

## 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

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Item 10 of the provisional agenda

### ISSUES RELATING TO THE GLOBALLY HARMONIZED SYSTEM OF CLASSIFICATION AND LABELLING OF CHEMICALS (GHS)

#### Alternative text proposal for the implementation of the GHS criteria in Class 8 of the UN Recommendations on the Transport of Dangerous Goods

#### Comments on ST/SG/AC.10/C.3/2009/15

#### Transmitted by the expert from Germany

### **Introduction**

1. In working document ST/SG/AC.10/C.3/2009/15 the Netherlands provided a proposal for the implementation of GHS corrosivity criteria in Class 8 of the Model Regulations on the Transport of Dangerous Goods.
2. Some delegations, including the expert from Germany, supported the proposal by the Netherlands to align the corrosivity criteria of the Model Regulations with those of the GHS. Others, however, expressed the view that, based on the building block approach of the GHS, a full introduction of all GHS corrosivity criteria was not necessary and, as their application might result in a number of consequential re-classifications, does not seem advisable. After a controversial debate, the Sub-Committee agreed to carry forward document ST/SG/AC.10/C.3/2009/15 to the 36<sup>th</sup> session for detailed consideration by a working group.
3. This informal document provides an alternative text proposal for implementation of the GHS criteria in the Model Regulation, which aims at maintaining the existing structure and terminology of Chapter 2.8 of the Model Regulations, 16<sup>th</sup> Edition, as far as possible, concentrating on the introduction of those elements of the GHS which in our view are crucial for the achievement of a harmonised approach.

### **Discussion**

4. The Globally Harmonized System for the Classification and Labelling of Chemicals (GHS) was developed to identify the intrinsic hazards found in substances and mixtures using

harmonized criteria for hazard classification across different regions or legislations and throughout all life-stages of a given product (substance or mixture).

5. Acknowledging that existing regulatory systems may not each require the full coverage of hazards included in the GHS, the GHS defines itself as a collection of building blocks from which to form a regulatory approach. According to the guidance on the interpretation of the building block approach (GHS, 3<sup>rd</sup> edition, paragraph 1.1.3.1.5.4), hazard classes are building blocks, and within a hazard class, each category can be seen as a building block. Nevertheless, “the classification criteria such as the cut-off values or concentration limits for adopted hazard categories should not be altered”.

6. For the classification of substances as “corrosive”, identical cut-off values are used in the Model Regulations and in the GHS. For the classification of mixtures, the GHS outlines two fundamentally different approaches: a) classification according to the same cut-off values as defined for substances; or b) where data for the complete mixture are not available, classification based on data on the individual ingredients, using defined concentration limits. The Model Regulations contain no specific provisions for the classification of mixtures, implying that data on the complete mixture must be generated in any case. Following the above-cited guidance on the GHS building block approach, we see the need to integrate the GHS concentration limits for the classification of mixtures based on individual ingredients into the corrosivity criteria of the Model Regulations. Otherwise, situations may arise, where classifications assigned to a mixture in other regulatory systems (based on the ingredients) are not accepted for transport, and conflicting classifications for the same product may result.

7. The GHS explicitly acknowledges the existence and use of all appropriate and relevant information concerning hazardous properties of substances. In conjunction with defined cut-off values for classification, it therefore also provides some guidance regarding the use of different information sources. The extent and format of this guidance has been criticized. A current, ongoing revision of the Chapter 3.2 of the GHS (see UN/SCEGHS/18/INF.3) indicates that particularly a figure on the tiered testing and evaluation, that is included in the text proposal included in document ST/SG/AC.10/C.3/2009/15 by the Netherlands, is going to be removed from this chapter in the GHS. We therefore propose not to include this figure in the Model Regulations. However, we believe a limited extent of guidance on the consideration of different sources of information may be a helpful and appropriate addition to Chapter 2.8 of the Model Regulation, in particular where it may reduce the need for additional testing.

8. The GHS proposes that pH values  $\leq 2$  or  $\geq 11.5$ , in conjunction with an assessment of buffering capacity, lead to the classification of a substance or mixture as “corrosive” (corresponding to the harmonized corrosion category 1 in the GHS), unless reliable test data demonstrate the contrary. The proposal in document ST/SG/AC.10/C.3/2009/15 to include such considerations also in chapter 2.8 of the Model Regulations has caused particularly vehement disagreement in the past discussion. Irrespective of the scientific validity assigned to this concept, we see little pragmatic value in it for the classification for transport purposes. While in other sectors assignment to a harmonized corrosion category 1 may be sufficient, in the transport sector the need to decide on one of the three Packing Groups (corresponding to the GHS subcategories 1A, 1B and 1C), will in any case require more specific information, and in most

cases reliable test data. We therefore propose not to include consideration of the pH value as a classification criterion in the Model Regulations.

### **Proposal**

9. The Sub-Committee is invited to consider the attached alternative text proposal for the implementation of GHS corrosivity criteria in the Model Regulations on the Transport of Dangerous Goods.

