



Summary of dangerous goods transportation rules for zinc powder/dust and zinc oxide

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1. Introductory remarks

This document considers regulations according to ADR/RID/ADN, IMDG-Code and ICAO/IATA applicable since 2009/2010 and changes which are already published for 2011/2012.

To a large extent the classification criteria for the different modes of transport have been harmonized in 2009/2010.

However, there will be new disharmony in 2011 between regulations for sea versus land/air shipments due to a prolonged transition period of two years for the ecotox criteria according to the 3rd edition of GHS.

All used expressions are harmonized for land and air transport with the GHS. For sea shipments, the terms “environmentally hazardous (aquatic toxicity)” and “marine pollutant” are used in parallel.

List of abbreviations:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road (Accord européen relatif au transport international des marchandises Dangereuses par Route) [Referring to the 2009 and 2011 editions]

RID: Rules concerning the International Carriage of Dangerous Goods by Rail (Règlement concernant le transport International ferroviaire de marchandises Dangereuses) [Referring to the 2009 and 2011 editions]

ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways

(Accord européen relatif au transport international des marchandises Dangereuses par voie de Navigation intérieure) [Referring to the 2009 and 2011 editions]

EPA United States Environmental Protection Agency

IMDG-Code: International Maritime Code for Dangerous Goods -Code [Referring to the 34th Amendment (currently mandatory) and the 35th Amendment (mandatory from 1st Jan 2012)]

IMO International Maritime Organisation

ICAO International Civil Aviation Organisation

ICAO-TI Technical Instructions (TI) for the safe Transport of Dangerous Goods by Air of ICAO [Referring to the 2009-2010 edition]

IATA International Aviation Transport Association

IATA-DGR Dangerous Goods Regulations (DGR) of IATA [Referring to the 51st (2010) and 52nd (2011) editions]

GHS (UN-GHS) Globally Harmonized System of Classification and Labelling of Chemicals of the United Nations (UN) [Referring to the 3rd edition 2009]

CLP REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

EU-directive 67/548/EEG (DSD) 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 [amended by regulation (EG) Nr. 1272/2008]

EU-directive 1999/45/EG (DPD) Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations [amended by directive 2006/8/EG of the commission, 23. January 2006]

OECD Organisation for Economic Co-Operation and Development [OECD Test methods:

OECD Test Guideline 201 (1984) Alga, Growth Inhibition Test

OECD Test Guideline 210 (1992) Fish, Early Life Stage Toxicity Test

OECD Test Guideline 211 (1998) Daphnia Magna Reproduction Test]

2. Classification

2.1 Classification criteria for all modes of transport

In 2009/2010, the characteristic "environmentally hazardous (aquatic environment)" was implemented for all transport modes, but several years ago, this characteristic had already been implemented in ADR/RID/ADN, although with reduced requirements. Starting in 2009/2010 the classification criteria will be harmonised with the UN-GHS (2nd. edition). This will also trigger a change to the classification criteria for environmentally hazardous substances and mixtures for ADR/RID/ADN.

All substances and mixtures must be checked for "environmentally hazardous (aquatic environment)" characteristics, even if already assigned to one or more of the classes 1 – 8¹. If the environmental hazard is the only hazard of a substance or mixture, the UN-numbers UN 3077 or UN 3082 are assigned.

UN 3077 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (not otherwise specified) or

UN 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.

UN 3077 is attributed to Zinc powder and zinc oxide

2.1.1 Classification of substances on the basis of criteria

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

- Acute aquatic toxicity
- Potential for or actual bioaccumulation;
- Degradation (biotic or abiotic) for organic chemicals;
- Chronic aquatic toxicity.

The following categories have been implemented, based on the criteria presented in the GHS:

- Acute Category 1
- Chronic Category 1
- Chronic Category 2

⇒ If even one of these categories is met, "packing group III" is assigned to the hazard "environmentally hazardous".

¹ With the exception of air freight, see section 2.3.4.

- ⇒ If the material meets classification criteria of classes 1 – 8 and thus another packing group applies based on these hazards, this packing group takes precedence as the packing group for that substance (the environmentally hazardous category is added to an already existing classification)
- ⇒ Substances shall be classified as "environmentally hazardous substances (aquatic environment)", if they satisfy the criteria for Acute 1, Chronic 1 or Chronic 2, according to the following tables:

Acute toxicity

Category: Acute 1		
Acute toxicity:		
96 hr LC ₅₀ (for fish)		≤ 1 mg/l and/or
48 hr EC ₅₀ (for crustacea)		≤ 1 mg/l and/or
72 or 96hr ErC ₅₀ (for algae or other aquatic plants)		≤ 1 mg/l

