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**Committee of Experts on the Transport of Dangerous Goods  
and on the Globally Harmonized System of Classification  
and Labelling of Chemicals****Sub-Committee of Experts on the Transport  
of Dangerous Goods****Forty-sixth session**

Geneva, 1–9 December 2014

Item 8 (g) of the provisional agenda

**Issues relating to the Globally Harmonized System of Classification criteria and related hazard communication:  
Classification and Labelling of Chemicals: corrosivity criteria****Sub-Committee of Experts on the Globally Harmonized  
System of Classification and Labelling of Chemicals****Twenty-eighth session**

Geneva, 10–12 (a.m) December 2014

Item 2 (d) of the provisional agenda

**Proposal for revision of Chapter 2.8 of the Model Regulations****Transmitted by the expert from the Netherlands<sup>1</sup>****Introduction**

1. For the 45<sup>th</sup> session of the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG Sub-Committee) and the 27<sup>th</sup> session of the Sub-Committee of Experts on the GHS (GHS Sub-Committee), the Netherlands on behalf of the joint TDG-GHS working group on corrosivity criteria, submitted a progress report and a proposal for a revised Chapter 2.8 of the Model Regulations (ST/SG/AC.10/C.3/2014/25 – ST/SG/AC.10/C.4/2014/3; INF.32 (45<sup>th</sup> session TDG Sub-Committee) – INF.9 (27<sup>th</sup> session GHS Sub-Committee). The approach, including the flow scheme, the formula for the assignment of packing groups to mixtures and default classification, received support from the TDG Sub-Committee. Based on this support, the Netherlands offered to prepare a formal proposal for revision of Chapter 2.8 of the Model Regulation for the 46<sup>th</sup> session of the TDG Sub-Committee.

2. The formal proposal presented in this working document is the result of our interpretation of the discussions and (written) comments received during and after the July meetings.

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<sup>1</sup> In accordance with the programme of work of the Sub-Committee for 2013–2014 approved by the Committee at its twenty-sixth session (see ST/SG/AC.10/C.3/84, para. 86 and ST/SG/AC.10/40, para.14).

3. The text of the proposed Chapter 2.8 was developed based on the current text in Chapter 3.2 of the GHS (Rev.5) and Chapter 2.8 of the Model Regulations (Rev.18). For ease of reference, the text of the proposed new Chapter 2.8 in INF 3 (46<sup>th</sup> session TDG Sub-Committee and 28<sup>th</sup> session GHS Sub-Committee) presents all amendments to the current text in visible mode (“track changes”).

## Explanatory notes

4. The new Chapter 2.8 has four main sections. Section 2.8.1 contains definitions and an introduction. Section 2.8.2 describes the GHS criteria for skin corrosivity necessary to determine the hazard classification of the substances and mixtures. Section 2.8.3 describes the criteria for assignment of packing groups. Section 2.8.4 contains criteria for classification and packing group assignment for substances and mixtures corrosive to metals.

5. Several delegations provided written remarks on the proposal presented in INF.32 (45<sup>th</sup> session TDG Sub-Committee) – INF.9 (27<sup>th</sup> session GHS Sub-Committee). Due to the nature of some remarks and diverging views not all suggestions have been incorporated. In particular, the Netherlands wishes to point out the following issues:

- (a) The GHS criteria are integrally reproduced in Chapter 2.8 in the same way that the GHS criteria for environmentally hazardous substances are integrally reproduced in Chapter 2.9.
- (b) Concerns were expressed about the introduction of the sub-classification 8A, 8B and 8C. The Netherlands is of the opinion that the sub-classification is a step to achieve harmonisation of hazard identification while respecting the transport specific assignment of transport conditions. Editorial changes have been made to clarify that sub-classification does not represent subdivisions within Class 8.
- (c) We received several suggestions to improve the GHS criteria, for example in Table 2.8.1 and in Figure 2.8.1. The Netherlands is of the opinion that it is undesirable to modify the GHS criteria only in the Model Regulations as this introduces discrepancies. Suggestions for improvement of the GHS criteria are more appropriately submitted separately to the GHS Sub-Committee for discussion.
- (d) Remarks were made on the non-regulatory nature of the GHS text. Although the GHS text is not a regulatory text, several legislative frameworks have implemented the text into regional and national legislation. Examples include the CLP Regulation for classification of substances and mixtures for supply and use in the European Union, as well as USA OSHA Hazard Communication Standard (HazCom 2012).
- (e) General support was received on the proposal to assign packing group I to substances for which no sub-classification can be made as these substances are expected to be data poor (e.g. only a pH value is available) and for which the hazards have been incompletely characterized.
- (f) We received conflicting remarks on the flow scheme for assigning packing group to mixtures classified based on the additivity calculations. Some suggested expanding the flow scheme to include mixtures classified as 8B and 8C. Another suggestion was to allow PGIII assignment to mixtures classified as 8A. Others supported the flow scheme as it was presented in INF.32-INF.9. In the new Chapter 2.8, we have retained the flow scheme

