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INLAND TRANSPORT COMMITTEE

Working Party on the Transport
of Dangerous Goods

REPORT OF THE WORKING PARTY ON ITS FIFTY-SEVENTH SESSION

Addendum 2

**EUROPEAN PROVISIONS CONCERNING THE INTERNATIONAL CARRIAGE
OF DANGEROUS GOODS BY INLAND WATERWAY (ADN)**

Annex B.2 of ADN (except Appendix 4)

Note by the secretariat

1. This document contains the text of Annex B.2 of ADN (except Appendix 4), and has been prepared on the basis of the decisions of the Working Party at its fifty-third session (20-29 October 1993) and fifty-seventh (extraordinary) session (23-24 August 1995) (see also TRANS/WP.15/136, para. 13).
2. Any editorial comment on this text or new proposal should be sent to the secretariat at the latest by 22 March 1996, for consideration by the Working Party at an extraordinary session scheduled to be held from 3 to 5 June 1996 (possibly 3 - 7 June 1996).

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Part I

DEFINITIONS AND GENERAL PROVISIONS APPLICABLE TO THE CARRIAGE OF DANGEROUS GOODS OF ALL CLASSES

General**210 000 Plan of Annex B.2**

(1) This Annex comprises provisions concerning the carriage of dangerous goods in tank vessels.

(2) The provisions of Annex B.2 are divided into parts as follows:

Part I - Definitions and general provisions applicable to the carriage of dangerous goods of all classes

Part II - Special provisions applicable to the carriage of dangerous goods of classes 2, 3, 4.1, 6.1, 8 and 9 supplementing or amending the provisions of Part I

Part III - Rules for construction of tank vessels

210 001 Applicability of other regulations

(1) For the purposes of the carriage of dangerous goods, the provisions laid down in the "**Recommendations on Technical Requirements for Inland Navigation Vessels**" (Annex to the revised resolution No. 17 of the Principal Working Party on Inland Water Transport of the Inland Transport Committee of the Economic Commission for Europe) are supplemented by the applicable rules for construction of Part III.

For the purposes of the carriage of dangerous goods, the provisions laid down in the **European Code for Inland Waterways (CEVNI)** are supplemented by the applicable provisions of Parts I and II.

(2) Where provisions of Parts II or III conflict with provisions of Part I or with provisions set out in the "**Recommendations on Technical Requirements for Inland Navigation Vessels**", those provisions of Part I or of the "**Recommendations on Technical Requirements for Inland Navigation Vessels**" shall not apply.

Nevertheless, the provisions of marginals 210 003 to 210 121 shall prevail over those of Parts II and III.

(3) The special provisions applicable to the individual classes as set out in Part II shall supplement the general provisions of Part I.

210 002

210 003 Scope of Annex B.2

The provisions of Annex B.2 shall also apply to empty vessels or vessels which have been unloaded as long as the cargo tanks are not free from dangerous goods or gases.

**210 004-
210 013**

210 014 Definitions

For the purposes of this Annex:

Electrical equipment

IEC means the International Electrotechnical Commission.

Limited explosion risk electrical apparatus

means an electrical apparatus which, during normal operation, does not cause sparks or exhibits surface temperatures which are above the required temperature class, including e.g.

- three-phase squirrel cage rotor motors;
- brushless generators with contactless excitation;
- fuses with an enclosed fuse element;
- contactless electronic apparatus;

or

- an electrical apparatus with a spray-water protected closure (degree of protection IP 55) which during normal operation does not exhibit surface temperatures which are above the required temperature class.

Certified safe type electrical apparatus

means an electrical apparatus which has been tested and approved by the competent authority regarding its safety of operation in an explosive atmosphere, e.g.

- intrinsically safe apparatus;
- flameproof enclosure apparatus;
- apparatus protected by pressurization;
- powder filling apparatus;
- apparatus protected by encapsulation;
- increased safety apparatus.

Note: "Limited explosion risk" apparatus is not covered by this definition.

**210 014
(cont'd)**

Explosion group (see IEC publication 79 and EN 50 014)

means a grouping of flammable gases and vapours according to their maximum experimental safe gaps and minimum ignition currents, and of electrical apparatus which may be used in the corresponding potentially explosive atmosphere.

Electrical apparatus protected against water jets

means an electrical apparatus so designed that water, projected by a nozzle on the enclosure from any direction, has no damaging effects. The test conditions are specified in the IEC publication 529, minimum degree of protection IP 55.

Temperature class (see IEC publication 79 and EN 50 014)

means a grouping of flammable gases and vapours of flammable liquids according to their ignition temperature, and of electrical apparatus which may be used in the corresponding potentially explosive atmosphere according to their maximum surface temperature.

Types of protection (see IEC Publication 79 and EN 50 014)

EEx (d)	:	flameproof enclosure (EN 50 018);
EEx (e)	:	increased safety (EN 50 019);
EEx (ia) and EEx (ib)	:	intrinsic safety (EN 50 020);
EEx (m)	:	encapsulation (EN 50 028);
EEx (p)	:	pressurized apparatus (EN 50 016);
EEx (q)	:	powder filling (EN 50 017).

Classification of zones (see IEC publication 79-10)

Zone 0:	areas in which dangerous explosive atmospheres of gases, vapours or sprays exist permanently or during long periods;
Zone 1:	areas in which dangerous explosive atmospheres of gases, vapours or sprays are likely to occur occasionally;
Zone 2:	areas in which dangerous explosive atmospheres of gases, vapours or sprays are likely to occur rarely and if so for short periods only.

DIVISION OF SPACE

Accommodation

means spaces intended for the use of persons normally living on board, including galleys, food stores, lavatories, washrooms, bathrooms, laundries, halls, alleyways, etc., but excluding the wheelhouse.

210 014 *Bulkhead (watertight)*
(cont'd)

A bulkhead shall be considered watertight if it has been constructed so that it can withstand water pressure with a head of 1 metre above the deck.

Bulkhead

means a metal wall or partition, generally vertical, both sides of which are inside the vessel and which is bounded by the bottom, the side plating, a deck or by another bulkhead.

Cargo area

see "MISCELLANEOUS".

Cargo pump-room (comparable to "zone 1")

means a service space where the cargo pumps and stripping pumps are installed together with their operational equipment.

Cargo tank (comparable to "zone 0")

means a tank which is permanently attached to the vessel and the boundaries of which are either formed by the hull itself or by walls separate from the hull and which is intended for the carriage of dangerous goods.

Cofferdam (comparable to "zone 1")

means an athwartship compartment which is bounded by watertight bulkheads and which can be inspected. The cofferdam shall extend over the whole area of the end bulkheads of the cargo tanks. The bulkhead not facing the cargo area shall extend from one side of the vessel to the other and from the bottom to the deck in one frame plane.

Hold space (comparable to "zone 1")

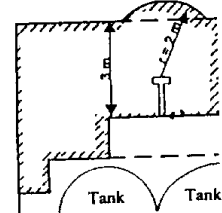
means an enclosed part of the vessel which is bounded fore and aft by watertight bulkheads and which is intended only to carry cargo tanks independent of the vessel's hull.

Independent cargo tank (comparable to "zone 0")

means a cargo tank which is permanently built in, but which is independent of the vessel's structure.

Service space

means a space which is accessible during the operation of the vessel and which is neither part of the accommodation nor of the cargo tanks, with the exception of the forepeak and after peak, provided no machinery has been installed in these latter spaces.



210 014 *Cargo area (part below deck)*
(cont'd)

means the space between two vertical planes perpendicular to the centre-line plane of the vessel, which comprises cargo tanks, hold spaces, cofferdams, double-hull spaces and double bottoms; these planes very often coincide with cofferdam bulkheads or hold end bulkheads. Their intersection with the deck is referred to as limit at deck of cargo area part below deck. In the case of a trunk-deck vessel or a vessel with independent cargo tanks, the deck is considered to coincide with the tank top.

Cargo area (main part above deck) (comparable to "zone 1")

means the space which is bounded:

- at the sides, by the shell plating extending upwards from the decks sides;
- fore and aft, by planes inclined at 45° towards the cargo area, starting at the limit at deck of cargo area part below deck;
- vertically, 3 m above the deck.

Cargo area (additional part above deck) (comparable to "zone 1")

means the spaces not included in the main part of cargo area above deck comprising 1 m radius spherical segments centred over the ventilation openings of the cofferdams and 2 m spherical segments centred over the ventilation openings of the cargo tanks.

Cargo piping

See "pipes for loading and unloading".

Cargo residues

means liquid cargo which cannot be removed from the cargo tank or cargo piping by discharging, draining or stripping.

Cargo tank (condition)

discharged: empty, but containing residual cargo;

empty: dry, but not gas-free;

gas-free: not containing any measurable concentration of dangerous gases or vapours.

Classification society (recognized)

means a classification society which is recognized by the competent authorities.

Damage control plan

The damage control plan shall indicate the boundaries of the watertight compartments serving as the basis for the stability calculations, the openings therein with the means of closure which are to be kept closed when the vessel is under way and position of any controls thereof, and the arrangements for the correction of any list due to flooding.

210 014
(cont'd)*Dangerous goods*

means the substances and materials themselves and articles containing dangerous substances, including wastes as defined in marginal 6000(5), and which are covered by the relevant definitions (see lists of substances) for classes 1 to 9 of ADR or which are listed as such in Part II of Annex A to ADN.

NOTE: *In accordance with marginal 6002(4) of Annex A, dangerous goods used for the propulsion of the vessels or vehicles, the operation of their special equipment, for household purposes or for maintaining safety and which are carried on board in their usual containment are not subject to the provisions of ADN.*

Escape device (suitable)

means a respiratory protection device, designed to cover the wearer's mouth, nose and eyes, which can be easily put on and which serves to escape from a danger area.

Filling ratio

Where a filling ratio is given for a cargo tank, it refers to a percentage of the volume at a temperature of the substance of 15 °C, except where a different temperature is indicated.

Flammable gas detector

means a device allowing measuring of any significant concentration of flammable gases below the lower explosive limit and which clearly indicates the presence of higher concentrations of such gases given off by the cargo. Flammable gas detectors may be designed for measuring both flammable gas concentrations and oxygen content.

This device shall be designed so that measurements are possible without the necessity of entering the spaces to be checked.

Gases

means gases or vapours.

Gas detection system

means a fixed system capable of detecting in time significant concentrations of flammable gases given off by the cargoes at concentrations below the lower explosion limit and capable of activating the alarms.

Highest class may be assigned to a vessel when:

- the hull, inclusive of rudder and steering gear and equipment of anchors and chains, complies with the rules and regulations of a recognized classification society and has been built and tested under its supervision;

210 014
(cont'd)

- the propulsion plant, together with the essential auxiliary engines, remainder machinery and electrical installation, have been made and tested in conformity with the rules and regulations of this classification society, and the installation has been carried out under its supervision and, was tested to its satisfaction on completion.

Identification number

means the number for identifying a substance, material or article. These numbers are, as a rule, taken from the United Nations "Recommendations on the Transport of Dangerous Goods" ("UN Number").

Loading journal

means a journal where all activities relating to loading, unloading, cleaning, gas-freeing, delivering washing water and taking in and delivering ballast water (in cargo tanks) are recorded.

Naked light

means light produced by a flame which is not enclosed in a flameproof enclosure.

Oxygen meter

means a device allowing measuring of any significant reduction of the oxygen content of the air. Oxygen meters may be designed and constructed for measuring oxygen only but also for measuring flammable gases and oxygen.

This device shall be designed so that such measurements are possible without the necessity of entering the spaces to be checked.

Pipes for loading or unloading (cargo piping)

means all pipes which may contain liquid or gaseous cargo, including the connected pumps, filters and closure devices.

Pressures

For cargo tanks, all kinds of pressures (e.g. test pressure, internal pressure, start-to-discharge pressure of safety valves) shall be expressed as gauge pressures in kPa (bar); the vapour pressure of substances, however, shall be expressed as absolute pressure in kPa (bar).

Rescue winch

means a device for hoisting persons from spaces such as hold spaces, cofferdams and double-hull spaces. The device shall be operable by one person.

210 014
(cont'd)*Residual cargo*

means liquid cargo remaining in the cargo tank or cargo piping after unloading without the use of the stripping system.

Slops

means a mixture of cargo residues and e.g. washing water, rust, etc., which is either suitable or not suitable for pumping.

Steersman

means a person as defined in Article 1.02 of the European Code for Inland Waterways (CEVNI).

Stripping system (efficient)

means a system for draining the cargo tanks and stripping the cargo piping except for the cargo residues.

Tank vessel

means a vessel intended for the carriage of substances in cargo tanks.

Toximeter

means a device allowing measuring of any significant concentration of toxic gases given off by the cargo.

This device shall be designed so that such measurements are possible without the necessity of entering the spaces to be checked.

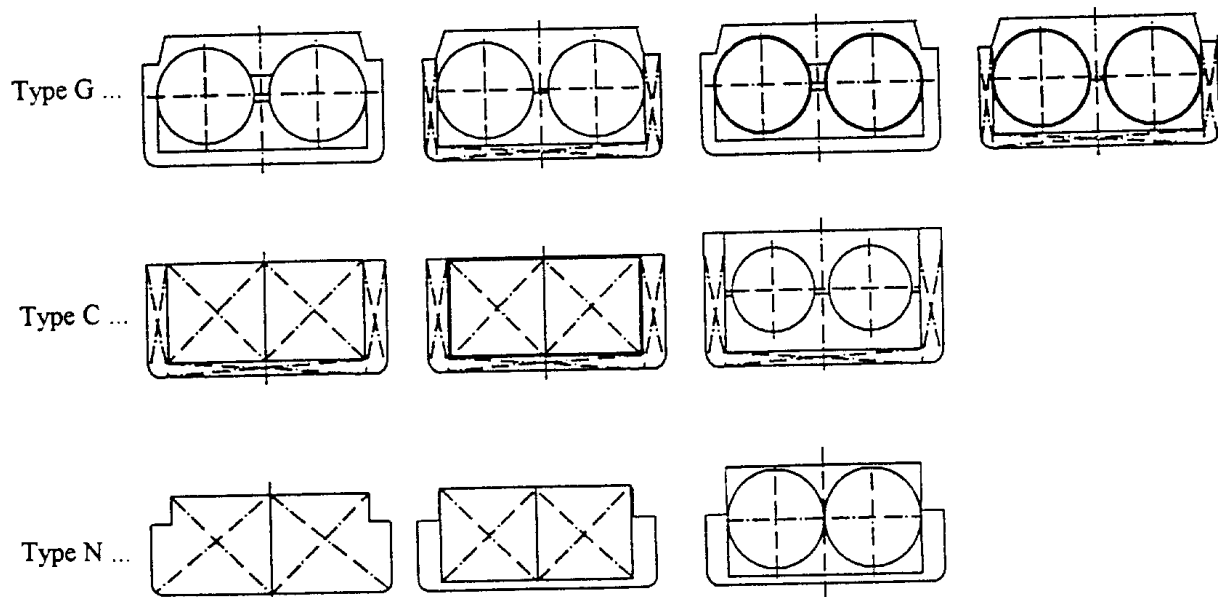
Type of vessels

Type G ...: means a tank vessel intended for the carriage of gases. Carriage may be under pressure or in the liquid state under refrigeration.

Type C ...: means a tank vessel intended for the carriage of liquids. The vessel shall be of the flush-deck/double-hull type with double hull spaces, double bottoms, but without trunk. The cargo tanks may be formed by the vessel's hull or may be placed and installed in the holds.

Type N ...: means a tank vessel intended for the carriage of liquids.

210 014 Sketches
(cont'd)



Vessel

means an inland navigation vessel or a seagoing vessel.

**210 015-
210 099**

SECTION 1. Mode of carriage of goods

**210 100-
210 120**

210 121 Carriage in cargo tanks

- (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 Appendix 4 to this Annex.
- (2) Substances, which according to the list of substances of Appendix 4 to this Annex, 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 prescribed in the list of substances of Appendix 4 are met.

**210 121
(cont'd)**

(3) Substances which, according to the list of substances of Appendix 4 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 prescribed in the list of substances of Appendix 4 are met.

(4) Substances which, according to the list of substances of Appendix 4 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 prescribed in the list of substances of Appendix 4 are met.

(5) Substances which, according to the list of substances of Appendix 4 has 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 prescribed in the list of substances of Appendix 4 are met.

**210 122-
210 199**

SECTION 2. Provisions applicable to vessels

210 200 Construction

Tank vessels carrying dangerous goods shall comply with the provisions of this Part as well as with the applicable provisions of Part II and the applicable rules for construction of Part III.

**210 201-
210 203**

210 204 Types of vessel

Distinction is made between the following types of vessel:

Type G, Type C and Type N

The test pressure of the cargo tanks and the relief pressure of the high-velocity vent valves, if any, shall be indicated in the certificate of approval. Where a vessel carries cargo tanks with different test pressures, the test pressure of each cargo tank shall be shown in the certificate of approval. This provision shall also apply for the relief pressure of the corresponding high-velocity vent valves.

210 205 Instructions for the use of devices and equipment

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 in a language the steersman understands and, additionally in the language(s) normally spoken on board, shall be readily available for consultation at appropriate places on board.

210 206 Gas detection system

The sensors of the gas detection system shall be set at not more than 10% of the lower explosive limit of the substances allowed for carriage in the vessel.

The system shall have been approved by the competent authority or a recognized classification society.

210 207

210 208 Classification

(1) Tank vessels intended for the carriage of dangerous goods shall be built under survey of a recognized classification society in accordance with the rules established by this classification society to its highest class. This shall be confirmed by the classification society by the issue of an appropriate certificate.

(2) The vessel's class shall be continued.

**210 209-
210 218**

210 219 Pushed convoys and side-by-side formations

(1) Where at least one vessel of a convoy or side-by-side formation is required to be provided with a certificate of approval in accordance with marginal 210 282, 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 marginal 10 219 of Annex B.1.

(2) For the purposes of the application of the provisions of Parts I and II, the entire pushed convoy or side-by-side formation shall be deemed to be a single vessel.

(3) Vessels used for propulsion shall comply with the following rules for construction of Part III of this Annex: marginals 331 200 (1) to (5), 331 210 (1) to (3), 331 212 (3) and (5), 331 216 (1) and (2), 331 217 (1) to (4), 331 231 (1) to (5), 331 232 (2), 331 234 (1) and (2), 331 240 (1) and (2), 331 241 (1) and (2), 331 250 (1) (c) and (2), 331 251 (1) to (3), 331 252 (3) (a) and (b) and (4) to (6), 331 256 (5) and 331 274 (1) to (3). However, for the purposes of the application of marginal 331 240 (1), one single fire or ballast pump shall be deemed sufficient.

210 220-
210 239

210 240 Fire-extinguishing systems

In addition to the fire-extinguishing appliances prescribed by the Recommendations on Technical Requirements for Inland Navigation Vessels */, each vessel shall be equipped with at least two additional hand fire-extinguishers having the same capacity. The fire-extinguishing agent contained in these additional hand fire-extinguishers shall be suitable for fighting fires involving the dangerous goods carried.

The fire-extinguishing agent contained in fixed fire-extinguishing installation shall be suitable and sufficient in quantity for fighting fires involving the dangerous goods carried.

210 241-
210 250

210 251 Electrical installations

The insulation resistance of the electrical installations, the earthing and the flameproof electrical equipment shall be inspected once in every 2 ½ years by a person authorized for this purpose by the competent authority. An appropriate inspection certificate shall be kept on board.