10. To facilitate the discussion in the scheduled working group on corrosivity criteria, Annex 1 of this informal document provides a tabular comparison of the current text of Chapter 2.8 Model Regulations, 16<sup>th</sup> Edition, the text proposal included in document ST/SG/AC.10/C.3/2009/15 by the Netherlands, and our alternative text proposal.

11. Annex 2 of this informal document provides our alternative text proposal as a separate document.

## **ANNEX 1.**

The following table provides a comparison between the current text of Chapter 2.8 Model Regulations, 16<sup>th</sup> Edition, the text proposed in document ST/SG/AC.10/C.3/2009/15 by the Netherlands, and the alternative text proposed by Germany in this informal document.

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
<p style="text-align: center;"><b>CHAPTER 2.8</b> <b>CLASS 8 – CORROSIVE SUBSTANCES</b></p> <p><b>2.8.1 Definitions</b></p> <p><i>Class 8 substances (corrosive substances)</i> are substances 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 means of transport.</p> <p><b>2.8.2 Assignment of packing groups</b></p> <p>2.8.2.1 Substances and preparations of Class 8 are divided among the three packing groups according to their degree of hazard in transport as follows:</p> <p style="padding-left: 40px;">(a) <i>Packing group I</i>: Very dangerous substances and preparations;  (b) <i>Packing group II</i>: Substances and preparations presenting medium danger;  (c) <i>Packing group III</i>: Substances and preparations presenting minor danger.</p> <p>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</p>	<p style="text-align: center;"><b>CHAPTER 2.8</b> <b>CLASS 8 – CORROSIVE SUBSTANCES</b></p> <p><b>2.8.1 Definitions</b></p> <p><i>Class 8 substances (corrosive substances)</i> are substances 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 means of transport.</p> <p><i>Skin corrosion</i> is 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.</p> <p>A substance or a mixture that is <i>corrosive to metal</i> is a substance or a mixture which, by chemical action, will materially damage, or even destroy, metals.</p> <p><b>2.8.2 Assignment of packing groups</b></p> <p>2.8.2.1 Substances and preparations of Class 8 are divided among the three packing groups according to their degree of hazard in transport as follows:</p> <p style="padding-left: 40px;">(a) Packing group I: Very dangerous substances and preparations;  (b) Packing group II: Substances and preparations presenting medium danger;  (c) Packing group III: Substances and preparations presenting minor danger.</p> <p>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</p>	<p style="text-align: center;"><b>CHAPTER 2.8</b> <b>CLASS 8 – CORROSIVE SUBSTANCES</b></p> <p><b>2.8.1 Definitions</b></p> <p><i>Class 8 substances (corrosive substances)</i> are substances 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 means of transport.</p> <p><i>Skin corrosion</i> is 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.</p> <p>A substance or a mixture that is <i>corrosive to metal</i> is a substance or a mixture which by chemical action will materially damage, or even destroy, metals.</p> <p><b>2.8.2 Assignment of packing groups</b></p> <p>2.8.2.1 Substances and preparations of Class 8 are divided among the three packing groups according to their degree of hazard in transport as follows:</p> <p style="padding-left: 40px;">(a) <i>Packing group I</i>: Very dangerous substances and preparations;  (b) <i>Packing group II</i>: Substances and preparations presenting medium danger;  (c) <i>Packing group III</i>: Substances and preparations presenting minor danger.</p> <p>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</p>

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
<p>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 (c) (ii).</p> <p>2.8.2.3 A substance or preparation 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).</p> <p>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 Guideline 404 or 435. A substance which is determined not to be corrosive in accordance with OECD Test Guideline 430 or OECD Test Guideline 431 may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.</p> <p>2.8.2.5 Packing groups are assigned to corrosive</p>	<p>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 <u>or synthetic</u> skin in accordance with the criteria in 2.8.3.4, <u>which correspond to the GHS criteria for the classification for skin corrosion</u>. Liquids, and solids, which may become liquid during transport <u>and</u> 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 2.8.6, <u>which correspond to the GHS classification ‘corrosive to metal’</u>.</p> <p>2.8.2.3 A substance or preparation 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).</p> <p>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 Guideline 404 or 435 <u>or on surrogate information as described in 2.8.3.2</u>. A substance, which is determined not to be corrosive in accordance with OECD Test Guideline 430 or OECD Test Guideline 431, may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.</p> <p>2.8.2.5 Packing groups are assigned to corrosive</p>	<p>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 <u>or synthetic</u> skin in accordance with the criteria in 2.8.2.4, <u>which correspond to the GHS criteria for the classification for skin corrosion</u>. Liquids, and solids which may become liquid during transport, <u>and</u> 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 (c) (ii), <u>which correspond to the GHS classification ‘corrosive to metal’</u>.</p> <p>2.8.2.3 A substance or preparation 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).</p> <p>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 Guideline 404 or 435 <u>or on surrogate information as described in 2.8.2.6</u>. A substance which is determined not to be corrosive in accordance with OECD Test Guideline 430 or OECD Test Guideline 431 may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.</p> <p>2.8.2.5 Packing groups are assigned to corrosive</p>