from INF.32-INF.9. The generic concentration limit chosen, 5%, is identical to the GHS limit for classification of mixtures containing additive substances as corrosive category 1A.

- (g) Concern was expressed over the assignment of packing group to mixtures classified Class 8 without sub-classification. With the aim of maintaining the level of safety in transport, a second flow scheme was developed. In this second flow scheme, a general concentration limit for assignment into PGIII of 1% is introduced. This limit is identical to the GHS limit for classification of mixtures containing non-additive substances as corrosive.
- (h) Currently the OECD Guidelines for the testing of chemicals referenced in Chapter 2.8 are dated whereas in GHS Chapter 3.2 they are not. It can be argued that having undated references means there is no longer a need to monitor for updates and modify the texts. On the other hand maintaining dated references means that newer versions of the guidelines can be assessed for applicability and scope as necessary and users are alerted of updates. If the TDG Sub-Committee wishes to maintain dated references then it will need to consider OECD Test Guidelines 430 and 431 as 2013 versions of both are now available.
- (i) In order to bring Chapter 2.8 in line with the terminology used in the Guiding Principles, editorial changes have been made to section 2.8.3.1 where the wording “hazard in transport” has been replaced with “danger in transport”.

6. The following sections of the proposed new Chapter 2.8 contain text in square brackets: section 2.8.2.2.4 (footnote 2 and 3); Section 2.8.3.4 (d) and Figure 2.8.2 Box 4; Table 2.8.3; Table 2.8.4.

## Proposal

7. Replace current Chapter 2.8 in the Model Regulations with the following text:

### “CHAPTER 2.8

#### CLASS 8 – CORROSIVE SUBSTANCES

##### 2.8.1 Definitions and general provisions

2.8.1.1 *Class 8 (corrosive) substances* are substances which, by chemical action, lead to the production of irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis, following the application of a test substance for up to 4 hours and observation periods of up to 14 days, 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, hazard classification is determined using criteria in section 2.8.2. Substances or mixtures shall be classified in one of the three sub-classifications 8A, 8B or 8C. Where the available data do not allow sub-classification, substances and mixtures shall be assigned to Class 8 without sub-classification. Substances and mixtures corrosive to skin are assigned to a packing group using criteria in section 2.8.3.

**NOTE:** *The sub-classifications 8A, 8B and 8C do not constitute divisions in Class 8.*

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 2.8.4.

2.8.1.4 A substance or a 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 2.6.2.4.1).

## **2.8.2 Criteria for hazard classification of substances or mixtures as corrosive to skin**

For hazard classification of a substance or a mixture into Class 8, all available information on corrosive properties of a substance or a mixture shall be taken into account in a tiered approach (see 2.8.2.2). Emphasis shall be placed upon existing human data, followed by existing animal data, followed by *in vitro* data and then other sources of information. Classification results directly when the data satisfy the criteria. In some cases, classification of a substance or a mixture is made on the basis of the weight of evidence within a tier. In a total weight of evidence approach all available information bearing on the determination of skin corrosion is considered together, including the results of appropriate validated *in vitro* tests, relevant animal data, and human data such as epidemiological and clinical studies and well-documented case reports and observations.

