

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

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Sub-Committee of Experts on the Transport of Dangerous Goods

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Item 10 (e) of the provisional agenda

Issues related to the Globally Harmonized System of Classification and Labelling of Chemicals: corrosivity criteria

Proposal for revision of chapter 2.8 of the Model Regulations: assignment to packing groups

Transmitted by the expert from Spain

Introduction

1. The purpose of this paper is to provide a method to assign the packing group to the corrosive substances and mixtures, based on physical criteria. Threshold values for these physical criteria have been set in collaboration with the Spanish chemical industry.

Background

2. Chapter 2.8.2.2. says that “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 2.8.2.3) and reactivity with water (including the formation of dangerous decomposition products). New substances...”.

3. In the present proposal this general principles are further explored, in order to provide a simple method to assign packing groups.

4. Two complementary factors are mentioned in 2.8.2.2, inhalation risk and reactivity with water. For both factors criteria based on physical-chemical properties is proposed, to make an unambiguous and clear assignment of the packaging groups possible.

5. Starting point for the proposed method is that the complete range of substances and mixtures classified as corrosive according to the GHS are introduced into the transport regulation; the concept of GHS subcategories can therefore be used. Nevertheless, the same physical-chemical criteria for assignment of the packing group could be used in case a different set of substances or mixtures would be considered as corrosive for the transport regulations.

Inhalation risk

6. The inhalation risk is directly related to the boiling point of the substance/mixture: a lower boiling point means a higher risk of inhalation of the substance/mixture. The threshold value for this criterion is proposed to be set at 65°C, in accordance with the Spanish chemical industry recommendations.

7. 65° C can be considered the upper limit for temperature during transport. A boiling point below this temperature can therefore be considered an indicative value of the existence of a risk of inhalation.

Reactivity with water

8. The reactivity with water is a physical-chemical property used in all Safety Data Sheets. It is also directly addressed and used in CLP regulation (Regulation EC 1272/2008), and is identified there with the phrase **EUH 014** – *Reacts violently with water*.

9. For incorporation into the Model Regulations, it is proposed to refer to the characteristics to which this phrase refers, specified in the ECHA guide “Guidance on the application of the CLP Regulation criteria (Version 4, November 2013):

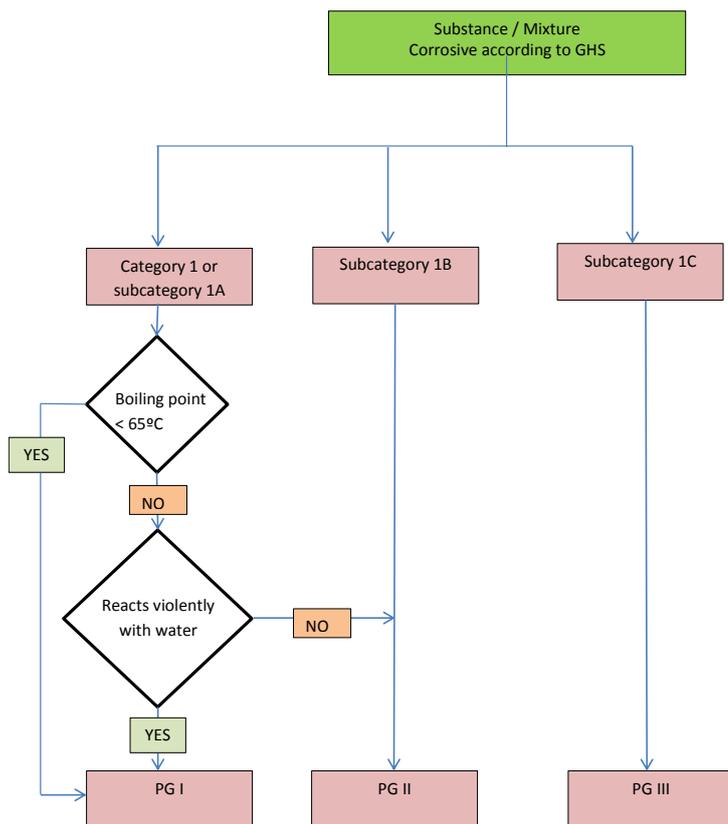
“Substances and mixtures which react dangerously with water are those ones which generate gas in contact with water:

- Heating up of the substance
- Splashing of the substance and thus e.g. contact with skin or additional risk during firefighting
- Pressure rise and bursting of e.g. packaging, tank”

10. Even though CLP Regulation is only used in Europe, most commercial substances or mixtures have been classified according to it, and therefore this criterion would be simple to apply.

