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Working Party on the Transport of Dangerous Goods

Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)*

Twelfth session
Geneva, 21-25 January 2008
Item 4 (b) of the provisional agenda

PROPOSALS FOR AMENDMENTS TO THE REGULATIONS ANNEXED TO ADN**

Protection of the aquatic environment

Note by the secretariat

I. INTRODUCTION

1. In accordance with the objectives set by the Inland Transport Committee at its sixty-eighth session, in its programme of work 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.7 (b)), the Joint Meeting of Experts is mandated to consider proposed amendments relating expressly to the Regulations annexed to the European Agreement

* This meeting is organized jointly by the Economic Commission for Europe and the Central Commission for the Navigation of the Rhine.

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concerning the International Carriage of Dangerous Goods by Inland Waterways and pertaining to administrative and technical questions concerning their implementation, in order to ensure the necessary updating of these provisions and the introduction of a uniform, harmonized and coherent system for the regulation of the national and international transport of dangerous goods by inland waterway throughout Europe.

2. In this connection, CCNR has transmitted a proposal aimed at aligning the provisions of ADN concerning the transport of substances hazardous to the aquatic environment with those adopted for navigation on the Rhine (ADNR), which are to enter into force on 1 January 2009.

3. Taking into account the decisions of the RID/ADR/ADN Joint Meeting at its autumn 2007 session (11-21 September 2007) (see ECE/TRANS/WP.15/AC.1/108/Add.2), the ECE secretariat has adapted these proposals to ensure their consistency with RID, ADR and ADN, as indicated in the following paragraphs.

II. PROPOSALS FOR AMENDMENTS TO THE REGULATIONS ANNEXED TO ADN CONCERNING POLLUTANTS OF THE AQUATIC ENVIRONMENT

A. Proposals for amendments to Chapter 1.6 - Transitional measures

4. Add a paragraph 1.6.1.17 to read as follows:

"1.6.1.17 For carriage in packages, substances of Classes 1 to 9, other than those assigned to UN Nos. 3077 or 3082, to which the classification criteria of 2.2.9.1.10 have not been applied and which are not marked in accordance with 5.2.1.8 and 5.3.6 may still be carried until 31 December 2010 without application of the provisions concerning the carriage of environmentally hazardous substances.".

(*References: ECE/TRANS/WP.15/AC.1/CRP.4/Add.5; ECE/TRANS/WP.15/AC.1/108/Add.2*)

5. Amend the following entries in paragraph 1.6.7.2.3.1 (Table of general transitional provisions for tank vessels) to read:

Table of transitional provisions		
Paragraphs	Subject	Time limit and comments
9.3.3.11.7	Distance between the cargo tanks and the outer wall of the vessel	N.R.M. after 01-01-2001 Renewal of certificate of approval after 31-12-2028
	Width of double hull	N.R.M. after 01-01-2007 Renewal of certificate of approval after 31-12-2028
	Distance between the suction well and the bottom spaces	N.R.M. after 01-01-2003 Renewal of certificate of approval after 01-01-2028
9.3.3.15	Stability (damaged condition)	N.R.M. after 01-01-2007 Renewal of certificate of approval after 01-01-2028

6. Add a paragraph 1.6.7.3.2 to read as follows:

"1.6.7.3.2 *Transitional provisions: vessels*

Single-hull tank vessels in service on 1 January 2009 with a dead weight on 1 January 2007 of less than 1,000 tonnes may continue to transport the substances they were authorized to carry on 31 December 2008 until 31 December 2018.

Supply vessels and oil separator vessels in service on 1 January 2009 with a dead weight on 1 January 2007 of less than 300 tonnes may continue to transport the substances they were authorized to carry on 31 December 2028 until 31 December 2038.".

7. Add a subsection 1.6.7.4 to read as follows:

"1.6.7.4 Transitional provisions concerning the transport of substances hazardous to the environment or to health

Transitional periods applicable to substances

By way of derogation from Part 3, Table C, the substances listed below may be transported in accordance with the requirements referred to in the following tables until the date specified [tables reproduced in the quadrilingual informal document INF.3].".

B. Proposals for amendments to Part 2 - Classification

8. Amend 2.1.3.8 to read as follows:

"Substances of Classes 1 to 9, other than UN Nos. 3077 and 3082, meeting the criteria of 2.2.9.1.10 shall, additionally to their hazards of Classes 1 to 9, be considered to be environmentally hazardous substances. Other substances meeting the criteria of 2.2.9.1.10.1 or 2.2.9.1.10.2 shall be assigned to UN Nos. 3077 or 3082 or to identification Nos. 9005 or 9006, as appropriate.".

(*References: ECE/TRANS/WP.15/AC.1/CRP.4/Add.5 or*

ECE/TRANS/WP.15/AC.1/108/Add.2, revised)

9. Amend 2.2.9.1.10 to read as follows:

"2.2.9.1.10.1 For carriage in packages, substances, solutions and mixtures meeting the criteria for Acute 1, Chronic 1 or Chronic 2 in Chapter 2.4 (see also 2.1.3.8) shall be considered to be environmentally hazardous (aquatic environment). Substances which cannot be assigned to other classes in ADN or to other Class 9 entries and which meet these criteria shall be assigned to

UN Nos. 3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., or 3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S, and to packing group III.

2.2.9.1.10.2 For carriage in tank vessels, the substances, solutions and mixtures referred to in 2.2.9.1.10.1 and those meeting the criteria for Acute 2, Acute 3 or Chronic 3 in Chapter 2.4 shall be considered to be environmentally hazardous.

Substances classified as environmentally hazardous which meet the criteria for Acute or Chronic Category 1 shall be assigned to group 'N1'.

Substances classified as environmentally hazardous which meet the criteria for Chronic Categories 2 or 3 shall be assigned to group 'N2'.

Substances classified as environmentally hazardous which meet the criteria for Acute Categories 2 or 3 shall be assigned to group 'N3'.

Substances which meet the criteria of 2.2.9.1.10 shall be assigned to UN Nos. 3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S, or 3077, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., MOLTEN. Those that meet the additional criteria in this paragraph shall be assigned to identification Nos. 9005, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S, MOLTEN, or 9006, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

2.2.9.1.10.3 Notwithstanding the provisions of 2.2.9.1.10.1,

(a) Substances which cannot be assigned to entries other than UN Nos. 3077 and 3082 in Class 9 or to other entries in Classes 1 to 8, but which are identified in Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances,* as amended, as substances to which letter N 'Environmentally hazardous' (R50; R50/53; R51/53) has been allocated; and

(b) Solutions and mixtures (such as preparations and wastes) of substances to which letter N 'Environmentally hazardous' (R50; R50/53; R51/53) has been allocated in Directive 67/548/EEC, as amended, and which, according to Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and

* Official Journal of the European Communities No. 196, of 16 August 1967, pp. 1-5.

administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations,* as amended, are also allocated letter N 'Environmentally hazardous' (R50; R50/53; R51/53) and which cannot be assigned to entries other than UN Nos. 3077 and 3082 in Class 9 or to other entries in Classes 1 to 8;

Shall be assigned to UN Nos. 3077 and 3082, as appropriate.".