210 252-
210 259

210 260 Special equipment

(1) When this is required in Part II, the following equipment shall be available on board:

- (a) for each member of the crew, a pair of protective goggles, a full face mask with suitable respirator, a pair of protective gloves and boots, and a protective suit;
- (b) a suitable escape device for each person on board;
- (c) two self-contained breathing apparatus;
- (d) two safety harnesses;
- (e) a rescue winch;
- (f) a flammable gas detector;
- (g) a toximeter.

*/ Annex to the revised resolution No.17 of the Principal Working Party on Inland Water Transport of the Inland Transport Committee of the Economic Commission for Europe.

210 260 Materials and additional protective equipment specified by the consignor in the
(cont'd) instructions shall be provided by the consignor and shall be available on board.

(2) For pushed convoys or side-by-side formations under way, it shall be sufficient, however, if the pusher tug or the vessel propelling the side-by-side formation is equipped with the special equipment referred to in (1) above, when this is required in Part II.

210 261-
210 279

210 280 Checking and inspection of equipment

(1) The fire-extinguishing appliances and hoses shall be inspected at least once every two years by persons authorized for this purpose by the competent authority.

(2) The pipes for loading and unloading shall be inspected once a year by persons authorized for this purpose by the competent authority.

(3) The special equipment referred to in marginal 210 260 (1) and the gas detection system shall be inspected in accordance with the instructions of the manufacturer concerned either by the manufacturer himself or by persons authorized for this purpose by the competent authority.

210 281

210 282 Certificate of approval

(1) Any tank vessel carrying dangerous goods shall be provided with an appropriate certificate of approval.

(2) The certificate of approval shall attest that the vessel has been inspected and that its construction and equipment comply with the applicable provisions of this Annex.

(3) The certificate of approval shall be issued by the competent authority after the inspection has been carried out by an expert designated by that authority.

It shall conform to model No. 1 in Appendix 1.

The competent authority may exempt a vessel from the inspection, provided that a certificate issued by a recognized classification society attests that the construction and equipment of the vessel comply with the applicable provisions of this Annex.

(4) The certificate of approval shall be valid for not more than five years. The date on which the period of validity expires shall be shown on the certificate. The competent authority which issued the certificate may, without inspection of the vessel, extend the validity of the certificate by not more than one year. Such extension may be granted only once within two periods of validity.

210 282
(cont'd)

(5) If the vessel's hull or equipment has undergone alterations liable to reduce the safety as regards the carriage of dangerous goods or has sustained damage affecting such safety, the vessel shall undergo a further inspection in accordance with (3) above without delay.

(6) The certificate of approval may be withdrawn if the vessel is not properly maintained or if the vessel's construction or equipment no longer complies with the applicable provisions of this Annex.

(7) The certificate of approval may only be withdrawn by the authority by which it has been issued.

Nevertheless, in the cases referred to in (5) and (6) above, the competent authority of the State in which the vessel is staying may prohibit its use for the carriage of those dangerous goods for which the certificate is required. For this purpose it may withdraw the certificate until such time as the vessel again complies with the applicable provisions of this Annex. In that case it shall notify the competent authority which issued the certificate.

(8) Notwithstanding (7) above, any competent authority may amend or withdraw the certificate of approval at the request of the vessel's owner, provided that it so notifies the competent authority which issued the certificate.

210 283

Provisional certificate of approval

(1) For a vessel which is not provided with a certificate of approval, a provisional certificate of approval of limited duration may be issued in the following cases, subject to the following conditions:

- (a) The vessel complies with the applicable provisions of this Annex, but the certificate of approval could not be issued in time. The provisional certificate of approval shall be valid for an appropriate period but not exceeding three months.
- (b) The vessel does not comply with every applicable provisions of this Annex after sustaining damage. In this case the provisional certificate of approval shall be valid only for a single specified voyage and for a specified cargo. The competent authority may impose additional conditions.

(2) The provisional certificate of approval shall conform to model No.2 in Appendix 1 to this Annex, or to a single certificate model for the provisional certificate of inspection and the provisional certificate of approval, provided that this single certificate model include the same particulars as Model No.2 and is approved by the competent authority.

210 284

Loading journal

All tank vessels shall be provided with a loading journal. The original of the loading journal shall be kept on board for not less than 12 months after the last entry is made.

210 284 (cont'd) The first loading journal shall be issued by the authority which issued the certificate of approval. Subsequent journals may be issued by authorities competent to do so.

**210 285-
210 286**

210 287 Derogations for type N vessels

(1) Vessels of type N, open, are not subject to the provisions of the following marginals of Section 3 of Part III:

331 208 (2) and (3), 331 210 (1), (2) and (3), 331 211 (6) (c), 331 212 (2), (4), (5) and (6), 331 217 (5) (g), (6) and (7), 331 220 (4), 331 221 (1) (e) and (1) (h), 331 221 (7), (9), (10) and (11), flame arresters, 331 222 (2), (3), (4) (b) and (5), 331 225(1), (2) (e), (3) and (4) (b) and 331 226 (3) as regards equipment.

(2) Vessels of type N, open, with flame arresters are not subject to the provisions of the following marginals of Section 3 of Part III : 331 221(1) (e), 331 221 (7), (9) and (10) and 331 222 (2), (4) (b) and (5).

**210 288
210 299**

SECTION 3. General service provisions

210 300

210 301 Access to cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections

(1) The empty cofferdams shall be inspected daily in order to ascertain that they are dry (except for condensation water).

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

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

(4) When the gas concentration has to be measured before entry into cargo tanks, cargo residue tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms or hold spaces, the results of these measurements shall be recorded in writing.

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

**210 302-
210 305**

210 306 Gas detection system

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

210 307 Gas-freeing of empty cargo tanks

(1) Empty or unloaded cargo tanks having previously contained dangerous goods of Class 2, Class 3, 5° and 11° to 19°, Class 6.1 or Class 8, letter (a) of all items, may only be gas-freed at the locations designated or approved for such purpose by the local competent authority. Gas-freeing may be carried out only by competent persons or companies approved for that purpose.

(2) Gas-freeing of empty or unloaded cargo tanks having contained dangerous goods other than those referred to under (1) above, may be carried out while the vessel is underway by means of suitable venting equipment with the tank lids closed and by leading the gas/air mixtures through the flame arresters, provided that in normal conditions of operation, the product concentration in the vented mixture at the outlet is less than 50 % of the lower explosive limit.

The suitable venting equipment may be used for gas-freeing by extraction only when a flame arrester is fitted immediately before the ventilation fan on the extraction side. During normal operation, the gas concentration in the mixture at the outlet shall be less than 50 % of the lower explosive limit. The gas concentration shall be measured once each hour during the two first hours after the beginning of the gas-freeing operation by forced ventilation or by extraction, by an expert referred to in marginal 210 315.

The results of these measurements shall be recorded in writing.

Gas-freeing is, however, prohibited within the area of locks including their lay-bys.

(3) Where gas-freeing of cargo tanks having previously contained the dangerous goods referred to in (1) above is not practicable at the locations designated or approved for this purpose by the local competent authority, gas-freeing may be carried out while the vessel is underway, provided that :

- the requirements of paragraph (2) are complied with; the concentration of dangerous substances in the vented mixture at the outlet shall, however, be not more than 10 % of the lower explosive limit;
- there is no risk involved for the crew;
- any entrances or openings of spaces connected to the outside are closed; this provision does not apply to the air supply openings of the engine room and overpressure installations;
- any member of the crew working on deck is wearing suitable protective equipment;

- 210 307 (cont'd)** - it is not carried out within the area of locks including their lay-bys, under bridges or within densely populated areas.

(4) Gas-freeing operations shall be interrupted when, due to unfavourable wind conditions, dangerous concentrations of gases are to be expected outside the cargo area in front of accommodation, the wheelhouse and service spaces. The critical state is reached as soon as concentrations of more than 30 % of the lower explosive limit have been detected in those areas by measurements by means of portable equipment.

210 308 Repair and maintenance work

No repair or maintenance work liable to cause sparks or requiring the use of an open flame or electric current shall be undertaken unless permission has been given by the local competent authority or a certificate attesting gas-free condition has been issued for the vessel.

In the service spaces outside the cargo area repair and maintenance work may be undertaken, provided the doors and openings are closed and the cargo tanks are not being loaded, unloaded or gas-freed.

The use of chromium vanadium steel screw drivers and wrenches is permitted.

**210 309-
210 311**

210 312 Ventilation

(1) While the machinery in the service spaces is operating, the extension ducts connected to the air inlets, if any, shall be in the upright position; otherwise the inlets shall be closed.

This provision does not apply to air inlets of service spaces outside the cargo area, provided the inlets without extension duct are located not less than 0.50 m above the deck.

- (2) The ventilation of pump rooms shall be in operation:
- at least 30 minutes before entry and during occupation;
 - during loading, unloading and gas-freeing; and
 - after the gas detection system has been activated.

**210 313-
210 314**

210 315 Dangerous goods training

(1) An expert shall be on board the vessel. This person shall not be less than 18 years of age.

(2) An expert is a person who has a special knowledge of the ADN. Proof of this knowledge shall be furnished by means of a certificate from a competent authority or from an agency recognized by the competent authority.

This certificate shall be delivered to persons who, after training, have successfully passed a qualifying ADN examination.

The certificate shall conform to model No. 3 of Appendix 1 to this Annex.

(3) The training programme shall comprise at least the subjects listed below and the training shall include practical exercises;

- (a) General provisions concerning the carriage of dangerous goods, e.g. with respect to contents, temperature, mass, quantity, concentration, degree of filling, calculation of contents, liquid-level gauging, sampling, check list, overfilling, pumping, marking of vessels, labelling of packages, instructions in writing;
- (b) Definition of terms (e.g. liquids, gases and vapours), basic knowledge of products;
- (c) Nature of risks such as combustion, explosion, sources of ignition, electrostatic charge, prevention of explosion, toxicity, radioactivity, corrosivity, danger to the aquatic environment;
- (d) Measures to avoid accidents;
- (e) Measures to be taken in the event of an accident or an incident (first aid, "keep-off" signal, emergency call, safety of traffic, use of appliances such as fire-extinguishers and personal protective equipment, etc.);
- (f) Tasks of the crew and of the expert with respect to the carriage of dangerous goods;
- (g) Equipment of vessels carrying dangerous goods e.g flammable gas detector, oxygen meters and toximeters; tests to be carried out before entering spaces; certificates attesting a gas-free condition;
- (h) Use of fire-extinguishers, fire-fighting equipment and personal protective equipment.

210 315 (cont'd) (4) Every competent authority or agency recognized by that competent authority may determine the procedures and syllabus of the qualifying examination according to (2) above on the basis of the subjects listed in (3) above, letters (a) to (g).

(5) The certificate referred to in (2) above shall be valid for a period of five years and may, at any time, be extended if proof is furnished of participation in a refresher or advanced training course recognized by the competent authority, which is based on the programme referred to in (3) above and which comprises, in particular, current new developments. The refresher or advanced training course shall be taken in the last year prior to the expiry of the certificate. The new period of validity shall begin on the expiry date of the preceding certificate.

210 316

210 317 Knowledge of gases

(1) An expert for the carriage of gases which may be carried in Type G vessels only, shall be on board.

(2) An expert for the carriage of gases is an expert person in accordance with marginal 210 315 having a specific knowledge of the carriage of gases in tank vessels. Proof of this knowledge shall be furnished by means of a certificate from a competent authority or from an agency recognized by the competent authority.

This certificate shall be delivered to persons who, after training, have successfully passed a qualifying examination concerning the carriage of gases and who may produce evidence of not less than one year work on board a Type G vessel during a period of two years prior to or after the examination. The training shall be approved by the competent authority.

The certificate shall conform to model No. 3 in Appendix 1 to this Annex.

(3) The training programme shall comprise at least the subjects listed below and the training shall include practical exercises:

- (a) Common properties of gases:
compressibility, mixtures and partial pressures, expansion at constant pressure, laws of Boyle-Mariotte and Gay-Lussac, specific gravity, volume; density and critical pressure;
- (b) Purging and sampling of gases;
- (c) Explosion hazards presented by liquefied gases;
- (d) Measurement of gas concentration, tests to be carried out before entering spaces, gas-freeing certificates;

210 317
(cont'd)

- (e) Knowledge of products:
chemical and physical properties, mixtures, compounds and chemical formulae - hydrocarbons, ammonia-;
 - (f) Liquids and vapours:
evaporation and condensation, relation between liquid volume and vapour volume;
 - (g) Action to be taken in case of emergency;
 - (h) Operational procedures:
loading and discharging, quick-action stop valve systems, effects of temperature, filling ratios/overfilling/compressors/pumps, functioning of excess flow valves, leakage;
 - (i) Participation in appropriate fire-fighting drills and training in the use of protective breathing apparatus.
- (4) Every competent authority or agency recognized by the competent authority may determine the procedures and syllabus of the qualifying examination according to (2) above on the basis of the subjects listed in (3) above.
- (5) The certificate referred to in (2) above shall be valid for a period of five years and may, at any time, be renewed if:
- proof is furnished of the participation in a refresher or advanced training course recognized by the competent authority, which is based on the programme referred to in (3) above and which comprises, in particular, current new developments. The refresher or advanced training course shall be taken in the last year prior to the expiry of the certificate; or if
 - proof is furnished of not less than one year's work on board a Type G vessel during the preceding two years.

The new period of validity shall begin on the expiry date of the preceding certificate.

(6) The document attesting training and experience in accordance with Resolution 12 of the International Conference on Training and Certification of Seafarers, 1978, on "Training and Qualifications of Masters, Officers and Ratings of Liquefied Gas Tankers" shall be equivalent to the certificate referred to in (2) above, provided it has been recognized by a competent authority.

No more than five years shall have passed since the date of issue or renewal of such a document.

210 318 Knowledge of chemicals

(1) An expert for the carriage of chemicals shall be on board where goods which are carried may be carried in Type C vessels only.

(2) An expert for the carriage of chemicals is an expert in accordance with marginal 210 315 having a specific knowledge of the carriage of chemicals in tank vessels. Proof of this knowledge shall be furnished by means of certificate from a competent authority or from an agency recognized by the competent authority.

This certificate shall be delivered to persons who, after training, have successfully passed a qualifying examination concerning the carriage of chemicals and who may produce evidence of not less than one year's work on board a Type C vessel during a period of two years prior to or after the examination. The training shall be approved by the competent authority.

The certificate shall conform to model No. 3 in Appendix 1 to this Annex.

(3) The training programme shall comprise at least the subjects listed below and the training shall include practical exercises:

- (a) Common properties of gases and vapours:
compressibility, mixtures and partial pressures, expansion at constant pressure, laws of Boyle-Mariotte and Gay-Lussac, vapour/density ratio and boiling point, relative density, volume;
- (b) Sampling of chemicals;
- (c) Explosion hazards presented by chemicals;
- (d) Measurement of gas concentration, cargo tank-washing, gas-freeing, venting, tests to be carried out before entering spaces, gas-freeing certificates;
- (e) Knowledge of products:
chemical and physical properties, mixtures, compounds and chemical formulae hydrocarbons, toxic substances, acids and alkalis, polymerization and oxidation;
- (f) Liquids and vapours:
evaporation and condensation, relation between liquid volume and vapour volume;
- (g) Action to be taken in case of emergency;
- (h) Operational procedures:
loading and discharging, vapour recovery systems, quick-action stop valve systems, effects of temperature, filling ratios/overfilling/types of pump, contamination;
- (i) Participation in appropriate fire-fighting drills, appropriate training in the

210 318

(cont'd) use of protective breathing apparatus.

(4) Every competent authority or agency recognized by the competent authority may determine the procedures and syllabus of the qualifying examination according to (2) above on the basis of the subjects listed in (3) above.

(5) The certificate referred to in (2) above shall be valid for a period of five years and may, at any time, be renewed if:

- proof is furnished of the participation in a refresher or advanced training course recognized by the competent authority, which is based on the programme referred to in (3) above and which comprises, in particular, current new developments. The refresher or advanced training course shall be taken in the last year prior to the expiry of the certificate; or if
- proof is furnished of not less than one year's work on board a Type C vessel during the preceding two years.

The new period of validity shall begin on the expiry date of the preceding certificate.

(6) The document attesting training and experience in accordance with Resolution 11 of IMO's International Conference on Training and Certification of Seafarers, 1978, on "Training and Qualifications of Officers and Ratings of Chemical Tankers" shall be equivalent to the certificate referred to in (2) above, provided it has been recognized by a competent authority. No more than five years shall have passed since the date of issue or renewal of such a document .

210 319

210 320 Water ballast

(1) Filling of cofferdams and hold spaces in which independent cargo tanks have been fitted with ballast water is not permitted. Double-hull spaces and double bottoms may be filled with ballast water provided the cargo tanks are empty.

If the cargo tanks are not empty, double-hull spaces and double bottoms may be filled with ballast water provided this has been taken into account in the damage-control plan and the ballast tanks are not filled to more than 90 % of their capacity and provided this is not prohibited in the list of substances of Appendix 4.

(2) Where ballast water is discharged from cargo tanks, an appropriate entry shall be made in the loading journal.

210 321

210 322 Opening of hold spaces, cargo pump-rooms below deck, cofferdams, cargo tanks and cargo residue tanks; closing devices

The cargo tanks, cargo residue tanks, cargo pump-rooms below deck, cofferdams and hold spaces shall remain closed except as otherwise permitted in this Annex.

210 323-
210 324

210 325 Connections between pipes

(1) Connecting two or more of the following groups of pipes is prohibited:

- (a) pipes for loading and unloading;
- (b) pipes for ballasting and emptying cargo tanks, cofferdams, double-hull spaces and double bottoms;
- (c) pipes located outside the cargo area.

(2) The provisions of paragraph (1) above does not apply to removable pipe connections between cofferdam pipes and

- pipes for loading and unloading;
- pipes located outside the cargo area while the cofferdams are filled with water.

In these cases the connections shall be designed so as to prevent water from being drawn from the cargo tanks. The cofferdams shall be emptied only by means of eductors or an independent system within the cargo area.

(3) Paragraphs (1) (b) and (c) above do not apply to pipes intended for ballasting and stripping double-hull spaces and double bottoms which have no wall common to the cargo tanks.

210 326

210 327 Passengers

(1) The carriage of passengers is prohibited.

The following persons are not deemed to be passengers:

- (a) persons who, although not members of the crew, normally live on board; and
- (b) persons who are on board in an official capacity.

210 327
(cont'd)

(2) The persons referred to in (1) (a) above shall not be permitted to remain in the cargo area except for short periods.

210 328

210 329 Lifeboats

The lifeboat required in accordance with the "Recommendations on Technical Requirements for Inland Navigation Vessel" */ shall be stowed outside the cargo area. The lifeboat may, however, be stowed in the cargo area provided an easily accessible collective life-saving appliance conforming to paragraph 15-9.4 of the "Recommendations on Technical Requirements for Inland Navigation Vessel" */ is available within the accommodation area.

210 330

210 331 Engines

- (1) The use of engines running on fuels having a flashpoint below 55 °C (e.g. petrol engines) is prohibited.
- (2) The carriage of power-driven conveyances such as passenger cars and motor boats in the cargo area is prohibited.

