The mark shall be a rectangle. The minimum dimensions shall be 150 mm wide x 250 mm high. The word "WARNING" shall be in red or white and be at least 25 mm high. Where dimensions are not specified, all features shall be in approximate proportion to those shown.

The word "WARNING" and the words "AS COOLANT" or "AS CONDITIONER", as appropriate, shall be in an official language of the country of origin and also, if that language is not English, French or German, in English, French or German, unless agreements concluded between the countries concerned in the transport operation provide otherwise.

5.5.3.7 ***Documentation***

5.5.3.7.1 Documents (such as a bill of lading, cargo manifest or CMR/CIM/CMNI consignment note) associated with the carriage of vehicles, wagons or containers containing or having contained dry ice (UN 1845) or substances used for cooling or conditioning purposes and that have not been completely ventilated before carriage shall include the following information:

(a) The UN number preceded by the letters "UN"; and

(b) The name indicated in Column (2) of Table A of Chapter 3.2, where appropriate followed by the words "AS COOLANT" or "AS CONDITIONER" in an official language of the country of origin and also, if that language is not English, French or German, in English, French or German, unless agreements, if any, concluded between the countries concerned in the transport operation provide otherwise.

For example: UN 1845, CARBON DIOXIDE, SOLID, AS COOLANT.

5.5.3.7.2 The transport document may be in any form, provided it contains the information required in 5.5.3.7.1. This information shall be easy to identify, legible and durable.

5.5.4 Dangerous goods contained in equipment in use or intended for use during carriage, attached to or placed in packages, overpacks, containers or load compartments

5.5.4.1 Dangerous goods (e.g. lithium batteries, fuel cell cartridges) contained in equipment such as data loggers and cargo tracking devices, attached to or placed in packages, overpacks, containers or load compartments are not subject to any provisions of ADN other than the following:

(a) the equipment shall be in use or intended for use during carriage;

(b) the contained dangerous goods (e.g. lithium batteries, fuel cell cartridges) shall meet the applicable construction and test requirements specified in ADN; and

(c) the equipment shall be capable of withstanding the shocks and loadings normally encountered during carriage and shall be safe for use in the dangerous environments to which it may be exposed.

5.5.4.2 When such equipment containing dangerous goods is carried as a consignment, the relevant entry of Table A of Chapter 3.2 shall be used and all applicable provisions of ADN shall apply.

PART 6

REQUIREMENTS FOR THE CONSTRUCTION AND TESTING OF PACKAGINGS, INTERMEDIATE BULK CONTAINERS (IBCS), LARGE PACKAGINGS, TANKS AND BULK CONTAINERS.

CHAPTER 6.1

GENERAL REQUIREMENTS

6.1.1 Packagings (including IBCs and large packagings) and tanks shall meet the following requirements of ADR in respect of construction and testing:

Chapter 6.1: Requirements for the construction and testing of packagings;

Chapter 6.2: Requirements for the construction and testing of pressure receptacles, aerosol dispensers, small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas;

Chapter 6.3: Requirements for the construction and testing of packagings for Class 6.2 infectious substances of category A (UN Nos. 2814 and 2900);

Chapter 6.4: Requirements for the construction, testing and approval of packages for radioactive material and for the approval of such material;

Chapter 6.5 Requirements for the construction and testing of intermediate bulk containers (IBCs);

Chapter 6.6 Requirements for the construction and testing of large packagings;

Chapter 6.7 Requirements for the design, construction, inspection and testing of portable tanks and UN multiple-element gas containers (MEGCs);

Chapter 6.8 Requirements for the construction, equipment, type approval, inspections and tests, and marking of fixed tanks (tank-vehicles), demountable tanks and tank-containers and tank swap bodies, with shell made of metallic materials and battery-vehicles and multiple element gas containers (MEGCs);

Chapter 6.9 Requirements for the design, construction, inspection and testing of portable tanks with shells made of fibre-reinforced plastics (FRP) materials;

Chapter 6.10 Requirements for the construction, equipment, type approval, inspection and marking of vacuum-operated waste tanks;

Chapter 6.11 Requirements for the design, construction, inspection and testing of bulk containers;

Chapter 6.12 Requirements for the construction, equipment, type approval, inspections and tests, and marking of tanks, bulk containers and special compartments for explosives of mobile explosive manufacturing units (MEMUs);

Chapter 6.13 Requirements for the design, construction, equipment, type approval, testing and marking of fibre-reinforced plastics (FRP) fixed tanks (tank-vehicles) and demountable tanks.

6.1.2 Portable tanks may also meet the requirements of Chapter 6.7 or, if appropriate, Chapter 6.9 of the IMDG Code.

6.1.3 Tank-vehicles may also meet the requirements of Chapter 6.8 of the IMDG Code.

6.1.4 Tank wagons, with fixed or demountable tanks and battery-wagons shall meet the requirements of Chapter 6.8 of the RID.

6.1.5 Bodies of vehicles for bulk carriage shall, if necessary, meet the requirements of Chapter 6.11 or of Chapter 9.5 of ADR.

6.1.6 When the provisions of 7.3.1.1 (a) of RID or ADR are applied, the bulk containers shall meet the requirements of Chapter 6.11 of RID or ADR.

PART 7

Requirements concerning loading, carriage, unloading and handling of cargo

CHAPTER 7.1

DRY CARGO VESSELS

7.1.0 General requirements

7.1.0.1 The provisions of 7.1.0 to 7.1.7 are applicable to dry cargo vessels.

7.1.0.2 to 7.1.0.99 *(Reserved)*

7.1.1 Mode of carriage of goods

7.1.1.1 to 7.1.1.9 *(Reserved)*

7.1.1.10 ***Carriage of packages***

Unless otherwise specified, the masses given for packages shall be the gross masses. When packages are carried in containers or vehicles, the mass of the container or vehicle shall not be included in the gross mass of such packages.

7.1.1.11 ***Carriage in bulk***

Carriage of dangerous goods in bulk shall be prohibited except where this mode of carriage is explicitly authorized in column (8) of Table A of Chapter 3.2. The code "B" shall then appear in this column.

7.1.1.12 ***Ventilation***

The ventilation of holds is required only if it is prescribed in 7.1.4.12 or by an additional requirement "VE ..." in column (10) of Table A of Chapter 3.2.

7.1.1.13 ***Measures to be taken prior to loading***

Additional measures to be taken prior to loading are required only if prescribed in 7.1.4.13 or by an additional requirement "LO ..." in column (11) of Table A of Chapter 3.2.

7.1.1.14 ***Handling and stowage of cargo***

During the handling and stowage of cargo additional measures are required only if prescribed in 7.1.4.14 or by an additional requirement "HA ..." in column (11) of Table A of Chapter 3.2.

7.1.1.15 *(Reserved)*

7.1.1.16 ***Measures to be taken during loading, carriage, unloading and handling of cargo***

The additional measures to be taken during loading, carriage, unloading and handling of cargo are required only if prescribed in 7.1.4.16 or by an additional requirement "IN ..." in column (11) of Table A of Chapter 3.2.

7.1.1.17 *(Reserved)*

7.1.1.18 ***Carriage in containers, in bulk containers, in intermediate bulk containers (IBCs) and in large packagings, in MEGCs, in portable tanks and in tank-containers***

The carriage of containers, bulk containers, IBCs, large packagings, MEGCs, portable tanks and tank-containers shall be in accordance with the provisions applicable to the carriage of packages.

7.1.1.19 ***Vehicles and wagons***

The carriage of vehicles and wagons shall be in accordance with the provisions applicable to the carriage of packages.

7.1.1.20 *(Reserved)*

7.1.1.21 ***Carriage in cargo tanks***

The carriage of dangerous goods in cargo tanks in dry-cargo vessels is prohibited.

7.1.1.22 to 7.1.1.99 *(Reserved)*

7.1.2 **Requirements applicable to vessels**

7.1.2.0 ***Permitted vessels***

7.1.2.0.1 Dangerous goods may be carried in quantities not exceeding those indicated in 7.1.4.1.4, or, if applicable, in 7.1.4.1.1.2 or 7.1.4.1.1.3:

– In dry cargo vessels conforming to the applicable construction requirements of 9.1.0.0 to 9.1.0.79; or

– In seagoing vessels conforming to the applicable construction requirements of 9.1.0.0 to 9.1.0.79, or otherwise to the requirements of 9.2.0 to 9.2.0.79.

7.1.2.0.2 Dangerous goods of classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9, with the exception of those for which a No. 1 model label is required in column (5) of table A of Chapter 3.2, may be carried in quantities greater than those indicated in 7.1.4.1.1.2, 7.1.4.1.1.3 and 7.1.4.1.4:

– In double-hull dry cargo vessels conforming to the applicable construction requirements of 9.1.0.80 to 9.1.0.95; or

– In double-hull seagoing vessels conforming to the applicable construction requirements of 9.1.0.80 to 9.1.0.95, or otherwise to the requirements of 9.2.0 to 9.2.0.95.

7.1.2.1 to 7.1.2.4 *(Reserved)*

7.1.2.5 ***Instructions for the use of devices and installations***

Where specific safety rules have to be complied with when using any device or installation, instructions for the use of the particular device or installation shall be readily available for consultation at appropriate places on board in the language normally spoken on board and also if that language is not English, French or German, in English, French or German unless agreements concluded between the countries concerned in the transport operation provide otherwise.

7.1.2.6 to 7.1.2.18 *(Reserved)*

7.1.2.19 ***Pushed convoys and side-by-side formations***

7.1.2.19.1 Where at least one vessel of a convoy or side-by-side formation is required to be in possession of a certificate of approval for the carriage of dangerous goods, all vessels of such convoy or side-by-side formation shall be provided with an appropriate certificate of approval.

Vessels not carrying dangerous goods shall comply with the requirements of the following paragraphs:

1.16.1.1, 1.16.1.2, 1.16.1.3, 1.16.1.4, 7.1.2.5, 8.1.4, 8.1.5, 8.1.6.1, 8.1.6.3, 8.1.7, 8.3.5, 9.1.0.0, 9.1.0.12.3, 9.1.0.12.4, 9.1.0.17.2, 9.1.0.17.3, 9.1.0.31, 9.1.0.32.2, 9.1.0.34, 9.1.0.40.2, 9.1.0.41, 9.1.0.51, 9.1.0.52, 9.1.0.71 and 9.1.0.74.

7.1.2.19.2 For the purposes of the application of the provisions of this Chapter with the exception of 7.1.4.1.1.2, 7.1.4.1.1.3 and 7.1.4.1.4, the entire pushed convoy or the side-by-side formation shall be deemed to be a single vessel.

7.1.2.20 to 7.1.2.99 *(Reserved)*

7.1.3 General service requirements

7.1.3.1 ***Access to holds, double-hull spaces and double bottoms; inspections***

7.1.3.1.1 Access to the holds is not permitted except for the purpose of loading or unloading and carrying out inspections or cleaning work.

7.1.3.1.2 Access to the double-hull spaces and the double bottoms is not permitted while the vessel is under way.

7.1.3.1.3 If the concentration of gases and vapours given off by the cargo or the oxygen content of the air in holds, double-wall spaces or double bottoms has to be measured before entry, the results of these measurements shall be recorded in writing. The measurement may only be effected by an expert referred to in 8.2.1.2, equipped with suitable breathing apparatus for the substance carried.

Entry into the spaces is not permitted for the purpose of measuring.

7.1.3.1.4 *Carriage of cargo in bulk or without packaging*

If a vessel carries dangerous goods in bulk or without packaging in its holds for which EX and/or TOX appears in column (9) of Table A of Chapter 3.2, the concentration of flammable and/or toxic gases and vapours given off by the cargo in these holds and adjacent holds shall be measured before any person enters these holds.

7.1.3.1.5 Entry into holds where dangerous goods are carried in bulk or without packaging as well as entry into double-hull spaces and double bottoms is only permitted if:

– the concentration of flammable gases and vapours given off by the cargo in the hold, double hull space or double bottom is below 10% of the LEL, the concentration of toxic gases and vapours given off by the cargo is below national accepted exposure levels, and the percentage of oxygen is between 20 and 23.5 vol %; or

– the concentration of flammable gases and vapours given off by the cargo is below 10% of the LEL, and the person entering the space wears a self-contained breathing apparatus and other necessary protective and rescue equipment, and is secured by a line. Entry into these spaces is only permitted if this operation is supervised by a second person for whom the same equipment is readily at hand. Another two persons capable of giving assistance in an emergency shall be on the vessel within calling distance.

In deviation of 1.1.4.6, more stringent national legislation on the entry into holds shall take precedence over the ADN.

7.1.3.1.6 *Carriage in packages*

In case of suspected damage to packages, the concentration of flammable and/or toxic gases and vapours given off by the cargo in holds containing dangerous goods of Classes 2, 3, 4.3, 5.2, 6.1 and 8 for which EX and/or TOX appears in column (9) of Table A of Chapter 3.2, shall be measured before any person enters these holds.

