall be done under a quality management system (as described e.g. in section 2.9.4. (e)) allowing for the traceability of tests results, reference data and characterization models used;*
  - (b) *The list of hazards expected in case of thermal runaway for the battery type, in the condition it is transported (e.g. usage of an inner packaging, state of charge (SOC), use of sufficient non-combustible, electrically non-conductive and absorbent cushioning material etc.), shall be clearly identified and quantified; the reference list of possible hazards for lithium batteries (rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours) can be used for this purpose. The quantification of this hazards shall rely on available scientific literature;*
  - (c) *The mitigations effects of the large packaging shall be identified and characterized, based on the nature of the protections provided and the construction material properties. A list of technical characteristics and drawings shall be used to support this assessment (Density [ $\text{kg}\cdot\text{m}^{-3}$ ], specific heat capacity [ $\text{J}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$ ], heating value [ $\text{kJ}\cdot\text{kg}^{-1}$ ], thermal conductivity [ $\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ ], melting temperature and flammability temperature [K], heat transfer coefficient of the outer packaging [ $\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ ], ...);*
  - (d) *The test and any supporting calculations shall assess the result of a thermal run-away of the battery inside the large packaging in the normal conditions of transport;*
  - (e) *In case the SOC of the battery is not known, the assessment used, shall be done with the higher possible SOC corresponding to the battery use conditions;*
  - (f) *The surrounding conditions in which the large packaging may be used and transported shall be described (including for possible consequences of gas or smoke emissions on the environment, such as ventilation or other methods) according to the gas management system of the packaging;*
  - (g) *The tests or the model calculation shall consider the worst case scenario for the thermal runaway triggering and propagation inside the battery: this scenario includes the worst possible failure in the normal transport condition, the maximum heat and flame emissions for the possible propagation of the reaction;*
  - (h) *The scenario consequences shall be assessed over a period covering all possible consequences (i.e. a period of 24 hours).*

- 4.1.5.12 The amendment does not apply to the English version.
- 4.1.6.1.4 In the third sentence, replace “risk” by “hazard”.
- 4.1.7.2.3 At the end, replace “7.1.5.3.1” by “7.1.5.3”.

4.1.8.1 The amendment does not apply to the English version.

4.1.9.1.5 Replace “risk” by “hazard” (twice).

## Chapter 4.2

4.2.1.19.1 Replace “risk” by “hazard”.

4.2.5.2.6, portable tank instruction T23 In the first line after the title, add a new sentence to read as follows: “The formulations listed below may also be transported packed in accordance with packing method OP8 of packing instruction P520 of 4.1.4.1, with the same control and emergency temperatures, if applicable.”.

4.2.5.2.6, portable tank instruction T23, footnote (d) Replace “risk” by “hazard”.

4.2.5.3, portable tank special provision TP10 Add the following new sentence at the end: “A portable tank may be offered for transport after the date of expiry of the last lining inspection for a period not to exceed three months beyond the date of expiry of the last testing, after emptying but before cleaning, for purposes of performing the next required test or inspection prior to refilling.”.

## Chapter 4.3

4.3.1.12 The amendment does not apply to the English version.

## Chapter 5.1

5.1.1 At the end, add the following Note:

*“NOTE: In accordance with the GHS, a GHS pictogram not required by these Regulations should only appear in transport as part of a complete GHS label and not independently (see GHS 1.4.10.4.4).”.*

5.1.4 Replace “risk” by “hazard” twice.

## Chapter 5.2

5.2.1.3 After “Salvage packagings” add “including large salvage packagings”.

5.2.2.1.1 Replace “risks” by “hazards” and “risk” by “hazard”.

5.2.2.1.2 Replace “risk” by “hazard” 6 times.

5.2.2.1.3 Replace “risk” by “hazard” 3 times.

5.2.2.1.3.1 Replace “risk” by “hazard” twice.

5.2.2.1.4 Replace “risk(s)” by “hazard(s)” 2 times and “risk” by “hazard” (twice).

5.2.2.1.5 Replace “risk” by “hazard”.

5.2.2.1.6 (c) Replace “risk” by “hazard”.