210 332 Oil fuel tanks

Double bottoms with a height of at least 0.6m may be used as oil fuel tanks, provided they have been constructed in accordance with Part III.

**210 333-
210 339**

210 340 Fire-extinguishing systems

The crew shall have been trained in the use of the fire-extinguishing systems and the fire-extinguishing appliances.

210 341 Fire and naked light

- (1) The use of fire or naked light is prohibited. This provision does not apply to the accommodation and the wheelhouse.
- (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.

*/ Annex to the revised Resolution No.17 of the Principal Working Party on Inland Tank Water Transport of the Inland Transport Committee of the Economic Commission for Europe.

- 210 341 (cont'd)** (3) Heating appliances or boilers fuelled with liquid fuels having a flashpoint above 55 °C which are installed in the engine room or in an other suitable space may, however, be used.

210 342 Cargo heating system

- (1) Heating of the cargo is not permitted except where there is a risk of solidification of the cargo or where the cargo, because of its viscosity, cannot be unloaded in the usual manner.

In general, the cargo shall not be heated up to a temperature above its flashpoint. Special provisions are included in the list of substances of Appendix 4.

- (2) Cargo tanks containing substances which are heated during transport shall be equipped with devices for measuring the temperature of the cargo.

- (3) During unloading, the cargo heating system may be used provided that the space where it has been installed meets in all respects the provisions of marginal 321 252 (3) (b) or 331 252 (3) (b).

- (4) The provisions of paragraph (3) above do not apply when the cargo heating system is supplied with steam from shore and only the circulation pump is in operation, as well as when the flashpoint of the cargo being unloaded is not less than 61 °C.

210 343

210 344 Cleaning operations

The use of liquids having a flashpoint below 55 °C c.c. for cleaning purposes is permitted only on deck in the cargo area.

**210 345-
210 350**

210 351 Electrical equipment

- (1) The electrical equipment shall be properly maintained in a faultless condition.
- (2) The use of movable electric cables is prohibited in the cargo area. This provision does not apply to:
- intrinsically safe electric circuits;
 - electric cables for connecting signal lights or gangway lighting, provided the socket is permanently fitted to the vessel close to the signal mast or gangway.

210 351 (3) The sockets for the signal lights and gangway lighting shall not be live except when
(cont'd) the signal lights and the gangway lighting are switched on.

Connecting or disconnecting is not permitted except when the sockets are not live.

210 352-
210 353

210 354 **Portable lamps**

The only portable lamps permitted on deck and in the cargo area are electric lamps of the "certified safe type" with their own source of power.

210 355-
210 359

210 360 **Special equipment**

(1) The crew shall be familiar with the use of the special equipment referred to in marginal 210 260 (1).

(2) Persons who have to wear the breathing apparatus in accordance with marginal 221 301 (2), 231 301 (2), 261 301 (2), 281 301 (2) or 291 301 (2) of Part II when entering cargo tanks, cargo residue tanks, cofferdams, double-hull spaces, double bottoms or hold spaces shall be trained in the use of such apparatus and shall be capable of withstanding the additional physical strain.

210 361-
210 370

210 371 **Admittance on board**

(1) No unauthorized person shall be permitted on board. This prohibition shall be displayed on notice boards at appropriate places.

(2) When the vessel is required to be marked with two blue cones or two blue lights in accordance with marginal 210 500, no persons under 14 years of age shall be permitted on board.

210 372-
210 373

210 374 **Prohibition of smoking**

Smoking on board the vessel is prohibited. This prohibition shall be displayed on notice boards in the appropriate places.

210 374 (cont'd) This prohibition does not apply to the accommodation or the wheelhouse provided the windows, doors, skylights and hatches are closed.

210 375 Risk of sparking

Work liable to cause sparking is prohibited in the cargo area. This provision does not apply to mooring work.

**210 376-
210 379**

210 380 Checking of equipment

Each time before use, the measuring instruments prescribed by this Annex shall be checked by the user in accordance with the instructions for use.

210 381 Documents

(1) In addition to the documents required by other regulations, the following documents shall be kept on board:

- (a) The vessel's certificate of approval;
- (b) Transport documents (see marginal 6002 (5)):
The transport documents shall cover all dangerous goods loaded on board the vessel;
- (c) The instructions in writing referred to in marginal 210 385 for all dangerous goods on board;
- (d) The loading journal required by marginal 210 284;
- (e) A copy of the ADN with its Annexes A and B.2 in force in their latest amended form;
- (f) The certificates referred to in marginal 210 315 and, where applicable, marginal 210 317 or marginal 210 318;
- (g) A book in which all required measurement results are recorded;
- (h) For vessels which have to conform to the conditions of damage-control, the damage-control plan;
- (i) The documents concerning intact stability as well as all cases of intact stability taken into account for the damaged stability calculation in a form understandable to the steersman.
- (j) The documents concerning electrical installations prescribed in marginals 311 250(1), 321 250(1) or 331 250(1).

(2) The transport documents and the instructions in writing shall be handed over to the steersman before loading. The gross mass may be entered after loading.

210 381
(cont'd)

(3) Where an inspection or examination is prescribed in this Annex, the following additional documents shall be kept on board:

- (a) The valid inspection documents for the fire-extinguishing appliances, fire-hoses, electrical appliances and, if required, for the special equipment;

Particulars of the inspection shall be marked on the fire-extinguishing appliances as a proof of inspection;

- (b) The valid inspection documents for the cargo piping;

- (c) The valid inspection documents according to Model No. 3 in Appendix 3 of this Annex for the stripping system.

(4) For tank vessels with empty cargo tanks or cargo tanks that have been discharged, the steersman is deemed to be the consignor for the purpose of the transport documents required. In this case, the following particulars shall be entered on the transport document for each empty cargo tank or cargo tank that has been discharged:

- number of cargo tank;
- name of the substance previously carried, class and item number and, if applicable, the letter in accordance with marginal 6002 (4).

210 382-
210 384

210 385 Instructions in writing

(1) For the action to be taken in the event of an accident or incident, the steersman shall be supplied by the consignor with instructions in writing specifying concisely:

- (a) The nature of the danger presented by the dangerous goods carried and the safety measures that need to be taken to avert it;
- (b) The action to be taken and the treatment to be given if any person comes into contact with the goods being carried or with any substance which might escape therefrom;
- (c) The measures to be taken in case of fire and the fire extinguishing agents or groups of agents to be used or not to be used to fight the fire;
- (d) The measures to be taken in case of breakage or other deterioration of the tanks or release of the dangerous goods being carried, in particular where such dangerous goods have spilled; and
- (e) The material and additional protective equipment if the special protective equipment referred to in marginal 210 260 (1) is not sufficient.

210 385 (cont'd) (2) Instructions shall be provided for each dangerous substance carried. The instructions shall be drawn up in the language the steersman understands and, additionally, in the language(s) normally spoken on board.

(3) The steersman shall bring these instructions to the attention of the persons on board to enable them to carry them out. They shall be kept readily at hand in the wheelhouse and clearly separated from those instructions which are not applicable.

**210 386-
210 399**

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

210 400

210 401 Limitation of the quantities carried

The carriage of packages in the cargo area is prohibited. Cargo residues, residual cargo and slops contained in approved intermediate bulk containers or tank-containers having a maximum capacity of not more than 2 m³ are exempted from this provision, provided, however, that no more than six such intermediate bulk containers or tank-containers are carried on board. These intermediate bulk containers or tank-containers shall be properly secured in the cargo area and shall comply with the provisions of marginals 321 226 or 331 226 for tanks intended for cargo residues, residual cargo or slops.

**210 402-
210 406**

210 407 Places of loading and unloading

Tank vessels may be loaded, unloaded or gas-freed only at the places designated or approved for this purpose by the local competent authority.

210 408

210 409 Cargo transfer operations

Partial or complete cargo transfer without permission from the local competent authority is prohibited outside a cargo transfer place approved for this purpose.

210 410 Check list

(1) Loading or unloading shall not be started before a check list for the cargo in question has been completed; the answers to the questions contained in this list shall be satisfactory. The list shall be completed in duplicate and signed by the steersman and the person responsible for the handling at the shore facilities.

210 410
(cont'd)

- (2) The list shall conform to the model in Appendix 2.
- (3) The list shall be printed in at least languages understood by the steersman and the person responsible for the handling at the shore facilities.

210 411 Loading journal

(1) The steersman shall record without delay in a loading journal all activities relating to loading, unloading, cleaning, gas-freeing, discharge of washing water and reception or discharge of ballast water (in cargo tanks). The goods shall be described as in the transport document (name of substance, class, item number, letter and, when applicable, substance identification number).

(2) The steersman shall indicate on a cargo stowage plan which substances are carried on board in the various cargo tanks. These substances shall be described as in the transport document (name of substance, class, item number, letter and, when applicable, substance identification number).

210 412

210 413 Measures to be taken before loading

- (1) When residues of the previous cargo may cause dangerous reactions with the next cargo, any such residues shall be properly removed.
- (2) Before the start of loading operations, any prescribed safety and control devices and any items of equipment shall, if possible, be checked and controlled for their proper functioning.

210 414

210 415 Measures to be taken after unloading

(1) After each unloading operation the cargo tanks and the cargo piping shall be emptied by means of the stripping system in accordance with the conditions laid down in the testing procedure. This provision may not be complied with if the new cargo is the same as the previous cargo.

Cargo residues shall be discharged ashore by means of the equipment provided to that effect or shall be stored in the vessel's own slop tank or stored in intermediate bulk containers or tank-containers permitted according to marginal 210 401.

(2) After additional stripping, cargo tanks and pipes for loading and unloading shall, if necessary, be cleaned and gas-freed by persons or companies approved for this purpose by the competent authority in places approved for this purpose.

210 416 Measures to be taken during loading, carriage, unloading and handling

(1) The loading rate and the maximum operational pressure of the cargo pumps shall be determined in agreement with the personnel at the shore installation.

(2) All safety or control devices required in the cargo tanks shall remain switched on. During carriage this provision is only applicable for the installations mentioned in marginals 311 221 (1) (e) and (f), 321 221 (1) (e) and (f) or 331 221 (1) (e) and (f).

When a cargo pump-room is located below deck, the prescribed safety and control devices in the cargo pump-room shall remain permanently switched on.

Any failure of the gas detection system shall be immediately signalled in the wheelhouse and on deck by a visual and audible warning.

(3) The shut-off devices of the cargo piping as well as of the pipes of the stripping systems shall remain closed except during loading, unloading, stripping or gas-freeing operations.

(4) If the vessel is fitted with a transversal bulkhead according to marginals 311 225(3), 321 225(3) or 331 225(3), the doors in this bulkhead shall be closed during loading and unloading.

(5) Receptacles intended for recovering possible liquid spillage shall be placed under connections to shore installations used for loading and unloading.

(6) In case of recovery of the gas-air mixture from shore into the vessel, the pressure at the connection point shall not be more than the opening pressure of the high velocity vent valve.

210 417 Closing of windows and doors

(1) During loading, unloading and gas-freeing operations, all entrances which are accessible from the deck and all openings of spaces facing the outside shall remain closed. This provision does not apply to:

- air intakes of running engines;
- ventilation inlets of engine rooms while the engines are running;
- air intakes of the overpressure ventilation system referred to in marginals 311 252 (3) (b), 321 252 (3) (b) or 331 252 (3) (b);
- air intakes of air conditioning installations if these openings are fitted with a gas detection system in accordance with marginals 311 252 (3) (b), 321 252(3) (b) or 331 252 (3) (b).

210 417 These entrances and openings may only be opened when necessary and for a short time,
(cont'd) after the steersman has given his permission.

(2) After the loading, unloading and gas-freeing operations, the spaces which are accessible from the deck shall be ventilated.

210 418-
210 420

210 421 Filling of cargo tanks

(1) For the carriage of liquid substances the degree of filling given in the list of substances of Appendix 4 or calculated in accordance with (3) below shall not be exceeded.

(2) The provisions of (1) above do not apply to cargo tanks the contents of which are maintained at the filling temperature during carriage by means of heating equipment. In this case calculation of the degree of filling at the beginning of carriage and control of the temperature shall be such that, during carriage, the maximum allowable degree of filling is not exceeded.

(3) For carriage of substances having a relative density higher than that stated in the certificate of approval, the degree of filling shall be calculated in accordance with the following formula:

$$\text{Permitted degree of filling} = \frac{a}{b} \times 100 (\%)$$

a = relative density stated in the certificate of approval.

b = relative density of the substance.

210 422 Opening of openings

(1) Opening of tank hatches, sampling outlets or ullage openings shall not be permitted except for the purpose of inspecting or cleaning of unloaded cargo tanks, after the tanks have been relieved from pressure. Sampling is permitted only when carried out by means of a device of the type prescribed in the list of substances of Appendix 4 or a device of a higher safety type.

(2) Opening of sampling outlets and ullage openings of cargo tanks loaded with dangerous goods listed in marginal 210 500 is permitted only:

- after the loading operations have been interrupted for not less than 10 minutes;
- if the persons carrying out the sampling or gauging operation are protected against the action of the gases or vapours released by the cargo against the eyes, skin or respiratory tract;

- 210 422** - after the pressure in the cargo tank concerned has been brought to the
(cont'd) atmosphere pressure.

(3) The sampling receptacles including all accessories such as ropes, etc., shall consist of electrostatically conductive material and shall, during sampling, be electrically connected to the vessel's hull.

(4) The duration of opening shall be limited to the time necessary for control, cleaning, sounding or sampling.

(5) Pressure relief of cargo tanks is permitted only when carried out by means of the device for safe pressure relief prescribed in marginals 321 222 (4) (a) or 331 222 (4) (a) of Part III.

210 423

210 424 Simultaneous loading and unloading

During loading or unloading of cargo tanks, no other cargo shall be loaded or unloaded.

The local competent authority may grant exceptions during unloading.

210 425 Cargo piping

(1) Loading and unloading as well as stripping of cargo tanks shall be carried out by means of the fixed cargo piping of the vessel.

The metal fittings of the connections to the shore piping shall be electrically earthed so as to prevent the accumulation of electrostatic charges.

(2) The cargo piping shall not be extended by rigid or flexible pipes fore or aft beyond the cofferdams.

(3) The shut-off devices of the cargo piping shall not be open except as necessary during loading, unloading or gas-freeing operations.

(4) The liquid remaining in the piping shall be completely drained into the cargo tanks, if possible, or safely removed.

(5) The gas/air mixtures shall be returned ashore through a pipe during loading operations when a closed type vessel is required in the list of substances of Appendix 4 and the shore installation is equipped for that purpose.

210 426-
210 439

210 440 Fire-extinguishing systems

During loading and unloading of vessels which are required to be marked in accordance with the list of substances of Appendix 4, the fire-fighting installations, the hoses and spray nozzles shall be kept operative on deck in the cargo area.

210 441 Fire or naked light

During loading, unloading or gas-freeing operations fires and naked lights are prohibited on board the vessel.

However, the provisions of marginal 210 342 (3) and (4) are applicable.

**210 442-
210 450**

210 451 Electrical equipment

(1) During loading, unloading or gas-freeing operations, only electrical equipment conforming to the rules for construction in Part III, or which are installed in spaces complying with the conditions of marginals 311 252(3), 321 252(3) or 331 252(3), may be used.

(2) Electrical equipment which have been switched off by the device mentioned in marginals 311 252 (3) b), 321 252(3) (b) or 331 252(3)(b) shall only be switched on after the gas-free condition has been established in these spaces.

210 452

210 453 Lighting

If loading or unloading is performed at night or during 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 placed so that they will not be damaged. Where these lamps are positioned in the cargo area, they shall be of the "certified safe" type.

**210 454-
210 459**

210 460 Specific equipment

The shower and the eye and face bath prescribed in the rules for construction shall be kept ready in all weather conditions for use during loading and unloading operations and transfer operations by pumping.

**210 461-
210 474**

210 475 Risk of sparking

All electrical power connections between the vessel and the shore shall be arranged so as to prevent the risk of sparking.

210 476 Synthetic ropes

During loading and 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.

**210 477-
210 499**

SECTION 5. Additional provisions concerning the operation of vessels

210 500 Marking

(1) Vessels carrying dangerous goods listed in the list of substances of Appendix 4 shall display the number of blue cones or blue lights indicated in that list.

(2) 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.

210 501 Mode of navigation

The competent local authorities may impose restrictions on the inclusion of tank vessels in pushed convoys of large dimension.

210 502

210 503 Mooring

Vessels shall be moored securely, but in such a way that electrical power cables and flexible hoses are not subject to tensile strain and that the moorings can be released quickly in an emergency.

210 504 Berthing

(1) The distances from other vessels to be kept by vessels carrying dangerous goods shall be not less than those prescribed by the European Code for Inland Waterways.

210 504
(cont'd)

(2) An expert as required by marginal 210 315 or, when applicable, by marginals 210 317 or 210 318 shall be permanently on board of vessels. The local competent authority may, however, exempt from this obligation those vessels which are berthed in a harbour basin.

(3) Outside the berthing areas specifically designated by the local competent authority, the distances to be kept 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 blue light in accordance with marginal 210 500;

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 marginal 210 500.

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

(4) The local competent authority may prescribe distances which are different from those given in (3) above, especially taking local conditions into account.

210 505-
220 099

Part II

SPECIAL PROVISIONS APPLICABLE TO THE CARRIAGE OF DANGEROUS GOODS OF CLASSES 2, 3, 4.1, 6.1, 8 AND 9 SUPPLEMENTING OR AMENDING THE PROVISIONS OF PART I

CLASS 2. GASES

General

221 000- (Only the general provisions of Part I apply.)
221 099

SECTION 1. Mode of carriage of goods

221 100- (Only the general provisions of Part I apply.)
221 199

SECTION 2. Provisions applicable to vessels

221 200-
221 220

221 221 Safety and control equipment

It shall be possible to interrupt loading or unloading of the cargo 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 the quay). Interruption of loading and unloading shall be operated by the means of a quick action stop valve which shall be directly fitted on 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.

221 222-
221 259

221 260 Special equipment

(1) When dangerous goods of Class 2 are carried on board the vessel, the protective equipment referred to in marginal 210 260 (1) (a) shall be on board and shall be suitable for the goods carried.

(2) The escape devices referred to in marginal 210 260 (1) (b) are required on board and shall be kept available for immediate use when dangerous goods of Class 2 are carried on board the vessel.

(3) The items of equipment referred to in marginal 210 260 (1) (c) and (d) are required on board when dangerous goods of Class 2 have been carried in the vessel and it is necessary to enter empty cargo tanks or hold spaces when the oxygen content is not sufficient or when a measurable concentration of dangerous substances still remains.

221 260 (cont'd) (4) The flammable gas detector referred to in marginal 210 260 (1) (f) is required on board, together with instructions for its use, when dangerous goods of Class 2 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board.

(5) The toximeter referred to in marginal 210 260 (1) (g) is required on board, together with instructions for its use, when dangerous goods of Class 2 for which a toximeter is required in the list of substances of Appendix 4 are carried on board.

**221 261-
221 299**

SECTION 3. General service requirements

221 300

221 301 Access to cargo tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections

(1) Before any person enters cargo tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms or hold spaces:

- (a) When dangerous goods of Class 2 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board the vessel, it shall be established, by means of the device referred to in marginal 221 260 (4) that the gas concentration in these cargo tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces, is less than 50 % of the lower explosive limit of the cargo. For the cargo pump-room below deck this may be determined by means of the permanent gas detection system;
- (b) When dangerous goods of Class 2, for which a toximeter is required in the list of substances of Appendix 4, are carried on board the vessel, it shall be established, by the means of the device prescribed in marginal 221 260 (5) that the cargo tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces do not contain any significant concentration of toxic gases.