(*References:* *ECE/TRANS/WP.15/AC.1/CRP.4/Add.5 or*

ECE/TRANS/WP.15/AC.1/108/Add.2)

10. Add the following two entries at the end of 2.2.9.1.14:

"- Identification No. 9005, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S, MOLTEN, which cannot be assigned to UN No. 3077;

- Identification No. 9006, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., which cannot be assigned to UN No. 3082.".

11. Add a Chapter 2.4 to read as follows:

(*Reference: GHS, 2nd revised edition, ST/SG/AC.10/30/Rev.2, chap. 4.1*)

"2.4 Criteria for substances hazardous to the aquatic environment

2.4.1 General definitions

2.4.1.1 Environmentally hazardous substances include, inter alia, liquid or solid substances pollutant to the aquatic environment and solutions and mixtures of such substances (such as preparations and wastes). For the purposes of this Chapter, 'substance' means chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

2.4.1.2 The aquatic environment may be considered in terms of the aquatic organisms that live in the water, and the aquatic ecosystem of which they are part.** The basis,

* Official Journal of the European Communities No. L 200, of 30 July 1999, pp. 1-68.

** This does not address aquatic pollutants for which there may be a need to consider effects beyond the aquatic environment such as the impacts on human health, etc.

therefore, of the identification of hazard is the aquatic toxicity of the substance or mixture, although this may be modified by further information on the degradation and bioaccumulation behaviour.

2.4.1.3 While the following classification procedure is intended to apply to all substances and mixtures, it is recognized that in some cases, e.g. metals or poorly soluble inorganic compounds, special guidance will be necessary.*

2.4.1.4 The following definitions apply for acronyms or terms used in this section:

- BCF: Bioconcentration Factor;
- BOD: Biochemical Oxygen Demand;
- COD: Chemical Oxygen Demand;
- GLP: Good Laboratory Practices;
- EC_{50}: the effective concentration of substance that causes 50% of the maximum response;
- ErC_{50}: EC_{50} in terms of reduction of growth;
- K_{ow}: octanol/water partition coefficient;
- LC_{50} (50% lethal concentration): the concentration of a substance in water which causes the death of 50% (one half) in a group of test animals;
- $L(E)C_{50}$: LC_{50} or EC_{50};
- NOEC: No Observed Effect Concentration;
- OECD Test Guidelines: test guidelines published by the Organisation for Economic Cooperation and Development (OECD).

2.4.2 Definitions and data requirements

2.4.2.1 The basic elements for classification of environmentally hazardous substances (aquatic environment) are as follows:

- Acute aquatic toxicity;
- Potential for or actual bioaccumulation;

* See annex 10 of GHS.

– Degradation (biotic or abiotic) for organic chemicals; and

– Chronic aquatic toxicity.

2.4.2.2 While data from internationally harmonized test methods are preferred, in practice, data from national methods may also be used where they are considered as equivalent. In general, it has been agreed that freshwater and marine species toxicity data can be considered as equivalent data and are preferably to be derived using OECD Test Guidelines or equivalent according to the principles of Good Laboratory Practices (GLP). Where such data are not available, classification should be based on the best available data.

2.4.2.3 **Acute aquatic toxicity** would normally be determined using a fish 96-hour LC_{50} (OECD Test Guideline 203 or equivalent), a crustacea species 48-hour EC_{50} (OECD Test Guideline 202 or equivalent) and/or an algal species 72- or 96-hour EC_{50} (OECD Test Guideline 201 or equivalent). These species are considered as surrogate for all aquatic organisms, and data on other species such as Lemna may also be considered if the test methodology is suitable.

2.4.2.4 **Bioaccumulation** means net result of uptake, transformation and elimination of a substance in an organism due to all routes of exposure (i.e. air, water, sediment/soil and food).

The **potential for bioaccumulation** would normally be determined by using the octanol/water partition coefficient, usually reported as a log K_{ow} determined by OECD Test Guideline 107 or 117. While this represents a potential to bioaccumulate, an experimentally determined Bioconcentration Factor (BCF) provides a better measure and should be used in preference when available. A BCF should be determined according to OECD Test Guideline 305.

2.4.2.5 **Environmental degradation** may be biotic or abiotic (e.g. hydrolysis) and the criteria reflect this fact. Ready biodegradation can most easily be defined using the OECD biodegradability tests, OECD Test Guideline 301 (A - F). A pass level in these tests can be considered as indicative of rapid degradation in most environments. These are freshwater tests and thus the use of the results from OECD Test Guideline 306, which is more suitable for marine environments, has also been included. Where such data are not available, a BOD_5 (5 days)/COD ratio $\geq$ 0.5 is considered as indicative of rapid degradation. Abiotic degradation such as hydrolysis, primary degradation, both abiotic and biotic, degradation in non-aquatic media and proven rapid degradation in the environment may all be considered in defining rapid degradability.*

* Special guidance on data interpretation is provided in Chapter 4.1 and Annex 9 to GHS.

Substances shall be considered rapidly degradable in the environment if the following criteria are met:

(a) In 28-day ready biodegradation studies, the following levels of degradation are achieved:

(i) Tests based on dissolved organic carbon: 70%;

(ii) Tests based on oxygen depletion or carbon dioxide generation: 60% of theoretical maxima;

These levels of biodegradation must be achieved within 10 days of the start of degradation, which point is taken as the time when 10% of the substance has been degraded; or

(b) In those cases where only BOD and COD data are available, when the ratio of BOD_5/COD is ≥ 0.5; or

(c) If other convincing scientific evidence is available to demonstrate that the substance or mixture can be degraded (biotically and/or abiotically) in the aquatic environment to a level above 70% within a 28-day period.

2.4.2.6 **Chronic toxicity** data are less available than acute data and the range of testing procedures less standardized. Data generated according to OECD Test Guidelines 210 (Fish Early Life Stage) or 211 (Daphnia Reproduction) and 201 (Algal Growth Inhibition) can be accepted. Other validated and internationally accepted tests could also be used. The No Observed Effect Concentrations (NOECs) or other equivalent L(E)Cx may be used.

2.4.3 Classification categories and criteria for substances

NOTA: C*hronic Category 4 of Chapter 4.1 of GHS is reproduced in this section for information, although it is not relevant in the context of ADN*.

2.4.3.1 The following substances shall be considered to be environmentally hazardous (aquatic environment):

(a) For carriage in packages, substances which meet the criteria for Acute 1, Chronic 1 or Chronic 2, according to the tables below; and

(b) For carriage in tank vessels, substances which meet the criteria for Acute 1, Acute 2 or Acute 3, or Chronic 1, Chronic 2 or Chronic 3, according to the tables below.