5.2.2.1.9 Replace “risk” by “hazard”.

5.2.2.1.10 Replace “risk” by “hazard” 4 times.

5.2.2.1.11 Replace “risk” by “hazard”.

Add the following new sub-section 5.2.2.1.13:

“5.2.2.1.13 *Labels for articles containing dangerous goods transported as UN Nos. 3537, 3538, 3539, 3540, 3541, 3542, 3543, 3544, 3545, 3546, 3547 and 3548*

5.2.2.1.13.1 Packages containing dangerous goods in articles and dangerous goods in articles transported unpackaged shall bear labels according to 5.2.2.1.2 reflecting the hazards established according to 2.0.5. If the article contains one or more lithium batteries with, for lithium metal batteries, an aggregate lithium content of 2 g or less, and for lithium ion batteries, a Watt-hour rating of 100 Wh or less, the lithium battery mark (Figure 5.2.5) shall be affixed to the package or unpackaged article. If the article contains one or more lithium batteries with, for lithium metal batteries, an aggregate lithium content of more than 2 g and for lithium ion batteries, a Watt-hour rating of more than 100 Wh, the lithium battery label (5.2.2.1.2 No. 9A) shall be affixed to the package or unpackaged article.

5.2.2.1.13.2 When it is required to ensure articles containing liquid dangerous goods remain in their intended orientation, orientation marks meeting 5.2.1.7.1 shall be affixed and visible on at least two opposite vertical sides of the package or of the unpackaged article where possible, with the arrows pointing in the correct upright direction.”

5.2.2.2.1.1.3 In the first sentence, after “the dimensions may be reduced” add “proportionally”. Delete the second and third sentences (“The line inside the edge shall remain 5 mm to the edge of the label. The minimum width of the line inside the edge shall remain 2 mm.”).





5.2.2.2.1.2 In the first sentence, insert ““Gas cylinders – Precautionary labels”” after “ISO 7225:2005” and delete it in the second sentence.


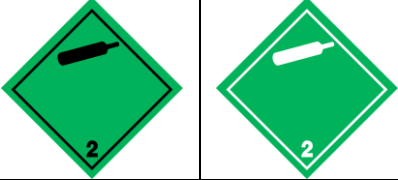

5.2.2.2.1.3 The amendment does not apply to the English version.




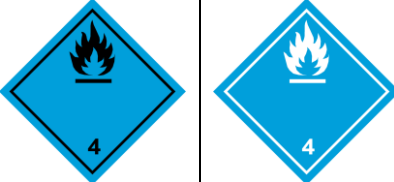
5.2.2.2.1.5 Replace “risk” by “hazard”.





5.2.2.2.2 Amend to read as follows:

“5.2.2.2.2 Specimen labels





Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
<b>Class 1: Explosive substances or articles</b>						
1	Divisions 1.1, 1.2, 1.3	Exploding bomb: black	Orange	1 (black)		** Place for division – to be left blank if explosive is the subsidiary hazard * Place for compatibility group – to be left blank if explosive is the subsidiary hazard
1.4	Division 1.4	1.4: black Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm)	Orange	1 (black)		* Place for compatibility group
1.5	Division 1.5	1.5: black Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm)	Orange	1 (black)		* Place for compatibility group
1.6	Division 1.6	1.6: black Numerals shall be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm × 100 mm)	Orange	1 (black)		* Place for compatibility group




Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
<b>Class 2: Gases</b>						
2.1	Division 2.1: Flammable gases (except as provided for in 5.2.2.2.1.6 d))	Flame: black or white	Red	2 (black or white)		-
2.2	Division 2.2: Non-flammable, non-toxic gases	Gas cylinder: black or white	Green	2 (black or white)		-
2.3	Division 2.3: Toxic gases	Skull and crossbones: black	White	2 (black)		-

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
<b>Class 3: Flammable liquids</b>						
3	-	Flame: black or white	Red	3 (black or white)		-
<b>Class 4: Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases</b>						
4.1	Division 4.1: Flammable solids, self-reactive substances, solid desensitized explosives and polymerizing substances	Flame: black	White with 7 vertical red stripes	4 (black)		-
4.2	Division 4.2: Substances liable to spontaneous combustion	Flame: black	Upper half white, lower half red	4 (black)		-
4.3	Division 4.3: Substances which, in contact with water emit flammable gases	Flame: black or white	Blue	4 (black or white)		-