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<p>substances and mixtures in accordance with the following criteria:</p> <p>(a) <i>Packing group I</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;</p> <p>(b) <i>Packing group II</i> 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;</p> <p>(c) <i>Packing group III</i> is assigned to substances that:</p> <p>(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; or</p> <p>(ii) are judged not to cause full thickness destruction 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 <i>Manual of Tests and Criteria</i>, Part III, Section 37.</p>	<p>substances and mixtures in accordance with the following criteria:</p> <p style="text-align: center;"><b>Table 2.8.1 Assignment of Packing group to substances and mixtures based on Skin corrosive subcategory or metal corrosion category</b></p> <p style="text-align: center;">[...]</p> <p>The classification criteria for skin corrosion are included in 2.8.3. (substances) and 2.8.4 (mixtures).</p> <p>The classification criteria for corrosive to metal are included in 2.8.6.</p>	<p>substances and mixtures in accordance with the following criteria:</p> <p>(a) <i>Packing group I</i> is assigned to substances that cause full thickness destruction of intact skin tissue<sup>a</sup> within an observation period up to 60 minutes starting after the exposure time of three minutes or less;</p> <p>(b) <i>Packing group II</i> is assigned to substances that cause full thickness destruction of intact skin tissue<sup>a</sup> within an observation period up to 14 days starting after the exposure time of more than three minutes but not more than 60 minutes;</p> <p>(c) <i>Packing group III</i> is assigned to substances that:</p> <p>(i) cause full thickness destruction of intact skin tissue<sup>a</sup> 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</p> <p>(ii) are judged not to cause full thickness destruction of intact skin tissue<sup>a</sup> 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<sup>b</sup>. 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 <i>Manual of Tests and Criteria</i>, Part III, Section 37.</p> <p><b>NOTES:</b> <sup>a</sup> For the interpretation of animal experiments, destruction of skin tissue is understood as visible necrosis through the epidermis and into the</p>

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<p><i>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.</i></p>	<p><b>2.8.3 Classification criteria for substances as skin corrosive</b></p> <p>2.8.3.1 The GHS harmonized system includes guidance on the use of data elements that are evaluated before animal testing for skin corrosion is undertaken. It also includes hazard categories for corrosion.</p> <p>2.8.3.2 Several factors should be considered in determining the corrosion potential of chemicals before testing is undertaken. Existing human experience and data, including from single or repeated exposure, and animal observations and data should be the first line of analysis, as they give information directly relevant to effects on the skin. In some cases enough information may be available from structurally related compounds to make classification decisions. Likewise, pH extremes like &lt; 2 and &gt; 11.5 may indicate skin effects, especially when buffering capacity is known, although the correlation is not perfect. Generally, such agents are expected to produce significant effects on the skin. If consideration of alkali/acid reserve suggests the substance may not be corrosive despite the low or high pH value, then further testing shall be carried out to confirm this, preferably by use of an appropriate</p>	<p><i>dermis in at least 1 of 3 tested animals after exposure. Corrosive reactions are typified by ulcers, bleeding, bloody scabs and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia and scars. Histopathology should be considered to discern questionable lesions.</i></p> <p><i><sup>b</sup> 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.</i></p> <p>2.8.2.6 In the absence of information from human experience or from experiments as specified in 2.8.2.4, several factors should be considered in determining the corrosion potential of chemicals before new testing is undertaken. In some cases enough information may be available from structurally related compounds to make classification decisions. Likewise, pH extremes like &lt; 2 and &gt; 11.5 may indicate skin effects, especially when buffering capacity is known, although the correlation is not perfect. Generally, such agents are expected to produce significant effects on the skin. Pre-existing animal data should be carefully reviewed to determine if in vivo skin corrosion testing is needed. For example, testing may not be needed when a test material has not produced any skin irritation in an acute skin toxicity test at the limit dose. It also stands to reason that if a chemical is highly toxic by the dermal route, a skin corrosion study may not be practicable since the amount of test substance to be applied would considerably</p>

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	<p>validated <i>in vitro</i> method. It also stands to reason that if a chemical is highly toxic by the dermal route, a skin corrosion 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, additional testing would not be needed, provided that the dilutions used and species tested are equivalent. <i>In vitro</i> alternatives that have been validated and accepted may also be used to help make classification decisions.</p> <p>All the above information that is available on a chemical should be used in determining the need for <i>in vivo</i> skin irritation testing. Although information might be gained from the evaluation of single parameters within a tier (see 2.8.3.3), e.g. caustic alkalis with extreme pH should be considered as skin corrosives, there is merit in considering the totality of existing information and making an overall weight of evidence determination. This is especially true when there is information available on some but not all parameters. Generally, primary emphasis should be placed upon existing human experience and data, followed by animal experience and testing data, followed by other sources of information, but case-by-case determinations are necessary.</p> <p>2.8.3.3 A <i>tiered approach</i> to the evaluation of initial information should be considered, where applicable (Figure 2.8.1), recognizing that all elements may not be relevant in certain cases.</p> <p><b>Figure 2.8.1: Tiered testing and evaluation of skin corrosion potential</b></p>	<p>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, additional testing would not be needed, provided that the dilutions used and species tested are equivalent. It should be kept in mind in evaluating acute skin toxicity information that the reporting of skin 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. In cases where existing information from structurally related compounds, measurements of pH and buffering capacity, or animal studies on acute dermal toxicity indicates that a substance has corrosive properties, but new testing seems necessary for the assignment of packing groups, an appropriate validated <i>in vitro</i> method should be preferred.</p>