7.1.3.1.7 Entry into holds where damage is suspected to packages in which dangerous goods of Classes 2, 3, 4.3, 5.2, 6.1 and 8 are carried as well as entry into double-hull spaces and double bottoms is only permitted if:

– the concentration of flammable gases and vapours given off by the cargo in the hold, double hull space or double bottom is below 10% of the LEL, the concentration of toxic gases and vapours given off by the cargo is below national accepted exposure levels, and the percentage of oxygen is between 20 and 23,5 vol %; or

– the concentration of flammable gases and vapours given off by the cargo in the hold is below 10% of the LEL and the person entering the space wears a self-contained breathing apparatus and other necessary protective and rescue equipment and is secured by a line. Entry into these spaces is only permitted if this operation is supervised by a second person for whom the same equipment is readily at hand. Another two persons capable of giving assistance in an emergency shall be on the vessel within calling distance.

In deviation of 1.1.4.6, more stringent national legislation on the entry into holds shall take precedence over the ADN.

7.1.3.2 to 7.1.3.14 *(Reserved)*

7.1.3.15 ***Expert on board the vessel***

When dangerous goods are carried, the responsible master shall at the same time be an expert according to 8.2.1.2.

NOTE: *Which master of the vessel's crew is the responsible master shall be determined and documented on board by the carrier. If there is no such determination, the requirement applies to every master.*

By derogation from this, for the loading and unloading of dangerous goods in a barge, it is sufficient that the person who is responsible for loading and unloading and for ballasting of the barge has the expertise required according to 8.2.1.2.

7.1.3.16 All measurements on board the vessel shall be performed by an expert according to 8.2.1.2, unless provided otherwise in the Regulations annexed to ADN. The results of the measurements shall be recorded in writing in the book according to 8.1.2.1 (g).

7.1.3.17 to 7.1.3.19 *(Reserved)*

7.1.3.20 ***Water ballast***

Double-hull spaces and double bottoms may be used for water ballast.

7.1.3.21 *(Reserved)*

7.1.3.22 ***Opening of holds***

7.1.3.22.1 Dangerous goods shall be protected against the influences of weather and against spray water except during loading and unloading or during inspection.

This provision does not apply when dangerous goods are loaded in sprayproof containers, IBCs, or large packagings, or in MEGCs, portable tanks, tank-containers, vehicles or wagons which are closed or sheeted.

7.1.3.22.2 Where dangerous goods are carried in bulk, the holds shall be covered with hatch covers.

7.1.3.23 to 7.1.3.30 *(Reserved)*

7.1.3.31 ***Engines***

The use of engines running on fuels having a flashpoint equal to or lower than 55 °C (e.g. petrol engines) is prohibited. This provision does not apply to:

– the petrol-operated outboard motors of lifeboats;

– the propulsion and auxiliary systems which meet the requirements of Chapter 30 and Annex 8, Section II, Chapter 1, and Section III, Chapter 2 of the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) as amended.[1]

If a substance is carried in bulk and has in column (9) of Table A of Chapter 3.2 an entry "EX" then:

– Outboard motors and their fuel tanks shall be carried on board only outside the protected area; and

– Mechanical inflation devices, outboard motors and their electrical installations shall be put into operation only outside the protected area.

7.1.3.32 ***Oil fuel tanks***

Double bottoms with a height of at least 0.6 m may be used as oil fuel tanks provided that they have been constructed in accordance with Chapters 9.1 or 9.2.

7.1.3.33 to 7.4.3.40 *(Reserved)*

7.1.3.41 ***Smoking, fire or naked light***

7.1.3.41.1 Smoking, including electronic cigarettes and other similar devices, fire and naked light are prohibited on board the vessel.

This prohibition shall be displayed on notice boards at appropriate places.

The prohibition does not apply in the accommodation or the wheelhouse, provided that their windows, doors, skylights and hatches are closed or the ventilation system is adjusted to guarantee an overpressure of at least 0.1 kPa.

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1 *As available on the website of the Comité Européen pour l'Élaboration de Standards dans le Domaine de Navigation Intérieure – CESNI,* https://www.cesni.eu/en/documents/es-trin/.

7.1.3.41.2 Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels.

Cooking and refrigerating appliances may only be used in the accommodation and in the wheelhouse.

7.1.3.41.3 Heating appliances or boilers fuelled with liquid fuels having a flash-point above 55° C which are installed in the engine room or in another suitable space may, however, be used.

7.1.3.42 ***Heating of holds***

The heating of holds or the operation of a heating system in the holds is prohibited.

7.1.3.43 *(Reserved)*

7.1.3.44 ***Cleaning operations***

The use of liquids having a flash-point below 55° C for cleaning purposes is prohibited.

7.1.3.45 to 7.1.3.50 *(Reserved)*

7.1.3.51 ***Electrical and non-electrical installations and equipment***

7.1.3.51.1 The electrical and non-electrical installations and equipment shall be properly maintained.

7.1.3.51.2 The use of movable electric cables is prohibited in the protected area. This provision does not apply to the electric cables referred to in 9.1.0.53.5.

Movable electric cables must undergo visual inspection each time before use. They must be installed in such a way as to ensure that they are not at risk of damage. Connectors must be located outside of the protected area.

The use of electric cables to connect the power network of a vessel to a land-based power network is not permitted:

– During the loading or unloading of substances that have an entry "EX" in column (9) of Table A of Chapter 3.2; or

– When the vessel is located immediately adjacent to or within an onshore assigned zone.

7.1.3.51.3 The sockets for connecting the signal lights and gangway lighting and for connecting containers, submerged pumps, hatch cover gantries, or hold fans shall not be live except when the signal lights or the gangway lighting are switched on or when the containers or the submerged pumps or the hatch cover gantries or hold fans are in operation. Connecting or disconnecting shall only be possible when the sockets are not live.

7.1.3.51.4 The electrical installations and equipment in the holds shall be kept switched off and protected against unintentional connection.

This provision does not apply to permanently installed electrical cables passing through the holds, to movable electrical cables connecting containers stowed according to 7.1.4.4.4, or to electrical installations and equipment fulfilling the requirements for use in zone 1.

7.1.3.51.5 During a stay in the immediate vicinity of or within an onshore assigned zone, electrical and non-electrical installations and equipment not fulfilling the requirements of 9.1.0.52.1 or that may have a surface temperature higher than 200 °C (marked in red according to 9.1.0.51 and 9.1.0.52.2) shall be switched off and cooled down to below 200 °C, or the measures mentioned in 7.1.3.51.6 shall be taken.

7.1.3.51.6 7.1.3.51.5 does not apply in accommodation, wheelhouse and service spaces located outside the protected area if:

(a) The ventilation system is adjusted to guarantee an overpressure of at least 0.1 kPa; and

(b) The gas detection system is switched on, taking measurements continuously.

7.1.3.51.7 Installations and equipment referred to in 7.1.3.51.5 that have been switched off during loading or unloading or during a stay in the immediate vicinity of or within an onshore assigned zone may only be switched on again when:

(a) The vessel is no longer in the vicinity of or within the onshore assigned zone; or

(b) A concentration of less than 10% of the LEL of n-Hexane is reached in the wheelhouse, accommodation and service spaces located outside the protected area.

The results of the measurements shall be recorded in writing.

7.1.3.51.8 If vessels are not able to meet the requirements of 7.1.3.51.5 and 7.1.3.51.6, they are not permitted to remain in the immediate vicinity of or within an onshore assigned zone. The competent authority may allow exceptions in individual cases.

7.1.3.52 to 7.1.3.69 *(Reserved)*

7.1.3.70 ***Aerials, lightning conductors, wire cables and masts***

7.1.3.70.1 No part of an aerial for electronic apparatus, no lightning conductor and no wire cable shall be situated above the holds.

7.1.3.70.2 No part of aerials for radiotelephones shall be located within 2.00 m from substances or articles of Class 1.

7.1.3.71 to 7.1.3.99 *(Reserved)*

7.1.4 Additional requirements concerning loading, carriage, unloading and other handling of the cargo

7.1.4.1 ***Limitation of the quantities carried***

7.1.4.1.1 Single-hull vessels may carry goods of Classes 1, 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 and 9 only in the limited quantities set out in 7.1.4.1.4. This provision also applies to pushed barges and double-hull vessels which do not meet the additional rules of construction in 9.1.0.88 to 9.1.0.95 or 9.2.0.88 to 9.2.0.95.

7.1.4.1.1.1 Where substances and articles of different divisions of Class 1 are loaded in a single vessel in conformity with the provisions for prohibition of mixed loading of 7.1.4.3.3 or 7.1.4.3.4, the entire load shall not exceed the smallest maximum mass given in 7.1.4.1.4 below for the goods of the most dangerous division loaded, the order of precedence being 1.1, 1.5, 1.2, 1.3, 1.6, 1.4.

7.1.4.1.1.2 For pushed convoys and side-by-side formations, the quantity limitations specified in 7.1.4.1.4 apply to each unit. A maximum of 1,100,000 kg is permitted for each unit.

7.1.4.1.1.3 When a vessel is carrying several types of dangerous goods, the total quantity shall not exceed 1,100,000 kg.

7.1.4.1.2 Double-hull vessels meeting the additional construction rules in 9.1.0.88 to 9.1.0.95 or 9.2.0.88 to 9.2.0.95 may carry goods without limitation of the quantity carried, except for:

- goods of Class 1, and
- goods of classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 and 9 for which a danger label of model No. 1 is required in column (5) of Table A of Chapter 3.2,

for which the limitations set in 7.1.4.1.1 and 7.1.4.1.1.1 to 7.1.4.1.1.3 apply.

7.1.4.1.3 For activity limits, transport index (TI) limits and criticality safety indices (CSI) in the case of the carriage of radioactive material, see 7.1.4.14.7.

7.1.4.1.4 Quantity limitations

Class	*Description*	*0 kg*	*90 kg*	*15,000 kg*	*50,000 kg*	*120,000 kg*	*300,000 kg*	*1,100,000 kg*
1	All substances and articles of Division 1.1, compatibility group A[1]		X					
	All substances and articles of Division 1.1, compatibility groups B, C, D, E, F, G, J or L[2]			X				
	All substances and articles of Division 1.2, compatibility groups B, C, D, E, F, G, H, J or L				X			
	All substances and articles of Division 1.3, compatibility groups C, G, H, J or L[3]						X	
	All substances and articles of Division 1.4, compatibility groups B, C, D, E, F, G or S							X
	All substances of Division 1.5, compatibility group D[2]			X				
	All substances and articles of Division 1.6, compatibility group N[3]						X	
	Empty packaging, uncleaned							X
	Note: *[1] In not less than three batches of a maximum of 30 kg each, distance between batches not less than 10.00 m.* *[2] In not less than three batches of a maximum of 5,000 kg each, distance between batches not less than 10.00 m.* *[3] Not more than 100,000 kg per hold. A wooden partition is permitted for subdividing a hold.*							
2	All goods for which label No. 2.1 is required in column (5) of Table A of Chapter 3.2: total						X	
	All goods for which label No. 2.3 is required in column (5) of Table A of Chapter 3.2: total					X		
	Other goods							X
3	All goods of packing groups I or II for which, in addition to a label of model No. 3, a label of model No. 6.1 is required in column (5) of Table A of Chapter 3.2: total					X		
	Other goods						X	

Class	*Description*	*0 kg*	*90 kg*	*15,000 kg*	*50,000 kg*	*120,000 kg*	*300,000 kg*	*1,100,000 kg*
4.1	UN Nos. 3221, 3222, 3231 and 3232: total			X				
	All goods of packing group I; All goods of packing group II for which, in addition to a label of model No. 4.1, a label of model No. 6.1 is required in column (5) of Table A of Chapter 3.2; Self-reactive substances of types C, D, E and F (UN Nos. 3223 to 3230 and 3233 to 3240); All other substances of classification code SR1 or SR2 (UN Nos. 2956, 3241, 3242 and 3251); and desensitized explosive substances of packing group II (UN Nos. 2907, 3319 and 3344): total					X		
	Other goods							X
4.2	All goods of packing groups I or II for which, in addition to a label of model No. 4.2, a label of model No. 6.1 is required in column (5) of Table A of Chapter 3.2: total						X	
	Other goods							X
4.3	All goods of packing groups I or II for which, in addition to a label of model No. 4.3, a label of model No. 3, 4.1 or 6.1 is required in column (5) of Table A of Chapter 3.2: total						X	
	Other goods							X
5.1	All goods of packing groups I or II for which, in addition to a label of model No. 5.1, a label of model No. 6.1 is required in column (5) of Table A of Chapter 3.2: total						X	
	Other goods							X
5.2	UN Nos. 3101, 3102, 3111 and 3112: total			X				
	Other goods					X		
6.1	All goods of packing group I: total					X		
	All goods of packing group II: total						X	
	All goods carried in bulk	X						
	Other goods							X

Class	Description	0 kg	90 kg	15,000 kg	50,000 kg	120,000 kg	300,000 kg	1,100,000 kg
7	UN Nos. 2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978 and 3321 to 3333	X						
	Other goods							X
8	All goods of packing group I;							
	All goods of packing group II for which, in addition to a label of model No. 8, a label of model No. 3 or 6.1 is required in column (5) of Table A of Chapter 3.2: total						X	
	Other goods							X
9	All goods of packing group II: total						X	
	UN No. 3077, goods carried in bulk and classified as hazardous to the aquatic environment, categories Acute 1 or Chronic 1, in accordance with 2.4.3	X						
	Other goods							X

7.1.4.2 ***Prohibition of mixed loading (bulk)***

Vessels carrying substances of Class 5.1 in bulk shall not carry any other goods.