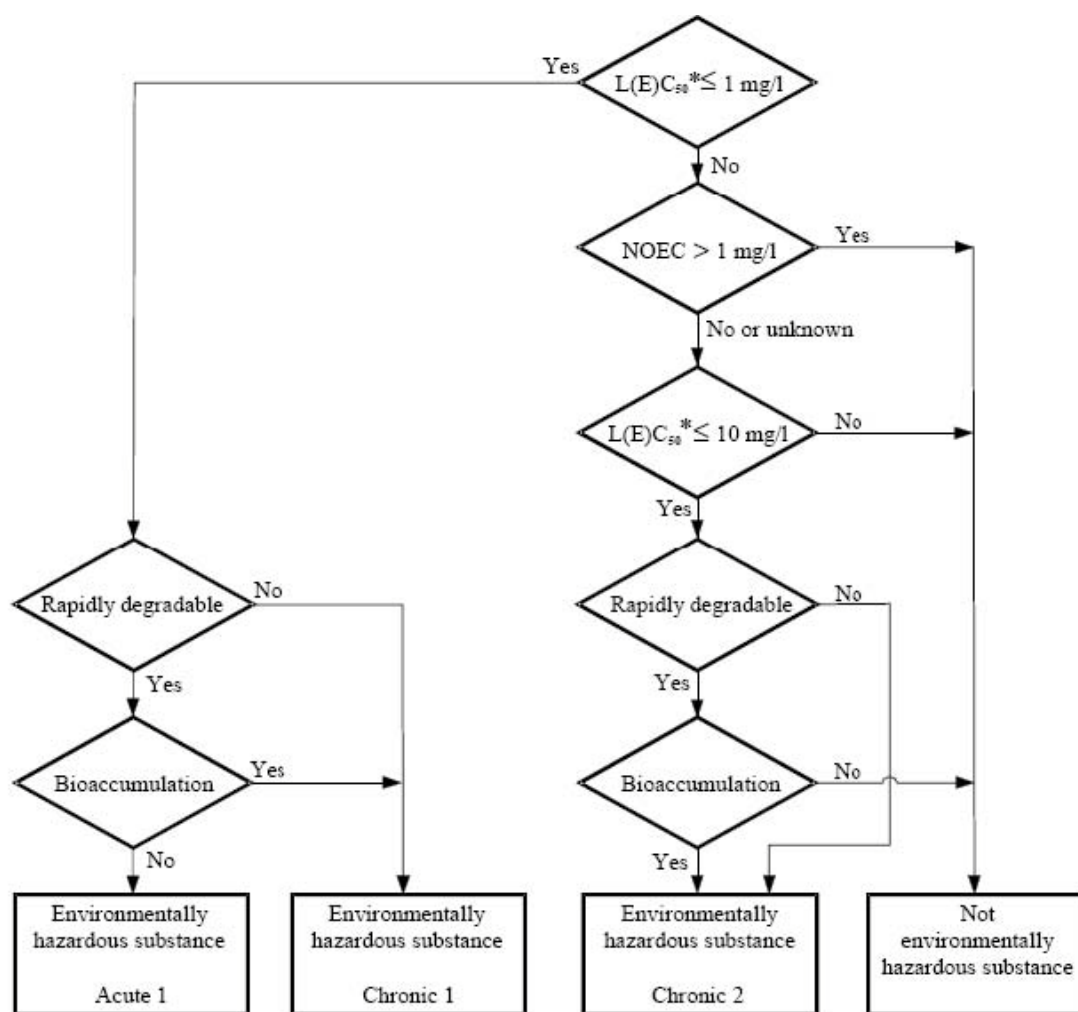
Chronic toxicity

Category: Chronic 1		
Acute toxicity:		
96 hr LC ₅₀ (for fish)		≤ 1 mg/l and/or
48 hr EC ₅₀ (for crustacea)		≤ 1 mg/l and/or
72 or 96hr 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		
Acute toxicity:		
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 96hr 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		

According to the available data, zinc powder, dust and zinc oxide are acute 1/chronic 1, thus they are considered “environmentally hazardous” and are assigned packaging group III. In principle, any preparation containing 2.5%<Zn or ZnO powder<25% is classified Chronic 2 and would also fit in this scheme.

3. The classification flowchart below outlines the process to be followed:



* Lowest value of 96-hour LC_{50} , 48-hour EC_{50} or 72-hour or 96-hour ErC_{50} , as appropriate.

New classification criteria 2011

There will be changes to these criteria, when regulations of the different transport modes are harmonized with the 16th edition of the UN Model regulations because the changes will also harmonise with the 3rd edition of the GHS. Implementation into the different transport modes will not be synchronized:

- ⇒ ADR/RID/ADN: 01/01/2011 (transition period until 31/12/2013, see 1.6.1.19 ADR 2011, transition period extended by the joint meeting March 2010)
- ⇒ IMDG Code: 01/01/2014 (can be used starting 01/01/2013).
- ⇒ IATA-Dangerous Goods regulations: the text of the classification contains a reference to the classification criteria of the UN Model regulations. Therefore the revised classification criteria will be applicable from 01/01/2011 without a transition period.

Four new classification criteria will be implemented when adequate chronic toxicity data are available: 2 for Non-rapidly degradable substances and 2 for rapidly degradable substances. The criteria NOEC > 1 mg/L will be moved to the new category “chronic 2”. Besides the changes to the classification criteria, the basic elements will also be changed as follows:

- (a) Acute aquatic toxicity;
- (b) Chronic aquatic toxicity;
- (c) Potential for or actual bioaccumulation; and
- (d) Degradation (biotic or abiotic).

For zinc powder/dust and oxide, this change is not applicable since the substance is inorganic and does not bioaccumulate. See extract of CSR in appendix 1.

Results are available from the REACH CSR:

Below is an overview on the new criteria. The existing criteria will remain valid, with the exception of the NOEC, which will be moved to the new categories.

The new criteria are only applicable if data is available for all trophic levels and taxonomic groups. These consist of the 3 normal water organisms (fish, crustacean species, and algae species). These species are considered as surrogates for all aquatic organisms and data on other species may also be considered if the test methodology is suitable².