Acute toxicity

Category: Acute 1	
96 hr LC_{50} (for fish)	≤1 mg/l and/or
48 hr EC_{50} (for crustacea)	≤1 mg/l and/or
72 or 96 hr ErC_{50} (for algae or other aquatic plants)	≤1 mg/l

Category: Acute 2	
96 hr LC_{50} (for fish)	>1 - ≤10 mg/l and/or
48 hr EC_{50} (for crustacea)	>1 - ≤10 mg/l and/or
72 or 96 hr ErC_{50} (for algae or other aquatic plants)	>1 - ≤10 mg/l

Category: Acute 3	
96 hr LC_{50} (for fish)	>10 - ≤100 mg/l and/or
48 hr EC_{50} (for crustacea)	>10 - ≤100 mg/l and/or
72 or 96 hr ErC_{50} (for algae or other aquatic plants)	>10 - ≤100 mg/l

Chronic toxicity

Category: Chronic 1	
96 hr LC_{50} (for fish)	≤ 1 mg/l and/or
48 hr EC_{50} (for crustacea)	≤ 1 mg/l and/or
72 or 96 hr ErC_{50} (for algae or other aquatic plants)	≤ 1 mg/l
and the substance is not rapidly degradable and/or the log K_{ow}	≥ 4 (unless the experimentally determined BCF <500).

Category: Chronic 2	
96 hr LC_{50} (for fish)	> 1 to ≤ 10 mg/l and/or
48 hr EC_{50} (for crustacea)	> 1 to ≤ 10 mg/l and/or
72 or 96 hr ErC_{50} (for algae or other aquatic plants)	> 1 to ≤ 10 mg/l
and the substance is not rapidly degradable and/or the log K_{ow}	≥ 4 (unless the experimentally determined BCF <500), unless the chronic toxicity NOECs are > 1 mg/l.

Category: Chronic 3	
96 hr LC_{50} (for fish)	> 10 to ≤ 100 mg/l and/or
48 hr EC_{50} (for crustacea)	> 10 to ≤ 100 mg/l and/or
72 or 96 hr ErC_{50} (for algae or other aquatic plants)	≥ 10 to ≤ 100 mg/l
and the substance is not rapidly degradable and/or the log K_{ow} experimentally determined BCF <500), unless the chronic toxicity NOECs are > 1 mg/l.	≥ 4 (unless the

Category: Chronic 4

Poorly soluble substances for which no acute toxicity is recorded at levels up to the water solubility, and which are not rapidly degradable and have a log $K_{ow} \geq 4$, indicating a potential to bioaccumulate, will be classified in this category unless other scientific evidence exists showing classification to be unnecessary. Such evidence would include an experimentally determined BCF < 500, or chronic toxicity NOECs > 1 mg/l, or evidence of rapid degradation in the environment.

Substances which come under Chronic Category 4 alone are not considered to be environmentally hazardous in the sense of ADN.

2.4.4 Classification categories and criteria for mixtures

NOTA: C*hronic Category 4 of Chapter 4.1 of GHS is reproduced in this section for information, although it is not relevant in the context of ADN*.

2.4.4.1 The classification system for mixtures covers all classification categories which are used for substances, meaning Acute Categories 1 to 3 and Chronic Categories 1 to 4. In order to make use of all available data for purposes of classifying the aquatic environmental hazards of the mixture, the following assumption has been made and is applied where appropriate.

The 'relevant ingredients' of a mixture are those which are present in a concentration of 1% (mass) or greater, unless there is a presumption (e.g. in the case of highly toxic ingredients) that an ingredient present at less than 1% can still be relevant for classifying the mixture for aquatic environmental hazards.

2.4.4.2 The approach for classification of aquatic environmental hazards is tiered and is dependent upon the type of information available for the mixture itself and for its ingredients. Elements of the tiered approach include:

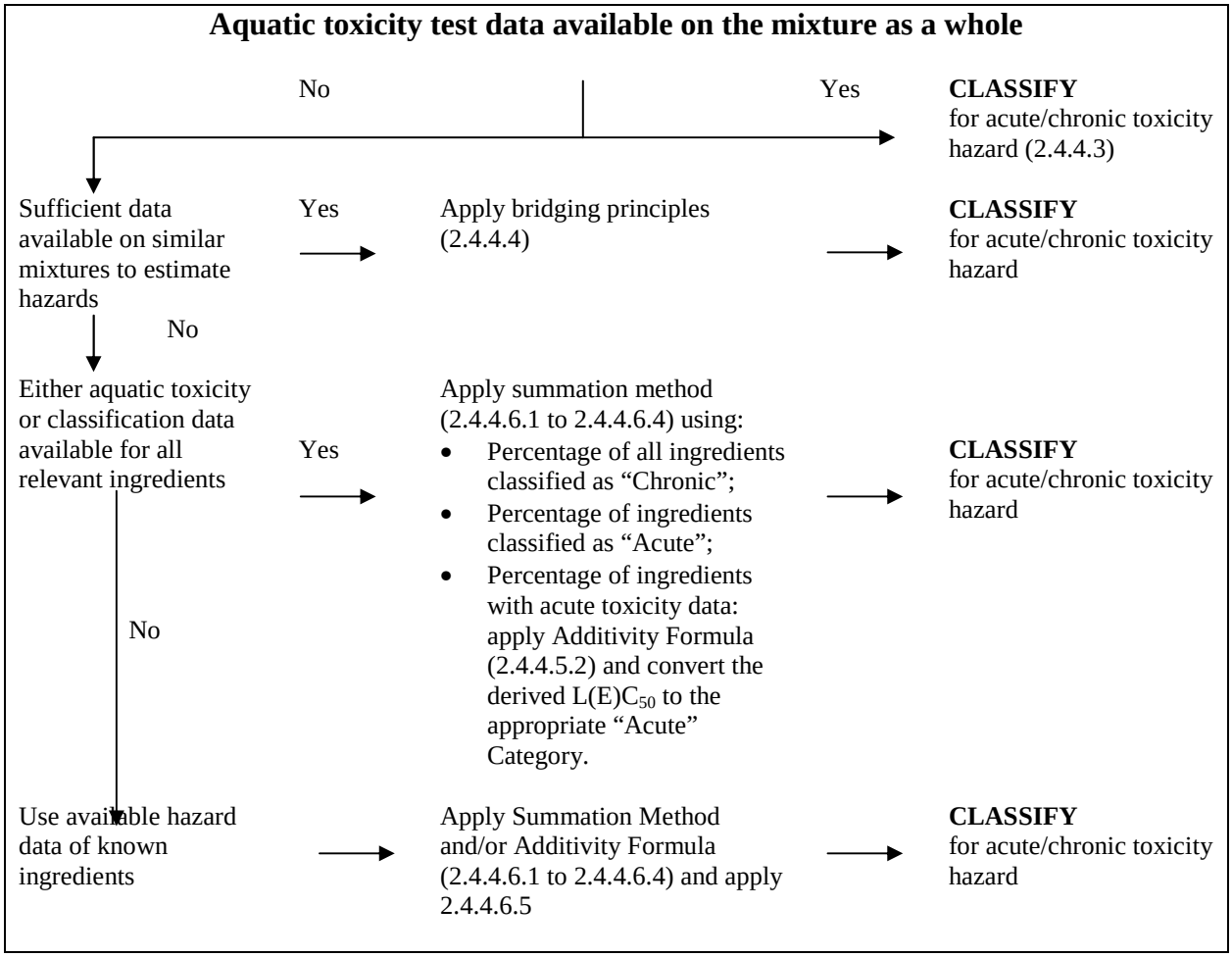
(a) Classification based on tested mixtures;

(b) Classification based on bridging principles,

(c) Use of 'summation of classified ingredients' and/or an 'additivity formula'.