7.1.4.3 ***Prohibition of mixed loading (packages in holds)***

7.1.4.3.1 Goods of different classes shall be separated by a minimum horizontal distance of 3.00 m. They shall not be stowed one on top of the other.

7.1.4.3.2 Irrespective of the quantity, dangerous goods for which marking with two blue cones or two blue lights is prescribed in column (12) of Table A of Chapter 3.2 shall not be stowed in the same hold together with flammable goods for which marking with one blue cone or one blue light is prescribed in column (12) of Table A of Chapter 3.2.

7.1.4.3.3 Packages containing substances or articles of Class 1 and packages containing substances of Classes 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2 shall be separated by a distance of not less than 12 m from goods of all other classes.

7.1.4.3.4 Substances and articles of Class 1 shall not be stowed in the same hold, except as indicated in the following table:

Compatibility group	A	B	C	D	E	F	G	H	J	L	N	S
A	X	-	-	-	-	-	-	-	-	-	-	-
B	-	X	-	1/	-	-	-	-	-	-	-	X
C	-	-	X	X	X	-	X	-	-	-	2/, 3/	X
D	-	1/	X	X	X	-	X	-	-	-	2/, 3/	X
E	-	-	X	X	X	-	X	-	-	-	2/, 3/	X
F	-	-	-	-	-	X	-	-	-	-	-	X
G	-	-	X	X	X	-	X	-	-	-	-	X
H	-	-	-	-	-	-	-	X	-	-	-	X
J	-	-	-	-	-	-	-	-	X	-	-	X
L	-	-	-	-	-	-	-	-	-	4/	-	-
N	-	-	2/, 3/	2/, 3/	2/, 3/	-	-	-	-	-	2/	X
S	-	X	X	X	X	X	X	X	X	-	X	X

"X" indicates that explosive substances or articles of corresponding compatibility groups in accordance with Part 2 of these Regulations may be stowed in the same hold.

1/ Packages containing articles assigned to compatibility group B or substances or articles assigned to compatibility group D may be loaded together in the same hold provided that they are carried in closed containers, vehicles or wagons.

2/ Different categories of articles of Division 1.6, compatibility group N, may be carried together as articles of Division 1.6, compatibility group N, only when it is proven by testing or analogy that there is no additional risk of sympathetic detonation between the articles. Otherwise they should be treated as hazard Division 1.1.

3/ When articles of compatibility group N are carried with substances or articles of compatibility groups C, D or E, the articles of compatibility group N should be considered as having the characteristics of compatibility group D.

4/ Packages with substances or articles of compatibility group L may be stowed in the same hold with packages containing the same type of substances or articles of the same compatibility group.

7.1.4.3.5 For the carriage of material Class 7 (UN Nos. 2916, 2917, 3323, 3328, 3329 and 3330) in Type B(U) or Type B(M) or Type C packages, the controls, restrictions or provisions specified in the competent authority approval certificate shall be complied with.

7.1.4.3.6 For the carriage of material of Class 7 under special arrangement (UN Nos. 2919 and 3331), the special provisions specified by the competent authority shall be met. In particular, mixed loading shall not be permitted unless specifically authorized by the competent authority.

7.1.4.4 ***Prohibition of mixed loading (containers, vehicles, wagons)***

7.1.4.4.1 7.1.4.3 shall not apply to packages stowed in containers, vehicles or wagons in accordance with international regulations.

7.1.4.4.2 7.1.4.3 shall not apply to:

- closed containers;
- closed vehicles and closed wagons;
- tank-containers, portable tanks and MEGCs;
- tank-vehicles and tank-wagons.

7.1.4.4.3 For containers other than those referred to in paragraph 7.1.4.4.1 and 7.1.4.4.2 above the separation distance required by 7.1.4.3.1 may be reduced to 2.40 m (width of container).

7.1.4.4.4 The electrical installations and equipment fitted to the outside of a closed container may be connected with removable electrical cables in accordance with the provisions of 9.1.0.53.5 or be put into operation provided that:

(a) These electrical installations and equipment are appropriate at least for use in zone 1 and comply with the requirements for temperature class T4 and explosion group II B; or that

(b) These electrical installations and equipment do not fulfil the requirements referred to in (a), but are sufficiently separated from other containers containing substances of:

- Class 2 for which a label No. 2.1 is required in column (5) of Table A of Chapter 3.2;
- Class 3, packing group I or II;
- Class 4.3;
- Class 6.1; packing group I or II, with an additional hazard of Class 4.3;
- Class 8, packing group I, with an additional hazard of Class 3; and
- Class 8, packing group I or II, with an additional hazard of Class 4.3.

This condition is deemed to be met if no container containing the above-mentioned substances is stowed within an area of cylindrical form with a radius of 2.40 m around the electrical installations and equipment and an unlimited vertical extension.

The requirements of subparagraphs (a) and (b) need not be complied with if containers with the electrical installations or equipment which do not meet the requirements for use in explosion hazardous areas and the containers containing the above-mentioned substances are stowed in separate holds.

Examples of stowage and segregation of containers

Legend

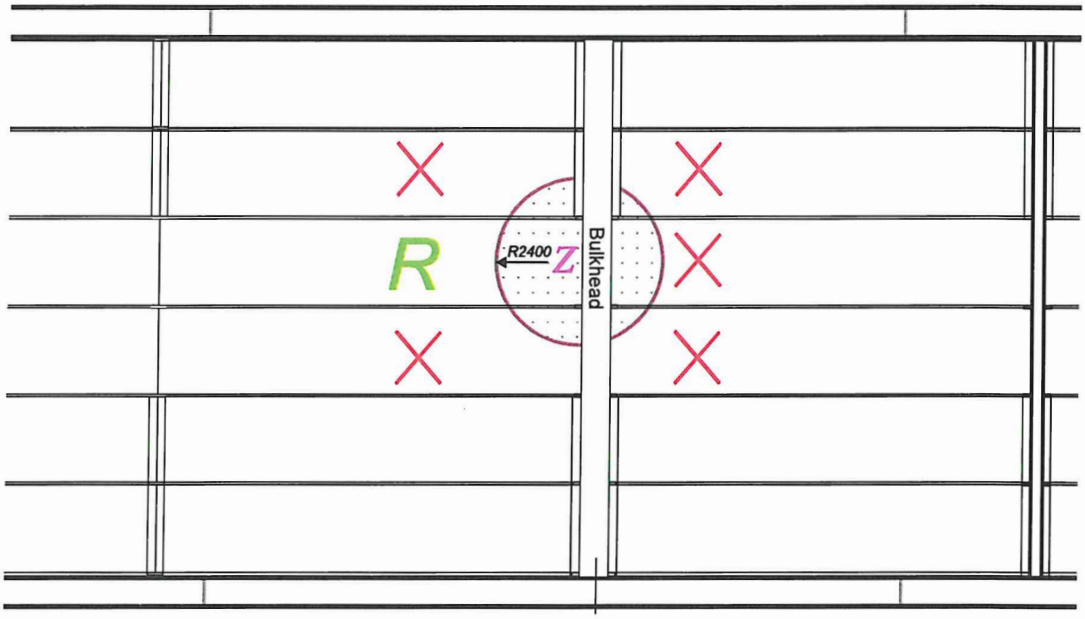
R Container (e.g. reefer) with electrical equipment which do not fulfil the requirements in 7.1.4.4.4 (a).

Z Electrical installations and equipment which do not fulfil the requirements in 7.1.4.4.4 (a).

X Container not allowed when containing dangerous substances for which sufficient separation is required.

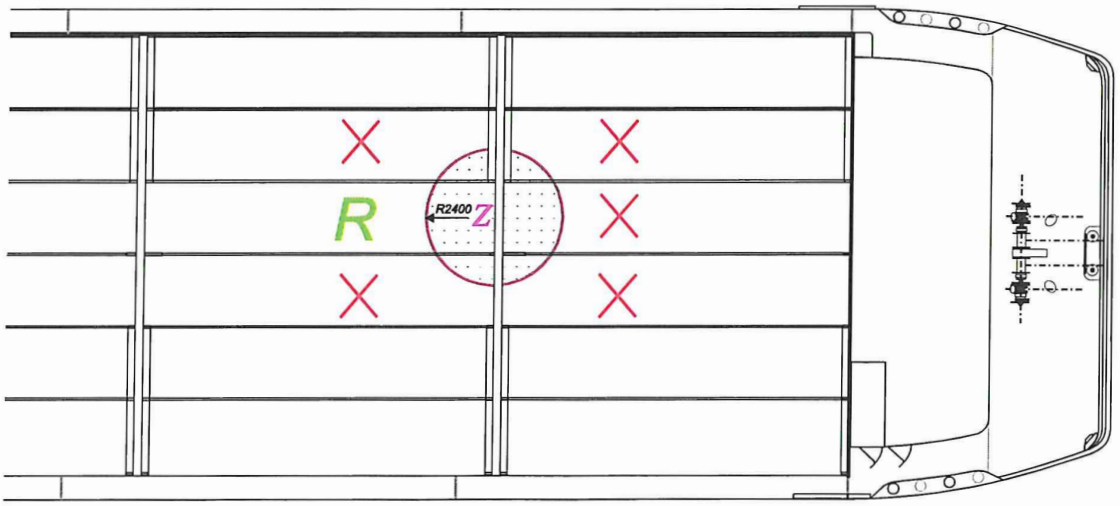
Top view

1. On deck



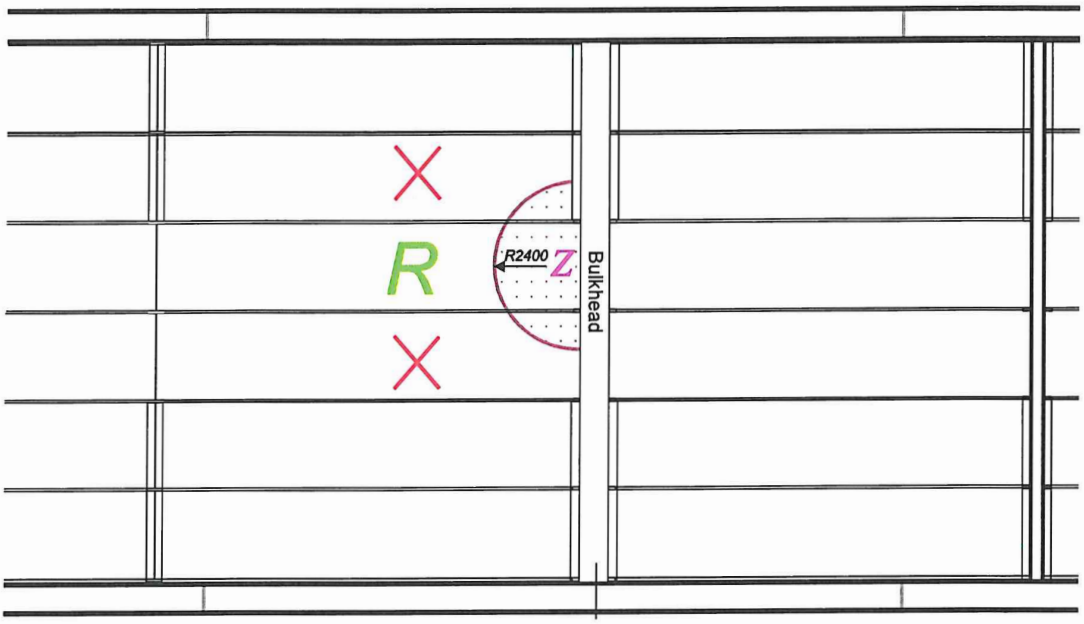
Top view

2. In the hold

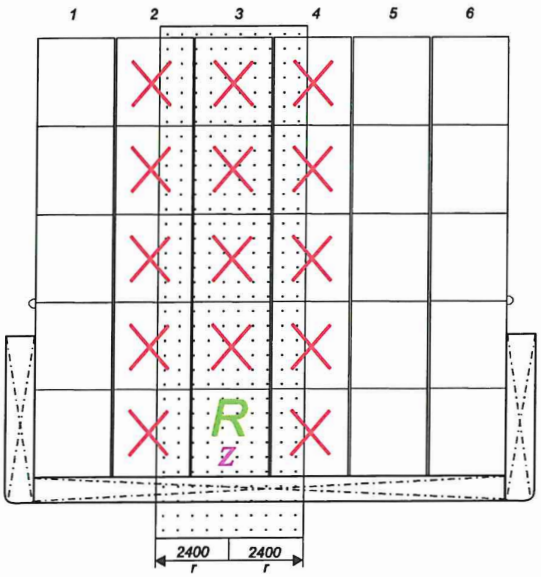


Top view

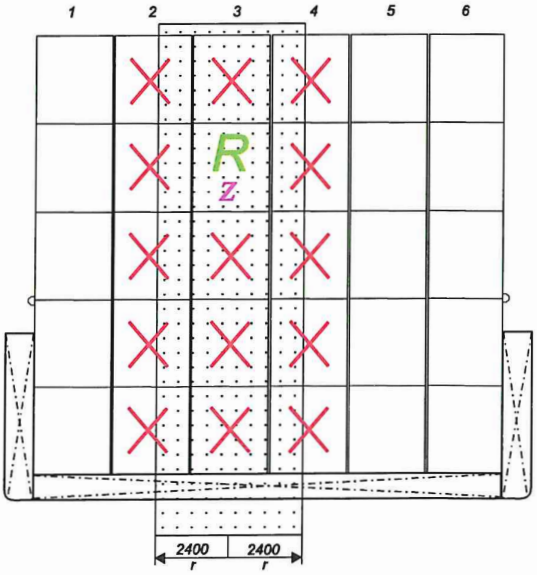
2. In the hold



Front view



Front view



7.1.4.4.5 Electrical installations and equipment fitted on an open container may not be connected with removable electrical cables in accordance with the provisions of 9.1.0.53.5 or be used unless they are appropriate at least for use in zone 1 and they comply with the requirements for temperature class T4 and explosion group II B, or the container is loaded in a hold free of containers containing substances mentioned in 7.1.4.4.4 (b).