### **2.8.2.1 Hazard classification corrosive to skin based on standard animal test data**

2.8.2.1.1 A substance is corrosive to skin when it produces destruction of skin tissue, namely, visible necrosis through the epidermis and into the dermis, in at least one tested animal after exposure for up to 4 hours. An example of an internationally accepted validated test method for skin corrosion is OECD Test Guideline 404<sup>1</sup>.

2.8.2.1.2 Three sub-categories are provided within the corrosion Class (Class 8, see Table 2.8.1): Class 8A, where corrosive responses are noted following up to 3 minutes exposure and up to 1 hour observation; Class 8B, where corrosive responses are described following exposure greater than 3 minutes and up to 1 hour and observations up to 14 days; and Class 8C, where corrosive responses occur after exposures greater than 1 hour and up to 4 hours and observations up to 14 days.

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

**Table 2.8.1: Skin corrosion hazard classification<sup>a</sup>**

	Criteria
<b>Class 8</b>	Destruction of skin tissue, namely, visible necrosis through the epidermis and into the dermis, in at least one tested animal after exposure $\leq$ 4 h
<b>Class 8A</b>	Corrosive responses in at least one animal following exposure $\leq$ 3 min during an observation period $\leq$ 1 h
<b>Class 8B</b>	Corrosive responses in at least one animal following exposure $>$ 3 min and $\leq$ 1 h and observations $\leq$ 14 days
<b>Class 8C</b>	Corrosive responses in at least one animal after exposures $>$ 1 h and $\leq$ 4 h and observations $\leq$ 14 days

<sup>a</sup> The use of human data is addressed in GHS 3.2.2.2 and in GHS chapters 1.1 (par. 1.1.2.5 (c)) and 1.3 (par. 1.3.2.4.7).

### 2.8.2.2 Hazard classification in a tiered approach

2.8.2.2.1 A tiered approach to the evaluation of initial information shall be considered, where applicable (Figure 2.8.1), recognizing that not all elements may be relevant.

2.8.2.2.2 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.

2.8.2.2.3 Acute dermal toxicity data may be used for classification. If a substance is highly toxic by the dermal route, a skin corrosion/irritation study may not be practicable since the amount of test substance to be applied would considerably exceed the toxic dose and, consequently, would result in the death of the animals. When observations are made of skin corrosion in acute toxicity studies and are observed up through the limit dose, these data shall be used for classification provided that the dilutions used and species tested are equivalent. Solid substances (powders) may become corrosive or irritant when moistened or in contact with moist skin or mucous membranes.

2.8.2.2.4 In vitro alternatives that have been validated and accepted can be used to make classification decisions. Examples of internationally accepted validated test methods for skin corrosion include OECD Test Guidelines 430<sup>2</sup> (Transcutaneous Electrical Resistance Test (TER)), 431<sup>3</sup> (Human Skin Model Test) and 435 (Membrane Barrier Test Method)<sup>4</sup>. Some in vitro tests are suitable to sub-classify. A substance which is determined not to be corrosive in accordance with OECD Test Guideline 430 or 431 may be considered not to be corrosive to skin for the purposes of these Regulations.

2.8.2.2.5 Likewise, pH extremes like  $\leq$  2 and  $\geq$  11.5 may indicate skin effects, especially when associated with significant acid/alkaline reserve (buffering capacity).

<sup>2</sup> OECD Guideline for the testing of chemicals No. 430 "In Vitro Skin Corrosion: Transcutaneous Electrical Resistance Test (TER)" [2004][2013].

<sup>3</sup> OECD Guideline for the testing of chemicals No. 431 "In Vitro Skin Corrosion: Human Skin Model Test" [2004][2013].

<sup>4</sup> OECD Guideline for the testing of chemicals No. 435 "Membrane Barrier Test Method" 2006.

Generally, such substances are expected to produce significant effects on the skin. In the absence of any other information, a substance is considered corrosive (Class 8) if it has a pH ≤ 2 or a pH ≥ 11.5. However, if consideration of acid/alkaline reserve<sup>5</sup> suggests the substance may not be corrosive despite the low or high pH value, this needs to be confirmed by other data, preferably by data from an appropriate validated in vitro test.

2.8.2.2.6 In some cases sufficient information may be available from structurally related substances to make classification decisions.