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
<b>Class 5: Oxidizing substances and organic peroxides</b>						
5.1	Division 5.1: Oxidizing substances	Flame over circle: black	Yellow	5.1 (black)		-
5.2	Division 5.2: Organic peroxides	Flame: black or white	Upper half red, lower half yellow	5.2 (black)		-
<b>Class 6: Toxic substances and infectious substances</b>						
6.1	Division 6.1: Toxic substances	Skull and crossbones: black	White	6 (black)		-
6.2	Division 6.2: Infectious substances	Three crescents superimposed on a circle: black	White	6 (black)		The lower half of the label may bear the inscriptions: "INFECTIOUS SUBSTANCE" and "In the case of damage or leakage immediately notify Public Health Authority" in black colour



Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
<b>Class 7: Radioactive material</b>						
7A	Category I	Trefoil: black	White	7 (black)		Text (mandatory), black in lower half of label: “RADIOACTIVE” “CONTENTS ...” “ACTIVITY ...” One red vertical bar shall follow the word: “RADIOACTIVE”
7B	Category II	Trefoil: black	Upper half yellow with white border, lower half white	7 (black)		Text (mandatory), black in lower half of label: “RADIOACTIVE” “CONTENTS ...” “ACTIVITY ...” In a black outlined box: “TRANSPORT INDEX”; Two red vertical bars shall follow the word: “RADIOACTIVE”
7C	Category III	Trefoil: black	Upper half yellow with white border, lower half white	7 (black)		Text (mandatory), black in lower half of label: “RADIOACTIVE” “CONTENTS ...” “ACTIVITY ...” In a black outlined box: “TRANSPORT INDEX”. Three red vertical bars shall follow the word: “RADIOACTIVE”
7E	Fissile material	-	White	7 (black)		Text (mandatory): black in upper half of label: “FISSILE”; In a black outlined box in the lower half of label: “CRITICALITY SAFETY INDEX”

Label model No.	Division or Category	Symbol and symbol colour	Background	Figure in bottom corner (and figure colour)	Specimen labels	Note
<b>Class 8: Corrosive substances</b>						
8	-	Liquids, spilling from two glass vessels and attacking a hand and a metal: black	Upper half white, lower half black with white border	8 (white)		-
<b>Class 9: Miscellaneous dangerous substances and articles, including environmentally hazardous substances</b>						
9	-	7 vertical stripes in upper half: black	White	9 underlined (black)		-
9A	-	7 vertical stripes in upper half: black; battery group, one broken and emitting flame in lower half: black	White	9 underlined (black)		-

”.

### Chapter 5.3

Amend the title of Chapter 5.3 to read as follows: “PLACARDING AND MARKING OF CARGO TRANSPORT UNITS AND BULK CONTAINERS”.

5.3.1.1.2 In the first sentence, replace “risks” by “hazards” and after “transport unit” add “and bulk container”. In the second sentence, in (b), replace “risks” by “hazards” and after “transport unit” add “and bulk container”.

5.3.1.1.3 In the first sentence, replace “risks” by “hazards” and “risk” by “hazard”. In the second sentence, replace “risk” by “hazard” twice.

5.3.2.3.1 After “transport unit” add “or bulk container” (twice).

5.3.2.3.2 After “cargo transport units” add “and bulk containers”.

### Chapter 5.4

5.4.1.4.1 (c) The amendment does not apply to the English version.

5.4.1.4.1 (d) Replace “risk” by “hazard”.

5.4.1.5.3 In the heading and the following sentence, after “salvage packagings” add “including large salvage packagings”.

5.4.1.5.4 Replace “7.1.5.3.1” by “7.1.5.3”.

5.4.1.5.5 In the heading, after “*Self-reactive substances*”, insert “, *polymerizing substances*”. In the text, replace “and for organic peroxides” by “, organic peroxides and polymerizing substances” and replace “7.1.5.3.1” by “7.1.5.3”.