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

(2) Entry into empty cargo tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces is not permitted, except where:

- there is no lack of oxygen and no measurable amount of dangerous substances in dangerous concentration; or

- 221 301 (cont'd)** - 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 permitted only 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. One other person only is sufficient when a rescue winch has been installed.

221 302 cargo pump-room below deck

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-room left 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.

**221 303-
221 399**

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

**221 400-
221 413**

221 414 Handling of cargo

When supervision is required for dangerous goods of Class 2 in the list of substances of Appendix 4, loading and unloading shall be carried out under supervision of a person who is not a member of the crew and who has been authorized for this purpose by the consignor or consignee.

**221 415-
221 424**

221 425 Cargo piping

The requirements of marginal 210 425 (4) shall be deemed to have been satisfied if, for the purpose of draining completely the liquid, the pipes for loading and unloading have been purged with the cargo gas or with nitrogen.

221 426

221 427

221 428 Water-spray system

If a water-spray system is required in the list of substances of Appendix 4, it shall be kept ready for operation during loading or unloading.

**221 429-
221 499**

SECTION 5. Special provisions for the operation of vessels

**221 500-
230 999** (Only the general provisions of Part I apply.)

CLASS 3. FLAMMABLE LIQUIDS

General

**231 000-
231 099** (Only the general provisions of Part I apply.)

SECTION 1. Mode of carriage of goods

**231 100-
231 199** (Only the general provisions of Part I apply.)

SECTION 2. Provisions applicable to vessels

**231 200-
231 221**

231 222 **Cargo tank openings**

For the carriage of dangerous goods of Class 3 for which the list of substances of Appendix 4 requires Type C vessels, the high velocity vent valves shall be set so as to prevent them from blowing off under normal conditions of transport.

**231 223-
231 259**

231 260 **Special equipment**

(1) When dangerous goods of Class 3 are carried on board the vessel, the protective equipment referred to in marginal 210 260 (1) (a) shall be on board and shall be suitable for the goods carried.

(2) The escape devices referred to in marginal 210 260 (1) (b) are required on board and shall be kept available for immediate use when dangerous goods of Class 2 are carried on board the vessel, except in the case of substances for which a tank vessel of type N, open, is required in the list of substances of Appendix 4.

(3) The items of equipment referred to in marginal 210 260 (1) (c) and (d) are required on board when dangerous goods of Class 3 have been carried in the vessel and it is necessary to enter empty cargo tanks or hold spaces when the oxygen content is not sufficient or a measurable concentration of dangerous substances still remains.

(4) The flammable gas detector referred to in marginal 210 260 (1) (f) is required on board, together with instructions for its use, when dangerous goods of Class 3 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board.

231 260 (cont'd) (5) The toximeter referred to in marginal 210 260 (1) (g) is required on board, together with instructions for its use, when dangerous goods of Class 3 for which a toximeter is required in the list of substances of Appendix 4 are carried on board.

**231 261-
231 299**

SECTION 3. General service requirements

231 300

231 301 Access to cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections

(1) Before any person enters cargo tanks, cargo residue tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms or hold spaces:

- (a) When dangerous goods of Class 3 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board the vessel, it shall be established, by means of the device referred to in marginal 231 260 (4) that the gas concentration in these cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces, is less than 50 % of the lower explosive limit of the cargo. For the cargo pump-room below deck this may be determined by means of the permanent gas detection system;
- (b) When dangerous goods of Class 3, for which a toximeter is required in the list of substances of Appendix 4, are carried on board the vessel, it shall be established, by the means of the device prescribed in marginal 231 260 (5) that the cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces do not contain any significant concentration of toxic gases.

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

(2) Entry into empty cargo tanks, cargo residue tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces is not permitted, except where:

- there is no lack of oxygen and no measurable amount of dangerous substances in dangerous concentration; or
- 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 permitted only 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. One other person only is sufficient when a rescue winch has been installed.

231 302 Cargo pump-room below deck

(1) 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-room left 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.

(2) Cargo pump-rooms shall be inspected for leakage once every day. The bilges and collecting receptacles shall be kept clean and free from cargo residues.

**231 303-
231 399**

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

**231 400-
231 427**

231 428 Water-spray system

(1) If a water-spray system is required in the list of substances of Appendix 4, it shall be kept ready for operation during loading or unloading.

(2) When water-spraying is required for substances of Class 3 in the list of substances of Appendix 4 and the pressure of the gaseous phase in the cargo tanks may reach 70 % of the set relief pressure of the high velocity vent valves, the steersman shall take all measures compatible with safety to avoid that the pressure reach that value. He shall in particular actuate the water-spray installation.

**231 429-
231 499**

SECTION 5. Special provisions for the operation of vessels

**231 500-
240 999** (Only the general provisions of Part I apply.)

CLASS 4.1. FLAMMABLE SOLIDS

General

**241 000-
241 099** These provisions apply only to the carriage of molten sulphur, UN No.2448, in tank vessels.

SECTION 1. Mode of carriage of goods

**241 100-
241 199** (Only the general provisions of Part I apply.)

SECTION 2. Provisions applicable to vessels

**241 200-
241 220**

241 211 Hold spaces and cargo tanks

Tanks shall be provided with an external insulation which is not readily combustible. Above deck, the insulation shall be protected with a covering.

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

241 212 Ventilation

(1) Hold spaces containing the cargo tanks shall be provided with ventilation. Duct connections for forced ventilation shall be provided.

(2) Cargo tanks shall be equipped with forced ventilation systems to maintain, in all conditions of transport, the concentration of hydrogen sulphide above the liquid phase below 1.85 % by volume.

(3) Ventilation systems shall be arranged so as to preclude depositing of substances to be carried within the system.

(4) Ventilation exhaust ducts shall be arranged so as not to constitute a danger for people.

**241 213-
241 220**

241 221 Safety and control equipment

Cargo tanks and hold spaces shall be provided with openings and pipes for gas sampling.

241 222 Openings of cargo tanks

(1) Openings of cargo tanks shall be situated at such a height that for a 2° trim angle and 10° list angle, no sulphur may escape. All openings shall be situated above the deck in the open air.

(2) Each opening of cargo tanks shall be provided with a satisfactory permanently fitted closure device. One of these devices shall open under the effect of a slight overpressure inside the tank.

241 223-

241 224

241 225 Pumps and pipes

Pipes for loading and unloading shall be provided with a sufficient insulation. It shall be possible to heat these pipes.

241 226-

241 241

241 242 Cargo heating systems

For carriage of sulphur in the molten state, the heating medium shall be of such a nature that in case of leakage inside the tank, no dangerous reaction with sulphur may happen.

Efficient temperature regulation of the medium shall be possible.

241 243

241 259

241 260 Special equipment

(1) When dangerous goods of Class 4.1 are carried on board the vessel, the protective equipment referred to in marginal 210 260 (1) (a) shall be on board and shall be suitable for the goods carried.

(2) The escape devices referred to in marginal 210 260 (1) (b) are required on board and shall be kept available for immediate use when dangerous goods of Class 4.1 are carried on board the vessel.

(3) The items of equipment referred to in marginal 210 260 (1) (c) and (d) are required on board when dangerous goods of Class 4.1 have been carried in the vessel and it is necessary to enter empty cargo tanks or hold spaces when the oxygen content is not sufficient or when a measurable concentration of dangerous substances still remains.

241 260
(cont'd)

(4) The flammable gas detector referred to in marginal 210 260 (1) (f) is required on board, together with instructions for its use, when dangerous goods of Class 4.1 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board.

(5) The toximeter referred to in marginal 210 260 (1) (g) is required on board, together with instructions for its use, when dangerous goods of Class 4.1 for which a toximeter is required in the list of substances of Appendix 4 are carried on board.

(6) During loading, carriage and unloading, each member of the crew in the cargo area shall be provided with a hydrogen sulphide detector constantly in operation which actuates an alarm when the MAC (Maximum Allowance Concentration) value of 10 ppm (i.e. 0.001 % in volume) has been reached.

241 261-
241 299

SECTION 3. General service requirements

241 300

241 301 Access to cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections

(1) Before any person enters cargo tanks, cargo residue tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms or hold spaces:

- (a) When dangerous goods of Class 4.1 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board the vessel, it shall be established, by means of the device referred to in marginal 241 260 (4) that the gas concentration in these cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces, is less than 50 % of the lower explosive limit of the cargo. For the cargo pump-room below deck this may be determined by means of the permanent gas detection system;
- (b) When dangerous goods of Class 4.1, for which a toximeter is required in the list of substances of Appendix 4, are carried on board the vessel, it shall be established, by the means of the device prescribed in marginal 241 260 (5) that the cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces do not contain any significant concentration of toxic gases.

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

(2) Entry into empty cargo tanks, empty cargo residues tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces is not permitted, except where:

- 241 301**
(cont'd)
- there is no lack of oxygen and no measurable amount of dangerous substances in dangerous concentration; or
 - 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 permitted only 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. One other person only is sufficient when a rescue winch has been installed.

241 302 Cargo pump-room below deck

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-room left 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.

241 303-
241 399

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

241 400-
241 411

241 412 Ventilation

(1) For the carriage of molten sulphur, the forced ventilation shall be actuated at the latest when the hydrogen sulphide concentration reaches 1.0 % (volume).

(2) For the carriage of molten sulphur, the steersman shall inform immediately the nearest competent authority if the hydrogen sulphide concentration is exceeding 1.85 %.

If a significant increase of the hydrogen sulphide concentration in a hold space leads to suppose that a leakage of sulphur has occurred, the cargo tanks shall be discharged as soon as possible. A new loading is not permitted until the vessel has been inspected by the competent authority which issued the certificate of approval.

(3) For the carriage of molten sulphur, the hydrogen sulphide concentration in the free space in the cargo tanks and the concentration of sulphur dioxide and hydrogen sulphide in the hold spaces shall be measured.

(4) The measurements required in (3) above shall be carried out at least once every eight hours. The results shall be recorded in writing.

241 413-
241 441

241 442 Cargo heating system

The maximum allowable temperature indicated in the list of substances of Appendix 4 (column 20) shall not be exceeded.

**241 443-
241 499**

SECTION 5. Special provisions for the operation of vessels

(Only the general provisions of Part I apply.)

**241 500
260 999**

Class 6.1 TOXIC SUBSTANCES

General

261 000- (Only the general provisions of Part I apply.)
261 099

SECTION 1. Mode of carriage of goods

261 100- (Only the general provisions of Part I apply.)
261 199

SECTION 2. Provisions applicable to vessels

261 200-
261 221

261 222 Cargo tanks openings

For the carriage of dangerous goods of Class 6.1 in tank vessels, the high velocity vent valves shall be set so as to prevent them from blowing off under normal conditions of transport.

261 223-
261 259

261 260 Special equipment

(1) When dangerous goods of Class 6.1 are carried on board the vessel, the protective equipment referred to in marginal 210 260 (1) (a) shall be on board and shall be suitable for the goods carried.

(2) The escape devices referred to in marginal 210 260 (1) (b) are required on board and shall be kept available for immediate use when dangerous goods of Class 6.1 are carried on board the vessel.

(3) The items of equipment referred to in marginal 210 260 (1) (c) and (d) are required on board when dangerous goods of Class 6.1 have been carried in the vessel and it is necessary to enter empty cargo tanks or hold spaces when the oxygen content is not sufficient or when a measurable concentration of dangerous substances still remains.

(4) The flammable gas detector referred to in marginal 210 260 (1) (f) is required on board, together with instructions for its use, when dangerous goods of Class 6.1 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board.

261 260 (cont'd) (5) The toximeter referred to in marginal 210 260 (1) (g) is required on board, together with instructions for its use, when dangerous goods of Class 6.1 for which a toximeter is required in the list of substances of Appendix 4 are carried on board.

**261 261-
261 299**

SECTION 3. General service requirements

261 300

261 301 Access to cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections

(1) Before any person enters cargo tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms or hold spaces:

- (a) When dangerous goods of Class 6.1 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board the vessel, it shall be established, by means of the device referred to in marginal 261 260 (4) that the gas concentration in these cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces, is less than 50 % of the lower explosive limit of the cargo. For the cargo pump-room below deck this may be determined by means of the permanent gas detection system;
- (b) When dangerous goods of Class 6.1, for which a toximeter is required in the list of substances of Appendix 4, are carried on board the vessel, it shall be established, by the means of the device prescribed in marginal 261 260 (5) that the cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces do not contain any significant concentration of toxic gases.

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

(2) Entry into empty cargo tanks, empty cargo residue tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces is not permitted, except where:

- there is no lack of oxygen and no measurable amount of dangerous substances in dangerous concentration; or
- 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 permitted only if this operation is supervised by a second person for whom the same equipment is readily at hand.

261 301 Another two persons capable of giving assistance in an emergency shall be
(cont'd) on the vessel within calling distance. One other person only is sufficient
when a rescue winch has been installed.

261 302 Cargo pump-room below deck

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-room left 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.

261 303-
261 399

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

261 400-
261 413

261 414 Handling of cargo

When supervision is required for dangerous goods of Class 6.1 in the list of substances of Appendix 4, loading and unloading shall be carried out under supervision of a person who is not a member of the crew and who has been authorized for this purpose by the consignor or consignee.

261 415-
261 427

261 428 Water-spray system

(1) If a water-spray system is required in the list of substances of Appendix 4, it shall be kept ready for operation during loading or unloading.

(2) When water-spraying is required for substances of Class 6.1 in the list of substances of Appendix 4 and the pressure of the gaseous phase in the cargo tanks may reach 70 % of the set relief pressure of the high velocity vent valves, the steersman shall take all measures compatible with safety to avoid that the pressure reaches that value. He shall in particular actuate the water-spray installation.

261 429-
261 499

SECTION 5. Special provisions for the operation of vessels

261 500- (Only the general provisions of Part I apply.)
280 999

CLASS 8. CORROSIVE SUBSTANCES

General

281 000- (Only the general provisions of Part I apply.)
281 099

SECTION 1. Mode of carriage of goods

281 100- (Only the general provisions of Part I apply.)
281 199

SECTION 2. Provisions applicable to vessels

281 200-
281 221

281 222 **Cargo tanks openings**

For the carriage of dangerous goods of Class 8 for which the list of substances of Appendix 4 requires type C vessels, the high velocity vent valves shall be set so as to prevent them from blowing off under normal conditions of transport.

281 223-
281 259

281 260 **Special equipment**

(1) When dangerous goods of Class 8 are carried on board the vessel, the protective equipment referred to in marginal 210 260 (1) (a) shall be on board and shall be suitable for the goods carried.

(2) The escape devices referred to in marginal 210 260 (1) (b) are required on board and shall be kept available for immediate use when dangerous goods of Class 8 are carried on board the vessel, except in the case of substances for which a tank vessel of type N, open, is required in the list of substances of Appendix 4.

(3) The items of equipment referred to in marginal 210 260 (1) (c) and (d) are required on board when dangerous goods of Class 8 have been carried in the vessel and it is necessary to enter empty cargo tanks or hold spaces, when the oxygen content is not sufficient or when a measurable concentration of dangerous substances still remains.

(4) The flammable gas detector referred to in marginal 210 260 (1) (f) is required on board, together with instructions for its use, when dangerous goods of Class 8 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board.

- 281 260 (cont'd)** (5) The toximeter referred to in marginal 210 260 (1) (g) is required on board, together with instructions for its use, when dangerous goods of Class 8 for which a toximeter is required in the list of substances of Appendix 4 are carried on board.

**281 261-
281 299**

SECTION 3. General service requirements

281 300

281 301 Access to cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces; inspections

(1) Before any person enters cargo tanks, cargo residues tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms or hold spaces:

- (a) When dangerous goods of Class 8 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board the vessel, it shall be established, by means of the device referred to in marginal 281 260 (4) that the gas concentration in these cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces, is less than 50 % of the lower explosive limit of the cargo. For the cargo pump-room below deck this may be determined by means of the permanent gas detection system;
- (b) When dangerous goods of Class 8, for which a toximeter is required in the list of substances of Appendix 4, are carried on board the vessel, it shall be established, by the means of the device prescribed in marginal 281 260 (5) that the cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces do not contain any significant concentration of toxic gases.

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

(2) Entry into empty cargo tanks, empty cargo residue tanks, the cargo pump-room below deck, cofferdams, double-hull spaces, double bottoms and hold spaces is not permitted, except where:

- there is no lack of oxygen and no measurable amount of dangerous substances in dangerous concentration; or
- 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 permitted only if this operation is supervised by a second person for whom the same equipment is readily at hand.

281 301 Another two persons capable of giving assistance in an emergency shall be
(cont'd) on the vessel within calling distance. One other person only is sufficient
when a rescue winch has been installed.

281 302 Cargo pump-room below deck

(1) 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-room left 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.

(2) Cargo pump-rooms shall be inspected for leakage once every day. The bilges and collecting receptacles shall be kept clean and free for cargo residues.

281 303-
281 399

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

281 400-
281 427

281 428 Water-spray system

(1) If a water-spray system is required in the list of substances of Appendix 4, it shall be kept ready for operation during loading or unloading.

(2) When water-spraying is required for substances of Class 8 in the list of substances of Appendix 4 and the pressure of the gaseous phase in the cargo tanks may reach 70 % of the set relief pressure of the high velocity vent valves, the steersman shall take all measures compatible with safety to avoid that the pressure reach that value. He shall in particular actuate the water-spray installation.

281 429-
281 499

SECTION 5. Special provisions for the operation of vessels

281 500- (Only the general provisions of Part I apply.)
290 999

CLASS 9. MISCELLANEOUS DANGEROUS SUBSTANCES AND ARTICLES

General

291 000- (Only the general provisions of Part I apply.)
291 099

SECTION 1. Mode of carriage of goods

291 100- (Only the general provisions of Part I apply.)
291 199

SECTION 2. Provisions applicable to vessels

291 200-
291 221

291 222 **Cargo tanks openings**

For the carriage of dangerous goods of Class 9 for which the list of substances of Appendix 4 requires type C vessels, the high velocity vent valves shall be set so as to prevent them from blowing off in normal conditions of transport.

291 223-
291 259

291 260 **Special equipment**

(1) When dangerous goods of Class 9 are carried on board the vessel, the protective equipment referred to in marginal 210 260 (1) (a) shall be on board and shall be suitable for the goods carried.

(2) The escape devices referred to in marginal 210 260 (1) (b) are required on board and shall be kept available for immediate use when dangerous goods of Class 9 are carried on board the vessel, except in the case of substances for which a tank vessel of type N, open, is required in the list of substances of Appendix 4.

(3) The items of equipment referred to in marginal 210 260 (1) (c) and (d) are required on board when dangerous goods of Class 9 have been carried in the vessel and it is necessary to enter empty cargo tanks or hold spaces, when the oxygen content is not sufficient or when a measurable concentration of dangerous substances still remains.

(4) The flammable gas detector referred to in marginal 210 260 (1) (f) is required on board, together with instructions for its use, when dangerous goods of Class 9 for which a flammable gas detector is required in the list of substances of Appendix 4 are carried on board.

