

PART 3

Dangerous goods list, special provisions and exemptions related to limited and excepted quantities

CHAPTER 3.1

GENERAL

(See Volume II)

CHAPTER 3.2

LIST OF DANGEROUS GOODS

3.2.1 **Table A: List of dangerous goods in numerical order**

See Volume II

3.2.2 **Table B: List of dangerous goods in alphabetical order**

See Volume II

3.2.3 **Table C: List of dangerous goods accepted for carriage in tank vessels in numerical order**

Explanations concerning Table C:

As a rule, each row of Table C of this Chapter deals with the substance(s) covered by a specific UN number or identification number. However, when substances belonging to the same UN number or identification number have different chemical properties, physical properties and/or carriage conditions, several consecutive rows may be used for that UN number or identification number.

Each column of Table C is dedicated to a specific subject as indicated in the explanatory notes below. The intersection of columns and rows (cell) contains information concerning the subject treated in that column, for the substance(s) of that row:

- The first four cells identify the substance(s) belonging to that row;
- The following cells give the applicable special provisions, either in the form of complete information or in coded form. The codes cross-refer to detailed information that is to be found in the numbers indicated in the explanatory notes below. An empty cell means either that there is no special provision and that only the general requirements apply, or that the carriage restriction indicated in the explanatory notes is in force.

The applicable general requirements are not referred to in the corresponding cells.

Explanatory notes for each column:

Column (1) “UN number/identification number”

Contains the UN number or identification number:

- of the dangerous substance if the substance has been assigned its own specific UN number or identification number, or
- of the generic or n.o.s. entry to which the dangerous substances not mentioned by name shall be assigned in accordance with the criteria (“decision trees”) of Part 2.

Column (2) “Name and description”

Contains, in upper case characters, the name of the substance, if the substance has been assigned its own specific UN number or identification

number or of the generic or n.o.s. entry to which the dangerous substances have been assigned in accordance with the criteria (“decision trees”) of Part 2. This name shall be used as the proper shipping name or, when applicable, as part of the proper shipping name (see 3.1.2 for further details on the proper shipping name).

A descriptive text in lower case characters is added after the proper shipping name to clarify the scope of the entry if the classification or carriage conditions of the substance may be different under certain conditions.

Column (3a) “Class”

Contains the number of the Class, whose heading covers the dangerous substance. This Class number is assigned in accordance with the procedures and criteria of Part 2.

Column (3b) “Classification code”

Contains the classification code of the dangerous substance.

- For dangerous substances of Class 2, the code consists of a number and one or more letters representing the hazardous property group, which are explained in 2.2.2.1.2 and 2.2.2.1.3.
- For dangerous substances or articles of Classes 3, 4.1, 6.1, 8 and 9, the codes are explained in 2.2.x.1.2.¹

Column (4) “Packing group”

Contains the packing group number(s) (I, II or III) assigned to the dangerous substance. These packing group numbers are assigned on the basis of the procedures and criteria of Part 2. Certain substances are not assigned to packing groups.

Column (5) “Danger”

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

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

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

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

In the case of a substance or mixture that floats on the water surface, does not evaporate and is not readily soluble in water or that sinks to the bottom of the water and is not readily soluble, the code ‘F’ (standing for

¹ *x = the Class number of the dangerous substance or article, without dividing point if applicable.*

‘Floater’) or ‘S’ (standing for ‘Sinker’), respectively, is added to the information.

Column (6)	“Type of tank vessel” Contains the type of tank vessel: G, C or N.
Column (7)	“Cargo tank design” Contains information concerning the design of the cargo tank: 1 Pressure cargo tank 2 Closed cargo tank 3 Open cargo tank with flame arrester 4 Open cargo tank
Column (8)	“Cargo tank type” Contains information concerning the cargo tank type. 1 Independent cargo tank 2 Integral cargo tank 3 Cargo tank with walls distinct from the outer hull
Column (9)	“Cargo tank equipment” Contains information concerning the cargo tank equipment. 1 Refrigeration system 2 Possibility of cargo heating 3 Water-spray system 4 Cargo heating system on board
Column (10)	“Opening pressure of high-velocity vent valve in kPa” Contains information concerning the opening pressure of the high-velocity vent valve in kPa.
Column (11)	“Maximum degree of filling (%)” Contains information concerning the maximum degree of filling of cargo tanks as a percentage.
Column (12)	“Relative density” Contains information concerning the relative density of the substance at 20° C. Data concerning the density are for information only.