7.1.4.5 ***Prohibition of mixed loading (seagoing vessels; inland navigation vessels carrying containers)***

For seagoing vessels and inland waterway vessels, where the latter only carry containers, the prohibition of mixed loading shall be deemed to have been met if the stowage and segregation requirements of the IMDG Code have been complied with.

7.1.4.6 *(Reserved)*

7.1.4.7 ***Places of loading and unloading***

7.1.4.7.1 The dangerous goods shall be loaded or unloaded only at the places designated or approved for this purpose by the competent authority. In those places the means of evacuation mentioned in subsection 7.1.4.77 should be made available. Otherwise trans-shipment is permitted only with the authorization of the competent authority.

7.1.4.7.2 When substances or articles of Class 1 and substances of Classes 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2 are on board, no goods of any kind may be loaded or unloaded except at the places designated or permitted for this purpose by the competent authority.

7.1.4.7.3 If a zone is assigned onshore at the loading or unloading station, the vessel is only authorized to stay in its immediate vicinity or within the zone if it meets the requirements of 9.1.0.12.3 (b) or (c), 9.1.0.51, 9.1.0.52.1 and 9.1.0.52.2. The competent authority may allow exceptions in individual cases.

7.1.4.8 ***Time and duration of loading and unloading operations***

7.1.4.8.1 Loading and unloading operations of substances or articles of Class 1 and substances of Classes 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2 shall not start without permission in writing from the competent authority. This provision also applies to loading or unloading of other goods when substances or articles of Class 1 or substances of Classes 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2 are on board.

7.1.4.8.2 Loading and unloading operations of substances or articles of Class 1 and substances of Classes 4.1 or 5.2, for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2, shall be suspended in the event of a storm.

7.1.4.9 ***Cargo transhipment operations***

Partial or complete cargo transhipment into another vessel without permission from the competent authority is prohibited outside a cargo transhipment place approved for this purpose.

Note: *For transhipment to means of transport of another mode see 7.1.4.7.1.*

7.1.4.10 ***Precautions with respect to foodstuffs, other articles of consumption and animal feeds***

7.1.4.10.1 When special provision 802 is indicated for a dangerous good in column (6) of Table A of Chapter 3.2, precautions shall be taken as follows with respect to foodstuffs, other articles of consumption and animal feeds:

Packages as well as uncleaned empty packagings, including large packagings and intermediate bulk containers (IBCs), bearing labels conforming to models Nos. 6.1 or 6.2, and those bearing labels of Class 9, containing substances of Class 9, UN Nos. 2212, 2315, 2590, 3151, 3152 or 3245, shall not be stacked on or loaded in immediate proximity to packages known to contain foodstuffs, other articles of consumption or animal feeds in the same hold and at places of loading and unloading or trans-shipment.

When these packages, bearing the said labels, are loaded in immediate proximity of packages known to contain foodstuffs, other articles of consumption or animal feeds, they shall be kept apart from the latter:

(a) by complete partitions which should be as high as the packages bearing the said labels; or

(b) by packages not bearing labels conforming to models Nos. 6.1, 6.2 or 9 or packages bearing labels of Class 9 but not containing substances of that class, UN Nos. 2212, 2315, 2590, 3151, 3152 or 3245; or

(c) by a space of at least 0.8 m;

unless the packages bearing said labels are provided with an additional packaging or are completely covered (e.g. by a sheeting, a fibreboard cover or other measures).

7.1.4.11 ***Stowage plan***

7.1.4.11.1 The master shall enter on a stowage plan the dangerous goods stowed in the individual holds or on deck. The goods shall be described as in the transport document in accordance with 5.4.1.1.1 (a), (b), (c) and (d).

7.1.4.11.2 Where the dangerous goods are transported in containers, the number of the container shall suffice. In this case, the stowage plan shall contain as an annex a list of all containers with their numbers and the description of the goods contained therein in accordance with 5.4.1.1.1 (a), (b), (c) and (d).

7.1.4.12 ***Ventilation***

7.1.4.12.1 During loading or unloading of road vehicles into or from the holds of ro-ro-vessels, there shall be not less than five changes of air per hour based upon the total volume of the empty hold.

7.1.4.12.2 On board vessels carrying dangerous goods only in containers placed in open holds, ventilators do not require to be incorporated but must be on board. Where damage of the container or release of content inside the container is suspected, the holds shall be ventilated so as to reduce the concentration of flammable gases and vapours given off by the cargo to less than 10% of the LEL or in the case of toxic gases and vapours to below national accepted exposure levels.

7.1.4.12.3 If tank-containers, portable tanks, MEGCs, tank vehicles or tank wagons are carried in closed holds, such holds shall be permanently ventilated for ensuring five air changes per hour.

7.1.4.13 ***Measures to be taken before loading***

The holds and cargo areas shall be cleaned prior to loading. The holds shall be ventilated.

7.1.4.14 ***Handling and stowage of the cargo***

7.1.4.14.1 The various components of the cargo shall be stowed such as to prevent them from shifting in relation to one another or to the vessel and such that no damage can be caused by other cargo.

7.1.4.14.1.1 Packages containing dangerous substances and unpackaged dangerous articles shall be secured by suitable means capable of restraining the goods (such as fastening straps, sliding slatboards, adjustable brackets) in a manner that will prevent any movement during carriage which would change the orientation of the packages or cause them to be damaged. When dangerous goods are carried with other goods (e.g. heavy machinery or crates), all goods shall be securely fixed or packed so as to prevent the release of dangerous goods. Movement of packages may also be prevented by filling any voids by the use of dunnage or by blocking and bracing. Where restraints such as banding or straps are used, these shall not be over-tightened to cause damage or deformation of the package. Flexible bulk containers shall be stowed in such way that there are no void spaces between them in the hold. If the flexible bulk containers do not completely fill the hold, adequate measures shall be taken to avoid shifting of cargo.

7.1.4.14.1.2 Packages shall not be stacked unless designed for that purpose. Where different design types of packages that have been designed for stacking are to be loaded together, consideration shall be given to their compatibility for stacking with each other. Where necessary, stacked packages shall be prevented from damaging the package below by the use of load-bearing devices. Flexible bulk containers may be stacked on each other in holds provided that the stacking height does not exceed three high. When flexible bulk containers are fitted with venting devices, the stowage of the flexible bulk containers shall not impede their function.

7.1.4.14.1.3 During loading and unloading, packages containing dangerous goods shall be protected from being damaged.

NOTE: *Particular attention shall be paid to the handling of packages during their preparation for carriage, the type of vessel on which they are to be carried and to the method of loading or unloading, so that accidental damage is not caused through dragging or mishandling the packages.*

7.1.4.14.1.4 When orientation arrows are required, packages and overpacks shall be oriented in accordance with such markings.

NOTE: *Liquid dangerous goods shall be loaded below dry dangerous goods whenever practicable.*

7.1.4.14.2 Dangerous goods shall be stowed at a distance of not less than 1 m from the accommodation, the engine rooms, the wheelhouse and any sources of heat.

When the accommodation or wheelhouse is situated above a hold, dangerous goods shall in no case be stowed beneath such accommodation or wheelhouse.

7.1.4.14.3 Packages shall be protected against heat, sunlight and the effects of the weather. This provision does not apply to vehicles, wagons, tank-containers, portable tanks, MEGCs and containers.

Where packages are not enclosed in vehicles, wagons or containers but loaded on deck, they shall be covered with tarpaulins that are not readily flammable.

The ventilation shall not be obstructed.

7.1.4.14.4 The dangerous goods shall be stowed in the holds. However, dangerous goods packed or loaded in:

- closed containers;
- MEGCs;
- sheeted vehicles or sheeted wagons;
- tank-containers or portable tanks;
- tank vehicles or tank wagons;

may be carried on deck in the protected area.

7.1.4.14.5 Packages containing dangerous goods of Classes 3, 4.1, 4.2, 5.1 or 8 may be stowed on deck in the protected area provided that drums are used or that they are contained in containers with complete walls or vehicles or wagons with complete walls. Substances of Class 2 may be stowed on deck in the protected area, provided they are contained in cylinders.

7.1.4.14.6 For seagoing vessels, the stowage requirements set out in 7.1.4.14.1 to 7.1.4.14.5 above and 7.1.4.14.7 below shall be deemed to have been met, if the relevant stowage provisions of the IMDG Code and, in the case of carriage of dangerous goods in bulk, those set out in subsection 9.3 of the IMSBC Code have been complied with.

7.1.4.14.7 *Handling and stowage of radioactive material*

NOTE 1: *"Critical group" means a group of members of the public which is reasonably homogeneous with respect to its exposure for a given radiation source and given exposure pathway and is typical of individuals receiving the highest effective dose by the given exposure pathway from the given source.*

NOTE 2: *"Members of the public" means in a general sense, any individuals in the population except when subject to occupational or medical exposure.*

NOTE 3: *"Workers" are any persons who work, whether full time, part-time or temporarily, for an employer and who have recognized rights and duties in relation to occupational radiation protection.*

7.1.4.14.7.1 *Segregation*

7.1.4.14.7.1.1 Packages, overpacks, containers, tanks and vehicles and wagons containing radioactive material and unpackaged radioactive material shall be segregated during carriage:

(a) from workers in regularly occupied working areas;

(i) in accordance with Table A below; or

(ii) by distances calculated using a dose criterion of 5 mSv in a year and conservative model parameters;

NOTE: *Workers subject to individual monitoring for the purposes of radiation protection shall not be considered for the purposes of segregation.*

(b) from members of the critical group of the public, in areas where the public has regular access;

(i) in accordance with Table A below; or

(ii) by distances calculated using a dose criterion of 1 mSv in a year and conservative model parameters;

(c) from undeveloped photographic film and mailbags;

(i) in accordance with Table B below; or

(ii) by distances calculated using a radiation exposure criterion for undeveloped photographic film due to the transport of radioactive material for 0.1 mSv per consignment of such film; and

NOTE: *Mailbags shall be assumed to contain undeveloped film and plates and therefore be separated from radioactive material in the same way.*

(d) from other dangerous goods in accordance with 7.1.4.3.

Table A: Minimum distances between packages of category II-YELLOW or of category III-YELLOW and persons

Sum of transport indexes not more than	Exposure time per year (hours)			
	Areas where members of the public have regular access		Regularly occupied working areas	
	50	250	50	250
	Segregation distance in metres, no shielding material intervening, from:			
2	1	3	0.5	1
4	1.5	4	0.5	1.5
8	2.5	6	1.0	2.5
12	3	7.5	1.0	3
20	4	9.5	1.5	4
30	5	12	2	5
40	5.5	13.5	2.5	5.6
50	6.5	15.5	3	6.5

Table B: Minimum distances between packages of category II-YELLOW or of category III-YELLOW and packages bearing the word "FOTO", or mailbags

Total number of packages not more than		Sum of transport indexes not more than	Journey or storage duration, in hours							
Category			1	2	4	10	24	48	120	240
III-yellow	II-yellow		Minimum distances in metres							
		0.2	0.5	0.5	0.5	0.5	1	1	2	3
		0.5	0.5	0.5	0.5	1	1	2	3	5
	1	1	0.5	0.5	1	1	2	3	5	7
	2	2	0.5	1	1	1.5	3	4	7	9
	4	4	1	1	1.5	3	4	6	9	13
	8	8	1	1.5	2	4	6	8	13	18
1	10	10	1	2	3	4	7	9	14	20
2	20	20	1.5	3	4	6	9	13	20	30
3	30	30	2	3	5	7	11	16	25	35
4	40	40	3	4	5	8	13	18	30	40
5	50	50	3	4	6	9	14	20	32	45

7.1.4.14.7.1.2 Category II-YELLOW or III-YELLOW packages or overpacks shall not be carried in compartments occupied by passengers, except those exclusively reserved for couriers specially authorized to accompany such packages or overpacks.