[Aquatic toxicity values in mg/l]

Classification categories			
Acute hazard (see Note 1)	Long-term hazard (see Note 2)		
	Adequate chronic toxicity data available		Adequate chronic toxicity data not available (see Note 1)
	Non-rapidly degradable substances (see Note 3)	Rapidly degradable substances (see Note 3)	
Category: Acute 1	Category: Chronic 1	Category: Chronic 1	Category: Chronic 1
L(E)C ₅₀ ≤ 1.00	NOEC or EC _x ≤ 0.1	NOEC or EC _x ≤ 0.01	L(E)C ₅₀ ≤ 1.00 and lack of rapid degradability and/or BCF ≥ 500 or, if absent log K _{ow} ≥ 4
	Category: Chronic 2	Category: Chronic 2	Category: Chronic 2
	0.1 < NOEC or EC _x ≤ 1	0.01 < NOEC or EC _x ≤ 0.1	1.00 < L(E)C ₅₀ ≤ 10.0 and lack of rapid degradability and/or BCF ≥ 500 or, if absent log K _{ow} ≥ 4

EC_x is EC₁₀ usually

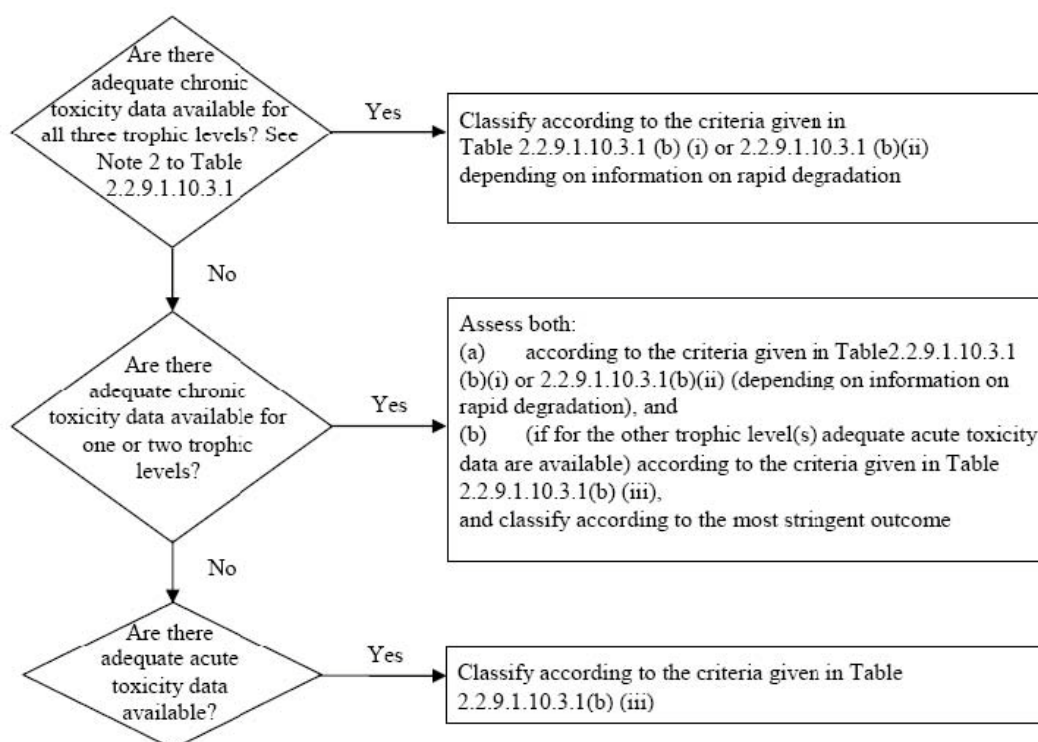
² To avoid unnecessary testing, QSAR or expert judgment can also be used. If these data are not available, the remaining classification criteria are applied.

Zinc reference values for aquatic toxicity

Concentration in (mg/l)	Acute	acute	chronic	chronic
	pH 6 - <7	pH ≥ 7- 8.5	pH 6 - <7	pH ≥ 7- 8.5
Ionic zinc (Zn ²⁺)	0.413 (Ceriodaphnia)	0.136 (algae)	0.082 (Daphnia)	0.019 (algae)
Zinc oxide => Transformed data	0.517	0.169	0.102	0.0236

This results in the following flow chart (ADR 2011):

The changes compared to the current flow chart are only the new criteria.



2.1.2 Classification of mixtures

When the mixture as a whole has been tested to determine its aquatic toxicity, it is classified according to the criteria that have been agreed for substances, but only for acute hazard. It is not possible to apply the criteria for chronic classification to mixtures because the data from degradability and bioaccumulation tests of mixtures cannot be interpreted; they are meaningful for single substances only.

Sum of components classified as:

Acute Category 1 $\times M^3 \geq 25\%$

Chronic Category 1 $\times M \geq 25\%$

$(M \times 10 \times \text{Chronic Category 1}) + \text{Chronic Category 2} > 25\%$

Mixture is classified as:

Acute Category 1

Chronic Category 1

Chronic Category 2

Therefore the classification of mixtures must be based on bridging principles or the summation method.

Complete rules for mixtures can be found in the GHS regulation, not of concern here.