Column (13)	“Type of sampling device” Contains information concerning the prescribed type of sampling device. 1 Closed sampling device 2 Partly closed sampling device 3 Open sampling device
Column (14)	“Pump-room below deck permitted” Contains an indication of whether a pump-room is permitted below deck. Yes pump-room below deck permitted No pump-room below deck not permitted
Column (15)	“Temperature class” Contains the temperature class of the substance.
Column (16)	“Explosion group” Contains the explosion group of the substance.
Column (17)	“Anti-explosion protection required” Contains a code referring to protection against explosions. Yes anti-explosion protection required No anti-explosion protection not required
Column (18)	“Equipment required” This column contains the alphanumeric codes for the equipment required for the carriage of the dangerous substance (see 8.1.5).
Column (19)	“Number of blue cones/lights” This column contains the number of cones/lights which should constitute the marking of the vessel during the carriage of this dangerous substance or article.
Column (20)	“Additional requirements/Remarks” This column contains the additional requirements or remarks applicable to the vessel. These additional requirements or remarks are: 1. Anhydrous ammonia is liable to cause stress crack corrosion in cargo tanks and cooling systems constructed of carbon-manganese steel or nickel steel.

In order to minimize the risk of stress crack corrosion the following measures shall be taken:

- (a) Where carbon-manganese steel is used, cargo tanks, pressure vessels of cargo refrigeration systems and cargo piping shall be constructed of fine-grained steel having a specified minimum yield stress of not more than 355 N/mm². The actual yield stress shall not exceed 440 N/mm². In addition, one of the following construction or operational measures shall be taken:
 - .1 Material with a low tensile strength ($R_m < 410 \text{ N/mm}^2$) shall be used; or
 - .2 Cargo tanks, etc., shall undergo a post-weld heat treatment for the purpose of stress relieving; or
 - .3 The transport temperature shall preferably be maintained close to the evaporation temperature of the cargo of -33° C, but in no case above -20° C; or
 - .4 Ammonia shall contain not less than 0.1 % water, by mass.
- (b) When carbon-manganese steel with yield stress values higher than those referred to in (a) above is used, the completed tanks, pipe sections, etc., shall undergo a post-weld heat treatment for the purpose of stress relieving.
- (c) Pressure vessels of the cargo refrigeration systems and the piping systems of the condenser of the cargo refrigeration system constructed of carbon-manganese steel or nickel steel shall undergo a post-weld heat treatment for the purpose of stress relieving.
- (d) The yield stress and the tensile strength of welding consumables may exceed only by the smallest value possible the corresponding values of the tank and piping material.
- (e) Nickel steels containing more than 5 % nickel and carbon-manganese steel which are not in compliance with the requirements of (a) and (b) above may not be used for cargo tanks and piping systems intended for the transport of this substance.
- (f) Nickel steels containing not more than 5 % nickel may be used if the transport temperature is within the limits referred to in (a) above.

- (g) The concentration of oxygen dissolved in the ammonia shall not exceed the values given in the table below:

t in °C	O ₂ in %
-30 and below	0.90
-20	0.50
-10	0.28
0	0.16
10	0.10
20	0.05
30	0.03

2. Before loading, air shall be removed and subsequently kept away to a sufficient extent from the cargo tanks and the accessory cargo piping by the means of inert gas (see also 7.2.4.18).
3. Arrangements shall be made to ensure that the cargo is sufficiently stabilized in order to prevent a reaction at any time during carriage. The transport document shall contain the following additional particulars:
 - (a) Name and amount of inhibitor added;
 - (b) Date on which inhibitor was added and expected duration of effectiveness under normal conditions;
 - (c) Any temperature limits having an effect on the inhibitor.