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	<p style="text-align: center;">[...]</p> <p>(a) <i>Classify in the appropriate harmonized category, as shown in Table 2.8.2 below;</i></p> <p>(b) <i>Structure-activity and structure-property relationships are presented separately but would be conducted in parallel;</i></p> <p>(c) <i>Measurement of pH alone may be adequate, but assessment of acid or alkali reserve is preferable; methods are needed to assess buffering capacity; If consideration of alkali/acid reserve suggests the substance may not be corrosive despite the low or high pH value, then further testing shall be carried out to confirm this, preferably by use of an appropriate validated in vitro method;</i></p> <p>(d) <i>Pre-existing animal data should be carefully reviewed to determine if in vivo skin corrosion/irritation testing is needed. For example, testing may not be needed when a test material has not produced any skin irritation in an acute skin toxicity test at the limit dose, or produces very toxic effects in an acute skin toxicity test. In the latter case, the material would be classified as being very hazardous by the dermal route for acute toxicity; it is moot whether the material is also irritating or corrosive on the skin. It should be kept in mind in evaluating acute skin toxicity information that the reporting of skin 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;</i></p> <p>(e) <i>Examples of internationally accepted validated in vitro test methods for skin corrosion are OECD Test Guidelines 430, 431 and 435;</i></p> <p>(f) <i>This evidence could be derived from single or repeated exposures.</i></p>	

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	<p><b>2.8.3.4 Corrosion subcategories</b></p> <p>2.8.3.4.1 A single harmonized corrosion category is provided in Table 2.8.2 using the results of animal testing. A corrosive is a test material that produces destruction of skin tissue, namely, visible necrosis through the epidermis and into the dermis, in at least 1 of 3 tested animals after exposure up to a 4-hour duration. Corrosive reactions are typified by ulcers, bleeding, bloody scabs and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia and scars. Histopathology should be considered to discern questionable lesions.</p> <p>2.8.3.4.2 Three subcategories are provided within the corrosive category (see Table 2.8.2): subcategory 1A - where responses are noted following up to 3 minutes exposure and up to 1 hour observation; subcategory 1B - where responses are described following exposure between 3 minutes and 1 hour and observations up to 14 days; and subcategory 1C - where responses occur after exposures between 1 hour and 4 hours and observations up to 14 days. The classification within a subcategory can be reached based on the results of <i>in vitro</i> (OECD 435) or <i>in vivo</i> testing (OECD 404).</p> <p style="text-align: center;"><b>Table 2.8.2 Skin corrosive category and subcategories</b></p> <p style="text-align: center;">[...]</p> <p><b>2.8.4 Classification criteria for mixtures as skin corrosive</b></p> <p><b>2.8.4.1 Classification of mixtures when data are</b></p>	<p><b>2.8.3 Classification criteria for mixtures as skin corrosive</b></p> <p><b>2.8.3.1 Classification of mixtures when data are</b></p>

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	<p><i>available for the complete mixture</i></p> <p>2.8.4.1.1 The mixture will be classified using the criteria for substances, and taking into account the testing and evaluation strategies to develop data for these hazard classes.</p> <p>2.8.4.1.2 Unlike other hazard classes, there are alternative tests available for skin corrosivity of certain types of chemicals that can give an accurate result for classification purposes, as well as being simple and relatively inexpensive to perform. When considering testing of the mixture classifiers are encouraged to use a tiered weight of evidence strategy as included in the criteria for classification of substances for skin corrosion to help ensure an accurate classification, as well as avoid unnecessary animal testing. A mixture is considered corrosive if it has a pH of 2 or less or a pH of 11.5 or greater. If consideration of alkali/acid reserve suggests the substance or-mixture may not be corrosive despite the low or high pH value, then further testing needs to be carried out to confirm this, preferably by use of an appropriate validated <i>in vitro</i> test.</p> <p><b>2.8.4.2</b> <i>Classification of mixtures when data are not available for the complete mixture: Bridging principles</i></p> <p>2.8.4.2.1 Where the mixture itself has not been tested to determine its skin corrosion, but there are sufficient data on 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 rules. 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</p>	<p><b>available for the complete mixture</b></p> <p>2.8.3.1.1 The mixture will be classified using the criteria for substances, based on information as specified in 2.8.2.4 – 2.8.2.6.</p> <p><b>2.8.3.2</b> <b>Classification of mixtures when data are not available for the complete mixture: Bridging principles</b></p> <p>2.8.3.2.1 Where the mixture itself has not been tested to determine its skin corrosion, but there are sufficient data on the individual ingredients and similar tested mixtures to adequately characterise the hazards of the mixture, these data will be used in accordance with the following agreed bridging rules. This ensures that the classification process uses the available data to the greatest extent possible in characterising the hazards of the mixture without the necessity for additional testing</p>