2.2 Classification of hazardous substances versus dangerous goods

ADR/RID/ADN 2009 includes a classification provision based on the classification according to the European Dangerous Substance Directive (67/548/EEC) and the Dangerous Preparations Directive (1999/45/EC). This provision requires a substance or a mixture which has been allocated the symbol N in connection with one of the R-phrases R50, R50/53, R51/53 to be classified as dangerous for transport. Same criteria are applicable with CLP.

There can be some discrepancies based on dates of adoption: CLP regulation is based on the second revised edition of the UN GHS while the current UN Model Regulations (16th ed. 2009) are based on the third revised edition.

Deviations from the old EU directives (67/548/EEC and 1999/45/EC) to GHS-based CLP (EC1272/2008) and dangerous goods regulations 2009 occur for the determination of the bioaccumulation the NOEC exit provided by GHS 2nd rev. ed.

This again should not have any impact on zinc powder and zinc oxide.

³ M factor means a multiplying factor. It is applied to the concentration of a substance classified as hazardous to the aquatic environment acute category 1 or chronic category 1, and is used to derive by the summation method the classification of a mixture in which the substance is present; M factor is equal to 1 when $0,1 < L(E) C_{50} \leq 1 \text{ mg/l}$

2.3 Deviations between the modes of transport

2.3.1 ADR/RID/ADN (without tank vessels on inland waterways)

Despite the classification criteria, ADR/RID/ADN 2.2.9.1.10.5.2 requires substances or mixtures allocated the N symbol [R50; R50/53; R51/53] and not otherwise classified in ADR/RID/ADN, to be classified under UN Nos. 3077 or 3082. This is a deviation from the UN Model Regulations and other modal regulations, which may cause a substance, be classified in class 9 with UN 3077 or 3082 for ADR/RID/ADN but classified as non-dangerous for the IMDG Code and IATA DGR.

To avoid this deviation in cases when data are available, the following amendments have been adopted for ADR/RID/ADN 2011:

The adoption of the EU DSD-DPD shall only be applied if data for classification, according the transport regulations, are not available.

References are now made not only to the directives 67/548/EEC and 1999/45/EC, but also to CLP.

The amendment, as adopted by the ADR/RID/ADN-Joint Meeting is:

2.2.9.1.10.5 Substances or mixtures classified as environmentally hazardous substances (aquatic environment) on the basis of other criteria Regulation 1272/2008/EC.

If data for classification according to the criteria of 2.2.9.1.10.3 and 2.2.9.1.10.4 is not available yet, the classification “environmentally hazardous” shall be adopted either according to the Directives 67/548/EEC and 1999/45/EC (risk phrases R50; R50/53; R51/53) or according to the Regulation 1272/2008/EC (category Acute 1, Chronic 1 or Chronic 2). This means that:*

If a substance, mixture or solution has been allocated such risk phrase(s) or category, it shall be classified as environmentally hazardous substance (aquatic environment).

If a substance, mixture or solution has not been allocated such risk phrase(s) or category, it shall not be classified as environmentally hazardous substance (aquatic environment).

2.2.9.1.10.6 Assignment of Substances classified environmentally hazardous according provisions 2.2.9.1.10.3, 2.2.9.1.10.4 or 2.2.9.1.10.5

2.2.9.1.10.6.2 Substances or mixtures classified as environmentally hazardous substances (aquatic environment), not otherwise classified under ADR shall be designated: UN No. 3077

ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S., packing group III; or UN No. 3082 ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., packing group III.

They shall be assigned to packing group III.

** Regulation 1272/2008/EC of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (Official Journal of the European Union No. L 353 of 30/12/2008).*

2.3.2 IMDG-Code

The criteria in the IMDG Code for environmentally hazardous substances (for the aquatic environment) are harmonized with the EU regulations for the road rail and inland waterway transport modes since January, 01. 2010. This is based on the criteria of the 2nd. Edition of the UN-GHS

The following discrepancies still remain:

The index of the IMDG-Code (34-08) still contains substances and materials which are identified as "Marine Pollutants" according to GESAMP criteria and are marked with the letter "P". These substances and materials must be classified as "Marine Pollutants". These marked substances should not be extended with new substances in future.

With the approval of the competent authority, substances that are identified as marine pollutants, but which no longer meet the criteria as a marine pollutant need not to be transported in accordance with the provisions of the IMDG-Code to marine Pollutants.

Therefore, classification according to the IMDG-Code is based on a self responsible criteria based classification by the shipper (producer) as well as a list based principle.

A link to the EU-Directives (67/548/EWG, 1999/45/EG) or CLP is missing in the IMDG Code (and in the ICAO-TI / IATA-DGR too) and consequently, a link to marking according the EU-regulations.

Implementation of the new classification criteria, based on harmonization with the 16th Edition of the UN Model Regulations will come into force with the 36th Amendment on January 01, 2014. IMDG Code amendments can be used one year before the mandatory compliance date, so the transitional periods for ADR/RID/ADN (ending December, 31. 2013) and the IMDG (in force January, 01. 2014) will meet beginning of 2013. At this date, the new classification rules for these modes of transport could be implemented together with one year of transition period.

2.3.3 ADN (tank vessels on inland waterways)

For transport of packaging, tank containers and bulk containers, the same classification criteria for ADR and RID are applicable. For carriage in tank ships, additional criteria are stipulated in chapter 2.4 ADN.