When stabilization is ensured solely by blanketing with an inert gas it is sufficient to mention the name of the inert gas used in the transport document.

When stabilization is ensured by another measurement, e.g. the special purity of the substance, this measurement shall be mentioned in the transport document.

4. The substance shall not be allowed to solidify; the transport temperature shall be maintained above the melting point. In instances where cargo heating installations are required, they must be so designed that polymerisation through heating is not possible in any part of the cargo tank. Where the temperature of steam-heated coils could give rise to overheating, lower-temperature indirect heating systems shall be provided.
5. This substance is liable to clog the vapour pipe and its fittings. Careful surveillance should be ensured. If a close-type tank vessel is required for the carriage of this substance the vapour pipe shall conform to 9.3.2.22.5 (a) (i), (ii), (iv), (b), (c) or (d) or to 9.3.3.22.5 (a) (i), (ii), (iv), (b), (c) or (d). This requirement does not apply when the cargo tanks and the corresponding piping are inerted in accordance with 7.2.4.18 nor when protection against explosions is not required in column (17) and when flame-arresters have not been installed.

6. When external temperatures are below or equal to that indicated in column (20), the substance may only be carried in tank vessels equipped with a possibility of heating the cargo.

In addition, in the event of carriage in a closed-type vessel, if the tank vessel:

- is fitted out in accordance with 9.3.2.22.5 (a) (i) or (d) or 9.3.3.22.5 (a) (i) or (d), it shall be equipped with pressure/vacuum valves capable of being heated; or
- is fitted out in accordance with 9.3.2.22.5 (a) (ii), (v), (b) or (c) or 9.3.3.22.5 (a) (ii), (v), (b) or (c), it shall be equipped with heatable vapour pipes and heatable pressure/vacuum valves; or
- is fitted out in accordance with 9.3.2.22.5 (a) (iii) or (iv) or 9.3.3.22.5 (a) (iii) or (iv), it shall be equipped with heatable vapour pipes and with heatable pressure/vacuum valves and heatable flame-arresters.

The temperature of the vapour pipes, pressure/vacuum valves and flame-arresters shall be kept at least above the melting point of the substance.

7. If a closed-type tank vessel is required to carry this substance or if the substance is carried in a closed-type tank vessel, if this vessel:

- is fitted out in accordance with 9.3.2.22.5 (a) (i) or (d) or 9.3.3.22.5 (a) (i) or (d), it shall be equipped with heatable pressure/vacuum valves, or
- is fitted out in accordance with 9.3.2.22.5 (a) (ii), (v), (b) or (c) or 9.3.3.22.5 (a) (ii), (v), (b) or (c), it shall be equipped with heatable vapour pipes and heatable pressure/vacuum valves, or
- is fitted out in accordance with 9.3.2.22.5 (a) (iii) or (iv) or 9.3.3.22.5 (a) (iii) or (iv), it shall be equipped with heatable vapour pipes and with heatable pressure/vacuum valves and heatable flame-arresters.

The temperature of the vapour pipes, pressure/vacuum valves and flame-arresters shall be kept at least above the melting point of the substance.

8. Double-hull spaces, double bottoms and heating coils shall not contain any water.

9. (a) While the vessel is underway, an inert-gas pad shall be maintained in the ullage space above the liquid level.
- (b) Cargo piping and vent lines shall be independent of the corresponding piping used for other cargoes.
- (c) Safety valves shall be made of stainless steel.

10. *(Reserved)*
11.
 - (a) Stainless steel of type 416 or 442 and cast iron shall not be used for cargo tanks and pipes for loading and unloading.
 - (b) The cargo may be discharged only by deep-well pumps or pressure inert gas displacement. Each cargo pump shall be arranged to ensure that the substance does not heat significantly if the pressure discharge line from the pump is shut off or otherwise blocked.
 - (c) The cargo shall be cooled and maintained at temperatures below 30° C.
 - (d) The safety valves shall be set at a pressure of not less than 550 kPa (5.5 bar) gauge pressure. Special authorization is required for the maximum setting pressure.
 - (e) While the vessel is underway, a nitrogen pad shall be maintained in the ullage space above the cargo (see also 7.2.4.18). An automatic nitrogen supply system shall be installed to prevent the pressure from falling below 7 kPa (0.07 bar) gauge within the cargo tank in the event of a cargo temperature fall due to ambient temperature conditions or to some other reason. In order to satisfy the demand of the automatic pressure control a sufficient amount of nitrogen shall be available on board. Nitrogen of a commercially pure quality of 99.9 %, by volume, shall be used for padding. A battery of nitrogen cylinders connected to the cargo tanks through a pressure reduction valve satisfies the intention of the expression “automatic” in this context.