Figure 2.4.4.2 outlines the process to be followed.

Figure 2.4.4.2: Tiered approach to classification of mixtures for acute and chronic environmental hazards



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

2.4.4.3.1 When the mixture as a whole has been tested to determine its aquatic toxicity, it can be classified according to the criteria that have been agreed for substances, but only for acute toxicity. The classification should be based on the data for fish, crustacea, algae and plants. Classification of mixtures by using LC_{50} or EC_{50} data for the mixture as a whole is not possible for chronic categories since both toxicity data and environmental fate data are needed, and there are no degradability and bioaccumulation data for mixtures as a whole. It is not possible to apply the criteria for chronic classification because the data from degradability and bioaccumulation tests of mixtures cannot be interpreted; they are meaningful only for single substances.

2.4.4.3.2 When there is acute toxicity test data (LC_{50} or EC_{50}) available for the mixture as a whole, these data as well as information with respect to the classification of components for chronic toxicity should be used to complete the classification for tested mixtures as follows. When chronic (long-term) toxicity data (NOEC) are also available, these should be used as well.

(a) $L(E)C_{50}$ (LC_{50} or EC_{50}) of the tested mixture $\leq$ 100 mg/l and NOEC of the tested mixture $\leq$ 1.0 mg/l or unknown:

(i) Classify mixture as Category Acute 1, 2 or 3;

(ii) Apply summation of classified components approach (see 2.4.4.6) for chronic classification (Chronic 1 to 4 or no need for chronic classification);

(b) $L(E)C_{50}$ of the tested mixture $\leq$ 100 mg/l and NOEC of the tested mixture > 1.0 mg/l:

(i) Classify mixture as Category Acute 1, 2 or 3;

(ii) Apply summation of classified components approach (see 2.4.4.6) for classification as Category Chronic 1. If the mixture is not classified as Category Chronic 1, then there is no need for chronic classification;

(c) $L(E)C_{50}$ of the tested mixture > 100 mg/l, or above the water solubility, and NOEC of the tested mixture $\leq$ 1.0 mg/l or unknown:

(i) No need to classify for acute toxicity hazard;

(ii) Apply summation of classified components approach (see 2.4.4.6) for chronic classification (Chronic 4 or no need for chronic classification);

(d) $L(E)C_{50}$ of the tested mixture >100 mg/l, or above the water solubility, and NOEC of the tested mixture > 1.0 mg/l:

– No need to classify for acute or chronic toxicity hazard.

2.4.4.4 *Classification of mixtures when data are not available for the complete mixture: bridging principles*

2.4.4.4.1 Where the mixture itself has not been tested to determine its aquatic environmental hazard, but there are sufficient data on the individual components 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 in animals.

2.4.4.4.2 *Dilution*

2.4.4.4.2.1 If a mixture is formed by diluting another classified mixture or a substance with a diluent which has an equivalent or lower aquatic hazard classification than the least toxic original component and which is not expected to affect the aquatic hazards of other components, then the mixture will be classified as equivalent to the original mixture or substance.

2.4.4.4.2.2 If a mixture is formed by diluting another classified mixture or a substance with water or other totally non-toxic material, the toxicity of the mixture will be calculated from the original mixture or substance.

2.4.4.4.3 *Batching*

The aquatic hazard classification 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 aquatic hazard classification of the batch has changed. If the latter occurs, new classification is necessary.

2.4.4.4.4 *Concentration of mixtures which are classified with the most severe classification categories (Chronic 1 and Acute 1)*

If a mixture is classified as Chronic 1 and/or Acute 1, and components of the mixture which are classified as Chronic 1 and/or Acute 1 are further concentrated, the more concentrated mixture should be classified with the same classification category as the original mixture without additional testing.

2.4.4.4.5 *Interpolation within one toxicity category*

If mixtures A and B are in the same classification category and mixture C is made in which the toxicologically active components have concentrations intermediate to those in mixtures A and B, then mixture C is assumed to be in the same category as A and B. Note that the identity of the components is the same in all three mixtures.

2.4.4.4.6 *Substantially similar mixtures*

Given the following:

(a) Two mixtures:

(i) A + B;

(ii) C + B;

(b) The concentration of component B is the same in both mixtures;

(c) The concentration of component A in mixture (i) equals that of component C in mixture (ii);

(d) Classifications for A and C are available and are the same, i.e. they are in the same hazard category and are not expected to affect the aquatic toxicity of B.

Then there is no need to test mixture (ii) if mixture (i) is already characterized by testing and both mixtures would be classified in the same category.

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

2.4.4.5.1 The classification of a mixture is based on summation of the concentrations of its classified components. The percentage of components classified as 'Acute' or 'Chronic' will feed straight into the summation method. Details of the summation method are described in 2.4.4.6.1 to 2.4.4.6.4.

2.4.4.5.2 Mixtures can be made of a combination of both components that are classified (as Acute 1 to 3 and/or Chronic 1 to 4) and those for which adequate test data are available. When adequate toxicity data are available for more than one component in the mixture, the combined toxicity of those components may be calculated using the following additivity formula, and the calculated toxicity may be used to assign that portion of the mixture an acute hazard category, which is then subsequently used in applying the summation method.

where:

$$\frac{\sum C_i}{L(E)C_{50m}} = \sum_n \frac{C_i}{L(E)C_{50i}}$$

Ci = concentration of component i (weight percentage)

L(E)C50i = LC_{50} or EC_{50} (in mg/l) for component i

n = number of components, and i is running from 1 to n

L(E)C50m = $L(E)C_{50}$ of the part of the mixture with test data

2.4.4.5.3 When applying the additivity formula for part of the mixture, it is preferable to calculate the toxicity of this part of the mixture using for each component toxicity values that relate to the same species (i.e. fish, daphnia or algae) and then to use the highest toxicity (lowest value) obtained (i.e. use the most sensitive of the three species). However, when toxicity data for each component are not available in the same species, the toxicity value of each component should be selected in the same manner that toxicity values are selected for the classification of substances, i.e. the highest toxicity (from the most sensitive test organism) is used. The calculated acute toxicity may then be used to classify this part of the mixture as Acute 1, 2 or 3 using the same criteria described for substances.

2.4.4.5.4 If a mixture is classified in more than one way, the method yielding the more conservative result should be used.

2.4.4.6 *Summation method*

2.4.4.6.1 *Classification procedures*

In general, a more severe classification for mixtures overrides a less severe classification, e.g. a classification with Chronic 1 overrides a classification with Chronic 2. As a consequence, the classification procedure is already completed if the result of the classification is Chronic 1. A more severe classification than Chronic 1 is not possible; therefore, it is not necessary to pursue the classification procedure further.

2.4.4.6.2 *Classification for Acute Categories 1, 2 and 3*

2.4.4.6.2.1 First, all components classified as Acute 1 are considered. If the sum of these components is 25% or greater, the whole mixture is classified as Acute 1. If the result of the calculation is a classification of the mixture as Acute 1, the classification process is completed.

2.4.4.6.2.2 In cases where the mixture is not classified as Acute 1, classification of the mixture as Acute 2 is considered. A mixture is classified as Acute 2 if 10 times the sum of all components classified as Acute 1 plus the sum of all components classified as Acute 2 is 25% or greater. If the result of the calculation is classification of the mixture as Acute 2, the classification process is completed.