For environmental hazards, these are the GHS criteria "acute 2", "acute 3" and "chronic 3" (s. ADN 2.2.9.1.10.2). Substances meeting these additional criteria must be classified as Substance Numbers 9005 or 9006 instead of the UN-No. 3077 or 3082. (s. ADN 3.2.3 table C). Additionally, these environmentally hazardous substances must be assigned into groups N1, N2 or N3.

Chapter 2.4 also includes criteria for substances with carcinogenic, mutagenic or toxic to reproduction properties (CMR). This also includes substances and mixtures which float on the surface of the water, do not evaporate and are slightly soluble in water (floaters) or sink to the waterway bed and are slightly soluble (sinker).

Assignment into the groups N1 to N3 according 2.2.9.1.10.2 ADN	Substances which fulfill the named GHS criteria due to their environmental hazard
N1	Category acute 1 or Category chronic 1
N2	Category chronic 2 or Category chronic 3
N3	Category acute 2 or Category acute 3

2.3.4 ICAO-TI/IATA-DGR

IATA-DGR (Chapter 3.9.2.4) and ICAO-TI (Chapter 9.2.1) have implemented a flexible reference to the criteria of the UN Model Regulations. Additionally, they make references to national or international regulations of the country of origin, transit or destination for environmentally hazardous substances. As a result, the EU classification criteria according to EU Directives (67/548/EEG und 1999/45/EG) and CLP regulation (1272/2008/EG) are indirectly relevant because of ADR/RID. However, ICAO-TI and IATA-DGR define the "environmentally hazardous" classification only for substances or mixtures which are not assigned to Classes 1 – 8 or entries of Class 9 other than UN 3077 or UN 3082. If a substance or mixture is still classified because it meets the criteria of any other class or entry into class 9, it need not also be named as "environmentally hazardous".

2.4 Summary

Review about the implementation dates of the new criteria. "X" means, this criterion is implemented already. The criteria are collected again in the following table.

Classification criteria	UN Model Regulations	UN-GHS	ADR/RID/ADN	IMDG Code	ICAO/IATA	DSD -DPD	CLP
Acute ecotoxic Category 1	X	X	X	X	X	X	X
Chronic ecotoxic Category 1 (sufficient data, rapidly degradable)	From 16th Edition (2009)	From 3rd Edition (2009)	From 2011 (Transitional period until 31/12/2013)	From 2014 (Pre usage from 01/01/2013)	From 2011	--	Implementation date still not fixed
Chronic ecotoxic Category 2 (sufficient data, rapidly degradable)	From 16th Edition (2009)	From 3rd Edition (2009)	From 2011 (Transitional period until 31/12/2013)	From 2014 (Pre usage from 01/01/2013)	From 2011	--	Implementation date still not fixed
Chronic ecotoxic Category 1 (sufficient data, not rapidly degradable)	From 16th Edition (2009)	From 3rd Edition (2009)	From 2011 (Transitional period until 31/12/2013)	From 2014 (Pre usage from 01/01/2013)	From 2011	--	Implementation date still not fixed
Chronic ecotoxic Category 2 (sufficient data, not rapidly degradable)	From 16th Edition (2009)	From 3rd Edition (2009)	From 2011 (Transitional period until 31/12/2013)	From 2014 (Pre usage from 01/01/2013)	From 2011	--	Implementation date still not fixed
Chronic ecotoxic Category 1 (no sufficient data)	X	X	X	X	X	X (Deviation to UN Regulations)	X
Chronic ecotoxic Category 2 (no sufficient data)	X	X	X	X	X	X (Deviation to UN)	X

						Regu- lations)	
		1272/2008/EG		67/548/EWG	ADR2009 / 2011		GHS
Aquatic hazard, Acute (short-term) effect, Category 1							
96 hr LC50 (for fish)		≤ 1 mg/l	and/or	identically	identically		identically
48 hr EC50 (for crustacea)		≤ 1 mg/l	and/or	identically	identically		identically
72 or 96 hr ErC50 (for algae or other aquatic plants)		≤ 1 mg/l		identically	identically		identically
Aquatic hazard, chronic (long-term) effect, Category 1							
Non-rapidly degradable substances for which adequate chronic toxicity data are available							
Chronic NOEC-or ECx-value (for fish)		-		-	≤0,1 and/or		identically
Chronic NOEC-or ECx-value (for crustacea)		-		-	≤0,1 and/or		identically
Chronic NOEC-or ECx-value (for algae or other aquatic plants)		-		-	≤0,1		identically
Aquatic hazard, chronic (long-term) effect, Category 2							
Non-rapidly degradable substances for which adequate chronic toxicity data are available							
Chronic NOEC-or ECx-value(for fish)		-		-	≤1 and/or		identically
Chronic NOEC-or ECx-value (for crustacea)		-		-	≤1 and/or		identically
Chronic NOEC-or ECx-value (for algae or other aquatic plants)		-		-	≤1		identically
Aquatic hazard, chronic (long-term) effect, Category 1							
Rapidly degradable substances for which adequate chronic toxicity data are available							
Chronic NOEC-or ECx-value (for fish)		-		-	≤0,01 and/or		identically
Chronic NOEC-or ECx-value (for crustacea)		-		-	≤0,01 and/or		identically
Chronic NOEC-or ECx-value (for algae or other aquatic plants)		-		-	≤0,01		identically
Aquatic hazard, chronic (long-term) effect, Category 2							
Rapidly degradable substances for which adequate chronic toxicity data are available							
Chronic NOEC-or ECx-value(for fish)		-		-	≤0,1 and/or		identically
Chronic NOEC-or ECx-value (for		-		-	≤0,1 and/or		identically