7.1.4.14.7.1.3 No persons other than the master of the vessel or the driver of the vehicle embarked, persons who are on board for duty reasons and the other members of the crew shall be permitted in vessels carrying packages, overpacks or containers bearing category II-YELLOW or III-YELLOW labels.

7.1.4.14.7.2 *Activity limits*

The total activity in a single hold or compartment of a vessel, or in another conveyance, for carriage of LSA material or SCO articles in Type IP-1, Type IP-2, Type IP-3 or unpackaged, shall not exceed the limits shown in Table C below. For SCO-III, the limits in Table C below may be exceeded provided that the transport plan contains precautions which are to be employed during carriage to obtain an overall level of safety at least equivalent to that which would be provided if the limits had been applied.

Table C: Conveyance activity limits for LSA material and SCO in industrial packages or unpackaged

Nature of material or articles	Activity limit for conveyances other than by vessel	Activity limit for a hold or compartment of a vessel
LSA-I	No limit	No limit
LSA-II and LSA-III non-combustible solids	No limit	$100A_2$
LSA-II and LSA-III combustible solids, and all liquids and gases	$100A_2$	$10A_2$
SCO	$100A_2$	$10A_2$

7.1.4.14.7.3 *Stowage during carriage and storage in transit*

7.1.4.14.7.3.1 Consignments shall be securely stowed.

7.1.4.14.7.3.2 Provided that its average surface heat flux does not exceed 15W/m^2 and that the immediately surrounding cargo is not in bags, a package or overpack may be carried or stored among packaged general cargo without any special stowage provisions except as may be specifically required by the competent authority in an applicable approval certificate.

7.1.4.14.7.3.3 Loading of containers and accumulation of packages, overpacks and containers shall be controlled as follows:

(a) Except under the conditions of exclusive use, and for consignments of LSA-I material, the total number of packages, overpacks and containers aboard a single conveyance shall be so limited that the total sum of the transport indexes aboard the conveyance does not exceed the values shown in Table D below;

(b) The dose rate under routine conditions of carriage shall not exceed 2 mSv/h at any point on the external surface of vehicles, wagons or containers and 0.1 mSv/h at 2 m from the external surface of vehicles, wagons or containers, except for consignments carried under exclusive use for which the dose rate limits around the vehicles or wagons are set forth in 7.1.4.14.7.3.5 (b) and (c);

(c) The total sum of the criticality safety indexes in a container and aboard a conveyance shall not exceed the values shown in Table E below.

Table D: Transport Index limits for containers and conveyances not under exclusive use

Type of container or conveyance	Limit on total sum of transport indexes in a container or aboard a conveyance
Small container	50
Large container	50
Vehicle or wagon	50
Vessel	50

Table E: Criticality Safety Index for containers and vehicles containing fissile material

Type of container or conveyance	Limit on total sum of criticality safety indexes	
	Not under exclusive use	Under exclusive use
Small container	50	n.a.
Large container	50	100
Vehicle or wagon	50	100
Vessel	50	100

7.1.4.14.7.3.4 Any package or overpack having either a transport index greater than 10, or any consignment having a criticality safety index greater than 50, shall be carried only under exclusive use.

7.1.4.14.7.3.5 For consignments under exclusive use in vehicles or wagons, the dose rate shall not exceed:

(a) 10 mSv/h at any point on the external surface of any package or overpack, and may only exceed 2 mSv/h provided that:

(i) the vehicle or wagon is equipped with an enclosure which, during routine conditions of carriage, prevents the access of unauthorized persons to the interior of the enclosure;

(ii) provisions are made to secure the package or overpack so that its position within the vehicle or wagon enclosure remains fixed during routine conditions of carriage; and

(iii) there is no loading or unloading during the shipment;

(b) 2 mSv/h at any point on the outer services of the vehicle or wagon, including the upper and lower surfaces, or, in the case of an open vehicle or wagon, at any point on the vertical planes projected from the outer edges of the vehicle or wagon, on the upper surface of the load, and on the lower external surface of the vehicle or wagon; and

(c) 0.1 mSv/h at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle or wagon, or, if the load is carried in an open vehicle or wagon, at any point 2 m from the vertical planes projected from the outer edges of the vehicle or wagon.

7.1.4.14.7.3.6 Packages or overpacks having a surface dose rate greater than 2 mSv/h, unless being carried in or on a vehicle or wagon under exclusive use and unless they are not removed from the vehicle or wagon when on board the vessel shall not be transported by vessel except under special arrangement.

7.1.4.14.7.3.7 The transport of consignments by means of a special use vessel which, by virtue of its design, or by reason of its being chartered, is dedicated to the purpose of carrying radioactive material, shall be excepted from the requirements specified in 7.1.4.14.7.3.3 provided that the following conditions are met:

(a) A radiation protection programme for the shipment shall be approved by the competent authority of the flag state of the vessel and, when requested, by the competent authority at each port of call of the transit countries;

(b) Stowage arrangements shall be predetermined for the whole voyage including any consignments to be loaded at ports of call en route; and

(c) The loading, carriage and unloading of the consignments shall be supervised by persons qualified in the transport of radioactive material.

7.1.4.14.7.4 *Segregation of packages containing fissile material during carriage and storage in transit*

7.1.4.14.7.4.1 Any group of packages, overpacks, and containers containing fissile material stored in transit in any one storage area shall be so limited that the total sum of the criticality safety indexes in the group does not exceed 50. Each group shall be stored so as to maintain a spacing of at least 6 m from other such groups.

7.1.4.14.7.4.2 Where the total sum of the criticality safety indexes on board a vehicle, a wagon or in a container exceeds 50, as permitted in Table E above, storage shall be such as to maintain a spacing of at least 6 m from other groups of packages, overpacks or containers containing fissile material or other vehicles or wagons carrying radioactive material. The space between such groups may be used for other dangerous goods of ADN. The carriage of other goods with consignments under exclusive use is permitted provided that the pertinent provisions have been taken by the consignor and that carriage is not prohibited under other requirements.

7.1.4.14.7.4.3 Fissile material meeting one of the provisions (a) to (f) of 2.2.7.2.3.5 shall meet the following requirements:

(a) Only one of the provisions (a) to (f) of 2.2.7.2.3.5 is allowed per consignment;

(b) Only one approved fissile material in packages classified in accordance with 2.2.7.2.3.5 (f) is allowed per consignment unless multiple materials are authorized in the certificate of approval;

(c) Fissile material in packages classified in accordance with 2.2.7.2.3.5 (c) shall be carried in a consignment with no more than 45 g of fissile nuclides;

(d) Fissile material in packages classified in accordance with 2.2.7.2.3.5 (d) shall be carried in a consignment with no more than 15 g of fissile nuclides;

(e) Unpackaged or packaged fissile material classified in accordance with 2.2.7.2.3.5 (e) shall be carried under exclusive use on a vehicle with no more than 45 g of fissile nuclides.

7.1.4.14.7.5 *Damaged or leaking packages, contaminated packagings*

7.1.4.14.7.5.1 If it is evident that a package is damaged or leaking, or if it is suspected that the package may have leaked or been damaged, access to the package shall be restricted and a qualified person shall, as soon as possible, assess the extent of contamination and the resultant dose rate of the package. The scope of the assessment shall include the package, the vehicle, the wagon, the vessel, the adjacent loading and unloading areas, and, if necessary, all other material which has been carried in the vessel. When necessary, additional steps for the protection of people, property and the environment, in accordance with provisions established by the competent authority, shall be taken to overcome and minimize the consequences of such leakage or damage.

7.1.4.14.7.5.2 Packages damaged or leaking radioactive contents in excess of allowable limits for normal conditions of carriage may be removed to an acceptable interim location under supervision, but shall not be forwarded until repaired or reconditioned and decontaminated.

7.1.4.14.7.5.3 Vehicles, wagons, vessels and equipment used regularly for the carriage of radioactive material shall be periodically checked to determine the level of contamination. The frequency of such checks shall be related to the likelihood of contamination and the extent to which radioactive material is carried.

7.1.4.14.7.5.4 Except as provided in paragraph 7.1.4.14.7.5.6, any vessel, or equipment or part thereof which has become contaminated above the limits specified in 7.1.4.14.7.5.5 in the course of carriage of radioactive material, or which shows a dose rate in excess of 5 μSv/h at the surface, shall be decontaminated as soon as possible by a qualified person and shall not be re-used unless the following conditions are fulfilled:

(a) The non-fixed contamination shall not exceed the limits specified in 4.1.9.1.2 of ADR;

(b) The dose rate resulting from the fixed contamination shall not exceed 5 μSv/h at the surface.

7.1.4.14.7.5.5 For the purposes of 7.1.4.14.7.5.4, non-fixed contamination shall not exceed:

– 4 Bq/cm^2 for beta and gamma emitters and low toxicity alpha emitters;

– 0.4 Bq/cm^2 for all other alpha emitters.

These are average limits applicable to any area of 300 cm^2 on any part of the surface.

7.1.4.14.7.5.6 Vessels dedicated to the carriage of radioactive material under exclusive use shall be excepted from the requirements of the previous paragraph 7.1.4.14.7.5.4 solely with regard to its internal surfaces and only for as long as it remains under that specific exclusive use.

7.1.4.14.7.6 *Limitation of the effect of temperature*

7.1.4.14.7.6.1 If the temperature of the accessible outer surfaces of a Type B (U) or Type B (M) package could exceed 50 °C in the shade, carriage is permitted only under exclusive use. As far as practicable, the surface temperature shall be limited to 85 °C. Account may be taken of barriers or screens intended to give protection to transport workers without the barriers or screens being subject to any test.

7.1.4.14.7.6.2 If the average heat flux from the external surfaces of a Type B (U) or B (M) package could exceed 15 W/m^2, the special stowage requirements specified in the competent authority package design approval certificate shall be met.

7.1.4.14.7.7 *Other provisions*

If neither the consignor nor the consignee can be identified or if the consignment cannot be delivered to the consignee and the carrier has no instructions from the consignor the consignment shall be placed in a safe location and the competent authority shall be informed as soon as possible and a request made for instructions on further action.

7.1.4.15 ***Measures to be taken after unloading***

7.1.4.15.1 After unloading the holds shall be inspected and cleaned if necessary. In the case of carriage in bulk, this requirement does not apply if the new cargo comprises the same goods as the previous cargo.

7.1.4.15.2 For material of Class 7 see also 7.1.4.14.7.5.

7.1.4.15.3 A cargo transport unit or hold space which has been used to carry infectious substances shall be inspected for release of the substance before re-use. If the infectious substances were released during carriage, the cargo transport unit or hold space shall be decontaminated before it is re-used. Decontamination may be achieved by any means which effectively inactivates the released infectious substance.

7.1.4.16 ***Measures to be taken during loading, carriage, unloading and handling of the cargo***

The filling or emptying of receptacles, tank vehicles, tank wagons, intermediate bulk containers (IBCs), large packagings, MEGCs, portable tanks or tank-containers on board the vessel is prohibited without special permission from the competent authority.

7.1.4.17 to 7.1.4.40 *(Reserved)*

7.1.4.41 ***Fire and naked light***

The use of fire or naked light is prohibited while substances or articles of Divisions 1.1, 1.2, 1.3, 1.5 or 1.6 of Class 1 are on board and the holds are open or the goods to be loaded are located at a distance of less than 50 m from the vessel.

7.1.4.42 to 7.1.4.50 *(Reserved)*

7.1.4.51 ***Electrical equipment***

The use of radiotelephone or radar transmitters is not permitted while substances or articles of Divisions 1.1, 1.2, 1.3, 1.5 or 1.6 of Class 1 are being loaded or unloaded.

This shall not apply to VHF-transmitters of the vessel, in cranes or in the vicinity of the vessel, provided the power of the VHF-transmitter does not exceed 25 W and no part of its aerial is located at a distance less than 2.00 m from the substances or articles mentioned above.

7.1.4.52 *(Reserved)*

7.1.4.53 ***Lighting***

If loading or unloading is performed at night or in conditions of poor visibility, effective lighting shall be provided.

If provided from the deck, it shall be effected by properly secured electric lamps which shall be positioned in such a way that they cannot be damaged.

Where these lamps are positioned on deck in zone 2, they must conform to the requirements for use in zone 2.

7.1.4.54 to 7.1.4.74 *(Reserved)*

7.1.4.75 ***Risk of sparking***

All electrically continuous connections between the vessel and the shore shall be so designed that they do not present a source of ignition. If substances are carried that have in column (9) of Table A of Chapter 3.2 an entry "EX", then taking off clothes not sufficiently dissipative shall be prohibited in the protected area.