2.4.4.6.2.3 In cases where the mixture is not classified either as Acute 1 or Acute 2, classification of the mixture as Acute 3 is considered. A mixture is classified as Acute 3 if 100 times the sum of all components classified as Acute 1 plus 10 times the sum of all components classified as Acute 2 plus the sum of all components classified as Acute 3 is 25% or greater.

2.4.4.6.2.4 The classification of mixtures for acute hazards based on this summation of classified components is summarized in Table 2.4.4.6.2.4.

Table 2.4.4.6.2.4: Classification of a mixture for acute hazards based on summation of classified components

Sum of components classified as:	Mixture is classified as:
Acute 1 × M* $\geq$ 25%	Acute 1
(M ×10 x Acute 1) + Acute 2 $\geq$ 25%	Acute 2
(M × 100 × Acute 1) + (10 × Acute 2) + Acute 3 $\geq$ 25%	Acute 3

* For explanation of the M factor, see 2.4.4.6.4.

2.4.4.6.3 *Classification for Chronic Categories 1, 2, 3 and 4*

2.4.4.6.3.1 First, all components classified as Chronic 1 are considered. If the sum of these components is 25% or greater, the mixture is classified as Chronic 1. If the result of the calculation is a classification of the mixture as Chronic 1, the classification procedure is completed.

2.4.4.6.3.2 In cases where the mixture is not classified as Chronic 1, classification of the mixture as Chronic 2 is considered. A mixture is classified as Chronic 2 if 10 times the sum of all components classified as Chronic 1 plus the sum of all components classified as Chronic 2 is 25% or greater. If the result of the calculation is classification of the mixture as Chronic 2, the classification process is completed.

2.4.4.6.3.3 In cases where the mixture is not classified either as Chronic 1 or Chronic 2, classification of the mixture as Chronic 3 is considered. A mixture is classified as Chronic 3 if 100 times the sum of all components classified as Chronic 1 plus 10 times the sum of all components classified as Chronic 2 plus the sum of all components classified as Chronic 3 is 25% or greater.

2.4.4.6.3.4 If the mixture is still not classified in Category Chronic 1, 2 or 3, classification of the mixture as Chronic 4 need not be considered for the purposes of ADN. A mixture is classified as Chronic 4 if the sum of the percentages of components classified as Chronic 1, 2, 3 and 4 is 25% or greater.

2.4.4.6.3.5 The classification of mixtures for chronic hazards based on this summation of classified components is summarized in Table 2.4.4.6.3.4.

Table 2.4.4.6.3.4: Classification of a mixture for chronic hazards based on summation of classified components

Sum of components classified as:	Mixture is classified as:
Chronic 1 × M* ≥ 25%	Chronic 1
(M × 10 × Chronic 1) + Chronic 2 ≥ 25%	Chronic 2
(M × 100 × Chronic 1) + (10 × Chronic 2) + Chronic 3 ≥ 25%	Chronic 3
Chronic 1 + Chronic 2 + Chronic 3 + Chronic 4 ≥ 25 %	Chronic 4

* For explanation of the M factor, see 2.4.4.6.4.

2.4.4.6.4 *Mixtures with highly toxic components*

Acute Category 1 components with toxicities well below 1 mg/l may influence the toxicity of the mixture and should be given increased weight in applying the summation method. When a mixture contains components classified as Acute or Chronic 1, the tiered approach described in 2.4.4.6.2 and 2.4.4.6.3 should be applied using a weighted sum by multiplying the concentrations of Acute 1 components by a factor, instead of merely adding up the percentages. This means that the concentration of 'Acute 1' in the left column of Table 2.4.4.6.2.4 and the concentration of 'Chronic 1' in the left column of Table 2.4.4.6.3.4 are multiplied by the appropriate multiplying factor. The multiplying factors to be applied to these components are defined using the toxicity value, as summarized in Table 2.4.4.6.4 below. Therefore, in order to classify a mixture containing Acute/Chronic 1 components, the classifier needs to be informed of the value of the M factor in order to apply the summation method. Alternatively, the additivity formula (see 2.4.4.5.2) may be used when toxicity data are available for all highly toxic components in the mixture and there is convincing evidence that all other components, including those for which specific acute toxicity data are not available, are of low or no toxicity and do not significantly contribute to the environmental hazard of the mixture.

Table 2.4.4.6.4 Multiplying factors for highly toxic components of mixtures

$L(E)C_{50}$ value	Multiplying factor (M)
$0.1 < L(E)C_{50} \leq 1$	1
$0.01 < L(E)C_{50} \leq 0.1$	10
$0.001 < L(E)C_{50} \leq 0.01$	100
$0.0001 < L(E)C_{50} \leq 0.001$	1 000
$0.00001 < L(E)C_{50} \leq 0.0001$	10 000
(continue in factor 10 intervals)	

2.4.4.6.5 *Classification of mixtures with components without any useable information*

In the event that no useable information on acute and/or chronic aquatic hazard is available for one or more relevant components, it is concluded that the mixture cannot be attributed (a) definitive hazard category(ies). In this situation, the mixture should be classified based on the known components only, with the additional statement that: 'x% of the mixture consists of (a) component(s) of unknown hazards to the aquatic environment'."

C. Proposals for amendments to Part 3 - Dangerous goods list

12. Add the following entries to Table A (List of dangerous goods in numerical order) in 3.2.1:

9005	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., MOLTEN	9			none			T	PP			0	Dangerous only when carried in tank vessels
9006	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.	9			none			T	PP			0	Dangerous only when carried in tank vessels

13. Make the following amendments to Table C (List of dangerous goods accepted for carriage in tank vessels in numerical order):

Explanatory notes for each column

Column (5) Danger: amend to read as follows:

"This column contains information concerning the hazards inherent in the dangerous substance. These hazards are included on the basis of the danger labels of Table A, column (5).

In the case of a chemically unstable substance, the code 'unst.' is added to the information.

In the case of a substance or mixture hazardous to the aquatic environment, the code 'N1', 'N2' or 'N3' is added to the information.