291 260 (5) The toximeter referred to in marginal 210 260 (1) (g) is required on board, together
(cont'd) with instructions for its use, when dangerous goods of Class 9 for which a toximeter is
required in the list of substances of Appendix 4 are carried on board.

291 261-
291 299

SECTION 3. General service requirements

291 300

291 301 **Access to cargo tanks, cargo residue tanks, cargo pump-room below deck, cofferdams,
double-hull spaces, double bottoms and hold spaces; inspections**

(1) Before any person enters cargo tanks, cargo residue tanks, the cargo pump-room
below deck, cofferdams, double-hull spaces, double bottoms or hold spaces:

- (a) When dangerous goods of Class 9 for which a flammable gas detector is
required in the list of substances of Appendix 4 are carried on board the
vessel, it shall be established, by means of the device referred to in marginal
291 260 (4) that the gas concentration in these cargo tanks, cargo residue
tanks, cargo pump-room below deck, cofferdams, double-hull spaces, double
bottoms and hold spaces, is less than 50 % of the lower explosive limit of
the cargo. For the cargo pump-room below deck this may be determined by
means of the permanent gas detection system;
- (b) When dangerous goods of Class 9, for which a toximeter is required in the
list of substances of Appendix 4, are carried on board the vessel, it shall be
established, by the means of the device prescribed in marginal 291 260 (5)
that the cargo tanks, cargo residue tanks, cargo pump-room below deck, cof-
ferdams, double-hull spaces, double bottoms and hold spaces do not contain
any significant concentration of toxic gases.

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

(2) Entry into empty cargo tanks, the cargo pump-room below deck, cofferdams, double-
hull spaces, double bottoms and hold spaces is not permitted, except where:

- there is no lack of oxygen and no measurable amount of dangerous
substances in dangerous concentration; or
- 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 permitted only 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. One other person only is sufficient when a
rescue winch has been installed.

291 302 Cargo pump-room below deck

(1) 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-room left 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.

(2) Cargo pump-rooms shall be inspected for leakage once a day. Bilges and collecting receptacles shall be kept clean and free from cargo residues.

**291 303-
291 399**

SECTION 4. Additional provisions concerning loading, carriage, unloading and other handling of cargo

**291 400-
291 427**

291 428 Water-spray system

(1) If a water-spray system is required in the list of substances of Appendix 4, it shall be kept ready for operation during loading or unloading.

(2) When water-spraying is required for substances of Class 9 in the list of substances of Appendix 4 and the pressure of the gaseous phase in the cargo tanks may reach 70 % of the set relief pressure of the high velocity relief devices, the steersman shall take all measures compatible with safety to avoid that the pressure reaches that value. He shall in particular actuate the water-spray installation.

**291 429-
291 499**

SECTION 5. Special provisions for the operation of vessels

**291 500-
310 999** (Only the general provisions of Part I apply.)

Part III

RULES FOR CONSTRUCTION

CHAPTER 1**Provisions for Type G Tank Vessels****311 000-
311 099****311 100 General**

The rules for construction of Chapter 1 of Part III apply to Type G tank vessels.

**311 101-
311 199****311 200 Materials of construction**

- (1) (a) The vessel's hull and the cargo tanks shall be constructed of shipbuilding steel or another metal at least equivalent.

The independent cargo tanks may also be constructed of other materials, provided these are equivalent with respect to mechanical properties and resistance against the effects of temperature and fire.

- (b) Every part of the vessel including any installation and equipment which may come into contact with the cargo shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products.

- (2) Except where explicitly permitted in (3) below or in the certificate of approval, the use of wood, aluminium alloys or plastics materials within the cargo area is prohibited.

- (3) (a) The use of wood, aluminium alloys or plastics materials within the cargo area is only permitted for:

- gangways and external ladders;
- movable items of equipment;
- chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment;
- masts and similar round timber;
- engine parts;
- parts of the electrical installation;
- lids of boxes which are placed on the deck.

311 200
(cont'd)

- (b) The use of wood or plastics materials within the cargo area is only permitted for:
 - supports and stops of any kind.
 - (c) The use of synthetic materials or rubber within the cargo area is only permitted for:
 - all kinds of gaskets (e.g. for dome or hatch covers);
 - electric cables;
 - pipes for loading and unloading;
 - insulation of cargo tanks and of pipes for loading and unloading.
 - (d) All materials used for fixed elements in the accommodation or wheelhouse, with the exception of furniture, shall not be readily flammable. They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.
- (4) The paint used in the cargo area shall not be liable to produce sparks in particular in case of shocks.
- (5) The use of synthetic material for vessel's boats is permitted only if the material is not readily flammable.

311 201-
311 207

311 208 Classification

(1) The tank vessel shall be built under survey of a recognized classification society in accordance with the rules established by that classification society for the highest class, and the tank vessel shall be classed accordingly.

The vessel's class shall be continued.

(2) The cargo pump-room shall be inspected by a recognized classification society whenever the certificate of approval has to be renewed as well as during the third year of validity of the certificate. The inspection shall comprise at least:

- an inspection of the whole system for its condition, for corrosion, leakage or conversion works which have not been approved;
- a checking of the condition of the gas detection system in the cargo pump-room.

311 208 (cont'd) Inspection certificates signed by the recognized classification society with respect to the inspection of the cargo pump-room shall be kept on board. The inspection certificates shall at least include particulars of the above inspection and the results obtained as well as the date of the inspection.

(3) The condition of the gas detection system referred to in marginal 311 252 (3) (b) shall be checked by a recognized classification society whenever the certificate of approval has to be renewed and during the third year of validity of the certificate of approval. A certificate signed by the recognized classification society shall be kept on board.

311 209

311 210 Protection against the penetration of gases

(1) The vessel shall be designed so as to prevent gases from penetrating into the accommodation and the service spaces.

(2) The coamings of doors in the sidewalls of superstructures and of access hatches to under-deck spaces shall have a height of not less than 0.50 m.

This requirement need not be complied with if the wall of the superstructures facing the cargo area extends from one side of the ship to the other and has doors the coamings of which have a height of not less than 0.50 m. In this case, the coamings of doors in the sidewalls of superstructures and of access hatches behind this wall shall have a height of not less than 0.10 m. The coamings of engine room doors and access hatches shall, however, always have a height of not less than 0.50 m.

(3) The bulwarks shall be provided with sufficiently large openings which are located directly above the deck.

311 211 Hold spaces and cargo tanks

(1) (a) The maximum permissible capacity of a cargo tank shall be determined in accordance with the following table:

$L \cdot B \cdot H \text{ (m}^3\text{)}$	Maximum permissible capacity of a cargo tank (m ³)
up to 600	$L \cdot B \cdot H \cdot 0.3$
600 - 3 750	$180 + (L \cdot B \cdot H - 600) \cdot 0.0635$
> 3 750	380

In the table above $L \cdot B \cdot H$ is the product of the main dimensions of the tank vessel in metres (according to the measurement certificate), where:

311 211
(cont'd)

L = overall length of the hull, in m;

B = extreme breadth of the hull, in m;

H = shortest vertical distance between the top of the keel and the lowest point of the deck at the side of the vessel (moulded depth) within the cargo area, in m;

For trunk vessels, H shall be replaced by H', where H' shall be obtained from the following formula:

$$H' = H + (ht \cdot bt/B \cdot lt/L)$$

where:

ht = trunk height, in m (distance between trunk deck and main deck measured on trunk side at L/2);

bt = trunk breadth, in m;

lt = trunk length, in m.

(b) Pressure cargo tanks whose ratio of length to diameter exceeds 7 are prohibited.

(c) The pressure cargo tanks shall be designed for a cargo temperature of 40°C.

(2) (a) In the cargo area, the hull shall be designed as follows */:

- as a double-hull and double bottom vessel, the internal distance between the sideplatings of the vessel and the longitudinal bulkheads shall not be less than 0.80 m, the height of the double bottom shall be not less than 0.60 m, the cargo tanks shall be supported by saddles extending between the tanks to not less than 20° below the horizontal centreline of the cargo tanks. Refrigerated cargo tanks shall be installed only in hold spaces bounded by double-hull spaces and double-bottom. Cargo tank fastenings shall meet the requirements of a recognized classification society;

*/ For a different design of the hull in the cargo area, proof shall be furnished by way of calculation that in the event of a lateral collision with another vessel having a straight bow, energy of 22 MJ can be absorbed without any rupture of the cargo tanks and the piping leading to the cargo tanks.

311 211
(cont'd)

or

- as a single-hull vessel with the sideplatings of the vessel between gangboard and top of floor plates provided with side stringers at regular intervals of not more than 0.60 m which are supported by web frames spaced at intervals of not more than 2.00 m. The side stringers and the web frames shall have a height of not less than 10 % of the depth, however, not less than 0.30 m. The side stringers and web frames shall be fitted with a face plate made of flat steel and having a cross-section of not less than 7.5 cm² or 15 cm²;
- The distance between the sideplating of the vessel and the cargo tanks shall be not less than 0.80 m and between the bottom and the cargo tanks not less than 0.60 m. The depth height below the pump sumps may be reduced to 0.50 m;
- The lateral distance between the sump of the cargo tanks and the bottom reinforcements shall be not less than 0.10 m.

The cargo tank supports and fastenings shall be as follows:

- the cargo tanks shall be supported by saddles extending between the tanks to not less than 10° below the horizontal centreline of the tanks; and
- for adjacent cylindrical cargo tanks, a spacer of 500 mm x 450 mm shall be provided at the saddles, and a spacer of 2 000 mm x 450 mm shall be provided midway between the saddles.

The spacers shall fit the adjacent cargo tanks closely.

The spacers shall consist of an energy-absorbing material.

- (b) The cargo tanks shall be fixed so that they cannot float.
- (c) The capacity of a suction well shall be limited to not more than 0.10 m³. For pressure cargo tanks, however, the capacity of a suction well may be of 0.20 m³.
- (3) (a) The hold spaces shall be separated from the accommodation and service spaces outside the cargo area below deck by bulkheads provided with a A.60 fire protection insulation according to SOLAS Chapter II-2, Regulation 3. A space of not less than 0.20 m shall be provided between the cargo tanks and the end bulkheads of the hold spaces. Where the cargo tanks have plane end bulkheads this space shall be not less than 0.50 m.

311 211
(cont'd)

- (b) The hold spaces and cargo tanks shall be capable of being inspected.
 - (c) All spaces in the cargo area shall be capable of being ventilated. Means for checking their gas-free condition shall be provided.
- (4) The bulkheads bounding the hold spaces shall be watertight. The cargo tanks and the end bulkheads of the hold spaces as well as the bulkheads bounding the cargo area shall have no openings or passages below deck. Passages through bulkheads between two hold spaces are, however, permitted. The bulkhead between the engine room and the service spaces within the cargo area may be fitted with passages provided that they conform to the requirements of marginal 311 217 (5).
- (5) Double-hull spaces and double bottoms shall be designed for ballasting only. Double bottoms may, however, be used as oil fuel tanks, provided they comply with the requirements of marginal 311 232.
- (6) (a) A space in the cargo area below deck may be arranged as a service space, provided that the walls bounding the service space extend vertically to the bottom and the bulkhead not facing the cargo area extends from one side of the vessel to the other in one frame plane. Such service space shall not be accessible except from the deck.
- (b) The service space shall be watertight with the exception of its access hatch and ventilation inlet.
- (c) No pipes for loading or unloading shall be fitted within the service space referred to under (a) above.
- Pipes for loading and unloading may be fitted in the cargo pump-room only when it conforms to the provisions of marginal 311 217 (6).
- (7) Where service spaces are located in the cargo area under deck, they shall be arranged so as to be easily accessible and to permit even persons wearing protective clothing and breathing apparatus to safely operate the service equipment contained therein. They shall be designed so as to allow injured or unconscious personnel to be removed from such spaces without difficulty, if necessary by means of fixed installed equipment.
- (8) Hold spaces and other accessible spaces within the cargo area shall be arranged so as to ensure that they may be completely inspected and cleaned in an appropriate manner. The dimensions of openings shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulty. These openings shall have a minimum section of 0.36 m² and a minimum side length of 0.50 m. They shall be designed so as to allow injured or unconscious personnel to be removed from the bottom of such spaces without difficulties, if necessary by means of fixed equipment. Cargo tanks may, however, have circular openings with a diameter of not less than 0.70 m.

311 212 Ventilation

(1) Each hold space shall have two openings the dimensions and arrangement of which shall be such as to permit effective ventilation of any part of the hold space. If there is no openings, it shall be possible to fill the hold spaces with inert gas or dry air.

(2) Double-hull spaces and double bottoms within the cargo area which are not arranged for ballasting and cofferdams between engine rooms and pump-rooms, if they exist, shall be provided with ventilation systems.

(3) Any service spaces located in the cargo area below deck shall be provided with a system of forced ventilation with sufficient power for ensuring at least 20 changes of air per hour based on the volume of the space. The ventilator fan shall be designed so as to prevent sparking on contact of a fan blade with the housing or by electrostatic discharge.

The ventilation exhaust ducts shall extend down to 50 mm above the bottom of the service space. The air shall be supplied through a duct at the top of the service space. The air inlets shall be located not less than 2 m above the deck, at a distance of not less than 2 m from tank openings and 6 m from the outlets of safety valves.

The extension pipes, which may be necessary, may be of the hinged type.

(4) Ventilation of accommodation and service spaces shall be possible.

(5) Ventilators used for gas-freeing of tanks shall be designed so as to prevent sparking on contact of a fan blade with the housing or by electrostatic discharge.

(6) Notice boards shall be fitted at the ventilation inlets indicating the conditions when they shall be closed. Any ventilation inlets of accommodation and service spaces leading outside shall be fitted with fire dampers. Such ventilation inlets shall be located not less than 2 m from the cargo area.

Ventilation inlets of service spaces in the cargo area below deck may be located within such area.

311 213 Stability (general)

(1) Proof of sufficient stability shall be furnished including for stability in damaged condition.

(2) The basic values for the stability calculation - the vessel's lightweight and location of the centre of gravity - shall be determined either by means of an inclining experiment or by detailed mass and moment calculation. In the latter case the lightweight of the vessel shall be checked by means of a lightweight test with a tolerance limit of $\pm 5\%$ between the mass determined by calculation and the displacement determined by the draught readings.

311 213 (cont'd) (3) Proof of sufficient intact stability shall be furnished for all stages of loading and unloading and for the final loading condition. Floatability after damage shall be proved for the most unfavourable loading condition. For this purpose, calculated proof of sufficient stability shall be established for critical intermediate stages of flooding and for the final stage of flooding. Negative values of stability in intermediate stage of flooding may be accepted only if the continued range of curve of righting lever in damage condition indicates adequate positive values of stability.

311 214 Stability (intact)

The requirements for intact stability resulting from the damaged stability calculation shall be fully complied with.

311 215 Stability (damaged condition)

(1) The following assumptions shall be taken into consideration for the damaged condition:

(a) The extent of side damage is as follows:

- longitudinal extent: at least 0.10 L, but not less than 5.00 m;
- transverse extent: 0.79 m;
- vertical extent: from the base line upwards without limit.

(b) The extent of bottom damage is as follows:

- longitudinal extent: at least 0.10 L, but not less than 5.00 m;
- transverse extent: 3.00 m;
- vertical extent: from the base 0.59 m upwards, the sump excepted.

(c) Any bulkheads within the damaged area shall be assumed damaged, which means that the location of bulkheads shall be chosen so as to ensure that the vessel remains afloat after the flooding of two or more adjacent compartments in the longitudinal direction.

The following provisions are applicable:

- For bottom damage, also two adjacent athwartship compartments shall be assumed as flooded.
- The lower edge of any non-watertight openings (e.g. doors, windows, access hatchways) shall, at the final stage of flooding, be not less than 0.10 m above the damage waterline.
- In general, permeability shall be assumed to be 95%. Where an average permeability of less than 95% is calculated for any compartment, this calculated value obtained may be used.

311 215
(cont'd)

However, the following minimum values shall be used:

- engine rooms: 85%
- accommodation: 95%
- double bottoms, oil fuel tanks, ballast tanks, etc., depending on whether, according to their function, they have to be assumed as full or empty for the vessel floating at the maximum permissible draught: 0% or 95%.

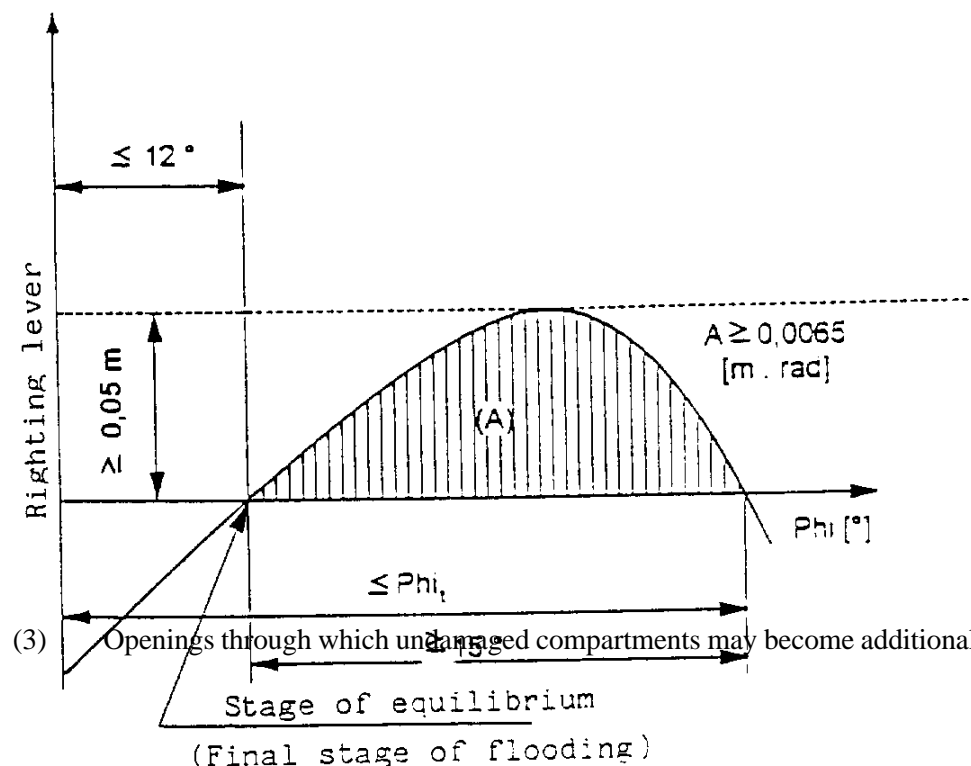
For the main engine room only the one-compartment standard need be taken into account, i.e. the end bulkheads of the engine room shall be assumed as not damaged.

(2) At the stage of equilibrium (final stage of flooding), the angle of heel shall not exceed 12° .

The positive range of the righting lever curve beyond the stage of equilibrium shall have a righting lever of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m.rad.

Non-watertight openings shall not be immersed before the above minimum criteria have been satisfied (angle Φ_i) or before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.

The minimum values of stability shall be satisfied up to an angle of heel $\geq 27^\circ$, which means that values beyond 27° shall not be taken into consideration.



311 215

(cont'd) shall be capable of being closed watertight. The closing appliances shall be marked accordingly.

(4) When cross- or down-flooding openings are provided for reduction of unsymmetrical flooding, the time for equalization shall not exceed 15 minutes, if during the intermediate stages of flooding sufficient stability has been proved.