Combination of physical criteria with classification of corrosive substances/mixtures according to GHS

11. For those substances/mixtures that are corrosive according to GHS, and not mentioned in the Dangerous Goods List in Chapter 3.2, this physical criteria, in combination with the GHS subcategories, could help to assign the packing groups according to the following diagram:



Flow scheme: Assignment of Packing Groups for substances and mixtures

12. Substances and mixtures shall be assigned to packing groups based on their classification according to GHS into subcategories 1A, 1B and 1C, or category 1 without subcategory, their boiling point and their reactivity with water (see table below):

- Substances and mixtures classified according to GHS as category 1 without subcategory or to subcategory 1A, and a boiling point < 65° and /or which react violently with water¹ are assigned to packing group I
- Substances and mixtures classified according to GHS as category 1 without subcategory or to subcategory 1A and boiling point > 65° and do not react violently with water are assigned to packing group II
- Substances and mixtures classified according to GHS as subcategory 1B are assigned to packing group II
- Substances and mixtures classified according to GHS as subcategory 1C are assigned to packing group III

¹ Substances and mixtures which react violently with water, for the purpose of this chapter, are those which, according to the ECHA guide “Guidance on the application of the CLP criteria (Version 4, November 2013). This condition is fulfilled if EUH 014, according to EU CLP regulation (EC 1272/2008), is assigned to the substance or mixture.

GHS classification	Additional criteria	Packing group
GHS 1 or 1A	Boiling Point < 65°C	PG I
GHS 1 or 1A	Reacts violently with water	PG I
GHS 1A	Boiling Point > 65°C and does not react violently with water	PG II
GHS 1B	-	PG II
GHS 1C	-	PG III

Proposal

13. In the following paragraphs a text proposal is included for the case when the complete range of substances and mixtures classified as corrosive according to the GHS are introduced into the transport regulation. Nevertheless, the same criteria for assignment of the packing group could be used to assign the packing group in case only part of the methods and criteria (and substances and mixtures) classified as corrosive according to GHS would be used.

14. A first version in track changes is included (new text underlined, deleted text appears stricken out), and a second version with the consolidated text is included for easier reading.

Chapter 2.8 (text in track changes)

Class 8 – Corrosive substances

2.8.1 Definition

Class 8 substances (corrosive substances) and mixtures are substances and mixtures which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport.

2.8.2 Assignment of packing groups

2.8.2.1 Substances and ~~preparations~~mixtures of Class 8 are divided among the three packing groups according to their degree of hazard in transport as follows:

- (a) *Packing group I:* Very dangerous substances and ~~preparations~~mixtures;
- (b) *Packing group II:* Substances and ~~preparations~~mixtures presenting medium danger;
- (c) *Packing group III:* Substances and ~~preparations~~mixtures presenting 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 2.8.2.3) and reactivity with water (including the formation of dangerous decomposition products). ~~New substances, including mixtures, can be~~

~~assigned to packing groups on the basis of the length of time of contact necessary to produce full thickness destruction of human skin in accordance with the criteria in 2.8.2.4. Liquids, and solids which may become liquid during transport, which are judged not to cause full thickness destruction of human skin shall still be considered for their potential to cause corrosion to certain metal surfaces in accordance with the criteria in 2.8.2.5 (e) (ii).~~

2.8.2.3 A substance or preparation meeting the criteria of Class 8 having an inhalation toxicity of dusts and mists (LC₅₀) 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).

~~2.8.2.4 In assigning the packing group to a substance in accordance with 2.8.2.2, 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 404¹ or 435². A substance which is determined not to be corrosive in accordance with OECD Test Guideline 430¹³ or 431²⁴ may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.~~

~~¹ OECD Guideline for the testing of chemicals No. 404 "Acute Dermal Irritation/Corrosion" 2002.~~

~~² OECD Guideline for the testing of chemicals No. 435 "In Vitro Membrane Barrier Test Method for Skin Corrosion" 2006.~~

~~¹³ OECD Guideline for the testing of chemicals No. 430 "In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)" 2004²⁰¹³.~~

~~²⁴ OECD Guideline for the testing of chemicals No. 431 "In Vitro Skin Corrosion: Human Skin Model Test" 2004²⁰¹³.~~

2.8.2.5 Packing groups are assigned to corrosive substances and mixtures not mentioned in the Dangerous Goods List in Chapter 3.2 in accordance with the following criteria:

(a) *Packing group I* is assigned to substances ~~that cause full thickness destruction of intact skin tissue within an observation period up to 60 minutes starting after the exposure time of three minutes or less~~ and mixtures classified according to GHS as category 1 without subcategory or to subcategory 1A, and a boiling point below 65°C and /or which react violently with water;

(b) *Packing group II* is assigned to substances ~~that cause full thickness destruction 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~~ and mixtures;

(i) classified according to GHS as category 1 without subcategory or to subcategory 1A and boiling point above 65°C and do not react violently with water; or

(ii) classified according to GHS as subcategory 1B

(c) *Packing group III* is assigned to substances and mixtures that:

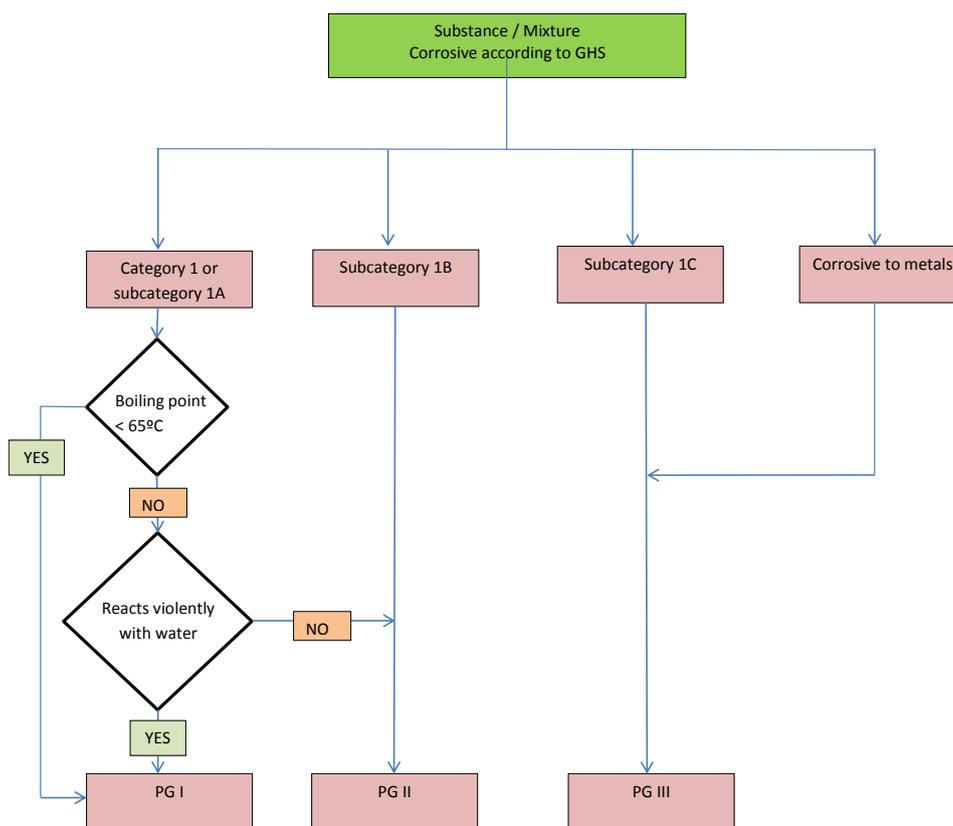
(i) cause full thickness destruction of intact skin tissue within an observation period up to 14 days starting after the

~~exposure time of more than 60 minutes but not more than 4 hours classified according to GHS as subcategory 1C ; or~~

~~(ii) are judged not to cause full thickness destruction of intact skin tissue not fulfilling the criteria under (a), (b) and (c)(i),~~ 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 1: *Substances and mixtures which react violently with water, for the purpose of this chapter, are those which, according to the ECHA guide "Guidance on the application of the CLP criteria (Version 4, November 2013). This condition is fulfilled if EUH 014, according to EU CLP Regulation EC 1272/2008, is assigned to the substance or mixture.*

NOTE 2: *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.*



Flow scheme 2.8.1: Assignment of Packing Groups for substances and mixtures

Table 2.8.2.5 table summarizing the criteria in 2.8.2.5

Packing group	Exposure time	Observation period	Effect
I	<3 min	<60 min	Full thickness destruction of intact skin
II	>3 min <1 h	<14d	Full thickness destruction of intact skin
III	>1 h <4 h	<14d	Full thickness destruction of intact skin
III	-	-	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at least at a test temperature of 55° when tested on both materials

GHS classification	Additional criteria	Packing group
GHS 1 or 1A	Boiling Point < 65°	PG I
GHS 1 or 1A	Reacts violently with water	PG I
GHS 1 or 1A	Boiling Point > 65° and does not react violently with water	PG II
GHS 1B	-	PG II
GHS 1C	-	PG III
-	Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at least at a test temperature of 55° when tested on both materials	PG III

Chapter 2.8 (consolidated version)

Class 8 – Corrosive substances

2.8.1 Definition

Class 8 substances (corrosive substances) and mixtures are substances and mixtures which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport.

2.8.2 Assignment of packing groups

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

- (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 presenting 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 2.8.2.3) and reactivity with water (including the formation of dangerous decomposition products).

2.8.2.3 A substance or preparation meeting the criteria of Class 8 having an inhalation toxicity of dusts and mists (LC50) 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).

2.8.2.4 A substance which is determined not to be corrosive in accordance with OECD Test Guideline 430~~13~~ or 431~~24~~ may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.