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
	<p>in animals.</p> <p><b>2.8.4.2.2 Dilution</b></p> <p>If a 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 mixture may be classified as equivalent to the original mixture. Alternatively, the method explained in section 2.8.4.3 could be applied.</p> <p><b>2.8.4.2.3 Batching</b></p> <p>The corrosion potential of one production batch of a complex mixture can be assumed to be substantially equivalent to that of another production batch of the same commercial product and produced by or under the control of the same manufacturer, unless there is reason to believe there is significant variation such that the toxicity of the batch has changed. If the latter occurs, new classification is necessary.</p> <p><b>2.8.4.2.4 Concentration of mixtures of the highest corrosion category</b></p> <p>If a tested mixture classified in the highest subcategory for corrosion is concentrated, a more concentrated mixture should be classified in the highest corrosion subcategory without additional testing.</p> <p><b>2.8.4.2.5 Interpolation within one toxicity category</b></p> <p>For three mixtures with identical ingredients, where A and B are in the same corrosion toxicity category and mixture C has the same</p>	<p>in animals.</p> <p><b>2.8.3.2.2 Dilution</b></p> <p>If a 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 mixture may be classified as equivalent to the original mixture. Alternatively, the method explained in section 2.8.3.3 could be applied.</p> <p><b>2.8.3.2.3 Concentration of mixtures assigned to skin corrosivity, packing group I</b></p> <p>If a tested mixture assigned to packing group I for skin corrosion is concentrated, a more concentrated mixture should be assigned to packing group I for skin corrosion without additional testing.</p> <p><b>2.8.3.2.4 Interpolation within one packing group</b></p> <p>For three mixtures with identical ingredients, where A and B are assigned to the same skin corrosion packing group and mixture C has the</p>

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	<p>toxicologically active ingredients with concentrations intermediate to the concentrations of those ingredients in mixtures A and B, then mixture C is assumed to be in the same corrosion category as A and B.</p> <p>2.8.4.2.6 <i>Substantially similar mixtures</i></p> <p>Given the following:</p> <p>(a) Two mixtures  (i) A + B  (ii) C + B;</p> <p>(b) The concentration of ingredient B is essentially the same in both mixtures;</p> <p>(c) The concentration of ingredient A in mixture (i) equals that of ingredient C in mixture (ii);</p> <p>(d) Data on corrosion for A and C are available and substantially equivalent, i.e. they are in the same hazard category and are not expected to affect the toxicity of B.</p> <p>If mixture (i) is already classified based on test data, then mixture (ii) can be classified in the same category.</p> <p>2.8.4.3 <i>Classification of mixtures when data are available for all ingredients or only for some ingredients of the mixture</i></p>	<p>same toxicologically active ingredients with concentrations intermediate to the concentrations of those ingredients in mixtures A and B, then mixture C is assumed to be in the same skin corrosion packing group as A and B.</p> <p>2.8.3.2.5 <i>Substantially similar mixtures</i></p> <p>Given the following:</p> <p>(b) Two mixtures  (i) A + B  (ii) C + B;</p> <p>(b) The concentration of ingredient B is essentially the same in both mixtures;</p> <p>(c) The concentration of ingredient A in mixture(i) equals that of ingredient C in mixture (ii);</p> <p>(d) Data on corrosion for A and C are available and substantially equivalent, i.e. they are in the same packing group and are not expected to affect the toxicity of B.</p> <p>If mixture (i) is already classified based on test data, then mixture (ii) can be assigned to the same packing group.</p> <p>2.8.3.3 <i>Classification of mixtures when data are available for all components or only for some components of the mixture</i></p>