crustacea)					
Chronic NOEC-or ECx-value (for algae or other aquatic plants)	-		-	≤0,1	identically
Aquatic hazard, chronic (long-term) effect, Category 1					
96 hr LC50 (for fish)	≤ 1 mg/l	and/or	identically	identically	identically
48 hr EC50 (for crustacea)	≤ 1 mg/l	and/or	identically	identically	identically
72 oder 96 hr ErC50 (for algae or other aquatic plants)	≤ 1 mg/l	and	identically	identically	identically
and the substance is	not readily degradable	and/or	identically	identically	identically
the experimentally determined	BCF is < 500	or	BCF is ≤ 100	identically	identically
or, if absent	log Kow ≥ 4		log Pow ≥ 3	identically	identically
Aquatic hazard, chronic (long-term) effect, Category 2					
96 hr LC50 (for fish)	> 1 bis ≤ 10 mg/l	and/or	identically	identically	identically
48 hr EC50 (for crustacea)	> 1 bis ≤ 10 mg/l	and/or	identically	identically	identically
72 oder 96 hr ErC50 (for algae or other aquatic plants)	> 1 bis ≤ 10 mg/l		identically	identically	identically
and the substance is	not readily degradable		identically	identically	identically
the experimentally determined	BCF is < 500	or	BCF is ≤ 100	identically	identically
or, if absent	log Kow ≥ 4)		log Pow ≥ 3	identically	identically
unless the NOEC for the chronic toxicity is	> 1 mg/l		missing	identically	identically

3. Marking / Labelling

3.1 “Fish & tree” mark (all modes of transport)

Marking of the environmentally hazardous properties of a substance is carried out for all modes of transport by the “fish & tree” mark. The design in the modal regulations has now been harmonized with the design shown in the UN Model Regulations, so that only marks meeting this design (see below) should be used (Note: The fish has no fins). In the IMDG Code, this has been amended by a respective corrigendum to the 34th Amdt. In the ADR/RID/AND, this will be implemented in the 2011 edition.

“Fish & tree” mark

Source of information in the modal regulations: Symbol and description:

ADR/RID/ADN 5.2.1.8.3: Environmentally hazardous substance mark



IMDG Code 5.2.1.6.3: Marine pollutant mark

IATA DGR 7.1.6.3: Environmentally hazardous substance mark

3.2 Marking and labelling of packaging (all modes of transportation)

3.2.1 Marking requirements for packages

The “fish & tree” mark is basically required for all packings containing substances that are “environmentally hazardous” according to the respective modal regulation, regardless of whether it is the only hazard or a subrisk.

For labelling usage, the following requirements apply:

To be placed adjacent to the UN number

Readily visible and legible

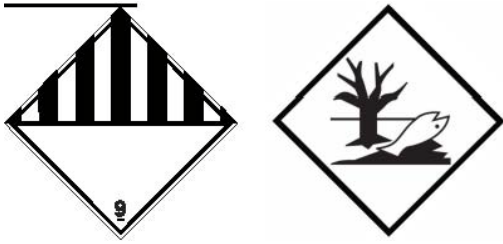
Shall be able to withstand open weather exposure without a substantial reduction in effectiveness (for the sea mode: Shall be such that this information will still be identifiable on packages surviving at least three month's immersion in the sea.)

IBCs and large packagings > 450 L to be marked on two opposite sides

For marking of packagings, the following specifications for the “fish & tree” mark are required: The dimensions shall be at least 100 mm × 100 mm, except in the case of packages of such dimensions that can only bear smaller marks.

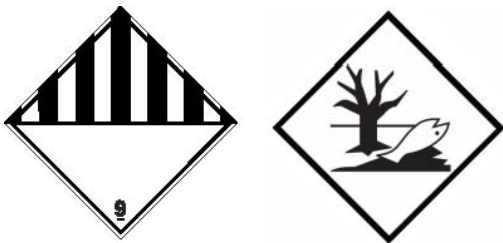
Display of the Symbol (“fish & tree”): Black on white or suitable contrasting background

ADR/RID:



UN3077

IMDG-Code / ICAO-TI / IATA-DGR:



UN3077

Environmentally hazardous substance, liquid, n.o.s. (.....*Technical Name of environmentally hazardous substance*.....)

3.2.2 Regulations for overpacks

When packages are combined into overpacks or unit Loads then:

When packages in the overpack are marked with the fish & tree and this Symbol is not clearly visible from the outside, the overpack must be marked with the word “overpack” and the required markings on (see above) the packages contained in the overpack must be repeated on the outside of the overpack.

Is it necessary to repeat the marking on the overpack, because the labelling and marking is not visible, so is a possibly existing Symbol “fish & tree” also repeated. This currently only applies for the IMDG-Code, but from 2011 regulation applies for ADR/RID too.

3.2.3 Exception from the package labelling for small packing units

Packages containing 5 l or less for liquids or 5 kg or less for solids

Per single packagings or

Combination packagings per inner packaging,

may be waived from the “fish and tree” marking.

3.3 Marking of transport units

The specification for the "fish and tree" symbol for the marking of transport units is the same for the relevant mode of transport as in surface transport. However, the rules for the implementation of identification are different.