2.8.2.2.7 The tiered approach provides guidance on how to organize existing information on a substance and to make a weight of evidence decision about hazard assessment and hazard classification (ideally without conducting new animal tests). Although information might be gained from the evaluation of single parameters within a tier (see 2.8.2.2.1), consideration shall be given to the totality of existing information and making an overall weight of evidence determination. This is especially true when there is conflict in information available on some parameters.

Figure 2.8.1: Tiered evaluation for skin corrosion

<u>Step</u>	<u>Parameter</u>	<u>Finding</u>	<u>Conclusion</u>
<b>1a:</b>	Existing human or animal skin corrosion data <sup>a</sup> → ↓ Not corrosive/No data ↓	Skin corrosive →	Classify as <b>skin corrosive</b> <sup>b</sup>
<b>1b:</b>	Existing human or animal skin corrosion data <sup>a</sup> → ↓ No/Insufficient data ↓	Not a skin corrosive →	<b>Not classified</b>
<b>2:</b>	Other existing skin data in animals <sup>c</sup> → ↓ No/Insufficient data ↓	Yes; other existing data showing that substance may cause skin corrosion →	May be deemed to be a <b>skin corrosive</b> <sup>b</sup>
<b>3:</b>	Existing <i>ex vivo/in vitro</i> data <sup>d</sup> → ↓ No/Insufficient data/Negative response ↓	Positive on corrosivity: Skin corrosive →	Classify as <b>skin corrosive</b> <sup>b</sup>

<sup>5</sup> Acid/Alkaline reserve may be determined e.g. by the methodology detailed in Young J.R., How M.J., Walker A.P., Worth W.M.H. (1988): *Classification as corrosive or irritant to skin of preparations containing acidic or alkaline substances, without testing on animals. Toxicology in Vitro* 2, 19-26 and Young J.R., How M.J. (1994): *Product classification as corrosive or irritant by measuring pH and acid / alkali reserve. In Alternative Methods in Toxicology vol. 10 - In Vitro Skin Toxicology: Irritation, Phototoxicity, Sensitization, eds. A.Rougier, A.M. Goldberg and H.I.Maibach, Mary Ann Liebert, Inc. 23-27.*

Figure 2.8.1: Tiered evaluation for skin corrosion

<u>Step</u>	<u>Parameter</u>	<u>Finding</u>	<u>Conclusion</u>
4:	pH-Based assessment (with consideration of acid/alkaline reserve of the chemical) <sup>e</sup> ↓ Not pH extreme, no pH data or extreme pH with data showing low/no acid/alkaline reserve ↓	pH ≤ 2 or ≥ 11.5 with high acid/alkaline reserve or no data for acid/alkaline reserve	Classify as <b>skin corrosive</b>
5:	Validated Structure Activity Relationship (SAR) methods ↓ No/Insufficient data ↓	Skin corrosive	Deemed to be <b>skin corrosive</b> <sup>b</sup>
6:	Consideration of the total weight of evidence <sup>f</sup> ↓	Skin corrosive	Deemed to be <b>skin corrosive</b> <sup>b</sup>
7:	<b>Not classified</b>		

<sup>a</sup> Existing human or animal data could be derived from single or repeated exposure(s), for example in occupational, consumer, transport, or emergency response scenarios; or from purposely-generated data from animal studies conducted according to validated and internationally accepted test methods. Although human data from accident or poison centre databases can provide evidence for classification, absence of incidents is not itself evidence for no classification as exposures are generally unknown or uncertain;

<sup>b</sup> Classify in Class 8/sub-classification, as applicable;

<sup>c</sup> All existing animal data shall be carefully reviewed to determine if sufficient skin corrosion evidence is available. In evaluating such data, however, the reviewer shall bear in mind that the reporting of dermal lesions may be incomplete, testing and observations may be made on a species other than the rabbit, and species may differ in sensitivity in their responses;

<sup>d</sup> Evidence from studies using validated protocols with isolated human/animal tissues or other, non-tissue-based, though validated, protocols shall be assessed. Examples of internationally accepted, validated test methods for skin corrosion include OECD Test Guideline 430 (Transcutaneous Electrical Resistance Test (TER)), 431 (Human Skin Model Test), and 435 (Membrane Barrier Test Method).