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
	<p>2.8.4.3.1 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:</p> <p>The “relevant ingredients” of a mixture are those which are present in concentrations of 1% (w/w for solids, liquids, dusts, mists and vapours and v/v for gases) or greater, unless there is a presumption (e.g. in the case of corrosive ingredients) that an ingredient present at a concentration of less than 1% can still be relevant for classifying the mixture for skin corrosion.</p> <p>2.8.4.3.2 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 corrosive ingredient contributes to the overall or 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 components exceeds a cut-off value/concentration limit.</p> <p>2.8.4.3.3 Table 2.8.3 below provides the cut-off value/concentration limits to be used to determine if the mixture is considered to be a corrosive to the skin.</p> <p style="text-align: center;"><b>Table 2.8.3: Concentration of ingredients of a mixture classified as Skin corrosive, that would trigger classification of the mixture as Skin corrosive.</b></p> <p style="text-align: center;">[...]</p> <p><i>Note to Table 2.8.3: The sum of all ingredients of a mixture classified as Skin Category 1A, 1B or 1C</i></p>	<p>2.8.3.3.1 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:</p> <p>The “relevant ingredients” of a mixture are those which are present in concentrations of 1% (w/w for solids, liquids, dusts, mists and vapours and v/v for gases) or greater, unless there is a presumption that an ingredient present at a concentration of less than 1% can still be relevant for classifying the mixture for skin corrosion.</p> <p>2.8.3.3.2 In general, the approach to classification of mixtures as corrosive to skin when data are available on the components, but not on the mixture as a whole, is based on the theory of additivity, such that each corrosive component contributes to the overall or 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 components exceeds a cut-off value/concentration limit.</p> <p>2.8.3.3.3 Table 2.8.1 below provides the cut-off value/concentration limits to be used to determine if the mixture is considered to be a corrosive to the skin.</p> <p style="text-align: center;"><b>Table 2.8.1: Concentration of ingredients of a mixture classified as Skin corrosive that would trigger classification of the mixture as Skin corrosive.</b></p> <p style="text-align: center;">[...]</p> <p><i>Note to Table 2.8.1: If the sum of all ingredients of a mixture classified as Skin corrosive, PG I, II, or III,</i></p>

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
	<p><i>respectively, should each be <math>\geq 5\%</math> in order to classify the mixture as either Skin Category 1A, 1B or 1C. In case the sum of the Skin Category 1A ingredients is <math>&lt; 5\%</math> but the sum of Skin Category ingredients 1A+1B is <math>\geq 5\%</math>, the mixture should be classified as Skin Category 1B. Similarly, in case the sum of Skin Category 1A+1B is <math>&lt; 5\%</math> but the sum of Category 1A+1B+1C is <math>\geq 5\%</math> the mixture would be classified as Category 1C.</i></p> <p>2.8.4.3.4 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 2.8.4.3.1 and 2.8.4.3.2 might not work given that many of such substances are corrosive at concentrations <math>&lt; 1\%</math>. For mixtures containing strong acids or bases the pH should be used as classification criteria (see 2.8.4.1.2) since pH will be a better indicator of corrosion than the concentration limits of Table 2.8.3. A mixture containing corrosive ingredients that cannot be classified based on the additivity approach shown in Table 2.8.3, due to chemical characteristics that make this approach unworkable, should be classified as Skin corrosive if it contains <math>\geq 1\%</math> of a corrosive ingredient. Classification of mixtures with ingredients for which the approach in Table 2.8.3 does not apply is summarized in Table 2.8.4 below.</p> <p style="text-align: center;"><b>Table 2.8.4: Concentration of ingredients of a mixture for which the additivity approach does not apply, that would trigger classification of the mixture as hazardous to skin</b></p> <p style="text-align: center;">[...]</p> <p>2.8.4.3.5 On occasion, reliable data may show that</p>	<p><i>respectively, should each be <math>\geq 5\%</math> in order to classify the mixture as either Skin corrosive, PG I, II, or III. In case the sum of the Skin corrosive, PG I ingredients is <math>&lt; 5\%</math> but the sum of Skin corrosive, PG I + II is <math>\geq 5\%</math>, the mixture should be classified as Skin corrosive, PG II. Similarly, in case the sum of Skin corrosive, PG I + II is <math>&lt; 5\%</math> but the sum of PG I + II + III is <math>\geq 5\%</math> the mixture would be classified as Skin corrosive, PG III.</i></p> <p>2.8.3.3.4 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 2.8.3.3.1 and 2.8.3.3.2 might not work given that many of such substances are corrosive at concentrations <math>&lt; 1\%</math>. For mixtures containing strong acids or bases the pH will be a better indicator of corrosion than the concentration limits of Table 2.8.1. A mixture containing corrosive ingredients that cannot be classified based on the additivity approach shown in Table 2.8.1, due to chemical characteristics that make this approach unworkable, should be classified as Corrosive if it contains <math>\geq 1\%</math> of a corrosive ingredient.</p> <p>2.8.3.3.5 On occasion, reliable data may show that</p>