5.4.1.5.5.1 Replace “risk” by “hazard”.

5.4.1.5.10 In the second paragraph, replace “the distinguishing sign for motor vehicles in international traffic” by “the distinguishing sign used on vehicles in international road traffic<sup>3</sup>”, with footnote 3 reading as follows:

“<sup>3</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968”.

For Chapter 5.4, renumber subsequent footnotes accordingly.

### Chapter 6.1

In the heading of the chapter, delete “(OTHER THAN FOR DIVISION 6.2 SUBSTANCES)”.

6.1.1.1 (a) (i) Replace “(subsidiary risks)” by “(subsidiary hazards)”.

6.1.1.1 Add a new sub-paragraph (e) to read as follows:

“(e) Packagings for Division 6.2 infectious substances of Category A.”.

6.1.3, Note 3 The amendment does not apply to the English version.

6.1.3.1 (f) Replace “indicated by the distinguishing sign for motor vehicles in international traffic” by “indicated by the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.1.3.8 (h) Replace “indicated by the distinguishing sign for motor vehicles in international traffic” by “indicated by the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

Footnote 2 reads as follows: “<sup>2</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.”.

6.1.5.7.1 Under item 8, add the following sentence at the end: “For plastics packagings subject to the internal pressure test in 6.1.5.5, the temperature of the water used.”.

## Chapter 6.2

6.2.1.6.1 (d) Replace the existing Note 2 with the following:

**NOTE 2:** *For seamless steel cylinders and tubes the check of 6.2.1.6.1 (b) and hydraulic pressure test of 6.2.1.6.1 (d) may be replaced by a procedure conforming to ISO 16148:2016 ‘Gas cylinders – Refillable seamless steel gas cylinders and tubes – Acoustic emission examination (AT) and follow-up ultrasonic examination (UT) for periodic inspection and testing’.*

6.2.1.6.1 (d) In Note 3, replace “The hydraulic pressure test may be replaced” by “The check of 6.2.1.6.1 (b) and the hydraulic pressure test of 6.2.1.6.1 (d) may be replaced”.

6.2.2.1.1 In the table, for “ISO 11118:1999”, in the column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2020”.

6.2.2.1.1 In the table, after “ISO 11118:1999”, insert a new line to read as follows:

ISO 11118:2015	Gas cylinders – Non-refillable metallic gas cylinders – Specification and test methods	Until further notice
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6.2.2.1.2 In the table, for “ISO 11120:1999”, in the column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2022”.

6.2.2.1.2 In the table, after “ISO 11120:1999”, insert a new line to read as follows:

ISO 11120:2015	Gas cylinders – Refillable seamless steel tubes of water capacity between 150 l and 3 000 l – Design, construction and testing	Until further notice
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6.2.2.1 Insert a new paragraph 6.2.2.1.8 to read as follows.

“6.2.2.1.8 The following standards apply for the design, construction and initial inspection and test of UN pressure drums, except that inspection requirements related to the conformity assessment system and approval shall be in accordance with 6.2.2.5:

Reference	Title	Applicable for Manufacture
ISO 21172-1:2015	Gas cylinders – Welded steel pressure drums up to 3 000 litres capacity for the transport of gases – Design and construction – Part 1: Capacities up to 1 000 litres <i>NOTE: Irrespective section 6.3.3.4 of this standard, welded steel gas pressure drums with dished ends convex to pressure may be used for the transport of corrosive substances provided all applicable requirements of these</i>	Until further notice

	<i>Regulations are met.</i>	
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

6.2.2.3 In the first table, for “ISO 13340:2001”, in the column “Applicable for manufacture”, replace “Until further notice” by “Until 31 December 2020”.

6.2.2.3 In the first table, insert the following rows at the end:

ISO 14246:2014	Gas cylinders – Cylinder valves – Manufacturing tests and examination	Until further notice
ISO 17871:2015	Gas cylinders – Quick-release cylinders valves- Specification and type testing	Until further notice

6.2.2.4 Amend the end of the introductory sentence to read: “...testing of UN cylinders and their closures:”. Move the last row of the table into a new table, after the existing one, with the same headings and a new introductory sentence to read: “The following standard applies to the periodic inspection and testing of UN metal hydride storage systems:”.