311 216 Engine rooms

(1) Internal combustion engines for the vessel's propulsion as well as internal combustion engines for auxiliary machinery shall be located outside the cargo area. Entrances and other openings of engine rooms shall be at a distance of not less than 2 m from the cargo area.

(2) The engine room shall be accessible from the deck; the entrance shall not face the cargo area. When its door is not located in a recess whose depth is at least equal to the door width, the hinges shall face the cargo area.

311 217 Accommodation and service spaces

(1) Accommodation and the wheelhouse shall be located outside the cargo area forward of the fore vertical plan or abaft the aft vertical plan bounding the part of cargo area below deck. Windows of the wheelhouse which are located not less than 1 m above the bottom of the wheelhouse may tilt forward.

(2) Entrances to spaces and openings of superstructures shall not face the cargo area. Doors openings outward and not located in a recess the depth of which is at least equal to the width of the doors shall have their hinges facing the cargo area.

(3) Entrances from the deck and openings of spaces facing the outside shall be capable of being closed.

The following instruction shall be displayed at the entrance of such spaces:

**DO NOT OPEN DURING LOADING, UNLOADING OR GAS-FREEING
WITHOUT PERMISSION FROM THE STEERSMAN.
CLOSE IMMEDIATELY.**

(4) Entrances and windows of superstructures and accommodation which can be opened as well as other openings of these spaces shall be located not less than 2 m from the cargo area. No wheelhouse doors and windows shall be located within 2 m from the cargo area, except where there is no direct connection between the wheelhouse and the accommodation.

(5) (a) Driving shafts of the bilge or ballast pumps may pass through the bulkhead between the service space and the engine room, provided the arrangement of the service space is in compliance with marginal 311 211 (6).

311 217
(cont'd)

- (b) The passage of the shaft through the bulkhead shall be gastight. The passage shall have been approved by a recognized classification society.
 - (c) The necessary operating instructions shall be displayed.
 - (d) Passages through the bulkhead between the engine room and the service space may be provided for electrical cables, hydraulic lines and piping for measuring, control and alarm systems, provided that the passages have been approved by a recognized classification society. The passages shall be gastight.
 - (e) Pipes may pass through the bulkhead between the engine room and the service space provided that these are pipes between the mechanical equipment in the engine room and the service space which do not have any openings within the service space and which are provided with shut-off devices at the bulkhead in the engine room.
 - (f) Pipes from the engine room may pass through the service space to the outside provided that within the service space they are of the thick-walled type and have no flanges or openings.
 - (g) Where a driving shaft of auxiliary machinery passes through a wall located above the deck the passage shall be gastight.
- (6) A cargo pump-room located within the cargo area below deck comprising the vessel's own gas discharging system, e.g. compressors or the compressor/heat exchanger pump combination, shall not be permitted, except where:
- the pump-room is separated from the engine room or from service spaces outside the cargo area by a cofferdam or a bulkhead with a "A.60" fire protection insulation according to SOLAS Chapter II-2, Regulation 3, or by a service space or a hold space;
 - the "A-60" bulkhead required above does not include passages referred to in paragraph (5) (a);
 - ventilation exhaust ducts outlets are located not less than 6 m from access to and openings of the accommodation and service spaces outside the cargo area;
 - the access hatches and ventilation inlets may be closed from the outside;
 - all pipes for loading and unloading (at the suction side and delivery side) are led through the deck above the pump-room. Operation of the control devices in the pump-room, starting of the vessel's own gas-discharging system and control of the liquid flow rate shall be effected from the deck;

311 271
(cont'd)

- the system is fully integrated in the gas and liquid pipe system;
- the cargo pump-room is provided with a permanent gas detection system which automatically indicates the presence of explosive gases or lack of oxygen by means of direct-measuring sensors and which actuates a visual and audible alarm when the gas concentration has reached 30 % of the lower explosive limit. The sensors of this system shall be placed at suitable positions at the bottom and direct below the deck. Measurement shall be continuous;
- the audible and visual alarms are installed in the wheelhouse and in the cargo pump-room and, when the alarm is actuated, the vessel's own gas discharging system is shut down. Failure of the gas detection system shall be immediately signalled in the wheelhouse and on deck by means of audible and visual alarms;
- the ventilation system prescribed in marginal 311 212 (3) has a capacity of not less than 30 changes of air per hour based on the total volume of the service space.

(7) The following instruction shall be displayed at the entrance of the cargo pump-room:

**BEFORE ENTERING THE CARGO PUMP-ROOM CHECK WHETHER
IT IS FREE FROM TOXIC GASES AND CONTAINS SUFFICIENT OXYGEN.
DO NOT OPEN DOORS AND ENTRANCE OPENINGS WITHOUT
THE PERMISSION OF THE STEERSMAN.
LEAVE IMMEDIATELY IN THE EVENT OF GAS OR FIRE ALARM.**

311 218-
311 220

311 221 Safety and control installations

- (1) Cargo tanks shall be provided with the following equipment:
- (a) (reserved);
 - (b) a liquid-level gauge;
 - (c) a liquid-level alarm device which is activated at the latest when the liquid-level corresponds to a filling ratio of 86 %;
 - (d) a high liquid-level sensor for actuating the overflow valve at the latest when the liquid-level corresponds to a filling ratio of 97.5 %;
 - (e) an instrument for measuring the pressure;
 - (f) an instrument for measuring the temperature of the cargo;

311 221

(cont'd)

- (g) a sampling device of the closed type;
- (h) (reserved).

(2) When the filling ratio in per cent is determined, an error of not more than 0.5 % is permitted. It shall be calculated on the basis of the total tank capacity including the expansion trunk.

(3) The liquid-level gauge shall allow readings from the control position of the shut-off devices of the particular cargo tank.

(4) The liquid-level alarm device shall give a visual and audible warning on board when actuated.

The liquid-level alarm device shall be independent of the liquid-level gauge.

(5) The high liquid-level sensor referred to in marginal 311 221 (1) (d) shall give a visual and audible alarm on board and at the same time actuate an electrical contact which in the form of a binary signal interrupts the electric current loop provided and fed by the shore facility, thus initiating measures at the shore facility against overflowing during loading operations. The signal shall be transmitted to the shore facility via a watertight two-pin plug of a connector device in accordance with IEC Publication No. 309 for direct current of 40 to 50 volts, identification colour white, position of the nose 10 h.

The plug shall be permanently fitted to the vessel close to the shore connections of the loading and unloading pipes.

The high liquid-level sensor shall also be capable of switching off the vessel's own discharging pump.

The high liquid-level sensor shall be independent of the liquid-level alarm device, but it may be connected to the liquid-level gauge.

(6) The visual and audible signals given by the liquid-level alarm device shall be clearly distinguishable from those of the high liquid-level sensor.

The visual alarm shall allow reading from each control position on deck of the cargo tank stop valves. It shall be possible to easily check the functioning of the sensors and electric circuits or these shall be of the "failsafe" design.

(7) When the temperature of the cargo or the pressure reaches a set value, the instruments for measuring the pressure and the temperature of the cargo shall activate a visual and an audible alarm in the wheelhouse and in the accommodation if the set pressure or temperature is exceeded. When a set value is reached during loading or unloading these instruments shall, by means of the plug referred to in (5) above, initiate an electrical contact which will interrupt the loading or unloading operation;

**311 221
(cont'd)**

When the vessel's own discharge pump is used, it shall be switched off automatically.

The sensor for the alarms referred to above may be connected to the alarm device of the high liquid-level sensor.

(8) Where the control elements of the shut-off devices of the cargo tanks are located in a control room, reading of the liquid-level gauges shall be possible in the control room and the visual and audible warning given in the control room and on deck by the liquid-level alarm device, the high liquid-level sensor and the instruments for measuring the pressure and temperature of the cargo shall be noticeable.

Satisfactory monitoring of the cargo area shall be ensured from the control room.

(9) The closed sampling device passing through the wall of the cargo tank but constituting a part of a closed system shall be designed so that during sampling no gas or liquid may escape for the cargo tank. The installation shall be of a type approved for this purpose by the competent authority.

311 222 Cargo tank openings

(1) Cargo tank openings shall be located on deck in the cargo area.

(2) Cargo tank openings shall be fitted with gastight closures capable of withstanding the test pressure in accordance with marginal 311 223 (2).

(3) The exhaust outlets of the pressure-relief valves shall be located not less than 2 m above the deck at a distance of not less than 6 m from the accommodation and from service spaces located outside the cargo area.

If extension pipes are arranged on the valves, this shall be taken into account for the approval of the valves.

311 223 Pressure test

(1) Cargo tanks and piping shall comply with the provisions concerning pressure vessels which have been established by the competent authority or a recognized classification society for the substances carried.

The test pressure of refrigerated cargo tanks shall be not less than 25 kPa (0.25 bar) gauge pressure.

(2) Any cofferdams shall be subjected to initial tests before being put into service and thereafter at the prescribed intervals.

The test pressure shall be not less than 10 kPa (0.10 bar) gauge pressure.

(3) The maximum intervals for the periodic tests referred to in paragraph (2) above shall be 11 years.

311 224

311 225 Pumps and piping

- (1) Pumps and compressors situated on deck shall be placed in the cargo area. Loading pumps and compressors shall be capable of being shut down from the cargo area and, in addition, from a position outside the cargo area. Cargo pumps and compressors shall be located not less than 6 m from entrances to, or openings of, the accommodation and service spaces outside the cargo area.
- (2) (a) Pipes for loading and unloading of cargo tanks shall be independent of any other piping of the vessel. No cargo-conveying lines shall be located below deck, except those inside the cargo tanks and in the service spaces intended for the installation of the vessel's own gas discharging system.
- (b) (reserved)
- (c) Pipes for loading and unloading shall be clearly distinguishable from other piping, e.g. by means of colour marking.
- (d) The pipes for loading and unloading located on deck - with the exception of the shore connections, shall be located not less than a quarter of the vessel's breadth from the outer shell .
- (e) The shore connections shall be located not less than 6 m from the entrances to, or openings of, the accommodation and service spaces outside the cargo area.
- (f) Each shore connection of the vent header and shore connections of the pipes for loading and unloading, through which the loading or unloading operation is carried out, shall be fitted with a shut-off device and a quick-action stop valve. However, each shore connection shall be fitted with a blind flange when it is not in operation.
- (g) (reserved)
- (h) (reserved)
- (i) Cargo piping, as well as the accessory shut-off valves and other valves shall be located within the fore-and-aft outer boundary of the dome. This provision shall not apply to the relief pipes situated behind the pressure relief valves. If there is, however, only one athwartship dome (e.g. in the case of the "bretzel" tank), the cargo piping together with the accessory shut-off valves and other valves shall be situated at a distance of not less than 2.70 m from the shell.

311 225
(cont'd)

- (j) The axis of the connection of the main liquid pipe to the dome shall be on the fore and aft centreline of the dome. In case of damage to the main liquid pipe, the pipe section between the shut-off valve and the dome and also the shut-off valve itself shall remain intact.
- (k) The requirement in (j) above shall be deemed to have been complied with, if the connection of the main liquid pipe to the dome is placed within 22° fore and aft of the longitudinal inner boundary of the dome.

(3) The distance referred to in (1) and (2) (e) may be reduced to 3 m if a transversal bulkhead complying with 311 210 (2) is situated at the end of the cargo area. The openings shall be provided with doors. The following notice shall be displayed on the doors.

**DO NOT OPEN DURING LOADING AND UNLOADING WITHOUT
THE PERMISSION OF THE STEERSMAN.
CLOSE IMMEDIATELY.**

- (4) Every component of the pipes for loading and unloading shall be electrically connected to the hull.
- (5) The position of the stop valves or other shut-off devices of the pipes for loading and unloading shall indicate whether they are open or shut.
- (6) The pipes for loading and unloading shall have, at the working pressure, the required elasticity, leakproofness and resistance to pressure.
- (7) The pipes for loading and unloading shall be fitted with pressure gauges at the pump inlet and outlet.

When these pressure gauges are manometers, the indicator scale shall have a diameter of not less than 0.14 m.

The pressure gauges shall be capable of being read from the control position of the loading pump at any time. The maximum permissible overpressure or vacuum shall be indicated by a red mark.

- (8) Pipes for loading and unloading shall not be used for ballasting purposes.

311 226

311 227 Cargo refrigeration systems

- (1) When refrigeration is required in the list of substances of Appendix 4, the vessel shall be provided with two independent refrigeration systems.
 - (a) The capacity of the cargo refrigeration systems shall be such that, in the event of the failure of one system, the remaining system may maintain the temperature of the cargo at such a value that gas may not escape through safety devices.

311 227
(cont'd)

- (b) If the systems are operated electrically, they shall be connected to two electric circuits which are independent of each other and which are supplied by at least two different sources of electrical power. In addition, there shall be a possibility for connection to a power source on shore; the necessary connecting cable shall be available on board.
- (c) Cargo tanks, piping and accessories shall be insulated so that, in the event of a failure of all cooling systems, the entire cargo remains for at least 52 hours in a condition not causing the safety valves to open. This provision shall be satisfied in the following ambience temperature conditions:
 - air temperature: + 30° C
 - water temperature: + 20°C
- (d) The cargo refrigeration systems shall be designed so that their function may be ensured by a third system independent from the vessel.

(2) The safety devices and the connecting lines from the refrigeration system shall be connected to the cargo tanks above the liquid phase of the cargo when the tanks are filled to their maximum permissible degree of filling. They shall remain within the gaseous phase, even if the vessel has a list up to 12 degrees.

(3) The cargo refrigeration system shall be installed only under deck in a separate space provided with forced mechanical ventilation.

(4) For all installations receiving cargo, the heat transmission coefficient shall be established by calculation. The correctness of the calculation shall be checked by means of a refrigeration test (heat balance test).

This test shall be performed in accordance with the rules set up by a recognized classification society.

(5) A certificate from a recognized classification society stating that paragraphs (1) and (4) above have been complied with shall be submitted together with the application for issue or renewal of the certificate of approval.

311 228

Water-spray system

When water-spraying is required in the list of substances of Appendix 4, a water-spray system shall be installed in the cargo area on deck for the purpose of reducing vapours given off by the cargo, by sprinkling water on the whole surface.

The system shall be fitted with a connection device for supply from the shore. The system shall be capable of being put into operation from the wheelhouse and from the deck.

The capacity of the water-spray system shall be such that when all the spray nozzles are in operation, the outflow is of 50 litres per square metre of deck and per hour.

311 229-
311 230

311 231 Machinery

- (1) Only internal combustion engines running on fuel with a flashpoint of more than 55° C are allowed.
- (2) Air intakes of the engines shall be located not less than 2 m away from the cargo area.
- (3) There shall be no sparking within the cargo area.
- (4) The external temperature of the outer parts of engines used during loading or unloading operations, as well as that of their ventilation and exhaust-gas ducts shall not exceed the allowable temperature according to the temperature class.

This provision does not apply to service spaces where engines fully conforming to the provisions of marginal 311 252 (3) (b) are installed.

- (5) The ventilation in the closed engine room shall be designed so that, at an ambient temperature of 20 °C, the average temperature in the engine room does not exceed 40 °C.

311 232 Oil fuel tanks

- (1) Double bottoms within the cargo area may be arranged as oil fuel tanks, provided their depth is not less than 0.60 m.

Oil fuel pipes and openings of such tanks are not permitted in the hold space.

- (2) The ventilation pipes of all oil fuel tanks shall lead to 0.5m above the open deck. Their open ends and the open ends of overflow pipes leading on deck shall be fitted with a protective device consisting of a grid or a perforated plate.

311 233

311 234 Engine exhaust pipes

- (1) Exhausts' gases shall be evacuated from the vessel into the open air either upwards through an exhaust pipe or through the shell plating. The exhaust outlet shall be located not less than 2 m from the cargo area. The exhaust pipes of engines shall be arranged so that the exhaust gases are blown away from the vessel. The exhaust pipes shall not be located within the cargo area.

- (2) Engine exhaust pipes shall be provided with a device preventing the escape of sparks, such as spark arresters.

311 235 Bilge pumping and ballasting arrangements

(1) Bilge and ballast pumps for spaces within the cargo area shall be installed within such area.

This provision does not apply to double-hull spaces and double bottoms if they do not have a wall common to the cargo tanks, and to cofferdams which may be filled by a ballast pump located in the engine room and emptied with eductors installed in the cargo area.

(2) Where the double bottom is used as an oil fuel tank, it shall not be connected to the bilge piping system.

(3) Where the ballast pump is installed in the cargo area, the fixed piping and its outboard connection for suction of ballast water shall be located within the cargo area.

**311 236-
311 239**

311 240 Fire-extinguishing systems

(1) A fire-extinguishing system shall be installed on the vessel.
This system shall comply with the following requirements:

- It shall be supplied by two independent fire or ballast pumps, one of which shall be ready for use at any time. These pumps shall not be installed in the same space;
- It shall be provided with a water main fitted with at least three hydrants in the cargo area above deck. Three suitable and sufficiently long hoses with spray nozzles having a diameter of not less than 12 mm shall be provided. It shall be possible to reach any point of the deck in the protected area simultaneously with at least two jets of water which do not emanate from the same hydrant;

A spring-loaded non-return valve shall be fitted to ensure that no gases can escape through the fire-extinguishing system into the accommodation or service spaces outside the cargo area;

- The capacity of the system shall be at least sufficient for a jet of water to reach a distance of not less than the vessel's breadth from any location on board with two spray nozzles being used at the same time.

(2) In addition the engine room, the cargo pump-room and all spaces containing essential equipment under deck (diesel generators, switchboards, compressor, etc.) for the refrigeration equipment, if any, shall be provided with a fixed fire-extinguishing system which can be operated from the deck.

(3) The two hand fire-extinguishers referred to in marginal 210 240 shall be located in the cargo area.

311 241 Fire and naked light

- (1) The outlets of funnels shall be located not less than 2 m away from the cargo area. Arrangements shall be provided to prevent the escape of sparks and the entry of water.
- (2) Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels. The installation in the engine room or in other separate space of heating appliances fuelled with liquid fuel having a flash-point above 55 °C is, however, permitted. Cooking and refrigerating appliances are permitted only in the accommodation.
- (3) Only electrical lighting appliances are permitted.

**311 242-
311 249**

311 250 Documents concerning electrical installations

- (1) In addition to the documents required by the "Recommendations on Technical Requirements for Inland Navigation Vessels"^{*/}, the following documents shall be on board:
 - (a) a drawing indicating the boundaries of the cargo area and the location of the electrical machines, appliances or other equipment installed in this area;
 - (b) a list of the electrical machines, appliances or other equipment referred to in (a) above including the following particulars:

machine or appliance, location, type of protection, type of protection against explosion, testing body and approval number;
 - (c) a list of or general plan indicating the electrical machines, appliances or other electrical equipment outside the cargo area which may be operated during loading, unloading or gas-freeing. All other electrical machines, appliances or equipment shall be marked in red. See marginal 311 252 (3) and (4).
- (2) The documents listed above shall bear the stamp of the competent authority issuing the certificate of approval.

311 251 Electrical installations

- (1) Only distribution systems without return connection to the hull are permitted.

^{*/} Annex to the revised Resolution No.17 of the Principal Working Party on Inland Water Transport of the Inland Transport Committee of the Economic Commission for Europe.