The required nitrogen pad shall be such that the nitrogen concentration in the vapour space of the cargo tank is not less than 45 % at any time.
 - (f) Before loading and while the cargo tank contains this substance in a liquid or gaseous form, it and the corresponding piping shall be inerted with nitrogen.
 - (g) The water-spray system shall be fitted with remote-control devices which can be operated from the wheelhouse or from the control station, if any.
 - (h) Transfer arrangements shall be provided for emergency transfer of ethylene oxide in the event of an uncontrollable self-reaction.
12.
 - (a) The substance shall be acetylene free.
 - (b) Cargo tanks which have not undergone appropriate cleaning shall not be used for the carriage of these substances if one of the previous three cargoes consisted of a substance known to promote polymerisation, such as:

- .1 mineral acids (e.g. sulphuric acid, hydrochloric acid, nitric acid);
- .2 carboxylic acids and anhydrides (e.g. formic acid, acetic acid);
- .3 halogenated carboxylic acids (e.g. chloroacetic acid);
- .4 sulphonic acids (e.g. benzene sulphonic acid);
- .5 caustic alkalis (e.g. sodium hydroxide, potassium hydroxide);
- .6 ammonia and ammonia solutions;
- .7 amines and amine solutions;
- .8 oxidizing substances.

- (c) Before loading, cargo tanks and their piping shall be efficiently and thoroughly cleaned so as to eliminate all traces of previous cargoes, except when the last cargo was constituted of propylene oxide or a mixture of ethylene oxide and propylene oxide. Special precautions shall be taken in the case of ammonia in cargo tanks built of steel other than stainless steel.
- (d) In all cases the efficiency of the cleaning of cargo tanks and their piping shall be monitored by means of appropriate tests or inspections to check that no trace of acid or alkaline substance remains that could present a danger in the presence of these substances.
- (e) The cargo tanks shall be entered and inspected prior to each loading of these substances to ensure freedom from contamination, heavy rust deposits or visible structural defects.

When these cargo tanks are in continuous service for these substances, such inspections shall be performed at intervals of not more than two and a half years.

- (f) Cargo tanks which have contained these substances may be reused for other cargoes once they and their piping have been thoroughly cleaned by washing and flushing with an inert gas.
- (g) Substances shall be loaded and unloaded in such a way that there is no release of gas into the atmosphere. If gas is returned to the shore installation during loading, the gas return system connected to the tank containing that substance shall be independent from all other cargo tanks.
- (h) During discharge operations, the pressure in the cargo tanks shall be maintained above 7 kPa (0.07 bar) gauge.

- (i) The cargo shall be discharged only by deep-well pumps, hydraulically operated submerged pumps or pressure inert gas displacement. Each cargo pump shall be arranged to ensure that the substance does not heat significantly if the pressure discharge line from the pump is shut off or otherwise blocked.
- (j) Each cargo tank carrying these substances shall be ventilated by a system independent from the ventilation systems of other cargo tanks carrying other substances.
- (k) Loading pipes used for these substances shall be marked as follows:

“To be used only for the transfer of alkylene oxide.”

- (l) *(Reserved)*
- (m) No air shall be allowed to enter the cargo pumps and cargo piping system while these substances are contained within the system.
- (n) Before the shore connections are disconnected, piping containing liquids or gas shall be depressurised at the shore link by means of appropriate devices.
- (o) The piping system for cargo tanks to be loaded with these substances shall be separate from piping system for all other cargo tanks, including empty cargo tanks. If the piping system for the cargo tanks to be loaded is not independent, separation shall be accomplished by the removal of spool pieces, shut-off valves, other pipe sections and by fitting blank flanges at these locations. The required separation applies to all liquid pipes and vapour vent lines and any other connections which may exist such as common inert gas supply lines.
- (p) These substances may be carried only in accordance with cargo handling plans that have been approved by a competent authority.