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
	<p>the skin corrosion of an ingredient will not be evident when present at a level above the generic concentration cut-off levels mentioned in Tables 2.8.3 – 2.8.4. In these cases the mixture could be classified according to that data (see also <i>Classification of Hazardous Substances and Mixtures – Use of Cut-Off Values/Concentration Limits</i> (UN Globally Harmonized system of Classification and Labelling of Chemicals paragraph 1.3.3.2)). 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 levels mentioned in Tables 2.8.3 and 2.8.4 testing of the mixture may be considered. In those cases the tiered weight of evidence strategy should be applied as described in 2.8.4.1.4 and illustrated in Figure 2.8.1.</p> <p>2.8.4.3.6 If there are data showing that (an) ingredient(s) may be corrosive at a concentration of &lt; 1% (corrosive), the mixture should be classified accordingly (see also <i>Classification of Hazardous Substances and Mixtures – The Use of Cut-Off Values/Concentration Limits</i> (UN Globally Harmonized system of Classification and Labelling of Chemicals paragraph_1.3.2.3.1.2)).</p> <p><b>2.8.5 Decision Logic for skin corrosion/irritation</b></p> <p>In the UN Globally Harmonized system of Classification and Labelling of Chemicals Chapter 3.2, a decision logic is presented. This decision logic is not part of the harmonized classification system but is provided as additional guidance. It is strongly recommended that the person responsible for classification study the criteria before and during use of the decision logic.</p> <p><b>2.8.6 Classification criteria for substance and</b></p>	<p>the skin corrosion of an ingredient will not be evident when present at a level above the generic concentration cut-off levels mentioned in Table 2.8.1. In these cases the mixture could be classified according to that data. 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 levels mentioned in Table 2.8.1 but reliable data are not available, testing of the mixture may be considered.</p> <p>2.8.3.3.6 If there are data showing that (an) ingredient(s) may be corrosive at a concentration of &lt; 1%, the mixture should be classified accordingly.</p>

Model Regulations 16 <sup>th</sup> Edition:	ST/SG/AC.10/C.3/2009/15:	Alternative text proposed by Germany:
	<p style="text-align: center;"><b>mixtures corrosive to metal</b></p> <p>A substance or a mixture, which is corrosive to metals, is classified in a single category for this class, using the testing in part III, sub-section 37 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, according to the following table:</p> <p style="text-align: center;"><b>Table 2.8.5 : Criteria for substances and mixtures corrosive to metal</b></p> <p style="text-align: center;">[...]</p> <p><i>Note: Where an initial test on either steel or aluminium indicates the substance or mixture being tested is corrosive the follow-up test on the other metal is not required.</i></p> <p><b>2.8.6.1 Guidance</b></p> <p>The corrosion rate can be measured according to the test method of sub-section 37.4 of the UN Recommendations on the Transport of Dangerous Goods, Manual of tests and Criteria. The specimen to be used for the test should be made of the following materials:</p> <ul style="list-style-type: none"> <li>(a) For the purposes of testing steel, steel types S235JR+CR (1.0037 resp.St 37-2), S275J2G3+CR (1.0144 resp.St 44-3), ISO 3574, Unified Numbering System (UNS) G 10200, or SAE 1020.</li> <li>(b) For the purposes of testing aluminium: non-clad types 7075-T6 or AZ5GU-T6.</li> </ul>	

## ANNEX 2.

Alternative text proposed by Germany:

### CHAPTER 2.8 CLASS 8 – CORROSIVE SUBSTANCES

#### 2.8.1 Definitions

Class 8 substances (corrosive substances) are substances 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 means of transport.

*Skin corrosion* is 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.

A substance or a mixture that is *corrosive to metal* is a substance or a mixture which by chemical action will materially damage, or even destroy, metals.

#### 2.8.2 Assignment of packing groups

2.8.2.1 Substances and preparations 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;
- (b) Packing group II: Substances and preparations presenting medium danger;
- (c) Packing group III: Substances and preparations 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 or synthetic skin in accordance with the criteria in 2.8.2.4, which correspond to the GHS criteria for the classification for skin corrosion. Liquids, and solids which may become liquid during transport, and 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 (c) (ii), which correspond to the GHS classification ‘corrosive to metal’.

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 Guideline 404 or 435 or on surrogate information as described in 2.8.2.6. A substance which is determined not to be corrosive in accordance with OECD Test Guideline 430 or OECD Test Guideline 431 may be considered not to be corrosive to skin for the purposes of these Regulations without further testing.

2.8.2.5 Packing groups are assigned to corrosive substances and mixtures in accordance with the following criteria:

(a) *Packing group I* is assigned to substances that cause full thickness destruction of intact skin tissue<sup>a</sup> 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 full thickness destruction of intact skin tissue<sup>a</sup> 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 full thickness destruction of intact skin tissue<sup>a</sup> 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 full thickness destruction of intact skin tissue<sup>a</sup> 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<sup>b</sup>. 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.

**NOTES:** *a For the interpretation of animal experiments, destruction of skin tissue is understood as visible necrosis through the epidermis and into the dermis in at least 1 of 3 tested animals after exposure. Corrosive reactions are typified by ulcers, bleeding, bloody scabs and, by the end of observation at 14 days, by discoloration due to blanching of the skin, complete areas of alopecia and scars. Histopathology should be considered to discern questionable lesions.*

*b 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.*

2.8.2.6 In the absence of information from human experience or from experiments as specified in 2.8.2.4, several factors should be considered in determining the corrosion potential of chemicals before new testing is undertaken. In some cases enough information may be available from structurally related compounds to make classification decisions. Likewise, pH

extremes like  $< 2$  and  $> 11.5$  may indicate skin effects, especially when buffering capacity is known, although the correlation is not perfect. Generally, such agents are expected to produce significant effects on the skin. Pre-existing animal data should be carefully reviewed to determine if *in vivo* skin corrosion testing is needed. For example, testing may not be needed when a test material has not produced any skin irritation in an acute skin toxicity test at the limit dose. It also stands to reason that if a chemical is highly toxic by the dermal route, a skin corrosion 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, additional testing would not be needed, provided that the dilutions used and species tested are equivalent. It should be kept in mind in evaluating acute skin toxicity information that the reporting of skin 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. In cases where existing information from structurally related compounds, measurements of pH and buffering capacity, or animal studies on acute dermal toxicity indicates that a substance has corrosive properties, but new testing seems necessary for the assignment of packing groups, an appropriate validated *in vitro* method should be preferred.