3.3.1 Specification of the symbol “fish and tree” for transport units (all modes of transport)

For the marking of transport units, the following specifications for of the “fish & tree” symbol are valid:

- A minimum dimensions of 250 mm by 250 mm
- Representation of the symbol in black on white or other suitable contrasting background

3.3.2 Marking of transport units for sea transport

According to the IMDG Code, all transport units, which contain substances classified as environmentally hazardous, must be marked with the "fish and tree" symbol. This applies particularly if the transport unit carries packages excepted from the marking.

That means, any transport unit, with environmentally hazardous substances

- in Limited Quantities or
- contains by their content of less than 5 L or 5 kg exempted from the marking of packages

must be marked with the symbol “fish and tree”

The application of marking transport units with the “fish and tree” symbol is analogous to the rules for the Placards: at least wagons on each side;

- a. in cargo containers, semi trailers or portable tanks, one on each side and one at each end of the unit;
- b. on wagons on each side;
- c. on multi chamber tanks that contain more than one dangerous goods or its residues, on each side in the amount of the associations concerned;
- d. for all other transport units, at least on two sides and the rear end of the unit.

3.3.3 Marking of transport units for land transport

For land transport, the rules for affixing placards are in 5.3.1. Transport units, which contain substances classified as environmentally hazardous, must therefore be marked as follows with the “fish and tree” symbol:

- a. Freight containers, MEGCs, tank containers or portable tanks to both sides and at each end;
- b. wagon at least every side;
- c. on multiple compartment tanks that contain more than one dangerous goods or its residues, in addition along each side at the position of the relevant compartments;
- d. bulk and tanker vehicles, battery vehicles and vehicles with demountable tanks to both sides and rear of the vehicle;
- e. road vehicles used for carrying packages only, not at all (the same for swap-bodies on road vehicles).

3.3.4 Examples of special aspects for placarding of transport units

For environmentally hazardous substances

... in packages in road vehicles

- Transported by road, the “fish and tree” symbol is not required.
- IMDG-Code for maritime transport on ferries, the “fish and tree” symbol must be affixed along each side and the rear end of the unit.
- Transport by rail in piggyback transport, the “fish and tree” symbol can either be affixed and visible either on the road vehicle or on the wagons on both sides.

... transported in packages in swap bodies, then the “fish and tree” symbol is

- Not required in pure road transport
- Multimodal transport by rail, barge or ship as well as for any other container is required on all four sides.

... in packages shipped in limited quantities (LQ) the “fish and tree” symbol on the transport unit

- Seas necessary
- Land transport not.

... in packages shipped as Excepted Quantities (EQ), the “fish and tree” symbol on the transport unit

- For all modes of transport is not required.

... transported in packages, where the maximum content of the packages or the biggest inner packaging is not more than 5 litres or 5 kg, for all means of transport no effect on the respective marking rules for the transport units.

3.4 Marking and labelling of packagings for air transport

In the ICAO-TI and the IATA-DGR does the "fish and tree" symbol apply only for packages of UN numbers 3077 and 3082.

For packages which contain other than these two UN numbers, according to the rules of other national or international transport regulations and are marked with the "fish and tree" symbol, these will be explicitly accepted (see the note to 7.1.6.3.1 from IATA-DGR 51st edition).

3.5 Summary

The information summarized in the table below relate only to the additional marks for environmentally dangerous substances and mixtures. Other "normal" markings for dangerous goods (such as labels for other dangers, UN number, proper shipping name, orientation arrows, etc.) are not addressed here, but must be considered when preparing packages for transport.

ADR/RID/ADN	IMDG-Code	ICAO-TI / IATA-DGR
starting on 01/01/2011	starting on 01/01/2010	starting on 01/01/2009
Marking with "fish and tree"	Marking with "fish and tree"	Marking with "fish and tree" only for the UN-numbers UN3077 and UN3082
-	Add recognized chemical name of the marine pollutant for generic or "not otherwise specified" (N.O.S.) entries	-
exception < 5 liters / 5 kilogram per packaging (inner or single)	exception < 5 liters / 5 kilogram per packaging (inner or single)	exception < 5 liters / 5 kilogram per packaging (inner or single)
Since 01/06/2009 in force for the UN-number UN 3077 and UN3082		

4. Transport documents

For different transport modes there are also different transport document requirements.

4.1 ADR/RID/ADN (without tank vessels on inland waterways)

Today, there are no additional requirements regarding the transport documents in the regulations for road, rail and inland waterway transports for environmentally hazardous substances.

Starting on **01/01/2011**, a new entry will be required for ADR, RID and ADN with a **transition period until 01/07/2011**. New paragraph 5.4.1.1.18, "Special provisions for carriage of environmentally hazardous substances (aquatic environment)" will be implemented in chapter 5.4. From this date, a substance belonging to one of classes 1 to 9, which meets the classification criteria of paragraph 2.2.9.1.10 (ADN 2.2.9.1.10.1) shall carry in the transport document the additional notation "ENVIRONMENTALLY HAZARDOUS". This additional requirement does not apply to UN Nos. 3077 and 3082 or for the exceptions listed in 5.2.1.8.1 (exception of packages with less than 5 l or 5kg).