7.1.4.76 ***Synthetic ropes***

During loading or unloading operations, the vessel may be moored by means of synthetic ropes only when steel cables are used to prevent the vessel from going adrift.

Steel cables sheathed in synthetic material or natural fibres are considered as equivalent when the minimum tensile strength required in accordance with the Regulations referred to in 1.1.4.6 is obtained from the steel strands.

However, during loading or unloading of containers, vessels may be moored by means of synthetic ropes.

7.1.4.77 ***Possible means of evacuation in case of an emergency***

		Dry cargo bulk (vessel and barge)		Container (vessel and barge) and packaged goods
		Class		Class
		4.1, 4.2, 4.3	5.1, 6.1, 7, 8, 9	All classes
1	Two escape routes inside or outside the protected area in opposite directions	•	•	•
2	One escape route outside the protected area and one safe haven outside the vessel including the escape route towards it at the opposite end	•	•	•
3	One escape route outside the protected area and one safe haven on the vessel at the opposite end	•	•	•
4	One escape route outside the protected area and one life boat at the opposite end	•	•	•
5	One escape route outside the protected cargo area and one escape boat at the opposite end	•	•	•
6	One escape route inside the protected area and one escape route outside the cargo area at the opposite end	•	•	•
7	One escape route inside the protected area and one safe haven outside the vessel in the opposite direction	•	•	•
8	One escape route inside the protected area and one safe haven on the vessel in the opposite direction	•	•	•
9	One escape route inside the protected cargo area and one life boat at the opposite end	•	•	•
10	One escape route inside the protected area and one escape boat at the opposite end	•	•	•
11	One escape route inside or outside the protected cargo area and two safe havens on the vessel at opposite ends	•	•	•
12	One escape route inside or outside the protected area and two safe areas on the vessel at opposite ends	•	•	•
13	One escape route outside the protected area	•	•	•
14	One escape route inside the protected area	•	•	•
15	One or more safe havens outside the vessel, including the escape route towards it	•	•	•
16	One or more safe havens on the vessel		•	•
17	One or more escape boats	•	•	•
18	One escape boat and one evacuation boat	•	•	•
19	One or more evacuation boats		•	•

• = *Possible option.*

Based on local circumstances, competent authorities may prescribe additional requirements for the availability of means of evacuation.

7.1.4.78 to 7.1.4.99 *(Reserved)*

7.1.5 Additional requirements concerning the operation of vessels

7.1.5.0 ***Marking***

7.1.5.0.1 Vessels carrying dangerous goods listed in Table A of Chapter 3.2 shall, in accordance with Chapter 3 of the European Code for Inland Waterways (CEVNI), display the markings prescribed in column (12) in this table.

7.1.5.0.2 Vessels carrying the dangerous goods listed in Table A of Chapter 3.2 in packages placed exclusively in containers shall display the number of blue cones or blue lights indicated in the following table instead of the number of blue cones or blue lights indicated in column (12) of Table A of Chapter 3.2:

Number of cones/lights indicated in Table A column (12):	*Class and packing group of the substance:*	*Total gross mass:*	*Number of cones/lights to be displayed:*
1 cone/light	Class 2 or PG I	> 130.000 kg	1
	Class 2 or PG I	≤ 130.000 kg	0
	Other classes or PG II or III	All masses	0
2 cones/lights	Class 2 or PG I	> 30.000 kg	2
	Class 2 or PG I	≤ 30.000 kg	0
	Other classes or PG II or III	All masses	0
3 cones/ lights	All classes	All masses	3

7.1.5.0.3 Vessels carrying empty, uncleaned tanks, battery vehicles, battery wagons or MEGCs shall display the marking referred to in column (12) of Table A of Chapter 3.2 if these cargo transport units have contained dangerous goods for which this table prescribes marking.

7.1.5.0.4 Where more than one marking could apply to a vessel, only the marking which includes the greatest number of blue cones or blue lights shall apply, i.e. in the following order of precedence:

– three blue cones or three blue lights; or

– two blue cones or two blue lights; or

– one blue cone or one blue light.

7.1.5.0.5 By derogation from paragraph 7.1.5.0.1, and in accordance with the footnotes to article 3.14 of the European Code for Inland Waterways (CEVNI), the competent authority of a Contracting Party may authorize seagoing vessels temporarily operating in an inland navigation area on the territory of this Contracting Party, the use of the day and night signals prescribed in the Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas adopted by the Maritime Safety Committee of the International Maritime Organization (by night an all-round fixed red light and by day flag "B" of the International Code of Signals), instead of the signals prescribed in 7.1.5.0.1. Contracting Parties which have taken the initiative with respect to the derogation granted shall notify the Executive Secretary of the UNECE, who shall bring this derogation to the attention of the Administrative Committee.

7.1.5.1 ***Mode of navigation***

7.1.5.1.1 The competent authorities may impose restrictions on the inclusion of vessels carrying dangerous goods in pushed conveys of large dimension.

7.1.5.1.2 When vessels carry substances or articles of Class 1, or substances of Classes 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2, or material of Class 7 of UN Nos. 2912, 2913, 2915, 2916, 2917, 2919, 2977, 2978 or 3321 to 3333, the competent authority may impose restrictions on the dimensions of convoys or side-by-side formations. Nevertheless, the use of a motorized vessel giving temporary towing assistance is permitted.

7.1.5.2 ***Vessels under way***

Vessels carrying substances or articles of Class 1, or substances of Classes 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2, when under way shall keep not less than 50 m away from any other vessel, if possible.

7.1.5.3 ***Mooring***

Vessels shall be moored securely, but in such a way that they can be released quickly in an emergency and that the electric cables are not compressed, folded or subject to tensile strain.

7.1.5.4 ***Berthing***

7.1.5.4.1 The distances to be kept by vessels carrying dangerous goods at berth from other vessels shall not be less than the distance prescribed by the Regulations referred to in 1.1.4.6.

7.1.5.4.2 An expert in accordance with 8.2.1.2 shall be permanently on board berthed vessels for which marking is prescribed in column (12) of Table A of Chapter 3.2.

The competent authority may, however, exempt from this obligation those vessels which are berthed in a harbour basin or in an accepted berthing position.

7.1.5.4.3 Outside the berthing areas specifically designated by the competent authority, the distances to be kept by berthed vessels shall not be less than:

- 100 m from residential areas, civil engineering structures or storage tanks, if the vessel is required to be marked with one blue cone or one blue light in accordance with the requirements of column (12) of Table A of Chapter 3.2;
- 100 m from civil engineering structures and storage tanks and 300 m from residential areas if the vessel is required to be marked with two blue cones or two blue lights in accordance with the requirements of column (12) of Table A of Chapter 3.2;
- 500 m from residential areas, civil engineering structures and storage tanks holding gas or flammable liquids if the vessel is required to be marked with three blue cones or three blue lights in accordance with the requirements of column (12) of Table A of Chapter 3.2.

While waiting in front of locks or bridges, vessels are allowed to keep distances different from and lower than those given above. In no case shall the distance be less than 100 m.

7.1.5.4.4 The competent authority may prescribe distances lower than those given in 7.1.5.4.3 above, especially taking local conditions into account.

7.1.5.5 ***Stopping of vessels***

If navigation of a vessel carrying substances and articles of Class 1 or substances of Class 4.1 or 5.2 for which marking with three blue cones or three blue lights is prescribed in column (12) of Table A of Chapter 3.2 threatens to become dangerous owing either to:

– external factors (bad weather, unfavourable conditions of the waterway, etc.); or

– the condition of the vessel itself (accident or incident);

the vessel shall be stopped at a suitable berthing area as far away as possible from residential areas, harbours, civil engineering structures or storage tanks for gas or flammable liquids, regardless of the provisions set out in 7.1.5.4.

The competent authority shall be notified without delay.

7.1.5.6 and 7.1.5.7 *(Reserved)*

7.1.5.8 ***Reporting duty***

7.1.5.8.1 In the States where the reporting duty is in force, the master of the vessel shall provide information in accordance with paragraph 1.1.4.6.1.

7.1.5.8.2 to 7.1.5.8.4 *(Deleted)*

7.1.5.9 to 7.1.5.99 *(Reserved)*

7.1.6 Additional requirements

7.1.6.1 to 7.1.6.10 *(Reserved)*

7.1.6.11 ***Carriage in bulk***

The following additional requirements shall be met when they are indicated in column (11) of Table A of Chapter 3.2:

CO01: The surfaces of holds shall be coated or lined such that they are not readily flammable and not liable to impregnation by the cargo.

CO02: Any part of the holds and of the hatchway covers which may come into contact with this substance shall consist of metal or of wood having a specific density of not less than 750 kg/m^3 (seasoned wood).

CO03: The inner surfaces of holds shall be lined or coated so as to prevent corrosion.

ST01: The substances shall have been stabilized in accordance with the requirements applicable to ammonium nitrate fertilizers set out in the IMSBC Code. Stabilizing shall be certified by the consignor in the transport document.

In those States where this is required, these substances may be carried in bulk only with the approval of the competent authority.

ST02: These substances may be carried in bulk if the results of the trough test according to subsection 38.2 of the *Manual of Tests and Criteria* show that the self-sustaining decomposition rate is not greater than 25 cm/h.

RA01: The materials may be carried in bulk provided that:

(a) for materials other than natural ores, carriage is under exclusive use and there is no escape of contents out of the vessel and no loss of shielding under normal conditions of transport; or

(b) for natural ores, carriage is under exclusive use.

RA02: The materials may be carried in bulk provided that:

(a) they are carried in a vessel so that, under normal conditions of transport, there is no escape of contents or loss of shielding;

(b) they are carried under exclusive use if the contamination on the accessible and inaccessible surfaces is greater than 4 Bq/cm^2 (10^{-4} $\mu Ci/cm^2$) for beta and gamma emitters and low toxicity alpha emitters or 0.4 Bq/cm^2 (10^{-5} $\mu Ci/cm^2$) for all other alpha emitters;

(c) measures are taken to ensure that radioactive material is not released into the vessel, if it is suspected that non-fixed contamination exists on inaccessible surfaces of more than 4 Bq/cm^2 (10^{-4} $\mu Ci/cm^2$) for beta and gamma emitters and low toxicity alpha emitters or 0.4 Bq/cm^2 (10^{-5} $\mu Ci/cm^2$) for all other alpha emitters.

Surface contaminated objects group (SCO-II) shall not be carried in bulk.

RA03: *Merged with RA02.*

7.1.6.12 ***Ventilation***

The following additional requirements shall be met when they are indicated in column (10) of Table A of Chapter 3.2:

VE01: Holds containing these substances shall be ventilated with the ventilators operating at full power, where after measurement it has been established that the concentration of flammable gases and vapours given off by the cargo exceeds 10% of the LEL. The measurement shall be carried out immediately after loading. A control measurement shall be repeated after one hour. The results of the measurement shall be recorded in writing.

VE02: Holds containing these substances shall be ventilated with the ventilators operating at full power, where after measurement it has been established that the holds are not free from toxic gases and vapours given off by the cargo. The measurement shall be carried out immediately after loading. A control measurement shall be repeated after one hour. The results of the measurement shall be recorded in writing. Alternatively, on vessels only containing these substances in containers in open holds, the holds containing such containers may be ventilated with the ventilation operating at full power only when it is suspected that the holds are not free of toxic gases and vapours given off by the cargo. Prior to unloading, the unloader shall be informed about this suspicion.

VE03: Spaces such as holds, accommodation and engine rooms, adjacent to holds containing these substances shall be ventilated.

After unloading, holds having contained these substances shall undergo forced ventilation.

After ventilation, the concentration of flammable or toxic gases and vapours given off by the cargo in these holds shall be measured.

The results of the measurement shall be recorded in writing.

VE04 When aerosols are carried for the purposes of reprocessing or disposal under special provision 327 of Chapter 3.3, provisions of VE01 and VE02 are applied.

7.1.6.13 ***Measures to be taken before loading***

The following additional requirements shall be met when they are indicated in column (11) of Table A of Chapter 3.2:

LO01: Before these substances or articles are loaded, it shall be ensured that there are no metal objects in the hold which are not an integral part of the vessel.

LO02: These substances may be loaded in bulk only if their temperature is not above 55 °C.

LO03: Before loading these substances in bulk or unpackaged, holds should be made as dry as possible.

LO04: Any loose organic material shall be removed from holds before loading these substances in bulk.

LO05: Prior to carriage of pressure receptacles it shall be ensured that the pressure has not risen due to potential hydrogen generation.

7.1.6.14 ***Handling and stowage of cargo***

The following additional requirements shall be met when they are indicated in column (11) of Table A of Chapter 3.2:

HA01: These substances or articles shall be stowed at a distance of not less than 3.00 m from the accommodation, engine rooms, the wheelhouse and from any sources of heat.