Each loading arrangement shall be shown on a separate cargo handling plan. Cargo handling plans shall show the entire cargo piping system and the locations for installations of blank flanges needed to meet the above piping separation requirements. A copy of each cargo handling plan shall be kept on board. Reference to the approved cargo handling plans shall be included in the certificate of approval.

- (q) Before loading of these substances and before carriage is resumed a qualified person approved by the competent authority shall certify that the prescribed separation of the piping has been effected; this certificate shall be kept on board. Each connection between a blank flange and a shut-off valve in the piping shall be fitted with a sealed wire to prevent the flange from being disassembled inadvertently.

- (r) During the voyage, the cargo shall be covered with nitrogen. An automatic nitrogen make-up system shall be installed to prevent the cargo tank pressure from falling below 7 kPa (0.07 bar) gauge in the event of a cargo temperature fall due to ambient temperature conditions or to some other reason. Sufficient nitrogen shall be available on board to satisfy the demand of automatic pressure control. Nitrogen of commercially pure quality of 99.9 %, by volume, shall be used for padding. A battery of nitrogen cylinders connected to the cargo tanks through a pressure reduction valve satisfies the intention of the expression “automatic” in this context.
- (s) The vapour space of the cargo tanks shall be checked before and after each loading operation to ensure that the oxygen content is 2 %, by volume, or less.

(t) Loading flow

The loading flow (L_R) of cargo tank shall not exceed the following value:

$$L_R = 3600 \times U/t \text{ (m}^3\text{/h)}$$

In this formula:

U = the free volume (m^3) during loading for the activation of the overflow prevention system;

T = the time (s) required between the activation of the overflow prevention system and the complete stop of the flow of cargo into the cargo tank;

The time is the sum of the partial times needed for successive operations, e.g. reaction time of the service personnel, the time needed to stop the pumps and the time needed to close the shut-off valves;

The loading flow shall also take account of the design pressure of the piping system.

13. If no stabilizer is supplied or if the supply is inadequate, the oxygen content in the vapour phase shall not exceed 0.1 %. Overpressure must be constantly maintained in cargo tanks. This requirement applies also to voyages on ballast or empty with uncleaned cargo tanks between cargo transport operations.
14. The following substances may not be carried under these conditions:
- substances with self-ignition temperatures ≤ 200 °C;
 - substances with a flash point < 23 °C and an explosion range > 15 percentage points;

- mixtures containing halogenated hydrocarbons;
 - mixtures containing more than 10 % benzene;
 - substances and mixtures carried in a stabilized state.
15. Provision shall be made to ensure that alkaline or acidic substances such as sodium hydroxide solution or sulphuric acid do not contaminate this cargo.
 16. If there is a possibility of a dangerous reaction such as polymerisation, decomposition, thermal instability or evolution of gases resulting from local overheating of the cargo in either the cargo tank or associated piping system, this cargo shall be loaded and carried adequately segregated from other substances the temperature of which is sufficiently high to initiate such reaction. Heating coils inside cargo tanks carrying this substance shall be blanked off or secured by equivalent means.
 17. The melting point of the cargo shall be shown in the transport documents.
 18. *(Reserved)*
 19. Provision shall be made to ensure that the cargo does not come into contact with water. The following additional requirements apply:

Carriage of the cargo is not permitted in cargo tanks adjacent to slop tanks or cargo tanks containing ballast water, slops or any other cargo containing water. Pumps, piping and vent lines connected to such tanks shall be separated from similar equipment of tanks carrying these substances. Pipes from slop tanks or ballast water pipes shall not pass through cargo tanks containing this cargo unless they are encased in a tunnel.
 20. The maximum permitted transport temperature given in column (20) shall not be exceeded.
 21. *(Reserved)*
 22. The relative density of the cargo shall be shown in the transport document.
 23. The instrument for measuring the pressure of the vapour phase in the cargo tank shall activate the alarm when the internal pressure reaches 40 kPa (0.4 bar). The water-spray system shall immediately be activated and remain in operation until the internal pressure drops to 30 kPa (0.3 bar).
 24. Substances having a flash-point above 61 °C which are handed over for carriage or which are carried heated within a limiting range of 15 K below their flash-point shall be carried under the conditions of substance number 9001.
 25. Type 3 cargo tank may be used for the carriage of this substance provided that the construction of the cargo tank has been accepted

by a recognized classification society for the maximum permitted transport temperature.

26. Type 2 cargo tank may be used for the carriage of this substance provided that the construction of the cargo tank has been accepted by a recognized classification society for the maximum permitted transport temperature.
27. The requirements of 3.1.2.8.1 are applicable.
28. (a) When UN 2448 SULPHUR, MOLTEN is carried, the forced ventilation of the cargo tanks shall be brought into service at latest when the concentration of hydrogen sulphide reaches 1.0 %, by volume.

(b) When during the carriage of UN 2448 SULPHUR, MOLTEN, the concentration of hydrogen sulphide exceeds 1.85 %, the boat master shall immediately notify the nearest competent authority.

When a significant increase in the concentration of hydrogen sulphide in a hold space leads it to be supposed that the sulphur has leaked, the cargo tanks shall be unloaded as rapidly as possible. A new load may only be taken on board once the authority which issued the certificate of approval has carried out a further inspection.

- (c) When UN 2448 SULPHUR, MOLTEN is carried, the concentration of hydrogen sulphide shall be measured in the vapour phase of the cargo tanks and concentrations of sulphur dioxide and hydrogen sulphide in the hold spaces.
 - (d) The measurements prescribed in (c) shall be made every eight hours. The results of the measurements shall be recorded in writing.
29. When particulars concerning the vapour pressure or the boiling point are given in column (2), the relevant information shall be added to the proper shipping name in the transport document, e.g.

UN 1224 KETONES, LIQUID, N.O.S.,
110 kPa < vp 50 ≤ 174 kPa or

UN 2929 TOXIC LIQUID, FLAMMABLE, ORGANIC, N.O.S.,
boiling point ≤ 60°C

30. When these substances are carried, the hold spaces of open type N tank vessels may contain auxiliary equipment.
31. When these substances are carried, the vessel shall be equipped with a rapid blocking valve placed directly on the shore connection.
32. In the case of transport of this substance, the following additional requirements are applicable:

- (a) The outside of the cargo tanks shall be equipped with insulation of low flammability. This insulation shall be strong enough to resist shocks and vibration. Above deck, the insulation shall be protected by a covering.

The outside temperature of this covering shall not exceed 70 °C.

- (b) The spaces containing the cargo tanks shall be provided with ventilation. Connections for forced ventilation shall be fitted.
- (c) The cargo tanks shall be equipped with forced ventilation installations which, in all transport conditions, will reliably keep the concentration of hydrogen sulphide above the liquid phase below 1.85 % by volume.

The ventilation installations shall be fitted in such a way as to prevent the deposit of the goods to be transported.

The exhaust line of the ventilation shall be fitted in such a way as not to present a risk to personnel.

- (d) The cargo tank and the hold spaces shall be fitted with outlets and piping to allow gas sampling.
- (e) The outlets of the cargo tanks shall be situated at a height such that for a trim of 2° and a list of 10°, no sulphur can escape. All the outlets shall be situated above the deck in the open air. Each outlet shall be equipped with a permanently fixed closing mechanism.

One of these mechanisms shall be capable of being opened for slight overpressure within the tank.

- (f) The pipes for loading and unloading shall be equipped with adequate insulation. They shall be capable of being heated.
- (g) The heat transfer fluid shall be such that in the event of a leak into a tank, there is no risk of a dangerous reaction with the sulphur.