<sup>e</sup> Measurement of pH alone may be adequate, but assessment of acid or alkali reserve (buffering capacity) would be preferable. Presently, there is no validated and internationally accepted method for assessing this parameter;

<sup>f</sup> All information that is available shall be considered and an overall determination made on the total weight of evidence. This is especially true when there is conflict in information available on some parameters. Expert judgment shall be exercised prior to making such a determination. Negative results from applicable validated skin corrosion/irritation in vitro tests are considered in the total weight of evidence evaluation.

### 2.8.2.3 *Hazard classification criteria for mixtures*

#### 2.8.2.3.1 *Hazard classification of mixtures when data are available for the complete mixture*

2.8.2.3.1.1 The mixture shall be classified using the criteria for substances, taking into account the tiered approach to evaluate data for Class 8 (as illustrated in Figure 2.8.1).

2.8.2.3.1.2 When considering testing of the mixture, classifiers are encouraged to use a tiered weight of evidence approach as included in the criteria for classification of substances for skin corrosion to help ensure an accurate classification, as well as to avoid unnecessary animal testing. In the absence of any other information, a mixture is considered corrosive (Class 8) if it has a  $\text{pH} \leq 2$  or a  $\text{pH} \geq 11.5$ . However, if consideration of acid/alkaline reserve<sup>6</sup> suggests the mixture may not be corrosive despite the low or high pH value, this needs to be confirmed by other data, preferably by data from an appropriate validated *in vitro* test.

#### 2.8.2.3.2 *Hazard classification of mixtures when data are not available for the complete mixture: bridging principles*

2.8.2.3.2.1 Where the mixture itself 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 characterize the hazards of the mixture, these data will be used in accordance with the following agreed bridging principles. This ensures that the classification process uses the available data to the greatest extent possible in characterizing the hazards of the mixture without the necessity for additional testing in animals.

##### 2.8.2.3.2.2 Dilution

If a tested mixture is diluted with a diluent which has an equivalent or lower corrosivity classification than the least corrosive original ingredient and which is not expected to affect the corrosivity of other ingredients, then the new diluted mixture may be classified as equivalent to the original tested mixture. Alternatively, the method explained in 2.8.2.3.3 could be applied.

##### 2.8.2.3.2.3 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.

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<sup>6</sup> Acid/Alkaline reserve may be determined e.g. by the methodology detailed in Young J.R., How M.J., Walker A.P., Worth W.M.H. (1988): *Classification as corrosive or irritant to skin of preparations containing acidic or alkaline substances, without testing on animals. Toxicology in Vitro* 2, 19-26 and Young J.R., How M.J. (1994): *Product classification as corrosive or irritant by measuring pH and acid/alkali reserve. In Alternative Methods in Toxicology vol. 10 - In Vitro Skin Toxicology: Irritation, Phototoxicity, Sensitization*, eds. A.Rougier, A.M. Goldberg and H.I Maibach, Mary Ann Liebert, Inc. 23-27.



#### 2.8.2.3.2.4 Concentration of mixtures of the highest corrosion sub-classification

If a tested mixture classified in the highest sub-classification for skin corrosion is concentrated, the more concentrated untested mixture shall be classified in the highest corrosion sub-classification without additional testing.

#### 2.8.2.3.2.5 Interpolation within one sub-classification

For three mixtures (X, Y and Z) with identical ingredients, where mixtures X and Y have been tested and are in the same skin corrosion sub-classification, and where untested mixture Z has the same toxicologically active ingredients as mixtures X and Y but has concentrations of toxicologically active ingredients intermediate to the concentrations in mixtures X and Y, then mixture Z is assumed to be in the same skin corrosion sub-classification as X and Y.

#### 2.8.2.3.2.6 Substantially similar mixtures

Given the following:

- (a) Two mixtures: (i) X + Y;  
(ii) Z + Y;
- (b) The concentration of ingredient Y is essentially the same in both mixtures;
- (c) The concentration of ingredient X in mixture (i) equals that of ingredient Z in mixture (ii);
- (d) Data on skin corrosion for X and Z are available and substantially equivalent, i.e. they are in the same sub-classification and are not expected to affect the skin corrosion potential of Y.