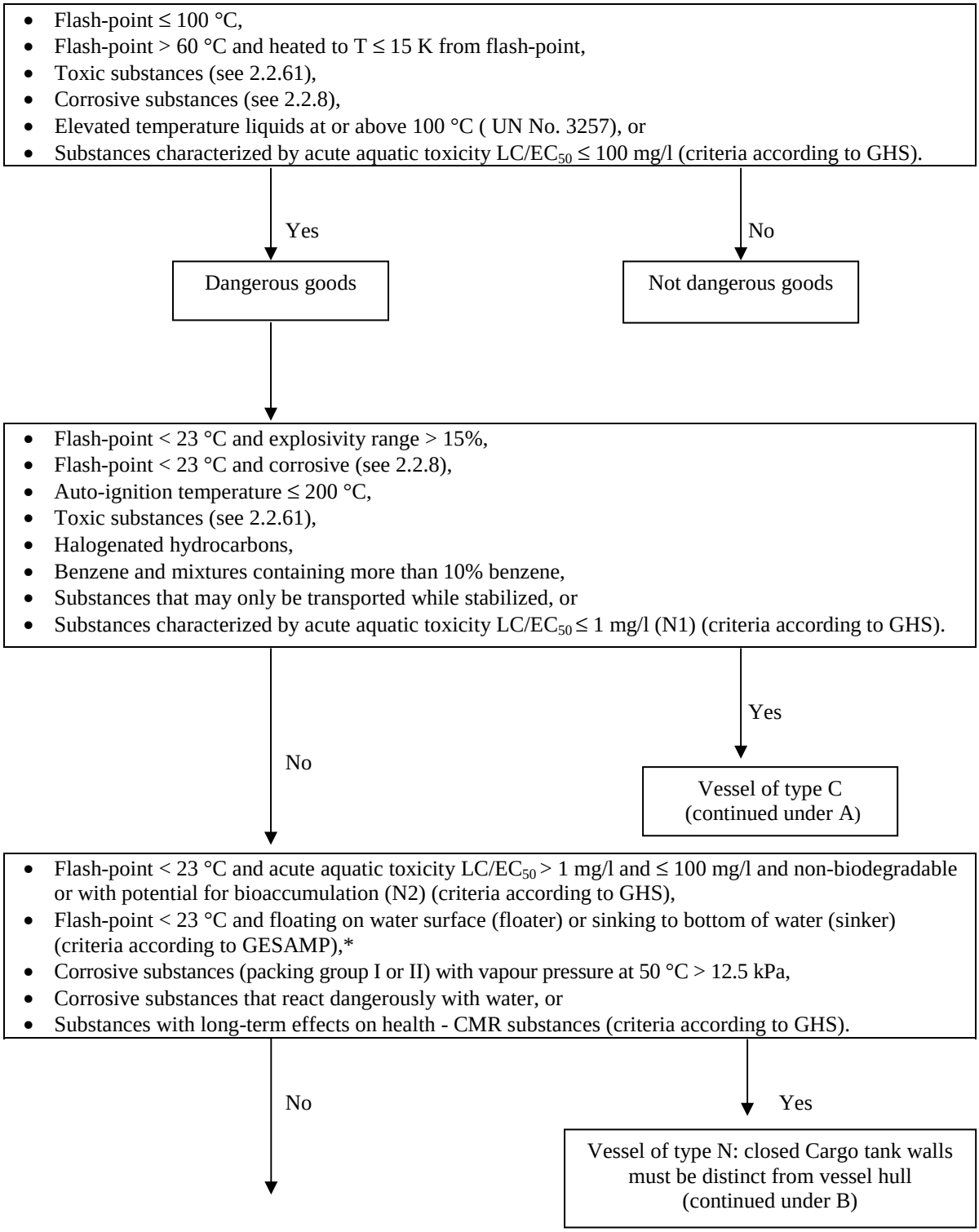
In the case of a substance or mixture with CMR properties, the code 'CMR' is added to the information.

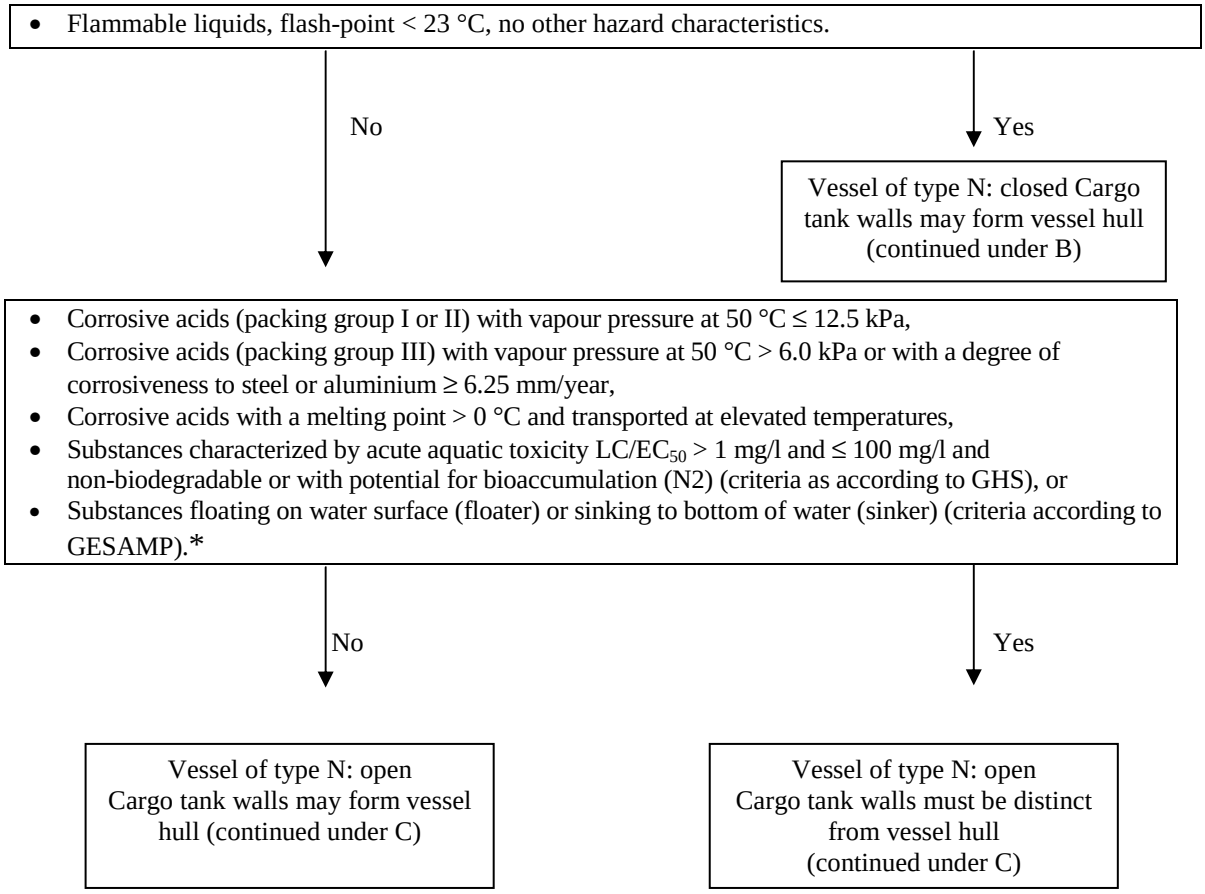
In the case of a substance or mixture that floats on the water surface, does not evaporate and is not readily soluble in water or that sinks to the bottom of the water and is not readily soluble, the code 'F' (standing for 'Floater') or 'S' (standing for 'Sinker'), respectively, is added to the information.".

[Table C is amended in accordance with the quadrilingual informal document INF.4].

14. Add the following flowchart after Table C:

Flowchart for classification of liquids of Classes 3, 6.1, 8 and 9 for carriage in tanks in inland navigation





Elevated temperature substances

Irrespective of the above classifications, for substances that must be transported at elevated temperatures, the type of cargo tank shall be determined on the basis of the transport temperature, using the following table:

Maximum transport temperature T in °C	Type N	Type C
T ≤ 80	Integral cargo tank	Integral cargo tank
80 < T ≤ 115	Independent cargo tank, remark 25	Independent cargo tank, remark 26
T > 115	Independent cargo tank	Independent cargo tank

* IMO publication: “The Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships”, GESAMP Reports and Studies No. 664, IMO, London, 2002.