6.2.2.4 In the table, for “ISO 11623:2002”, in column “Applicable”, replace “Until further notice” by “Until 31 December 2020”. After the row for “ISO 11623:2002” insert the following new row:

ISO 11623:2015	Gas cylinders – Composite construction – Periodic inspection and testing	Until further notice
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6.2.2.4 At the end of the first table, insert the following row:

ISO 22434:2006	Transportable gas cylinders – Inspection and maintenance of cylinder 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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6.2.2.7.2 (c) Replace “indicated by the distinguishing signs for motor vehicles in international traffic” by: “the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.2.2.7.4 Under subparagraph (m), insert a new Note to read as follows:

*“NOTE: Information on marks that may be used for identifying threads for cylinders is given in ISO/TR 11364, Gas cylinders – Compilation of national and international valve stem/gas cylinder neck threads and their identification and marking system.”.*

6.2.2.7.4 (n) Replace “indicated by the distinguishing signs for motor vehicles in international traffic<sup>3</sup>” by: “the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.2.2.7.7 (a) Replace “indicated by the distinguishing signs of motor vehicles in international traffic<sup>3</sup>” by: “the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.2.2.9.2 (c) and (h) Replace “indicated by the distinguishing signs of motor vehicles in international traffic<sup>3</sup>” by: “the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.2.2.9.4 (a) Replace “indicated by the distinguishing signs of motor vehicles in international traffic<sup>3</sup>” by: “the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”

Footnote 2 reads as follow:

“<sup>2</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968”.

6.2.4.3 Renumber footnote 2 as footnote 3.

### **Chapter 6.3**

6.3.4.2 (e) Replace “indicated by the distinguishing sign for motor vehicles in international traffic<sup>2</sup>” by: “the distinguishing sign used on vehicles in international road traffic<sup>1</sup>”.

Footnote 1 reads as follows: “<sup>1</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968”.

### **Chapter 6.4**

6.4.23.11 (a) In paragraph (a), replace “the international vehicle registration identification code<sup>1</sup>” by “the distinguishing sign used on vehicles in international road traffic<sup>1</sup>”.

Amend footnote 1 to read as follows: “<sup>1</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.”.

### **Chapter 6.5**

6.5.2.1.1 (e) Replace “indicated by the distinguishing sign for motor vehicles in international traffic<sup>2</sup>” by: “the distinguishing sign used on vehicles in international road traffic<sup>1</sup>”.

Footnote 1 reads as follows: “<sup>1</sup> Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968”

6.5.6.9.3 Amend the last paragraph to read as follows:

“The same IBC or a different IBC of the same design may be used for each drop.”

6.5.6.14.1 Under item 8, add the following sentence: “For rigid plastics and composite IBCs subject to the hydraulic pressure test in 6.5.6.8, the temperature of the water used.”.

### **Chapter 6.6**

6.6.3.1 (e) Replace indicated by the distinguishing sign for motor vehicles in international traffic<sup>2</sup>” by “indicated by the distinguishing sign used on vehicles in international road traffic<sup>1</sup>”.

Footnote 1 should read as follows: “<sup>1</sup> *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*”

## Chapter 6.7

6.7.2.2.16 The amendment does not apply to the English version.

6.7.2.18.1 In the fourth sentence, replace “i.e. the distinguishing sign for use in international traffic as prescribed by the Convention on Road Traffic, Vienna 1968” by “indicated by the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.7.3.14.1 In the fourth sentence, replace “i.e. the distinguishing sign for use in international traffic, as prescribed by the Convention on Road Traffic, Vienna 1968” by “indicated by the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

6.7.4.13.1 In the fourth sentence, replace “i.e. the distinguishing sign for use in international traffic as presented by the Convention on Road Traffic, Vienna 1968” by “indicated by the distinguishing sign for use in international road traffic<sup>2</sup>”.

6.7.5.11.1 In the fourth sentence, replace “i.e. the distinguishing sign for use in international traffic, as prescribed by the Convention on Road Traffic, Vienna 1968” by “indicated by the distinguishing sign used on vehicles in international road traffic<sup>2</sup>”.