If mixture (i) or (ii) is already classified based on test data, then the other mixture can be classified in the same sub-classification.

#### 2.8.2.3.3 *Hazard classification of mixtures when data are available for all ingredients or only for some ingredients of the mixture*

2.8.2.3.3.1 In order to make use of all available data for purposes of classifying the skin corrosion hazards of mixtures, the following assumption has been made and is applied where appropriate in the tiered approach:

The “relevant ingredients” of a mixture are those which are present in concentrations  $\geq 1\%$  (w/w for solids, liquids, dusts, mists and vapours and v/v for gases), unless there is a presumption that an ingredient present at a concentration  $< 1\%$  can still be relevant for classifying the mixture for skin corrosion.

#### 2.8.2.3.3.2 Additivity

In general, the approach to classification of mixtures as corrosive to skin when data are available on the ingredients, but not on the mixture as a whole, is based on the theory of additivity, such that each skin corrosive ingredient contributes to the overall corrosive properties of the mixture in proportion to its potency and concentration. The

mixture is classified as corrosive when the sum of the concentrations of such ingredients exceeds a cut-off value/concentration limit.

2.8.2.3.3.3 Where the sum of all ingredients of a mixture sub-classified 8A, 8B or 8C is each  $\geq 5\%$  the mixture shall be classified as skin sub-classification 8A, 8B or 8C, respectively. Where the sum of 8A ingredients is  $< 5\%$  but the sum of 8A + 8B ingredients is  $\geq 5\%$ , the mixture shall be classified as sub-classification 8B. Similarly, where the sum of 8A + 8B ingredients is  $< 5\%$  but the sum of 8A + 8B + 8C ingredients is  $\geq 5\%$  the mixture shall be classified as sub-classification 8C. Where at least one relevant ingredient in a mixture is classified as Class 8 without sub-classification, the mixture shall be classified as Class 8 without sub-classification if the sum of all ingredients corrosive to skin is  $\geq 5\%$ .

2.8.2.3.3.4 Non-additivity

Particular care must be taken when classifying certain types of chemicals such as acids and bases, inorganic salts, aldehydes, phenols, and surfactants. The approach explained in 2.8.2.3.3.2 and 2.8.2.3.3.3 might not work given that many such substances are corrosive at concentrations  $< 1\%$ . For mixtures containing strong acids or bases the pH shall be used as classification criterion (see 2.8.2.3.1.2) since pH will be a better indicator of corrosion than the concentration limits in 2.8.2.3.3.3. A mixture containing corrosive ingredients that cannot be classified based on the additivity approach due to chemical characteristics that make this approach unworkable, shall be classified as Class 8 if it contains  $\geq 1\%$  of a corrosive ingredient. Classification of mixtures with ingredients for which the approach in 2.8.2.3.3.3 does not apply is summarized in Table 2.8.2 below.

2.8.2.3.3.5 Exemptions

On occasion, reliable data may show that the skin corrosion of an ingredient will not be evident when present at a level above the generic concentration limits/cut-off values mentioned in 2.8.2.3.3.3 and Table 2.8.2. In these cases the mixture may be classified according to those data. On occasion, when it is expected that the skin corrosion of an ingredient will not be evident when present at a level above the generic concentration cut-off values mentioned in 2.8.2.3.3.3 and Table 2.8.2, testing of the mixture may be considered. In those cases the tiered weight of evidence approach shall be applied as described in 2.8.2.2 and illustrated in Figure 2.8.1.

2.8.2.3.3.6 If there are data showing that (an) ingredient(s) may be corrosive to skin at a concentration of  $< 1\%$  (corrosive) the mixture shall be classified accordingly.

**Table 2.8.2: Concentration of ingredients of a mixture when the additivity approach does not apply, that would trigger classification of the mixture as corrosive to skin**

Ingredient	Concentration	Mixture classified as
Acid with pH $\leq 2$	$\geq 1\%$	Class 8
Base with pH $\geq 11.5$	$\geq 1\%$	Class 8
Other skin corrosive (Class 8) ingredient	$\geq 1\%$	Class 8

### 2.8.3 Assignment of packing group

2.8.3.1 Substances and mixtures of Class 8 are divided among three packing groups according to their degree of danger 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.