Remark 25: Type 3 cargo tank (with walls distinct from vessel hull) may be used for the carriage of this substance provided that the construction of the cargo tank has been accepted by a recognized classification society for the maximum permitted transport temperature.

Remark 26: Type 2 cargo tank (integral cargo tank) may be used for the carriage of this substance provided that the construction of the cargo tank has been accepted by a recognized classification society for the maximum permitted transport temperature.

Scheme A: Criteria for cargo tank equipment in vessels of type C

Cargo tank equipment	Vapour pressure at liquid temperature of 30 °C and gaseous phase temperature of 37.8 °C > 50 kPa	Vapour pressure at liquid temperature of 30 °C and gaseous phase temperature of 37.8 °C > 50 kPa	Vapour pressure unknown, owing to absence of certain data
With refrigeration (No. 1 in column (9))	Refrigerated		
Pressure tank (400 kPa)	Non-refrigerated	Vapour pressure at 50 °C > 50 kPa without water spraying	Boiling point ≤ 60°C
High-velocity vent valve opening pressure: 50 kPa, with water-spraying system (No. 3 in column (9))		Vapour pressure at 50 °C > 50 kPa with water spraying	60 °C < boiling point ≤ 85°C
High-velocity vent valve opening pressure as calculated, but at least 10 kPa		Vapour pressure at 50 °C ≤ 50 kPa	
High-velocity vent valve opening pressure: 50 kPa			85 °C < boiling point ≤ 115°C
High-velocity vent valve opening pressure: 35 kPa			Boiling point > 115°C

Scheme B: Criteria for equipment of vessels of type N with closed cargo tanks

Cargo tank equipment	Class 3, boiling point < 23°C				Corrosive substances	CMR substances
Pressure tank (400 kPa)	175 kPa ≤ $P_{d\,50}$ < 300 kPa without refrigeration					
High-velocity vent valve opening pressure: 50 kPa	175 kPa ≤ $P_{d\,50}$ < 300 kPa, with refrigeration (No. 1 in column (9))	110 kPa ≤ $P_{d\,50}$ < 175 kPa without water spraying				
High-velocity vent valve opening pressure: 10 kPa			110 kPa ≤ $P_{d\,50}$ < 150 kPa with water spraying (No. 3 in column (9))	$P_{d\,50}$ < 110 kPa	Packing group I or II with $P_{d\,50}$ > 12.5 kPa or reacting dangerously with water	High-velocity vent valve opening pressure: 10 kPa; with water spraying when vapour pressure > 10 kPa

Scheme C: Criteria for equipment of vessels of type N with open cargo tanks

Cargo tank equipment	Class 3	Flammable substances	Corrosive substances
With flame-arrester	Flash-point ≥ 23 °C	Flash-point > 60 °C transported while heated to ≤ 15 K below flash-point	Flammable substances or acids, transported while heated
Without flame-arrester			Non-flammable substances

Cargo tank equipment for substances transported in a molten state

- **Possibility of heating the cargo (number 2 in column (9))**

  A possibility of heating the cargo shall be required on board:

  – When the melting point of the substance to be transported is + 15 °C or greater, or

  – When the melting point of the substance to be transported is greater than 0 °C but less than + 15 °C and the outside temperature is no more than 4 K above the melting point. In column (20), reference shall be made to remark 6 with the temperature derived as follows: melting point + 4 K.

- **Heating system on board (number 4 in column (9))**

  A cargo heating system shall be required on board:

  – For substances that must not be allowed to solidify owing to the possibility of dangerous reactions on reheating, and

  – For substances that must be maintained at a guaranteed temperature not less than 15 K below their flash-point.

Column (10): Determination of opening pressure of high-velocity vent valve in kPa

For vessels of type C, the opening pressure of the high-velocity vent valve shall be determined on the basis of the internal pressure of the tanks, rounded up to the nearest 5 kPa.

To calculate the internal pressure, the following formula shall be used:

$$P_{max} = P_{Obmax} + \frac{k \cdot v_a (P_0 - P_{Da})}{v_a - \alpha \cdot \delta_t + \alpha \cdot \delta_t \cdot v_a} - P_0$$

$$k = \frac{T_{Dmax}}{T_a}$$

In this formula:

P_{max} : Maximum internal pressure in kPa

P_{Obmax} : Maximum absolute vapour pressure at liquid surface temperature in kPa

P_{Da} : Absolute vapour pressure at filling temperature in kPa

P_0 : Atmospheric pressure in kPa

v_a : Free relative volume at filling temperature compared with cargo tank volume

α : Cubic expansion coefficient in K^{-1}

δ_t : Average liquid temperature increase through reheating in K

T_{Dmax} : Maximum gaseous phase temperature in K

T_a : Filling temperature in K

k : Temperature correction factor

t_{Ob} : Maximum liquid surface temperature in °C

In the formula, the following basic data are used:

P_{Obmax} : At 50 °C and 30 °C

P_{Da} : At 15 °C

P_0 : 101.3 kPa

v_a : 5% = 0.05

δ_t : 5 K

T_{Dmax} : 323 K and 310.8 K

T_a : 288 K

t_{Ob} : 50 °C and 30 °C

Column (11): Determination of maximum degree of filling of cargo tanks

If, in accordance with the provisions under A above:

- Type G is required: 91%; however, in the case of deeply refrigerated substances: 95%
- Type C is required: 95%
- Type N is required: 97%; however, in the case of substances in a molten state and of flammable liquids with 175 kPa $\leq P_{v50} <$ 300 kPa: 95%.

Column (12): Density of substance at 20 °C

These data are provided for information only.

Column (13): Determination of type of sampling connection

1 = *closed*:
- Substances to be transported in pressure cargo tanks
- Substances with T in column (3b) and assigned to packing group I
- Stabilized substances to be transported under inert gas.

2 = *partly closed*:
- All other substances for which type C is required.

3 = *open*:
- All other substances.

Column (14): Determination of whether a pump-room is permitted below deck

No
- All substances with T in column (3b) with the exception of substances of Class 2.

Yes
- All other substances.

Column (15): Determination of temperature class

Flammable substances shall be assigned to a temperature class on the basis of their auto-ignition point:

Temperature class	Auto-ignition temperature T of flammable liquids and gases in °C
T1	$T > 450$
T2	$300 < T \leq 450$
T3	$200 < T \leq 300$
T4	$135 < T \leq 200$
T5	$100 < T \leq 135$
T6	$85 < T \leq 100$

When anti-explosion protection is required and the auto-ignition temperature is not known, reference shall be made to temperature class T4, considered safe.

Column (16): Determination of explosion group

Flammable substances shall be assigned to an explosion group on the basis of their maximum experimental safe gaps. The maximum experimental safe gaps shall be determined in accordance with the standard contained in IEC Publication No. 79-1A.

The different explosion groups are as follows:

Explosion group	Maximum experimental safe gap in mm
II A	> 0.9
II B	≥ 0.5 to ≤ 0.9
II C	< 0.5

When anti-explosion protection is required and the relevant data are not provided, reference shall be made to explosion group II B, considered safe.