33. The following provisions are applicable to transport of this substance:

Construction requirements:

- (a) Hydrogen peroxide solutions may be transported only in cargo tanks equipped with deep-well pumps.
- (b) Cargo tanks and their equipment shall be constructed of solid stainless steel of a type appropriate to hydrogen peroxide solutions (for example, 304, 304L, 316, 316L or 316 Ti). None of the non-metallic materials used for the system of cargo tanks shall be attacked by hydrogen peroxide solutions or cause the decomposition of the substance.

- (c) The temperature sensors shall be installed in the cargo tanks directly under the deck and at the bottom. Remote temperature read-outs and monitoring shall be provided for in the wheelhouse.
- (d) Fixed oxygen monitors (or gas-sampling lines) shall be provided in the areas adjacent to the cargo tanks so that leaks in such areas can be detected. Account shall be taken of the increased flammability arising from the increased presence of oxygen. Remote read-outs, continuous monitoring (if the sampling lines are used, intermittent monitoring will suffice) and visible and audible alarms similar to those for the temperature sensors shall also be located in the wheelhouse. The visible and audible alarms shall be activated if the oxygen concentration in these void spaces exceeds 30 % by volume. Two additional oxygen monitors shall also be available.
- (e) The cargo tank venting systems which are equipped with filters shall be fitted with pressure/vacuum relief valves appropriate to closed-circuit ventilation and with an extraction installation should cargo tank pressure rise rapidly as a result of an uncontrolled decomposition (see under m). These air supply and extraction systems shall be so designed that water cannot enter the cargo tanks. In designing the emergency extraction installation account shall be taken of the design pressure and the size of the cargo tanks.
- (f) A fixed water-spray system shall be provided for diluting and washing away any hydrogen peroxide solutions spilled onto the deck. The area covered by the jet of water shall include the shore connections and the deck containing the cargo tanks designated for carrying hydrogen peroxide solutions.

The following minimum requirements shall be complied with:

- .1 The substance shall be diluted from the original concentration to a 35 % concentration within five minutes from the spillage on the deck;
 - .2 The rate and estimated size of the spill shall be determined in the light of the maximum permissible loading or unloading rates, the time required to halt the spillage in the event of tank overfill or a piping/hose failure, and the time necessary to begin application of dilution water with actuation of the alarm at the cargo control location or in the wheelhouse.
- (g) The outlets of the pressure valves shall be situated at least 2 metres above the walkways if they are less than 4 metres from the walkway.

- (h) A temperature sensor shall be installed by each pump to make it possible to monitor the temperature of the cargo during unloading and detect any overheating due to defective operation of the pump.

Servicing requirements:

Carrier

- (i) Hydrogen peroxide solutions may only be carried in cargo tanks which have been thoroughly cleaned and passivated, in accordance with the procedure described under (j), of all traces of previous cargoes, their vapours or their ballast waters. A certificate stating that the procedure described under (j) has been duly complied with must be carried on board.

Particular care in this respect is essential to ensure the safe carriage of hydrogen peroxide solutions:

- .1 When a hydrogen peroxide solution is being carried, no other cargo may be carried simultaneously;
 - .2 Tanks which have contained hydrogen peroxide solutions may be reused for other cargoes after they have been cleaned by persons or companies approved for this purpose by the competent authority;
 - .3 In the design of the cargo tanks, efforts must be made to keep to a minimum any internal tank structure, to ensure free draining, no entrapment and ease of visual inspection.
- (j) Procedures for inspection, cleaning, passivation and loading for the transport of hydrogen peroxide solutions with a concentration of 8 to 60 per cent in cargo tanks which have previously carried other cargoes.

Before their reuse for the transport of hydrogen peroxide solutions, cargo tanks which have previously carried cargoes other than hydrogen peroxide must be inspected, cleaned and passivated. The procedures described in paragraphs .1 to .7 below for inspection and cleaning apply to stainless steel cargo tanks. The procedure for passivating stainless steel is described in paragraph .8. Failing any other instructions, all the measures apply to cargo tanks and to all their structures which have been in contact with other cargoes.

- .1 After unloading of the previous cargo, the cargo tank must be degassed and inspected for any remaining traces, carbon residues and rust.
- .2 The cargo tanks and their equipment must be washed with clear filtered water. The water used must be at least of the same quality as drinking water and have a low chlorine content.