2.8.3.2 Allocation of substances and mixtures listed in the Dangerous Goods List in Chapter 3.2 to packing groups in Class 8 has been made on the basis of experience taking into account such additional factors as inhalation risk (see 2.8.1.4) and reactivity with water (including the formation of dangerous decomposition products).

2.8.3.3 Unless otherwise specified in section 2.8.3.4 to 2.8.3.5, substances and mixtures not listed by name in the Dangerous Goods List shall be assigned to packing groups as follows:

- (a) Substances and mixtures classified as Class 8A are assigned to packing group I
- (b) Substances and mixtures classified as Class 8B are assigned to packing group II
- (c) Substances and mixtures classified as Class 8C are assigned to packing group III
- (d) Substances and mixtures classified as Class 8 without sub-classification are assigned to packing group I.

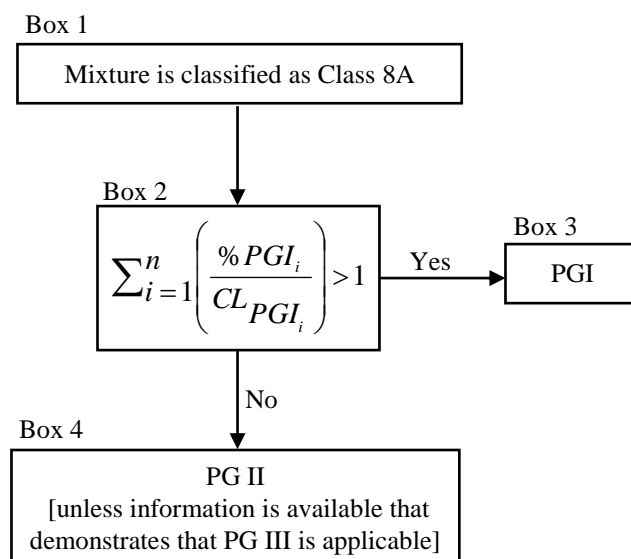
2.8.3.4 Notwithstanding 2.8.3.3, the packing group of mixtures classified as Class 8A based on additivity calculations (see 2.8.2.3.3.2 and 2.8.2.3.3.3) may be assigned using the following method:

- (a) Derive the packing group for each individual ingredient. For substances listed by name in the Dangerous Goods List, the packing group shall be taken directly from the list. For substances not listed by name, the packing group from the most appropriate n.o.s entry shall be used;
- (b) Identify the specific or generic concentration threshold for each individual ingredient. For some substances listed by name on the Dangerous Goods List, the concentration threshold can be taken directly from the list. If no specific concentration threshold is available, generic concentration threshold listed in Table 2.8.3 shall be used;
- (c) Assign the packing group for the mixture in accordance with Figure 2.8.2 [unless information is available that demonstrates that packing group III is applicable].

**Table 2.8.3: Generic concentration limit for determination of the packing group of mixtures classified as Class 8A based on additivity calculations**

Generic Concentration Limit	Concentration
CL PG I	[5% ]

**Figure 2.8.2: Flow chart scheme for assignment of packing group for mixtures with hazard classification 8A based on additivity calculations**



**Notes to Figure 2.8.2:**

*% PGI<sub>i</sub> is the concentration of ingredient i assigned to packing group I.*

*CL<sub>PGI<sub>i</sub></sub> is the concentration limit for ingredient i with packing group I. This concentration limit can be either a specific concentration limit from the Dangerous Goods List or generic concentration limit from Table 2.8.3.*