Footnote 2 should read as follows: “<sup>2</sup> *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*”

Under chapter 7.2, renumber the following footnotes accordingly.

## Chapter 6.8

6.8.5.5.1 (e) Replace “indicated by the distinguishing signs for motor vehicles in international traffic” by: “the distinguishing signs used on vehicles in international road traffic<sup>2</sup>”.

Footnote 2 reads as follows: “<sup>2</sup> *Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.*”

## Chapter 7.1

7.1.2.3 (c) Replace “risk” by “hazard” (three times).

7.1.5 and 7.1.6 Amend to read as follows:

**“7.1.5 Special provisions applicable to the transport of self-reactive substances of Division 4.1, organic peroxides of Division 5.2 and substances stabilized by temperature control (other than self-reactive substances and organic peroxides)**

7.1.5.1 All self-reactive substances, organic peroxides and polymerizing substances shall be protected from direct sunlight and all sources of heat, and placed in adequately ventilated areas.

**NOTE:** Some substances which are transported under temperature control are prohibited from transport by certain modes.

7.1.5.2 Where a number of packages are assembled in a freight container, closed road vehicle or unit load, the total quantity of substance, the type and number of packages and the stacking arrangement shall not create an explosion hazard.”.

7.1.5.3 *Temperature control provisions*

7.1.5.3.1 These provisions apply to certain self-reactive substances when required by 2.4.2.3.4, and certain organic peroxides when required by 2.5.3.4.1 and certain polymerizing substances when required by 2.4.2.5.2 or special provision 386 of Chapter 3.3 which may only be transported under conditions where the temperature is controlled.

7.1.5.3.2 These provisions also apply to the transport of substances for which:

- (a) The proper shipping name as indicated in column 2 of the Dangerous Goods List of Chapter 3.2 or according to 3.1.2.6 contains the word “STABILIZED”; and
- (b) The self-accelerating decomposition temperature (SADT) or the self-accelerating polymerisation temperature (SAPT)<sup>1</sup> determined for the substance (with or without chemical stabilization) as offered for transport is:
  - (i) 50 °C or less for single packagings and IBCs; or
  - (ii) 45 °C or less for portable tanks.

When chemical inhibition is not used to stabilize a reactive substance which may generate dangerous amounts of heat and gas, or vapour, under normal transport conditions, these substances need to be transported under temperature control. These provisions do not apply to substances which are stabilized by the addition of chemical inhibitors such that the SADT or the SAPT is greater than that prescribed in (b) (i) or (ii), above.

7.1.5.3.3 In addition, if a self-reactive substance or organic peroxide or a substance the proper shipping name of which contains the word “STABILIZED” and which is not normally required to be transported under temperature control is transported under conditions where the temperature may exceed 55 °C, it may require temperature control.

7.1.5.3.4 The “control temperature” is the maximum temperature at which the substance can be safely transported. It is assumed that during transport the temperature of the immediate surroundings of the package does not exceed 55 °C and attains this value for a relatively short time only during each period of 24 hours. In the event of loss of temperature control, it may be necessary to implement emergency procedures. The “emergency temperature” is the temperature at which such procedures shall be implemented.

7.1.5.3.5 Derivation of control and emergency temperatures

Type of receptacle	SADT <sup>a</sup> /SAPT <sup>a</sup>	Control temperature	Emergency temperature
Single packagings and IBCs	20 °C or less over 20 °C to 35 °C over 35 °C	20 °C below SADT/SAPT 15 °C below SADT/SAPT 10 °C below SADT/SAPT	10 °C below SADT/SAPT 10 °C below SADT/SAPT 5 °C below SADT/SAPT

<sup>1</sup> The SAPT shall be determined in accordance with the test procedures established for the SADT for self-reactive substances in accordance with Part II, Section 28 of the Manual of Tests and Criteria.



Portable tanks	< 50 °C	10 °C below SADT/SAPT	5 °C below SADT/SAPT
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<sup>a</sup> i.e. the SADT/SAPT of the substance as packed for transport.