### **2.8.3 Classification criteria for mixtures as skin corrosive**

#### *2.8.3.1 Classification of mixtures when data are available for the complete mixture*

2.8.3.1.1 The mixture will be classified using the criteria for substances, based on information as specified in 2.8.2.4 – 2.8.2.6.

#### *2.8.3.2 Classification of mixtures when data are not available for the complete mixture: Bridging principles*

2.8.3.2.1 Where the mixture itself has not been tested to determine its skin corrosion, but there are sufficient data on the individual ingredients and similar tested mixtures to adequately characterise the hazards of the mixture, these data will be used in accordance with the following agreed bridging rules. This ensures that the classification process uses the available data to the greatest extent possible in characterising the hazards of the mixture without the necessity for additional testing in animals.

#### 2.8.3.2.2 Dilution

If a 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 mixture may be classified as equivalent to the original mixture. Alternatively, the method explained in section 2.8.3.3 could be applied.

#### 2.8.3.2.3 Concentration of mixtures assigned to skin corrosivity, packing group I

If a tested mixture assigned to packing group I for skin corrosion is concentrated, a more concentrated mixture should be assigned to packing group I for skin corrosion without additional testing.

#### 2.8.3.2.4 Interpolation within one packing group

For three mixtures with identical ingredients, where A and B are assigned to the same skin corrosion packing group and mixture C has the same toxicologically active ingredients with concentrations intermediate to the concentrations of those ingredients in mixtures A and B, then mixture C is assumed to be in the same skin corrosion packing group as A and B.

#### 2.8.3.2.5 Substantially similar mixtures

Given the following:

- (a) Two mixtures
  - (i) A + B
  - (ii) C + B;
- (b) The concentration of ingredient B is essentially the same in both mixtures;
- (c) The concentration of ingredient A in mixture(i) equals that of ingredient C in mixture (ii);
- (d) Data on corrosion for A and C are available and substantially equivalent, i.e. they are in the same packing group and are not expected to affect the toxicity of B.

If mixture (i) is already classified based on test data, then mixture (ii) can be assigned to the same packing group.

#### 2.8.3.3 *Classification of mixtures when data are available for all components or only for some components of the mixture*

2.8.3.3.1 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:

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

2.8.3.3.2 In general, the approach to classification of mixtures as corrosive to skin when data are available on the components, but not on the mixture as a whole, is based on the theory of additivity, such that each corrosive component contributes to the overall or 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 components exceeds a cut-off value/concentration limit.

2.8.3.3.3 Table 2.8.1 below provides the cut-off value/concentration limits to be used to determine if the mixture is considered to be a corrosive to the skin.

**Table 2.8.1: Concentration of ingredients of a mixture classified as Skin corrosive that would trigger classification of the mixture as Skin corrosive.**

Sum of ingredients classified as:	Concentration triggering classification of a mixture as:		
	Skin corrosive		
	Packing Group I	Packing Group II	Packing Group III
Skin corrosive, PG I	≥5%		
Skin corrosive, PG I + II		≥5%	
Skin corrosive, PG I + II + III			≥5%

*Note to Table 2.8.1: If the sum of all ingredients of a mixture classified as Skin corrosive, PG I, II, or III, respectively, should each be  $\geq 5\%$  in order to classify the mixture as either Skin corrosive, PG I, II, or III. In case the sum of the Skin corrosive, PG I ingredients is  $< 5\%$  but the sum of Skin corrosive, PG I + II is  $\geq 5\%$ , the mixture should be classified as Skin corrosive, PG II. Similarly, in case the sum of Skin corrosive, PG I + II is  $< 5\%$  but the sum of PG I + II + III is  $\geq 5\%$  the mixture would be classified as Skin corrosive, PG III.*

2.8.3.3.4 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 2.8.3.3.1 and 2.8.3.3.2 might not work given that many of such substances are corrosive at concentrations  $< 1\%$ . For mixtures containing strong acids or bases the pH may be a better indicator of corrosion than the concentration limits of Table 2.8.1. A mixture containing corrosive ingredients that cannot be classified based on the additivity approach shown in Table 2.8.1, due to chemical characteristics that make this approach unworkable, should be classified as Corrosive if it contains  $\geq 1\%$  of a corrosive ingredient.

2.8.3.3.5 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 cut-off levels mentioned in Table 2.8.1. In these cases the mixture could be classified according to that data. 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 levels mentioned in Table 2.8.1 but reliable data are not available, testing of the mixture may be considered.

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

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