HA02: These substances or articles shall be stowed at a distance of not less than 2.00 m from the vertical planes defined by the sides of the vessel.

HA03: Any friction, impact, jolting, overturning or dropping shall be prevented during handling of these substances or articles.

All packages loaded in the same hold shall be stowed and wedged as to prevent any jolting or friction during carriage.

Stacking of non-dangerous goods on top of packages containing these substances or articles is prohibited.

Where these substances or articles are loaded together with other goods in the same hold, these substances or articles shall be loaded after, and unloaded before, all the other goods.

There is no need for these substances or articles to be loaded after, and unloaded before, all others if these substances or articles are contained in containers.

While these substances or articles are being loaded or unloaded, no loading or unloading operations shall take place in the other holds and no filling or emptying of fuel tanks shall be allowed. The competent authority may, however, permit exceptions to this provision.

HA04: *Merged with HA03.*

HA05: *Merged with HA03.*

HA06: *Merged with HA03.*

HA07: It is prohibited to load or unload these substances in bulk or unpackaged if there is a danger that they may get wet because of the prevailing weather conditions.

HA08: If the packages with these substances are not contained in a container, they shall be placed on gratings and covered with waterproof tarpaulins arranged in such a way that the water drains off to the outside and the air circulation is not hindered.

HA09: If these substances are carried in bulk they shall not be loaded in the same hold together with flammable substances.

HA10: These substances shall be stowed on deck in the protected area. For seagoing vessels, the stowage requirements are deemed to be met if the provisions of the IMDG Code are complied with.

7.1.6.15 *(Reserved)*

7.1.6.16 ***Measures to be taken during loading, carriage, unloading and handling of cargo***

The following additional requirements shall be met when they are indicated in column (11) of Table A of Chapter 3.2:

IN01: After loading and unloading of these substances in bulk or unpackaged and before leaving the cargo transfer site, the concentration of flammable gases and vapours given off by the cargo in the accommodation, engine rooms and adjacent holds shall be measured by the loader or unloader or by an expert according to 8.2.1.2 using a gas detector. The results of the measurement shall be recorded in writing.

Before any person enters a hold and prior to unloading, the concentration of flammable gases and vapours given off by the cargo shall be measured by the unloader of the cargo or by an expert according to 8.2.1.2. The results of the measurement shall be recorded in writing.

The hold shall not be entered or unloading started until the concentration of flammable gases and vapours given off by the cargo in the airspace above the cargo is below 50% of the LEL.

If the concentrations of flammable gases and vapours given off by the cargo is not below 50% of the LEL safety measures shall be taken immediately by the loader, the unloader or the responsible master.

IN02: If a hold contains these substances in bulk or unpackaged, the concentration of toxic gases and vapours given off by the cargo shall be measured in all other spaces of the vessel which are used by the crew at least once every eight hours with a toximeter. The results of the measurements shall be recorded in writing.

IN03: If a hold contains these substances in bulk or unpackaged, the master shall make sure every day by checking the hold bilge wells or pump ducts that no water has entered the hold bilges.

Water which has entered the hold bilges shall be removed immediately.

7.1.6.17 to 7.1.6.99 *(Reserved)*

7.1.7 Special provisions applicable to the carriage of self-reactive substances of Class 4.1, organic peroxides of Class 5.2 and substances stabilized by temperature control (other than self-reactive substances and organic peroxides)

7.1.7.1 All self-reactive substances, organic peroxides and polymerizing substances shall be protected from direct sunlight and all sources of heat, and placed in adequately ventilated areas.

7.1.7.2 Where a number of packages are assembled in a container or closed vehicle, the total quantity of substance, the type and number of packages and the stacking arrangement shall not create an explosion hazard.

7.1.7.3 ***Temperature control provisions***

7.1.7.3.1 These provisions apply to certain self-reactive substances when required by 2.2.41.1.17, and certain organic peroxides when required by 2.2.52.1.15 and certain polymerizing substances when required by 2.2.41.1.21 or special provision 386 of Chapter 3.3 which may only be carried under conditions where the temperature is controlled.

7.1.7.3.2 These provisions also apply to the carriage of substances for which:

(a) The proper shipping name as indicated in column (2) of Table A of Chapter 3.2 or according to 3.1.2.6 contains the word "TEMPERATURE CONTROLLED"; and

(b) The SADT or SAPT determined for the substance (with or without chemical stabilization) as offered for carriage is:

(i) 50 °C or less for single packagings and IBCs; or

(ii) 45 °C or less for tanks.

When chemical inhibition is not used to stabilize a reactive substance which may generate dangerous amounts of heat and gas, or vapour, under normal carriage conditions, this substance needs to be carried under temperature control. These provisions do not apply to substances which are stabilized by the addition of chemical inhibitors such that the SADT or the SAPT is greater than that prescribed in (b) (i) or (ii), above.

7.1.7.3.3 In addition, if a self-reactive substance or organic peroxide or a substance the proper shipping name of which contains the word "STABILIZED" and which is not normally required to be carried under temperature control is carried under conditions where the temperature may exceed 55 °C, it may require temperature control.

7.1.7.3.4 The "control temperature" is the maximum temperature at which the substance can be safely carried. It is assumed that during carriage the temperature of the immediate surroundings of the package does not exceed 55 °C and attains this value for a relatively short time only during each period of 24 hours. In the event of loss of temperature control, it may be necessary to implement emergency procedures. The "emergency temperature" is the temperature at which such procedures shall be implemented.

7.1.7.3.5 *Derivation of control and emergency temperatures*

Type of receptacle	SADT[a] /SAPT[a]	Control temperature	Emergency temperature
Single packagings and IBCs	20 °C or less	20 °C below SADT/SAPT	10 °C below SADT/SAPT
	over 20 °C to 35 °C	15 °C below SADT/SAPT	10 °C below SADT/SAPT
	over 35 °C	10 °C below SADT/SAPT	5 °C below SADT/SAPT
Tanks	≤ 45 °C	10 °C below SADT/SAPT	5 °C below SADT/SAPT

[a] i.e. the SADT/SAPT of the substance as packed for carriage.

7.1.7.3.6 The control and emergency temperatures are derived using the table in 7.1.7.3.5 from the SADT or from the SAPT which are defined as the lowest temperatures at which self-accelerating decomposition or self-accelerating polymerization may occur with a substance in the packaging, IBC or tank as used in carriage. An SADT or SAPT shall be determined in order to decide if a substance shall be subjected to temperature control during carriage. Provisions for the determination of the SADT and SAPT are given in Part II, section 28 of the *Manual of Tests and Criteria*.

7.1.7.3.7 Control and emergency temperatures, where appropriate, are provided for currently assigned self-reactive substances in 2.2.41.4 and for currently assigned organic peroxide formulations in 2.2.52.4.

7.1.7.3.8 The actual carriage temperature may be lower than the control temperature but shall be selected so as to avoid dangerous separation of phases.

7.1.7.4 ***Carriage under temperature control***

7.1.7.4.1 Maintenance of the prescribed temperature is an essential feature of the safe carriage of substances stabilized by temperature control. In general, there shall be:

(a) Thorough inspection of the cargo transport unit prior to loading;

(b) Instructions to the carrier about the operation of the refrigeration system including a list of the suppliers of coolant available en route;

(c) Procedures to be followed in the event of loss of control;

(d) Regular monitoring of operating temperatures; and

(e) Provision of a back-up refrigeration system or spare parts.

7.1.7.4.2 Any control and temperature sensing devices in the refrigeration system shall be readily accessible and all electrical connections weather-proof. The temperature of air space within the cargo transport unit shall be measured by two independent sensors and the output shall be recorded so that temperature changes are readily detectable. The temperature shall be checked every four to six hours and logged. When substances having a control temperature of less than +25 °C are carried, the cargo transport unit shall be equipped with visible and audible alarms, powered independently of the refrigeration system, set to operate at or below the control temperature.

7.1.7.4.3 If during carriage the control temperature is exceeded, an alert procedure shall be initiated involving any necessary repairs to the refrigeration equipment or an increase in the cooling capacity (e.g. by adding liquid or solid refrigerants). The temperature shall also be checked frequently and preparations made for implementation of the emergency procedures. If the emergency temperature is reached, the emergency procedures shall be initiated.

7.1.7.4.4 The suitability of a particular means of temperature control for carriage depends on a number of factors. Factors to be considered include:

(a) The control temperature(s) of the substance(s) to be carried;

(b) The difference between the control temperature and the anticipated ambient temperature conditions;

(c) The effectiveness of the thermal insulation;

(d) The duration of carriage; and

(e) Allowance of a safety margin for delays.

7.1.7.4.5 Suitable methods for preventing the control temperature being exceeded are, in order of increasing control capability:

(a) Vehicle, container, packaging or overpack with thermal insulation provided that the initial temperature of the substance(s) to be carried is sufficiently below the control temperature;

(b) Vehicle, container, packaging or overpack with thermal insulation and coolant system provided that:

(i) An adequate quantity of non-flammable coolant (e.g. liquid nitrogen or solid carbon dioxide), allowing a reasonable margin for delay, is carried or a means of replenishment is assured;

(ii) Liquid oxygen or air is not used as coolant;

(iii) There is a uniform cooling effect even when most of the coolant has been consumed; and

(iv) The need to ventilate the transport unit before entering is clearly indicated by a warning on the door(s) of the transport unit;

(c) Vehicle or container with thermal insulation and single mechanical refrigeration provided that for substance(s) to be carried with a flash point lower than the sum of the emergency temperature plus 5 °C explosion-proof electrical fittings, EEx IIB T3 are used within the cooling compartment to prevent ignition of flammable vapours from the substances;

(d) Vehicle or container with thermal insulation and combined mechanical refrigeration system with coolant system; provided that:

(i) The two systems are independent of one another;

(ii) The provisions in (b) and (c) are complied with;

(e) Vehicle or container with thermal insulation and dual mechanical refrigeration system; provided that:

(i) Apart from the integral power supply unit, the two systems are independent of one another;

(ii) Each system alone is capable of maintaining adequate temperature control; and

(iii) For substance(s) to be carried with a flash point lower than the sum of the emergency temperature plus 5 °C explosion-proof electrical fittings, EEx IIB T3 are used within the cooling compartment to prevent ignition of flammable vapours from the substances.

7.1.7.4.6 The methods described in 7.1.7.4.5 (d) and (e) may be used for all organic peroxides and self-reactive substances and polymerizing substances.

The method described in 7.1.7.4.5 (c) may be used for organic peroxides and self-reactive substances of Types C, D, E and F and, when the maximum ambient temperature to be expected during carriage does not exceed the control temperature by more than 10 °C, for organic peroxides and self-reactive substances of Type B and polymerizing substances.

The method described in 7.1.7.4.5 (b) may be used for organic peroxides and self-reactive substances of Types C, D, E and F and polymerizing substances when the maximum ambient temperature to be expected during carriage does not exceed the control temperature by more than 30 °C.

The method described in 7.1.7.4.5 (a) may be used for organic peroxides and self-reactive substances of Types C, D, E and F and polymerizing substances when the maximum ambient temperature to be expected during carriage is at least 10 °C below the control temperature.

7.1.7.4.7 Insulated, refrigerated and mechanically refrigerated containers intended for the carriage of temperature controlled substances shall conform to the following conditions:

(a) The overall heat transfer coefficient of an insulated container shall be not more than 0.4 $W/m^2/K$;

(b) The refrigerant used shall not be flammable; and

(c) Where containers are provided with vents or ventilation valves care shall be taken to ensure that refrigeration is not impaired by the vents or ventilation valves.

Where substances are required to be carried in insulated, refrigerated or mechanically-refrigerated vehicles, these vehicles shall satisfy the requirements of Chapter 9.6 of ADR.

7.1.7.4.8 If substances are contained in protective packagings filled with a coolant, they shall be loaded in closed or sheeted vehicles or closed or sheeted containers. If the vehicles or containers used are closed they shall be adequately ventilated. Sheeted vehicles and containers shall be fitted with sideboards and a tailboard. The sheets of these vehicles and containers shall be of an impermeable and non-combustible material.

7.1.7.5 to 7.1.9.99 *(Reserved)*

CHAPTER 7.2

TANK VESSELS

7.2.0 General requirements

7.2.0.1 The provisions of 7.2.0 to 7.2.5 are applicable to tank vessels.

7.2.0.2 to 7.2.0.99 *(Reserved)*

7.2.1 Mode of carriage of goods

7.2.1.1 to 7.2.1.20 *(Reserved)*

7.2.1.21 *Carriage in cargo tanks*

7.2.1.21.1 Substances, their assignment to the various types of tank vessels and the special conditions for their carriage in these tank vessels, are listed in Table C of Chapter 3.2.

7.2.1.21.2 Substances, which according to column (6) of Table C of Chapter 3.2, have to be carried in a tank vessel of type N, open, may also be carried in a tank vessel of type N, open, with flame-arresters; type N, closed; types C or G provided that all conditions of carriage prescribed for tank vessels of type N, open, as well as all other conditions of carriage required for these substances in Table C of Chapter 3.2 are met.