- .3 Traces of the residues and vapours of the previous cargo must be removed by the steam cleaning of the cargo tanks and their equipment.
 - .4 The cargo tanks and their equipment must then be rewashed with clear water of the quality specified in paragraph 2 above and dried in filtered, oil-free air.
 - .5 Samples must be taken of the atmosphere in the cargo tanks and these must be analysed for their content of organic gases and oxygen.
 - .6 The cargo tank must be reinspected for any traces of the previous cargo, carbon residues or rust or odours of the previous cargo.
 - .7 If the inspection and the other measures point to the presence of traces of the previous cargo or of its gases, the measures described in paragraphs .2 to .4 above must be repeated.
 - .8 Stainless steel cargo tanks and their structures which have contained cargoes other than hydrogen peroxide solutions and which have been repaired must, regardless whether or not they have previously been passivated, be cleaned and passivated in accordance with the following procedure:
 - .8.1 The new weld seams and other repaired parts must be cleaned and scrubbed with stainless steel brushes, graving tools, sandpaper and polishers. Rough surfaces must be made smooth and a final polishing must be carried out;
 - .8.2 Fatty and oily residues must be removed with the use of organic solvents or appropriate cleaning products diluted with water. The use of chlorinated products shall be avoided because these might seriously interfere with the passivation procedure;
 - .8.3 Any residues that have been removed must be eliminated and the tanks must then be washed.
- (k) During the transfer of the hydrogen peroxide solutions, the related piping system must be separated from all other systems. Loading and unloading piping used for the transfer of hydrogen peroxide solutions must be marked as follows:
- “For Hydrogen Peroxide
Solution Transfer only”
- (l) If the temperature in the cargo tanks rises above 35 °C, visible and audible alarms shall activate in the wheelhouse.

Master

- (m) If the temperature rise exceeds 4 °C for 2 hours or if the temperature in the cargo tanks exceeds 40 °C, the master must contact the consignor directly, with a view to taking any action that might be necessary.

Filler

- (n) Hydrogen peroxide solutions must be stabilized to prevent decomposition. The manufacturer must provide a stabilization certificate which must be carried on board and must specify:
- .1 The disintegration date of the stabilizer and the duration of its effectiveness;
 - .2 Actions to be taken should the product become unstable during the voyage.
- (o) Only those hydrogen peroxide solutions which have a maximum decomposition rate of 1.0 per cent per year at 25 °C may be carried. A certificate from the filler stating that the product meets this standard must be presented to the master and kept on board. An authorized representative of the manufacturer must be on board to monitor the loading operations and to test the stability of the hydrogen peroxide solutions to be transported. He shall certify to the master that the cargo has been loaded in a stable condition.
34. For type N carriage, the flanges and stuffing boxes of the loading and unloading hoses must be fitted with a protection device to protect against splashing.
35. A direct system for the cargo refrigerating system is not permitted for this substance.
36. Only an indirect system for the cargo refrigerating system is permitted for this substance.
37. For this substance, the cargo tank system shall be capable of resisting the vapour pressure of the cargo at higher ambient temperatures whatever the system that has been adopted for treating the boil-off gas.
38. When the initial melting point of these mixtures in accordance with standard ASTM D86-01 is above 60° C, the transport requirements for packing group II are applicable.
39. (a) The joints, outlets, closing devices and other technical equipment shall be of such a sort that there cannot be any leakage of carbon dioxide during normal transport operations (cold, fracturing of materials, freezing of fixtures, run-off outlets etc.).
- (b) The loading temperature (at the loading station) shall be mentioned in the transport document.

(c) An oxygen meter shall be kept on board, together with instructions on its use which can be read by everyone on board. The oxygen meter shall be used as a testing device when entering holds, pump rooms, areas situated at depth and when work is being carried out on board.

(d) At the entry of accommodation and in other places where the crew may spend time there shall be a measuring device which lets off an alarm when the oxygen level is too low or when the CO₂ level is too high.

(e) The loading temperature (established after loading) and the maximum duration of the journey shall be mentioned in the transport document.