Column (17): Determination of whether anti-explosion protection is required for electrical equipment and systems

Yes - Substances with a flash-point ≤ 60 °C.

- Substances that must be transported while heated to a temperature less than 15 K from their flash-point.

- Flammable gases.

No - All other substances.

Column (18): Determination of whether personal protective equipment, escape devices, portable flammable gas detectors, portable toximeters or ambient-air-dependent breathing apparatus is required

- PP: For all substances of Classes 1 to 9;

- EP: For all substances

  - Of Class 2 with letter T or letter C in the classification code indicated in column (3b),

  - Of Class 3 with letter T or letter C in the classification code indicated in column (3b),

  - Of Class 4.1,

  - Of Class 6.1, and

  - Of Class 8,

  - CMR substances of Category 1A or 1B according to GHS;

- EX: For all substances for which anti-explosion protection is required;
- TOX: For all substances of Class 6.1,

  For all substances of other classes with T in column (3b),

  For CMR substances of Category 1A or 1B according to GHS;
- A: For all substances for which EX or TOX is required.

Column (19): Determination of the number of cones or blue lights

For all substances of Class 2 with letter F in the classification code indicated in column (3b):	1 cone/light
For all substances of Classes 3 to 9 with letter F in the classification code indicated in column (3b) and assigned to packing group I or II:	1 cone/light
For all substances of Class 2 with letter T in the classification code indicated in column (3b)	2 cones/lights
For all substances of Classes 3 to 9 with letter T in the classification code indicated in column (3b) and assigned to packing group I or II:	2 cones/lights

Column (20): Determination of additional requirements and remarks

***Remark 1*:** Reference shall be made in column (20) to remark 1 for transport of UN No. 1005 AMMONIA, ANHYDROUS.

***Remark 2*:** Reference shall be made in column (20) to remark 2 for stabilized substances that react with oxygen.

***Remark 3*:** Reference shall be made in column (20) to remark 3 for substances that must be stabilized.

***Remark 4*:** Reference shall be made in column (20) to remark 4 for substances that must not be allowed to solidify owing to the possibility of dangerous reactions on reheating.

***Remark 5*:** Reference shall be made in column (20) to remark 5 for substances liable to polymerization.

***Remark 6*:** Reference shall be made in column (20) to remark 6 for substances liable to crystallization and for substances for which a heating system or possibility of heating is required and the vapour pressure of which at 20 ºC is greater than 0.1 kPa.

***Remark 7*:** Reference shall be made in column (20) to remark 7 for substances with a flash-point of + 15 ºC or greater.

***Remark 8*:** Reference shall be made in column (20) to remark 8 for substances that react dangerously with water.

***Remark 9*:** Reference shall be made in column (20) to remark 9 for transport of UN No. 1131 CARBON DISULPHIDE.

***Remark 10*:** *No longer used.*

***Remark 11*:** Reference shall be made in column (20) to remark 11 for transport of UN No. 1040 ETHYLENE OXIDE WITH NITROGEN.

***Remark 12*:** Reference shall be made in column (20) to remark 12 for transport of UN No. 1280 PROPYLENE OXIDE and UN No. 2983 ETHYLENE OXIDE AND PROPYLENE OXIDE MIXTURE.

***Remark 13*:** Reference shall be made in column (20) to remark 13 for transport of UN No. 1086 VINYL CHLORIDE, STABILIZED.

***Remark 14*:** Reference shall be made in column (20) to remark 14 for mixtures or N.O.S. entries which are not clearly defined and for which type N is stipulated under the classification criteria.

***Remark 15*:** Reference shall be made in column (20) to remark 15 for substances that react dangerously with alkalis or acids such as sodium hydroxide or sulphuric acid.

***Remark 16*:** Reference shall be made in column (20) to remark 16 for substances that may react dangerously to local overheating.

***Remark 17*:** Reference shall be made in column (20) to remark 17 when reference is made to remark 6 or 7.

***Remark 18*:** *No longer used.*

***Remark 19*:** Reference shall be made in column (20) to remark 19 for substances that must under no circumstances come into contact with water.

***Remark 20*:** Reference shall be made in column (20) to remark 20 for substances the transport temperature of which must not exceed a maximum temperature in combination with the cargo tank materials. Reference shall be made to this maximum permitted temperature immediately after the number 20.

***Remark 21*:** *No longer used.*

***Remark 22*:** Reference shall be made in column (20) to remark 22 for substances for which a range of values or no value is indicated in column (11).

***Remark 23*:** Reference shall be made in column (20) to remark 23 for substances the internal pressure of which at 30 ºC is less than 50 kPa and which are transported with water spraying.

***Remark 24*:** Reference shall be made in column (20) to remark 24 for transport of UN No. 3257 ELEVATED TEMPERATURE LIQUID, N.O.S.

***Remark 25*:** Reference shall be made in column (20) to remark 25 for substances that must be transported while heated in a type 3 cargo tank.

***Remark 26*:** Reference shall be made in column (20) to remark 26 for substances that must be transported while heated in a type 2 cargo tank.

***Remark 27*:** Reference shall be made in column (20) to remark 27 for substances for which the reference N.O.S. or a generic reference is made in column (2).

***Remark 28*:** Reference shall be made in column (20) to remark 28 for transport of UN No. 2448 SULPHUR, MOLTEN.

***Remark 29*:** Reference shall be made in column (20) to remark 29 for substances for which the vapour pressure or boiling point is indicated in column (2).

***Remark 30*:** Reference shall be made in column (20) to remark 30 for transport of UN Nos. 1719, 1794, 1814, 1819, 1824, 1829, 1830, 1832, 1833, 1906, 2240, 2308, 2583, 2584, 2677, 2679, 2681, 2796, 2797, 2837 and 3320 under the entries for which open type N is required.

***Remark 31*:** Reference shall be made in column (20) to remark 31 for transport of substances of Class 2 and UN Nos. 1280 PROPYLENE OXIDE and 2983 ETHYLENE OXIDE AND PROPYLENE OXIDE MIXTURE of Class 3.

***Remark 32*:** Reference shall be made in column (20) to remark 32 for transport of UN No. 2448 SULPHUR, MOLTEN, of Class 4.1.

***Remark 33*:** Reference shall be made in column (20) to remark 33 for transport of UN Nos. 2014 and 2984 HYDROGEN PEROXIDE, AQUEOUS SOLUTION, of Class 5.1.

***Remark 34*:** Reference shall be made in column (20) to remark 34 for transport of substances for which hazard 8 is mentioned in column (5) and type N in column (6).

***Remark 35*:** Reference shall be made in column (20) to remark 35 for substances that must not have a direct system for the refrigeration system.

***Remark 36*:** Reference shall be made in column (20) to remark 36 for substances that must have an indirect system for the refrigeration system.

***Remark 37*:** Reference shall be made in column (20) to remark 37 for substances for which the cargo storage system must be capable of resisting the full vapour pressure of the cargo at the upper limits of the ambient design temperatures, whatever the system adopted for the boil-off gas.

***Remark 38*:** Reference must be made in column (20) to remark 38 for mixtures with an initial melting point above 60 ºC in accordance with ASTMD 86-01.