7.2.1.21.3 Substances which, according to column (6) of Table C of Chapter 3.2 have to be carried in a tank vessel of type N, open, with flame-arresters, may also be carried in tank vessels of type N, closed, and types C or G provided that all conditions of carriage prescribed for tank vessels of type N, open, with flame arresters, as well as all other conditions of carriage required for these substances in Table C of Chapter 3.2 are met.

7.2.1.21.4 Substances which, according to column (6) of Table C of Chapter 3.2 have to be carried in a tank vessel of type N, closed, may also be carried in tank vessels of type C or G provided that all conditions of carriage prescribed for tank vessels of type N, closed, as well as all other conditions of carriage required for these substances in Table C of Chapter 3.2 are met.

7.2.1.21.5 Substances which, according to column (6) of Table C of Chapter 3.2 have to be carried in tank vessels of type C may also be carried in tank vessels of type G provided that all conditions of carriage prescribed for tank vessels of type C as well as all other conditions of carriage required for these substances in Table C of Chapter 3.2 are met.

7.2.1.21.6 Oily and greasy wastes resulting from the operation of the vessel may only be carried in fire-resistant receptacles, fitted with a lid, or in cargo tanks.

7.2.1.21.7 A substance which according to column (8) of Table C of Chapter 3.2 must be carried in cargo tank type 2 (integral cargo tank), may also be carried in a cargo tank type 1 (independent cargo tank) or cargo tank type 3 (cargo tank with walls distinct from the outer hull) of the vessel type prescribed in Table C or a vessel type prescribed in 7.2.1.21.2 to 7.2.1.21.5, provided that all other conditions of carriage required for this substance by Table C of Chapter 3.2 are met.

7.2.1.21.8 A substance which according to column (8) of Table C of Chapter 3.2 must be carried in cargo tank type 3 (cargo tank with walls distinct from the outer hull), may also be carried in a cargo tank type 1 (independent cargo tank) of the vessel type prescribed in Table C or a vessel type prescribed in 7.2.1.21.2 to 7.2.1.21.5 or in a type C vessel with cargo tank type 2 (integral cargo tank), provided that at least the conditions of carriage concerning the prescribed N type are met and all other conditions of carriage required for this substance by Table C of Chapter 3.2 or 7.2.1.21.2 to 7.2.1.21.5 are met.

7.2.1.22 to 7.2.1.99 *(Reserved)*

7.2.2 Requirements applicable to vessels

7.2.2.0 ***Permitted vessels***

NOTE 1: *The relief pressure of the safety valves shall be indicated in the certificate of approval (see 8.6.1.3).*

NOTE 2: *The design pressure and the test pressure of cargo tanks shall be indicated in the certificate of the recognised classification society prescribed in 9.3.1.8.1 or 9.3.2.8.1 or 9.3.3.8.1.*

NOTE 3: *Where a vessel carries cargo tanks with different valve-relief pressures, the relief pressure of each tank shall be indicated in the certificate of approval and the design and test pressures of each tank shall be indicated in the certificate of the recognised classification society.*

7.2.2.0.1 Dangerous substances may be carried in tank vessels of Types G, C or N in accordance with the requirements of sections 9.3.1, 9.3.2 or 9.3.3 respectively. The type of tank vessel to be used is specified in column (6) of Table C of Chapter 3.2 and in 7.2.1.21.

NOTE: *The substances accepted for carriage in the individual vessel are listed in the vessel substance list to be drawn up by the recognised classification society (see 1.16.1.2.5).*

7.2.2.1 to 7.2.2.4 *(Reserved)*

7.2.2.5 ***Instructions for the use of devices and installations***

Where specific safety rules have to be complied with when using any device or installation, instructions for the use of the particular device or installation shall be readily available for consultation at appropriate places on board in the language normally spoken on board, and also, if that language is not English, French or German, in English, French or German unless agreements concluded between the countries concerned in the transport operation provide otherwise.

7.2.2.6 to 7.2.2.18 *(Reserved)*

7.2.2.19 ***Pushed convoys and side-by-side formations***

7.2.2.19.1 Where at least one vessel of a convoy or side-by-side formation is required to be in possession of a certificate of approval for the carriage of dangerous goods, all vessels of such convoy or side-by-side formation shall be provided with an appropriate certificate of approval.

Vessels not carrying dangerous goods shall comply with the provisions of 7.1.2.19.

7.2.2.19.2 For the purposes of the application of this Chapter, the entire pushed convoy or side-by-side formation shall be deemed to be a single vessel.

7.2.2.19.3 When a pushed convoy or a side-by-side formation comprises a tank vessel carrying dangerous substances, vessels used for propulsion shall meet the requirements of the following paragraphs:

1.16.1.1, 1.16.1.2, 1.16.1.3, 1.16.1.4, 7.2.2.5, 8.1.4, 8.1.5, 8.1.6.1, 8.1.6.3, 8.1.7, 8.3.5, 9.3.3.0.1.1 for the vessel's hull , 9.3.3.0.4 last line from Table 4 for the vessel's boat, 9.3.3.0.6, 9.3.3.10.1, 9.3.3.10.4, 9.3.3.12.4, 9.3.3.12.6, 9.3.3.16.1, 9.3.3.16.2, 9.3.3.17.1 to 9.3.3.17.4, 9.3.3.31.1 to 9.3.3.31.5, 9.3.3.32.2, 9.3.3.34.1, 9.3.3.34.2, 9.3.3.40.1, (however, one single fire or ballast pump shall be sufficient), 9.3.3.40.2, 9.3.3.41, 9.3.3.51, 9.3.3.52.1 to 9.3.3.52.8, 9.3.3.71 and 9.3.3.74.

Vessels used only to move tank vessels where the list of substances on the vessel according to 1.16.1.2.5 contains only substances for which explosion protection is not required do not have to meet the requirements of 9.3.3.10.1, 9.3.3.10.4, 9.3.3.12.6, 9.3.3.51 and 9.3.3.52.1. In this case the following entry shall be made in the certificate of approval or provisional certificate of approval under number 5, permitted derogations: 'Derogation from 9.3.3.10.1, 9.3.3.10.4, 9.3.3.12.6, 9.3.3.51 and 9.3.3.52.1; the vessel may only move tank vessels where the list of substances on the vessel according to 1.16.1.2.5 contains only substances for which explosion protection is not required'.

7.2.2.19.4 During loading and unloading of substances for which explosion protection is required in column (17) of Table C of Chapter 3.2, only installations and equipment that meet the requirements of 9.3.3.53 may be used on the deck of other vessels of the convoy. This condition shall not apply to:

(a) Installations and equipment of vessels linked fore or aft of the vessel which is being loaded or unloaded, if the tank vessel being loaded or unloaded is equipped with a protective wall at the respective end of the cargo area or located at a distance of at least 12.00 m from the boundary plane of the cargo area of the vessel being loaded or unloaded.

(b) Installations and equipment of tank vessels coupled side-by-side with the vessel being loaded or unloaded, if such installations or equipment are positioned behind a protective wall according to 9.3.3.10.3 and the protective wall is not next to the cargo area of the vessel being loaded or unloaded, or located at a distance of at least 12.00 m from the boundary plane of the cargo area of the vessel being loaded or unloaded.

7.2.2.20 *(Reserved)*

7.2.2.21 ***Safety and control equipment***

It shall be possible to interrupt loading or unloading of substances of Class 2 and substances assigned to UN Nos. 1280 and 2983 of Class 3 by means of switches installed at two locations on the vessel (fore and aft) and at two locations ashore (directly at the access to the vessel and at an appropriate distance on shore). Interruption of loading and unloading shall be effected by the means of a quick closing valve which shall be directly fitted to the flexible connecting hose between the vessel and the shore facility.

The system of disconnection shall be designed in accordance with the closed circuit principle.

7.2.2.22 *(Deleted)*

7.2.2.23 to 7.2.2.99 *(Reserved)*

7.2.3 General service requirements

7.2.3.1 ***Access to cargo tanks, residual cargo tanks, cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections***

7.2.3.1.1 The cofferdams shall be empty, as long as the adjacent cargo tanks are not empty. They shall be inspected before each filling and if not filled they shall be inspected frequently, at least once a week, in order to ascertain that they are dry (except for condensation water).

7.2.3.1.2 Access to the cargo tanks, residual cargo tanks, cofferdams, double-hull spaces, double bottoms and hold spaces is not permitted except for carrying out inspections or cleaning operations.

7.2.3.1.3 Access to the double-hull spaces and the double bottoms is not permitted while the vessel is under way.

7.2.3.1.4 When the concentration of flammable or toxic gases and vapours given off by the cargo or the oxygen content has to be measured before entry into cargo tanks, residual cargo tanks, cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms or hold spaces, the results of these measurements shall be recorded in writing.

The measurement may only be effected by an expert referred to in 8.2.1.2 equipped with breathing apparatus suited to the substance carried.

Entry into these spaces is not permitted for the purpose of measuring.

7.2.3.1.5 Before any person enters cargo tanks, the residual cargo tanks, the cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms, hold spaces or other confined spaces:

(a) When dangerous substances of Classes 2, 3, 4.1, 6.1, 8 or 9 for which a gas detector is required in column (18) of Table C of Chapter 3.2 are carried on board the vessel, it shall be established, by means of this device that the concentration of flammable gases and vapours given off by the cargo in these cargo tanks, residual cargo tanks, cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms, or hold spaces is not more than 50% of the LEL. For the cargo pump rooms below deck this may be determined by means of the permanent gas detection system;

(b) When dangerous substances of Classes 2, 3, 4.1, 6.1, 8 or 9 for which a toximeter is required in column (18) of Table C of Chapter 3.2 are carried on board the vessel, it shall be established, by means of this device that the cargo tanks, residual cargo tanks, cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms or hold spaces do not contain concentration of toxic gases and vapours given off by the cargo which exceeds national accepted exposure levels.

In deviation of 1.1.4.6, more stringent national legislation on the entry into holds shall take precedence over the ADN.

7.2.3.1.6 Entry into empty cargo tanks, the residual cargo tanks, the cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms, hold spaces or other confined spaces is only permitted if:

– The concentration of flammable gases and vapours given off by the cargo in the cargo tanks, the residual cargo tanks, the cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms, hold spaces or other confined spaces, is below 10% of the LEL, the concentration of toxic gases and vapours given off by the cargo is below national accepted exposure levels, and the percentage of oxygen is between 20 and 23,5 vol %; or

– The concentration of flammable gases and vapours given off by the cargo in the cargo tanks, the residual cargo tank, the cargo pump rooms below deck, cofferdams, double-hull spaces, double bottoms, hold spaces or other confined spaces, is below 10% of the LEL, and the person entering the spaces wears a self-contained breathing apparatus and other necessary protective and rescue equipment, and is secured by a line. Entry into these spaces is only permitted if this operation is supervised by a second person for whom the same equipment is readily at hand. Another two persons capable of giving assistance in an emergency shall be on the vessel within calling distance. If a rescue winch has been installed, only one other person is sufficient.

In case of emergency or mechanical problems, it is allowed to enter the tank when the concentration of flammable gases and vapours given off by cargo is between 10 and 50% of the LEL. The breathing apparatus (self-contained) in use has to be designed in such a way that the causing of sparks is avoided.

In deviation of 1.1.4.6, more stringent national legislation on the entry into cargo tanks shall take precedence over the ADN.

7.2.3.2 ***Cargo pump rooms below deck***

7.2.3.2.1 When carrying dangerous substances of classes 3, 4.1, 6.1, 8 or 9, the cargo pump rooms below deck shall be inspected daily so as to ascertain that there are no leaks. The bilges and the drip pans shall be kept free from products.

7.2.3.2.2 When the gas detection system is activated, the loading and unloading operations shall be stopped immediately. All shut-off devices shall be closed and the cargo pump rooms shall be evacuated immediately. All entrances shall be closed. The loading or unloading operations shall not be continued except when the damage has been repaired or the fault eliminated.

7.2.3.3 to 7.2.3.5 *(Reserved)*

7.2.3.6 ***Gas detection system***

The gas detection system shall be maintained and calibrated by trained and qualified personnel in accordance with the instructions of the manufacturer.

7.2.3.7 ***Degassing of empty or unloaded cargo tanks and piping for loading and unloading***

7.2.3.7.0 Degassing of empty or unloaded cargo tanks and piping for loading and unloading into the atmosphere or to reception facilities is permitted under the conditions below but only if and insofar it is not prohibited on the basis of other legal requirements.

7.2.3.7.1 *Degassing of empty or unloaded cargo tanks and piping for loading and unloading into the atmosphere*

7.2.3.7.1.1 Empty or unloaded cargo tanks having previously contained dangerous substances of:

– Class 2 or Class 3, with a classification code including the letter "T" in column (3b) of Table C of Chapter 3.2;

– Class 6.1; or

– Packing group I of Class 8;

may only be degassed by an expert according to 8.2.1.2. This may be carried out only at the locations approved by the competent authority.