For carriage in a transport chain including sea transport, it will be allowed to replace the words "ENVIRONMENTALLY HAZARDOUS" by the statement "MARINE POLLUTANT", pursuant to Subsection 5.4.1.4.3 of the IMDG Code.

4.2 IMDG-Code

For maritime transport, a mandatory declaration for environmentally hazardous substances as "marine pollutant" currently exists (see subsection 3.1.2.9 5.4.1.4.3.5 in connection with IMDG). This obligation applies to all classes and for UN numbers 3077 and 3082.

Moreover, all generic and n.o.s.-entries for substances containing environmental hazards must be designated with a technical name. This means that even for generic entries where no danger triggers are required, it is necessary to add technical descriptors in the event of a marine pollutant.

Example: "UN 1133, Adhesives (contains Cyclohexane), 3, II, (-12 °C c.c.) marine pollutant"

4.3 ICAO-TI/IATA-DGR

For air transport, no additional documentation requirements exist for environmental hazardous substances (except UN 3077 and UN 3082).

4.4 ADN (tank vessels on inland waterways)

Starting on **01/01/2011** (Transition period until 01/07/2011) the entry "environmentally hazardous" is required in the transport document for the transport in tank vessels on inland waterways as well. There are additional requirements regarding documentation for transport in a tank vessel on inland waterways. For the additional classifications of groups N1 to N3, this information must carry over in the transport documents. Furthermore, the hazards of the environment which meet the criteria of GESAMP must be documented. The latter are floaters ("F", to swim, does not evaporate and is poorly soluble) or Sinker ("S", drops to the ground and is poorly soluble). This information is included in Table C Section 3.2.3 in the ADN.

It should also be noted that for tank vessel transport on inland waterways, substances also must be classified and declared in accordance with GHS in "Acute 2", "Acute 3" or "Chronic 3", with the

substance identification number 9005 and the description "environmentally hazardous substance, solid, n.o.s., molten" or "9006 environmentally hazardous substance, liquid, n.o.s." assigned.

4.5 Summary

ADR/RID/ADN	IMDG-Code	IATA-DGR / ICAO-TI	ADN (tank vessel)
from 01/01/2011			
Additional claim "ENVIRONMENTALLY HAZARDOUS" if the criteria are met. "MARINE POLLUTANT" allowed in case of an sea-transport (from or to the harbor)	Additional claim "ENVIRONMENTALLY HAZARDOUS (MARINE POLLUTANT)", if the criteria are met.	-	Additional indication of the classification group (N1 N3) and Floater or Sinker (F, S). Additional Declaration of GHS "Acute 2 and 3" substances. (substance identification numbers 9005 or 9006)
Exception: UN 3077 / UN 3082 and no markings with fish and tree required (<5 liters / 5 kg per packaging)	-	-	-
-	Approved chemical name of the marine pollutants required for all generic or n.o.s. entries as a technical name.	-	-

Appendix 1

Aquatic bioaccumulation

Bioaccumulation is not considered relevant for essential elements because of the general presence of homeostatic control mechanisms.

McGeer et al (2003) recently extensively reviewed the evidence on bioconcentration and bioaccumulation of zinc as a function of exposure concentration in a number of taxonomic groups (algae, molluscs, arthropods, annelids, salmonid fish, cyprinid fish, and other fish). The data clearly illustrated that internal zinc content is well regulated. All eight species taxonomic groups investigated exhibited very slight increases in whole body concentration over a dramatic increase in exposure concentration. In fact, most species did not show significant increases in zinc accumulation when exposure levels increased, even when exposure concentrations reached those that would be predicted to cause chronic effects. This suggests that adverse effects related to Zn exposure are independent of whole body accumulation. Due to the general lack of increased whole body and tissue concentrations at higher exposure levels, the zinc BCF data showed an inverse relationship to exposure concentrations. In all cases, the relationship of BCF to exposure was significant and negative. The slopes of the BCF/BAF – exposure relations were: algae: -1.0, insects: -0.79, arthropods: -0.73, molluscs: -0.83, salmonids: -0.92, Centrarchids: -0.80, Killifish: -0.84, other fish: -0.87. Overall, species mean slope was -0.85 +/- 0.03 (McGeer et al 2003).

The physiological basis for the inverse relationship of BCF to zinc exposure concentration arises from Zn uptake and control mechanisms. At low environmental zinc levels, organisms are able to sequester and retain Zn in tissues for essential functions. When Zn exposure is more elevated, aquatic organisms are able to control uptake. There is clear evidence that many species actively regulate their body Zn concentrations, including crustaceae, oligochaetes, mussels, gastropods, fish, amphipods, chironomids by different mechanisms (McGeer et al 2003).

The following information is taken into account for any hazard / risk / bioaccumulation assessment:

Zinc is an essential element which is actively regulated by organisms, so bioconcentration/bioaccumulation is not considered relevant.

Reference

McGeer J, Brix KV, Skeaff JM, De Forest DK, Bingham SI, Adams WJ and Green A (2003). Inverse relationship between bioconcentration factors and exposure concentration of metals: implications for hazard assessment of metals in the aquatic environment. *Env. Tox. & Chem.* 22, nr 5, 1017-1037.

Marine transport IMDG labeling

Class:	9
Packaging:	group III
UN number:	3077
Proper shipping name:	environmentally hazardous substance, solid, n.o.s.
Danger releasing substance:	ZINC OXIDE
EmS:	F-A, S-F
MARPOL:	P
Label:	9