1 *OECD Guideline for the testing of chemicals No. 430 "In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)" 2013.*

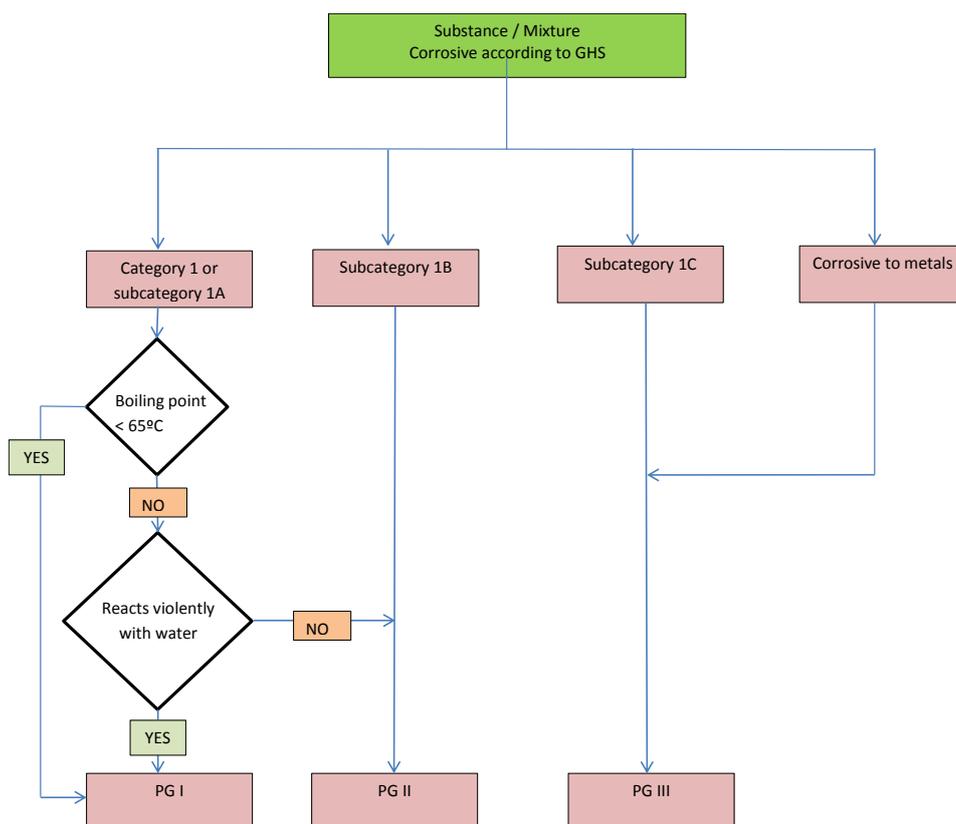
2 *OECD Guideline for the testing of chemicals No. 431 "In Vitro Skin Corrosion: Human Skin Model Test" 2013.*

2.8.2.5 Packing groups are assigned to corrosive substances and mixtures not mentioned in the Dangerous Goods List in Chapter 3.2 in accordance with the following criteria:

- (a) *Packing group I* is assigned to substances and mixtures classified according to GHS as category 1 without subcategory or to subcategory 1A, and a boiling point below 65°C and /or which react violently with water;
- (b) *Packing group II* is assigned to substances and mixtures:
 - (i) classified according to GHS as category 1 without subcategory or to subcategory 1A and boiling point above 65°C and do not react violently with water; or
 - (ii) classified according to GHS as subcategory 1B
- (c) *Packing group III* is assigned to substances and mixtures:
 - (i) classified according to GHS as subcategory 1C ; or
 - (ii) not fulfilling the criteria under (a), (b) and (c)(i), 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 1: Substances and mixtures which react violently with water, for the purpose of this chapter, are those which, according to the ECHA guide "Guidance on the application of the CLP criteria (Version 4, November 2013). This condition is fulfilled if EUH 014, according to EU CLP regulation EC 1272/2008, is assigned to the substance or mixture.

NOTE 2: 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.



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Table 2.8.2.5 table summarizing the criteria in 2.8.2.5

GHS classification	Additional criteria	Packing group
<u>GHS 1 or 1A</u>	<u>Boiling Point < 65° C</u>	<u>PG I</u>
<u>GHS 1 or 1A</u>	<u>Reacts violently with water</u>	<u>PG I</u>
<u>GHS 1 or 1A</u>	<u>Boiling Point > 65° C and does not react violently with water</u>	<u>PG II</u>
<u>GHS 1B</u>	=	<u>PG II</u>
<u>GHS 1C</u>	=	<u>PG III</u>
=	<u>Corrosion rate on either steel or aluminium surfaces exceeding 6.25 mm a year at least at a test temperature of 55° when tested on both materials</u>	<u>PG III</u>