**311 251
(cont'd)**

This provision does not apply to:

- certain limited parts of the installation located outside the cargo area (e.g. connections of starters of diesel engines);
- the device for checking the insulation level referred to in (2) below.

(2) Every insulated distribution network shall be fitted with an independent device with a visual and audible alarm for checking the insulation level.

(3) For the selection of electrical equipment to be used in zones presenting an explosion risk, the explosion groups and temperature classes assigned to the substances carried in the list of substances of Appendix 4 shall be taken into consideration.

311 252**Type and location of electrical installations**

- (1) (a) Only the following equipments are permitted in cargo tanks and pipes for loading and unloading (comparable to zone 0):
- measuring, control and alarm devices of the EEx (ia) type of protection;
- (b) Only the following equipments are permitted in the hold spaces :
- measuring, control and alarm devices of the "certified safe" type;
 - lighting appliances of the "flame-proof enclosure" or "pressurized apparatus" type of protection;
 - hermetically sealed echo sounding devices the cables of which are led through thick-walled steel tubes with gastight connections up to the main deck;
 - cables for the active cathodic protection of the shell plating in protective steel tubes such as those provided for echo sounding devices.
- (c) Only the following equipments are permitted in the service spaces in the cargo area below deck (comparable to zone 1):
- measuring, control and alarm devices of the "certified safe" type;
 - lighting appliances of the "flame-proof enclosure" or "pressurized apparatus" type of protection;
 - motors driving essential equipment such as ballast pumps; they shall be of the "certified safe" type.

311 252
(cont'd)

- (d) The control and protective equipment of the installations referred to in paragraphs (a), (b) and (c) above shall be located outside the cargo area if they are not intrinsically safe.
 - (e) The electrical installations in the cargo area on deck (comparable to zone 1) shall be of the "certified safe" type.
- (2) Accumulators shall be located outside the cargo area.
- (3)
 - (a) Electrical installations used during loading, unloading and gas-freeing during berthing and which are located outside the cargo area (comparable to zone 2) shall be at least be of the "limited explosion risk" type.
 - (b) This provision shall not apply to the electrical installations in the accommodation, the wheelhouse or the service spaces outside the cargo areas if:
 - these spaces are fitted with a ventilation system ensuring an overpressure of 0.1 kPa (0.001 bar) and none of the windows is capable of being opened; the air intakes of the ventilation system shall be located as far away as possible, however, not less than 6 m from the cargo area and not less than 2 m above the deck;
 - the spaces are fitted with a gas detection system with sensors
 - at the suction inlets of the ventilation system;
 - directly at the top edge of the sill of the entrance doors of the accommodation and service spaces;
 - the gas concentration measurement is continuous;
 - when the gas concentration reaches 30 % of the lower explosive limit, the ventilators are switched off. In such a case and when the overpressure is not maintained or in the event of failure of the gas detection system, the electrical installations which do not comply with (a) above, shall be switched off. These operations shall be performed immediately and automatically and activate the emergency lighting in the accommodation, the wheelhouse and the service spaces, which shall comply at least with the "limited explosion risk" type. The switch off shall be indicated in the accommodation and wheelhouse by visual and audible signals;
 - the ventilation system, the gas detection system and the alarm of the shut-off device fully comply with the requirements of (a) above;

311 252
(cont'd)

- the automatic switch off device is set so that no automatic switch off may occur while the vessel is under way.

(4) The electrical installations which do not meet the requirements set out in (3) above together with their switchgear shall be marked in red. The disconnection of such installations shall be operated from a centralized location on board.

(5) An electric generator which is permanently driven by an engine and which does not meet the requirements of paragraph (3) above, shall be fitted with a multipolar switch capable of switching off all external circuits and excitation circuits. A notice board with the operating instructions shall be displayed near the switch.

(6) Sockets for the connection of signal lights and gangway lighting shall be permanently fitted to the vessel close to the signal mast or the gangway. Connecting and disconnecting shall not be possible except when the sockets are not live.

(7) The failure of the power supply for the safety and control equipment shall be immediately indicated by visual and audible signals at the locations where the alarms are usually actuated.

311 253 Earthing

(1) The metallic parts of electrical appliances in the cargo area which are not live as well as protective metal tubes or metal sheaths of cables in normal service shall be earthed, unless they are so arranged that they are automatically earthed by bonding to metal structure of the vessel.

(2) The provisions of paragraph (1) above apply also to installations having service voltages of less than 50 V.

(3) Cargo tanks shall be earthed.

311 254-
311 255

311 256 Electrical cables

(1) All cables in the cargo area shall have a metallic sheath.

(2) Cables and sockets in the cargo area shall be protected against mechanical damage.

(3) Movable cables are prohibited in the cargo area, except for intrinsically safe electric circuits or for the supply of signal lights and gangway lighting.

(4) Cables of intrinsically safe circuits shall only be used for such circuits and shall be separated from other cables not intended for being used in such circuits (e.g. they shall not be installed together in the same string of cables and they shall not be fixed by the same cable clamps).

311 256 (cont'd) (5) For movable cables intended for signal lights and gangway lighting, only sheathed cables of type H 07 RN-F in accordance with 245 IEC 66 or cables of at least equivalent design having conductors with a cross-section of not less than 1.5 mm² shall be used.

These cables shall be as short as possible and installed so that accidental damage is not likely to occur.

**311 257-
311 259**

311 260 Special equipment

A shower and an eye and face bath shall be provided on the vessel at a location which is directly accessible from the cargo area.

**311 261-
311 270**

311 271 Admittance on board

The notice boards displaying the prohibition of admittance in accordance with marginal 210 371 shall be easily legible from either side of the vessel.

**311 272-
311 273**

311 274 Prohibition of smoking

(1) The notice boards displaying the prohibition of smoking in accordance with marginal 210 374 shall be easily legible from either side of the vessel.

(2) Notice boards shall be fitted at the entrances of spaces where smoking or the use of fire or naked light is sometimes prohibited, indicating in which circumstances the prohibition is applicable.

(3) Ashtrays shall be provided in the accommodation and wheelhouse, close to each exit.

**311 275
311 991**

311 992 Emergency exit

Spaces the entrances or exits of which are likely to become partly or completely immersed in the damaged condition shall have an emergency exit which is situated not less than 0.10 m above the waterline.

**311 993-
311 999**

CHAPTER 2**Provisions for Type C Tank Vessels****321 000-
321 099****321 100 General**

The rules for construction of Chapter 1 of Part III apply to Type C tank vessels.

**321 101-
321 199****321 200 Materials of construction**

- (1) (a) The vessel's hull and the cargo tanks shall be constructed of shipbuilding steel or another metal at least equivalent.

The independent cargo tanks may also be constructed of other materials, provided these are equivalent with respect to mechanical properties and resistance against the effects of temperature and fire.

- (b) Every part of the vessel including any installation and equipment which may come into contact with the cargo shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products.
- (2) Except where explicitly permitted in (3) below or in the certificate of approval, the use of wood, aluminium alloys or plastics materials within the cargo area is prohibited.
- (3) (a) The use of wood, aluminium alloys or plastics materials within the cargo area is only permitted for:
- gangways and external ladders;
 - movable items of equipment (aluminium gauging rods are, however permitted, provided that they are fitted with brass feet or protected in another way to avoid sparking);
 - chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment;
 - masts and similar round timber;
 - engine parts;
 - parts of the electrical installation;
 - loading and unloading appliances;
 - lids of boxes which are placed on the deck.

321 200
(cont'd)

- (b) The use of wood or plastics materials within the cargo area is only permitted for:
- supports and stops of any kind.
- (c) The use of synthetic materials or rubber within the cargo area is only permitted for:
- coating of cargo tanks and of pipes for loading and unloading;
 - all kinds of gaskets (e.g. for dome or hatch covers);
 - electric cables;
 - pipes for loading and unloading;
 - insulation of cargo tanks and of pipes for loading and unloading.
- (d) All materials used for fixed elements in the accommodation or wheelhouse, with the exception of furniture, shall not be readily flammable. They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.
- (4) The paint used in the cargo area shall not be liable to produce sparks in particular in case of shocks.
- (5) The use of synthetic material for vessel's boats is permitted only if the material is not readily flammable.

321 201-
321 207

321 208 Classification

- (1) The tank vessel shall be built under survey of a recognized classification society in accordance with the rules established by that classification society for the highest class, and the tank vessel shall be classed accordingly.

The vessel's class shall be continued.

- (2) The cargo pump-room shall be inspected by a recognized classification society whenever the certificate of approval has to be renewed as well as during the third year of validity of the certificate. The inspection shall comprise at least:

- an inspection of the whole system for its condition, for corrosion, leakage or conversion works which have not been approved;
- a checking of the condition of the gas detection system in the cargo pump-room.

321 208 Inspection certificates signed by the recognized classification society with respect to the

(cont'd) inspection of the cargo pump-room shall be kept on board. The inspection certificates shall at least include particulars of the above inspection and the results obtained as well as the date of the inspection.

(3) The condition of the gas detection system referred to in marginal 321 252 (3) (b) shall be checked by a recognized classification society whenever the certificate of approval has to be renewed and during the third year of validity of the certificate of approval. A certificate signed by the recognized classification society shall be kept on board.

321 209

321 210 Protection against the penetration of gases

(1) The vessel shall be designed so as to prevent gases from penetrating into the accommodation and the service spaces.

(2) The coamings of doors in the sidewalls of superstructures and of access hatches to under-deck spaces shall have a height of not less than 0.50 m.

This requirement need not be complied with if the wall of the superstructures facing the cargo area extends from one side of the ship to the other and has doors the coamings of which have a height of not less than 0.50 m. In this case, the coamings of doors in the sidewalls of superstructures and of access hatches behind this wall shall have a height of not less than 0.10 m. The coamings of engine room doors and access hatches shall, however, always have a height of not less than 0.50 m.

(3) The bulwarks shall be provided with sufficiently large openings which are located directly above the deck.

321 211 Hold spaces and cargo tanks

(1) (a) The maximum permissible capacity of a cargo tank shall be determined in accordance with the following table:

$L \cdot B \cdot H \text{ (m}^3\text{)}$	Maximum permissible capacity of a cargo tank (m ³)
up to 600	$L \cdot B \cdot H \cdot 0.3$
600 - 3 750	$180 + (L \cdot B \cdot H - 600) \cdot 0.0635$
> 3 750	380

In the table above $L \cdot B \cdot H$ is the product of the main dimensions of the tank vessel in metres (according to the measurement certificate), where:

321 211

L = overall length of the hull, in m;

(cont'd)

B = extreme breadth of the hull, in m;

H = shortest vertical distance between the top of the keel and the lowest point of the deck at the side of the vessel (moulded depth) within the cargo area, in m;

- (b) The relative density of the substances to be carried shall be taken into consideration in the design of the cargo tanks. The maximum relative density shall be indicated in the certificate of approval.
 - (c) When the vessel is provided with pressure cargo tanks, these tanks shall be designed for a working pressure of 400 kPa (4 bar).
 - (d) For vessels with a length of not more than 50 m, the length of a cargo tank shall not exceed 10.00 m; for vessels with a length of more than 50 m, the length of a cargo tank shall not exceed 0.20 L.
- (2) (a) In the cargo area (except cofferdams) the vessel shall be designed as a flush-deck double-hull vessel, with double-hull spaces and double bottoms, but without a trunk.

Cargo tanks independent of the vessels' hull and refrigerated cargo tanks may only be installed in a hold space which is bounded by double-hull spaces and double bottoms in accordance with (7) below. The cargo tanks shall not extend beyond the deck.

- (b) The cargo tanks independent of the vessel's hull shall be fixed so that they cannot float.
 - (c) The capacity of a suction well shall be limited to not more than 0.10 m³.
- (3) (a) The cargo tanks shall be separated by cofferdams of at least 0.60 m in width from the accommodation, engine room and service spaces outside the cargo area below deck or, if there are no such accommodation, engine room and service spaces, from the vessel's ends. Where the cargo tanks are installed in a hold space, a space of not less than 0.50 m shall be provided between such tanks and the end bulkheads of the hold space. In this case an insulated end bulkhead meeting the definition for Class "A-60" according to SOLAS II-2, Regulation 3, shall be deemed equivalent to the cofferdam. For pressure cargo tanks, the 0.50 m distance may be reduced to 0.20 m.
- (b) Hold spaces, cofferdams and cargo tanks shall be capable of being inspected.
 - (c) All spaces in the cargo area shall be capable of being ventilated. Means for checking their gas-free condition shall be provided.

**321 211
(cont'd)**

(4) The bulkheads bounding the cargo tanks, cofferdams and hold spaces shall be watertight. The cargo tanks, cofferdams and the end bulkheads of the hold spaces, as well as the bulkheads bounding the cargo area shall not be fitted with any openings or passages below deck.

Passages through bulkheads between two hold spaces are, however, permitted.

The bulkhead between the engine room and the cofferdam or service space in the cargo area may be fitted with passages provided that these conform to the provisions of marginal 321 217 (5).

The bulkhead between the cargo tank and the cargo pump-room below deck may be fitted with passages provided that these conform to the provisions of marginal 321 217 (6). If the vessel is fitted with a cargo pump-room below deck, the bulkheads between the cargo tanks may be fitted with passages provided that the loading pipes are fitted with shut-off devices in the cargo tank direct at the bulkhead and in the cargo pump-room direct at the bulkhead.

The shut-off devices shall be capable of being activated from the deck.

(5) Double-hull spaces and double bottoms in the cargo area shall be designed for ballasting only. Double bottoms may, however, be used as oil fuel tanks, provided they comply with the provisions of marginal 321 232.

- (6) (a) A cofferdam, the centre part of a cofferdam or another space below deck in the cargo area may be arranged as a service space, provided the walls bounding the service space extend vertically to the bottom.
This service space shall only be accessible from the deck.
- (b) Such a service space shall be watertight with the exception of its access hatch and ventilation inlets.
- (c) No pipes for loading and unloading shall be fitted within the service space referred to under (a) above.

Pipes for loading and unloading may be fitted in the cargo pump-room only when it conforms to the provisions of marginal 321 217 (6).

(7) For double-hull construction with the cargo tanks integrated in the vessel's frames, the distance between the side wall of the vessel and the longitudinal bulkhead of the cargo tanks shall be not less than 1.00 m. A distance of 0.80 m may however be permitted, provided that, compared with the scantling requirements specified in the rules of construction of a recognized classification society, the following reinforcements have been made:

- (a) 25 % increase in the thickness of the deck stringer plate;
- (b) 15 % increase in the side plating thickness;

321 211
(cont'd)

- (c) arrangement of a longitudinal system at the vessel's side, where the frame depth shall be not less than 0.15 m and the longitudinals shall have a face plate cross-section of not less than 7 cm².
- (d) The stringer and longitudinal systems shall be supported by frames similar to bottom girders with lightening holes at distances of not more than 1.80 m.

These distances may be increased if the longitudinals are strengthened accordingly.

When vessels are built according to the transverse framing system, a longitudinal stringer system shall be arranged instead of (c) above. The distance between the longitudinal stringers shall not exceed 0.80 m and their depth shall be not less than 0.15 m, provided they are completely joined to the frames. The cross-section of the face plate shall be not less than 7 cm² as in (c) above. Where clearance cuts exist in the frames, the web depth shall be increased by the depth of such cuts.

The mean depth of the double bottoms shall be not less than 0.70 m. It shall, however, never be less than 0.60 m. The depth below the suction wells may be reduced to 0.50 m.

(8) In the case of a vessel construction with cargo tanks inserted in a hold space, the depth of the double bottoms shall be not less than 0.60 m.

The minimum distance between the inner and outer walls of double-hull spaces shall be not less than 0.80 m.

(9) Where service spaces are located in the cargo area under deck, they shall be arranged so as to be easily accessible and to permit even persons wearing protective clothing and breathing apparatus to safely operate the service equipment contained therein. They shall be designed so as to allow injured or unconscious personnel to be removed from such spaces without difficulties, if necessary by means of fixed installed equipment.

(10) Cofferdams, double-hull spaces, double bottoms, cargo tanks, hold spaces and other accessible spaces within the cargo area shall be arranged so that they may be completely inspected and cleaned in an appropriate manner. The dimensions of openings shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulties. These openings shall have a minimum cross-section of 0.36 m² and a minimum side length of 0.50 m. They shall be designed so as to allow injured or unconscious personnel to be removed from the bottom of such a space without difficulties, if necessary by means of fixed installed equipment. Cargo tanks may, however, have circular openings with a diameter of not less than 0.70 m.

321 212 Ventilation

(1) Double-hull spaces and double bottoms within the cargo area which are not arranged for ballasting, hold spaces and cofferdams shall be provided with ventilation systems.

(2) Any service spaces located in the cargo area below deck shall be provided with a system of forced ventilation with sufficient power for ensuring at least 20 changes of air per hour based on the volume of the space. The ventilator fan shall be designed so as to prevent sparking on contact of a fan blade with the housing or by electrostatic discharge.

The ventilation exhaust ducts shall extend down to 50 mm above the bottom of the service space. The air shall be supplied through a duct at the top of the service space. The air inlets shall be located not less than 2 m above the deck, at a distance of not less than 2 m from tank openings and 6 m from the outlets of safety valves.

The extension pipes, which may be necessary, may be of the hinged type.

(3) Ventilation of accommodation and service spaces shall be possible.

(4) Ventilators used for gas-freeing of tanks shall be designed so as to prevent sparking on contact of a fan blade with the housing or by electrostatic discharge.

(5) Notice boards shall be fitted at the ventilation inlets indicating the conditions when they shall be closed. Any ventilation inlets of accommodation and service spaces leading outside shall be fitted with fire dampers. Such ventilation inlets shall be located not less than 2 m from the cargo area.

Ventilation inlets of service spaces in the cargo area below deck may be located within such area.

(6) The flame arresters prescribed in marginals 321 220 (4), 321 221 (11), 321 222 (4) and (5) and 321 226 (2) shall be of a type approved for this purpose by the competent authority.

321 213 Stability (general)

(1) Proof of sufficient stability shall be furnished including for stability in damaged condition.

(2) The basic values for the stability calculation - the vessel's lightweight and location of the centre of gravity - shall be determined either by means of an inclining experiment or by detailed mass and moment calculation. In the latter case the lightweight of the vessel shall be checked by means of a lightweight test with a tolerance limit of $\pm 5\%$ between the mass determined by calculation and the displacement determined by the draught readings.

321 213
(cont'd)

(3) Proof of sufficient intact stability shall be furnished for all stages of loading and unloading and for the final loading condition. Floatability after damage shall be proved for the most unfavourable loading condition. For this purpose, calculated proof of sufficient stability shall be established for critical intermediate stages of flooding and for the final stage of flooding. Negative values of stability in intermediate stage of flooding may be accepted only if the continued range of curve of righting lever in damage condition indicates adequate positive values of stability.

321 214

Stability (intact)

(1) The requirements for intact stability resulting from the damage stability calculation shall be fully complied with.

(2) For vessels with cargo tanks of more than $0.70 \cdot B$ in width, additional proof shall be furnished that, at an angle of 5° or, when this angle is less, at a heeling angle at which an opening becomes immersed, the righting arm is 0.10 m. The stability-reducing free surface effect in the case of cargo tanks filled to less than 95% of their capacity shall be taken into account.

(3) The most stringent requirement of paragraphs (1) and (2) is applicable to the vessel.