7.1.5.3.6 The control and emergency temperatures are derived using the table in 7.1.5.3.5 from the SADT or from the SAPT which are defined as the lowest temperatures at which self-accelerating decomposition or self-accelerating polymerization may occur with a substance in the packaging, IBC or portable tank as used in transport. An SADT or SAPT shall be determined in order to decide if a substance shall be subjected to temperature control during transport. Provisions for the determination of the SADT and SAPT are given in 2.4.2.3.4, 2.5.3.4.2 and 2.4.2.5.2 for self-reactive substances, organic peroxides and polymerizing substances and mixtures, respectively.

7.1.5.3.7 Control and emergency temperatures, where appropriate, are provided for currently assigned self-reactive substances in 2.4.2.3.2.3 and for currently assigned organic peroxide formulations in 2.5.3.2.4.

7.1.5.3.8 The actual transport temperature may be lower than the control temperature but shall be selected so as to avoid dangerous separation of phases.

7.1.5.4 *Transport under temperature control*

**NOTE:** *Since the circumstances to be taken into account differ for the various modes of transport, only general guidance is provided.*

7.1.5.4.1 Maintenance of the prescribed temperature is an essential feature of the safe transport of substances stabilized by temperature control. In general, there shall be:

- (a) Thorough inspection of the cargo transport unit prior to loading;
- (b) Instructions to the carrier about the operation of the refrigeration system;
- (c) Procedures to be followed in the event of loss of control;
- (d) Regular monitoring of operating temperatures; and
- (e) Provision of a back-up refrigeration system or spare parts.

7.1.5.4.2 Any control and temperature sensing devices in the refrigeration system shall be readily accessible and all electrical connections weather-proof. The temperature of air space within the cargo transport unit shall be measured by two independent sensors and the output shall be recorded so that temperature changes are readily detectable. The temperature shall be checked every four to six hours and logged. When substances having a control temperature of less than +25 °C are carried, the cargo transport unit shall be equipped with visible and audible alarms, powered independently of the refrigeration system, set to operate at or below the control temperature.

7.1.5.4.3 If during transport the control temperature is exceeded, an alert procedure shall be initiated involving any necessary repairs to the refrigeration equipment or an increase in the cooling capacity (e.g. by adding liquid or solid refrigerants). The temperature shall also be checked frequently and preparations made for implementation of the emergency procedures. If the emergency temperature is reached, the emergency procedures shall be initiated.

7.1.5.4.4 The suitability of a particular means of temperature control for transport depends on a number of factors. Factors to be considered include:

- (a) The control temperature(s) of the substance(s) to be transported;

- (b) The difference between the control temperature and the anticipated ambient temperature conditions;
- (c) The effectiveness of the thermal insulation;
- (d) The duration of transport; and
- (e) Allowance of a safety margin for delays.

7.1.5.4.5 Suitable methods for preventing the control temperature being exceeded are, in order of increasing control capability:

- (a) Thermal insulation; provided that the initial temperature of the substance(s) to be transported is sufficiently below the control temperature;
- (b) Thermal insulation with coolant system; provided that:
  - (i) An adequate quantity of coolant (e.g. liquid nitrogen or solid carbon dioxide), allowing a reasonable margin for delay, is carried;
  - (ii) Liquid oxygen or air is not used as coolant;
  - (iii) There is a uniform cooling effect even when most of the coolant has been consumed; and
  - (iv) The need to ventilate the unit before entering is clearly indicated by a warning on the door(s) of the unit;
- (c) Single mechanical refrigeration; provided that for substance(s) to be transported with a flash point lower than the sum of the emergency temperature plus 5 °C explosion-proof electrical fittings are used within the cooling compartment to prevent ignition of flammable vapours;
- (d) Combined mechanical refrigeration system with coolant system; provided that:
  - (i) The two systems are independent of one another;
  - (ii) The provisions in (b) and (c) are complied with;
- (e) Dual mechanical refrigeration system; provided that:
  - (i) Apart from the integral power supply unit, the two systems are independent of one another;
  - (ii) Each system alone is capable of maintaining adequate temperature control; and
  - (iii) For substance(s) to be transported with a flash point lower than the sum of the emergency temperature plus 5 °C explosion-proof electrical fittings are used within the cooling compartment to prevent ignition of flammable vapours.

7.1.6 (Reserved).”

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