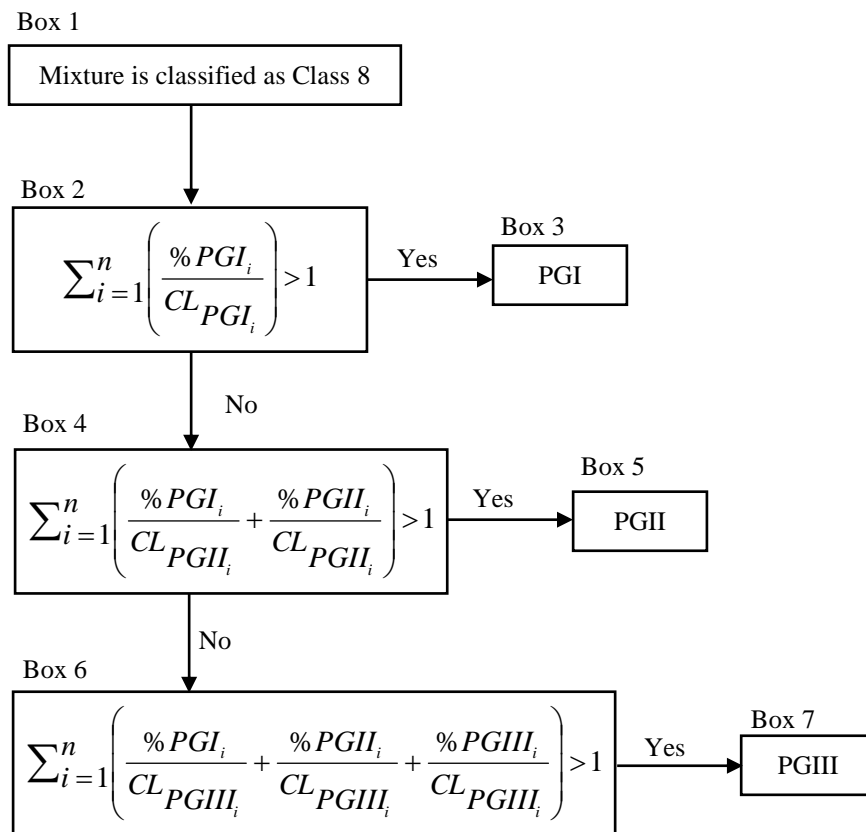
2.8.3.5 Notwithstanding 2.8.3.3, the packing group of mixtures classified as Class 8 without sub-classification may be assigned using the following method:

- (a) Derive the packing group for each individual ingredient. For substances listed by name in the Dangerous Goods List, the packing group shall be taken directly from the list. For substances not listed by name, the packing group from the most appropriate n.o.s entry shall be used;
- (b) Identify the specific or generic concentration threshold for each individual ingredient. For some substances listed by name on the Dangerous Goods List, the concentration threshold can be taken directly from the list. If no specific concentration threshold is available, generic concentration threshold listed in Table 2.8.4 shall be used;
- (c) Assign the packing group for the mixture in accordance with Figure 2.8.3.

**Table 2.8.4: Generic concentration limit for determination of the packing group of mixtures classified as Class 8 without sub-classification**

Generic Concentration Limit	Concentration
CL PG I	[5% ]
CL PG II	[3% ]
CL PG III	[1%]

**Figure 2.8.3: Flow chart scheme for assignment of packing group for mixtures classified as Class 8 without sub-classification based on non-additivity**



**Notes to Figure 2.8.3:**

*% PG I<sub>i</sub> is the concentration of ingredient i assigned to packing group I.*

*% PG II<sub>i</sub> is the concentration of ingredient i assigned to packing group II.*

*% PG III<sub>i</sub> is the concentration of ingredient i assigned to packing group III.*

*CL<sub>PG I<sub>i</sub></sub> is the concentration limit for ingredient i in PG I. This concentration limit can be either a specific concentration limit taken from the Dangerous Goods List or the generic concentration limit from Table 2.8.4.*

*CL<sub>PG II<sub>i</sub></sub> is the concentration limit for ingredient i in PG II. This concentration limit can be either a specific concentration limit taken from the Dangerous Goods List or the generic concentration limit from Table 2.8.4.*

*CL<sub>PG IIIi</sub> is the concentration limit for ingredient i in PG III. This concentration limit can be either a specific concentration limit taken from the Dangerous Goods List or the generic concentration limit from Table 2.8.4.*

**2.8.4 Corrosive to metals**

2.8.4.1 Liquids, and solids which may become liquid during transport, which are judged not to be corrosive to skin, 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 are assigned to Class 8.

2.8.4.2 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.*

2.8.4.3 Packing group III is assigned in accordance with Table 2.8.5.

**Table 2.8.5**

<b>Packing Group</b>	<b>Effect</b>
<b>III</b>	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