321 215

Stability (damaged condition)

(1) The following assumptions shall be taken into consideration for the damaged condition:

(a) The extent of side damage is as follows:

- longitudinal extent: at least 0.10 L, but not less than 5.00 m;
- transverse extent: 0.79 m;
- vertical extent: from the base line upwards without limit.

(b) The extent of bottom damage is as follows:

- longitudinal extent: at least 0.10 L, but not less than 5.00 m;
- transverse extent: 3.00 m;
- vertical extent: from the base 0.59 m upwards, the sump excepted.

(c) Any bulkheads within the damaged area shall be assumed damaged, which means that the location of bulkheads shall be chosen so as to ensure that the vessel remains afloat after the flooding of two or more adjacent compartments in the longitudinal direction.

The following provisions are applicable:

- For bottom damage, also two adjacent athwartship compartments shall be assumed as flooded;

321 215
(cont'd)

- The lower edge of any non-watertight openings (e.g. doors, windows, access hatchways) shall, at the final stage of flooding, be not less than 0.10 m above the damage waterline;
- In general, permeability shall be assumed to be 95%. Where an average permeability of less than 95% is calculated for any compartment, this calculated value obtained may be used. However, the following minimum values shall be used:
 - engine rooms: 85%
 - accommodation: 95%
 - double bottoms, oil fuel tanks, ballast tanks, etc., depending on whether, according to their function, they have to be assumed as full or empty for the vessel floating at the maximum permissible draught: 0% or 95%.

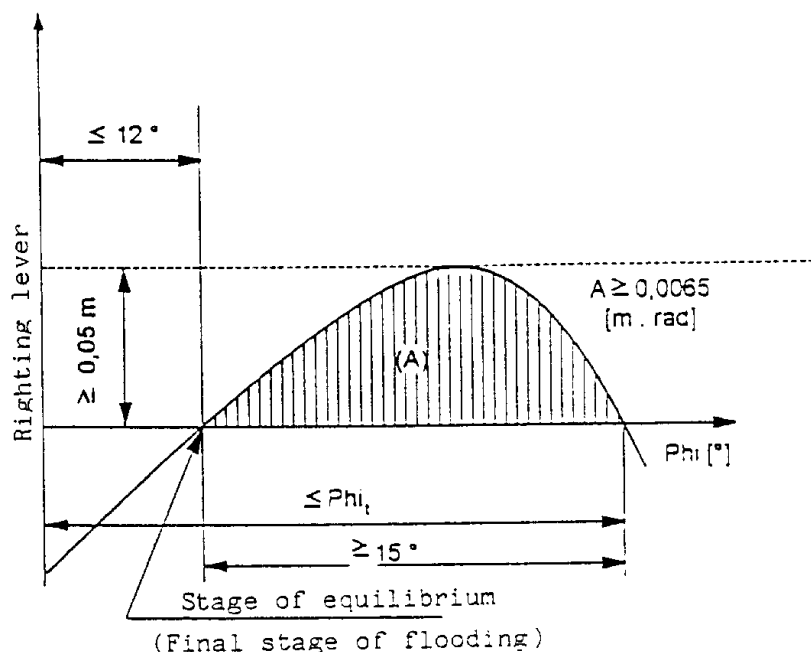
For the main engine room only the one-compartment standard need be taken into account, i.e. the end bulkheads of the engine room shall be assumed as not damaged.

(2) At the stage of equilibrium (final stage of flooding), the angle of heel shall not exceed 12° .

The positive range of the righting lever curve beyond the stage of equilibrium shall have a righting lever of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m.rad.

Non-watertight openings shall not be immersed before the above minimum criteria have been satisfied (angle Φ_{i_1}) or before reaching the stage of equilibrium. If such openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purpose of stability calculation.

The minimum values of stability shall be satisfied up to an angle of heel $\geq 27^\circ$, which means that values beyond 27° shall not be taken into consideration.



321 215 (cont'd) (3) Openings through which undamaged compartments may become additionally flooded shall be capable of being closed watertight. The closing appliances shall be marked accordingly.

(4) Where cross- or down-flooding openings are provided for reduction of unsymmetrical flooding, the time for equalization shall not exceed 15 minutes, if during the intermediate stages of flooding sufficient stability has been proved.

321 216 Engine rooms

(1) Internal combustion engines for the vessel's propulsion as well as internal combustion engines for auxiliary machinery shall be located outside the cargo area. Entrances and other openings of engine rooms shall be at a distance of not less than 2 m from the cargo area.

(2) The engine room shall be accessible from the deck; the entrance shall not face the cargo area. Where its door is not located in a recess whose depth is at least equal to the door width, the hinges shall face the cargo area.

321 217 Accommodation and service spaces

(1) Accommodation and the wheelhouse shall be located outside the cargo area forward of the fore vertical plane or abaft the aft vertical plane bounding the part of cargo area below deck. Windows of the wheelhouse which are located not less than 1 m above the bottom of the wheelhouse may tilt forward.

(2) Entrances to spaces and openings of superstructures shall not face the cargo area. Doors openings outward and not located in a recess the depth of which is at least equal to the width of the doors shall have their hinges face the cargo area.

(3) Entrances from the deck and openings of spaces facing the outside shall be capable of being closed.

The following instruction shall be displayed at the entrance of such spaces:

**DO NOT OPEN DURING LOADING, UNLOADING OR GAS-FREEING
WITHOUT PERMISSION FROM THE STEERSMAN.
CLOSE IMMEDIATELY.**

(4) Entrances and windows of superstructures and accommodation which can be opened as well as other openings of these spaces shall be located not less than 2 m from the cargo area. No wheelhouse doors and windows shall be located within 2 m from the cargo area, except where there is no direct connection between the wheelhouse and the accommodation.

(5) (a) Driving shafts of the bilge or ballast pumps may pass through the bulkhead between the service space and the engine room, provided the arrangement of the service space is in compliance with marginal 321 211 (6).

321 217
(cont'd)

- (b) The passage of the shaft through the bulkhead shall be gastight. The passage shall have been approved by a recognized classification society.
 - (c) The necessary operating instructions shall be displayed.
 - (d) Passages through the bulkhead between the engine room and the service space may be provided for electrical cables, hydraulic lines and piping for measuring, control and alarm systems, provided that the passages have been approved by a recognized classification society. The passages shall be gastight.
 - (e) Pipes may pass through the bulkhead between the engine room and the service space provided that these are pipes between the mechanical equipment in the engine room and the service space which do not have any openings within the service space and which are provided with shut-off devices at the bulkhead in the engine room.
 - (f) Pipes from the engine room may pass through the service space to the outside provided that within the service space they are of the thick-walled type and have no flanges or openings.
 - (g) Where a driving shaft of auxiliary machinery passes through a wall located above the deck the passage shall be gastight.
- (6) A service space located within the cargo area below deck shall not be used as a cargo pump-room for the loading and unloading system, except where:
- the pump room is separated from the engine room or from service spaces outside the cargo area by a cofferdam or a bulkhead with a "A.60" fire protection insulation according to SOLAS Chapter II-2, Regulation 3, or by a service space or a hold space;
 - the "A-60" bulkhead required above does not include passages referred to in paragraph (5) (a);
 - ventilation exhaust ducts' outlets are located not less than 6 m from access to and openings of the accommodation and service spaces outside the cargo area;
 - the access hatches and ventilation inlets may be closed from the outside;
 - all pipes for loading and unloading as well as those of stripping systems are provided with shut-off devices at the pump suction side in the cargo pump-room immediately at the bulkhead. Operation of the control devices in the pump room, starting of pumps and compressors and control of the liquid flow rate shall be effected from the deck;

321 217
(cont'd)

- the bilge of the cargo pump-room is equipped with a gauging device for measuring the filling level which activates a visual and audible alarm in the wheelhouse when liquid is accumulating in the cargo pump-room bilge;
- the cargo pump-room is provided with a permanent gas-detection system which automatically indicates the presence of explosive gases or lack of oxygen by means of direct-measuring sensors and which actuates a visual and audible alarm when the gas concentration has reached 30 % of the lower explosive limit. The sensors of this system shall be placed at suitable positions at the bottom and direct below the deck. Measurement shall be continuous;
- the audible and visual alarms are installed in the wheelhouse and in the cargo pump-room and, when the alarm is actuated, the vessel's own gas discharging system is shut down. Failure of the gas detection system shall be immediately signalled in the wheelhouse and on deck by means of audible and visual alarms;
- the ventilation system prescribed in marginal 321 212 (3) has a capacity of not less than 30 changes of air per hour based on the total volume of the service space.

(7) The following instruction shall be displayed at the entrance of the cargo pump-room:

**BEFORE ENTERING THE CARGO PUMP-ROOM CHECK WHETHER
IT IS FREE FROM TOXIC GASES AND CONTAINS SUFFICIENT OXYGEN.
DO NOT OPEN DOORS AND ENTRANCE OPENINGS WITHOUT
THE PERMISSION OF THE STEERSMAN.
LEAVE IMMEDIATELY IN THE EVENT OF GAS OR FIRE ALARM.**

321 218-
321 219

321 220 Arrangement of cofferdams

- (1) Cofferdams or cofferdam compartments remaining after a service space has been arranged in accordance with marginal 321 211 (6) shall be accessible through an access hatch. The access hatches and ventilation inlets shall be located not less than 0.50 m above the deck.
- (2) Cofferdams shall be capable of being filled with water and emptied by means of a pump. Filling shall be effected within 30 minutes. The cofferdams shall not be fitted with filling valves.
- (3) No fixed pipe shall permit connection between a cofferdam and other piping of the vessel outside the cargo area.
- (4) The ventilation openings of cofferdams shall be fitted with a flame arrester.

321 221 Safety and control installations

- (1) Cargo tanks shall be provided with the following equipment:
 - (a) a mark inside the tank indicating the liquid level of 95 %;
 - (b) a liquid-level gauge;
 - (c) a liquid-level alarm device which is activated at the latest when the liquid-level corresponds to a filling ratio of 90 %;
 - (d) a high liquid-level sensor for actuating the overflow valve at the latest when the liquid-level corresponds to a filling ratio of 97.5 %;
 - (e) an instrument for measuring the pressure of the vapour phase inside the cargo tank;
 - (f) when a possibility of heating the cargo is required in the list of substances of Appendix 4 or a maximum temperature is indicated in column 20 of that list, an instrument for measuring the temperature of the cargo;
 - (g) as required in the list of substances of Appendix 4, a sampling device of the closed type or of the partly closed type and/or a sampling opening;
 - (h) an ullage opening.
- (2) When the filling ratio in per cent is determined, an error of not more than 0.5 % is permitted. It shall be calculated on the basis of the total tank capacity including the expansion trunk.
- (3) The liquid-level gauge shall allow readings from the control position of the shut-off devices of the particular cargo tank.
- (4) The liquid-level alarm device shall give a visual and audible warning on board when actuated.

The liquid-level alarm device shall be independent of the liquid-level gauge.

- (5) The high liquid-level sensor referred to in paragraph (1) (d) shall give a visual and audible alarm on board and at the same time actuate an electrical contact which in the form of a binary signal interrupts the electric current loop provided and fed by the shore facility, thus initiating measures at the shore facility against overflowing during loading operations. The signal shall be transmitted to the shore facility via a watertight two-pin plug of a connector device in accordance with IEC Publication No. 309 for direct current of 40 to 50 volts, identification colour white, position of the nose 10 h.

The plug shall be permanently fitted to the vessel close to the shore connections of the loading and unloading pipes.

321 221
(cont'd)

The high liquid-level sensor shall also be capable of switching off the vessel's own discharging pump.

The high liquid-level sensor shall be independent of the liquid-level alarm device, but it may be connected to the liquid-level gauge.

(6) The visual and audible signals given by the liquid-level alarm device shall be clearly distinguishable from those of the high liquid-level sensor.

The visual alarm shall allow reading from each control position on deck of the cargo tank stop valves. It shall be possible to easily check the functioning of the sensors and electric circuits or these shall be of the "failsafe" design.

(7) When the pressure in the vapour phase or the temperature of the cargo reaches a set value, the instruments for measuring the vacuum or overpressure of the vapour phase in the cargo tank, or the temperature of the cargo, when required, shall activate a visual and an audible alarm in the wheelhouse and in the accommodation if the set pressure or temperature is exceeded. When this set value is reached during loading or unloading these instruments shall, by means of the plug referred to in (5) above, initiate an electrical contact which shall interrupt the loading or unloading operation;

When the vessel's own discharge pump is used, it shall be switched off automatically.

The instruments for measuring the vacuum or overpressure in the vapour phase shall be actuated for an overpressure equal to 1.15 times the set pressure of the high-velocity vent valves for a fall of pressure of 1.5 kPa (0.015 bar). The maximum allowable temperature is indicated in the list of substances of Appendix 4.

The sensors for the alarms referred to above may be connected to the alarm device of the high liquid-level sensor.

(8) When the control elements of the shut-off devices of the cargo tanks are located in a control room, reading of the liquid-level gauges shall be possible in the control room and the visual and audible warning given in the control room and on deck by the liquid-level alarm device, the high liquid-level sensor and the instruments for measuring the pressure of the vapour phase and temperature of the cargo shall be noticeable.

Satisfactory monitoring of the cargo area shall be ensured from the control room.

(9) The closed type sampling device passing through the wall of the cargo tank but constituting a part of a closed system shall be designed so that during sampling no gas or liquid may escape for the cargo tank. The installation shall be of a type approved for this purpose by the competent authority.

(10) The partly closed sampling device leading through the wall of the cargo tank shall be such that during sampling only a small quantity of gaseous or liquid cargo can escape into the open air. As long as the device is not used it shall be closed completely. The device shall be of a type approved by the competent authority for this purpose.

321 221 (cont'd) (11) The sampling opening shall have a diameter of not more than 0.30 m. It shall be fitted with a flame-arrester and it shall be such that the period during which it remains open is as short as possible and that the flame-arrester cannot remain open without external action.

(12) The ullage opening shall be such that the filling level may be measured by means of a gauging rod. The ullage opening shall be fitted with a self-closing lid.

321 222 Cargo tank openings

(1) (a) Cargo tank openings shall be located on deck in the cargo area.

(b) Cargo tank openings with a cross-section of more than 0.10 m² and openings of safety devices shall be located not less than 0.50 m above deck.

(2) The cargo tank openings shall be fitted with gastight closures capable of withstanding the test pressure in accordance with marginal 321 223 (2).

(3) Closures which are normally used during loading or unloading operations shall not cause sparking when operated.

(4) (a) Each cargo tank or group of cargo tanks connected to a common vent header shall be fitted with:

- safety devices for preventing unacceptable overpressures or vacuums, where the vacuum valve is fitted with a flame-arrester and the pressure-relief valve is designed as a high-velocity vent valve with a flame-arrester. The gases shall be discharged upwards;
- a connection for the safe return ashore of gases escaping during loading;
- a device for the safe depressurization of the tanks consisting of at least a flame-arrester and a stop valve the position of which shall clearly indicate whether it is open or shut;
- manometers, the indicator scale of which shall have a diameter of not less than 0.14 m. The maximum permissible overpressure or vacuum shall be indicated by a red mark. The manometers shall be capable of being read at any time from the location where it is possible to interrupt loading or unloading.

(b) The outlets of high-velocity vent valves shall be located not less than 2 m above the deck and at a distance of not less than 6 m from the accommodation and service spaces outside the cargo area. The setting of the high-velocity vent valves shall be such that during the voyage they do not start to discharge until the maximum permissible working pressure

321 222
(cont'd)

of the cargo tanks is reached. If extension pipes are arranged on the high-velocity vent valves, this shall be taken into account for the approval of the valves.

- (5) (a) A vent header connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a flame-arrester capable of withstanding an explosion or detonation inside the header.

Only substances which do not mix and which do not react dangerously with each other may be carried simultaneously in cargo tank connected to a common vent header.

or:

- (b) A vent header connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a pressure/vacuum relief device provided with a flame-arrester; the gas expelled shall be discharged into the vent header;

Several different substances may be carried simultaneously if they do not react dangerously with each other in the gaseous phase.

or:

- (c) Each tank has its own vent header fitted with a vacuum relief valve incorporating a flame-arrester and a high-velocity vent valve incorporating a flame-arrester.

Several different substances may be carried simultaneously on board.

321 223

Pressure tests

- (1) The cargo tanks, cargo residue tanks, cofferdams, pipes for loading and unloading shall be subjected to initial tests before being put into service and thereafter at prescribed intervals.

Where a heating system is provided inside the cargo tanks, the heating coils shall be subjected to initial tests before being put into service and thereafter at prescribed intervals.

- (2) The test pressure for the cargo tanks and cargo residue tanks shall be not less than 1.3 times the working pressure. The test pressure for the cofferdams shall be not less than 10 kPa (0.10 bar) gauge pressure.

- (3) The test pressure for pipes for loading and unloading shall be not less than 1000 kPa (10 bar).

- (4) The maximum intervals for the periodic tests shall be 11 years.

- (5) The procedure for pressure tests shall comply with the provisions established by the competent authority or a recognized classification society.

321 224

321 225 Pumps and piping

(1) Pumps situated on deck shall be placed in the cargo area.

Loading pumps shall be capable of being shut down from the cargo area and, in addition, from a position outside the cargo area.

Cargo pumps shall be located not less than 6 m from entrances to, or openings of, the accommodation and service spaces outside the cargo area.

- (2) (a) Pipes for loading and unloading of cargo tanks shall be independent of any other piping of the vessel. No cargo-conveying lines shall be located below deck, except those inside the cargo tanks and inside the cargo pump-room.
- (b) The pipes for loading and unloading shall be arranged so that, after loading or unloading operations, the liquid remaining in these pipes may be safely removed and may flow either into the vessel tanks or the tanks ashore.
- (c) Pipes for loading and unloading shall be clearly distinguishable from other piping, e.g. by means of colour marking.
- (d) The pipes for loading and unloading located on deck, with the exception of the shore connections, shall be located not less than a quarter of the vessels' breadth from the outer shell .
- (e) The shore connections shall be located not less than 6 m from the entrances to, or openings of, the accommodation and service spaces outside the cargo area.
- (f) Each shore connection of the vent header and shore connections of the pipes for loading and unloading, through which the loading or unloading operation is carried out, shall be fitted with a shut-off device. However, each shore connection shall be fitted with a blind flange when it is not in operation. Each shore connection of the pipes for loading and unloading through which the loading or unloading operation is carried out shall be fitted with the device intended for the discharge of residual cargo described in Model No.1 of Appendix 3.
- (g) The vessel shall be equipped with a permanently installed stripping system.
- (h) The flanges and stuffing boxes shall be provided with a spray protection device.

(3) The distance referred to in (1) and (2) (e) may be reduced to 3 m if a transversal bulkhead complying with 321 210 (2) is situated at the end of the cargo area. The openings shall be provided with doors.

321 225
(cont'd)

The following notice shall be displayed on the doors:

**DO NOT OPEN DURING LOADING AND UNLOADING WITHOUT
THE PERMISSION OF THE STEERSMAN.
CLOSE IMMEDIATELY.**

- (4) (a) Every component of the pipes for loading and unloading shall be electrically connected to the hull.
- (b) The pipes for loading shall extend down to the bottom of the cargo tanks.
- (5) The position of the stop valves or other shut-off devices of the pipes for loading and unloading shall indicate whether they are open or shut.
- (6) The pipes for loading and unloading shall have, at the working pressure, the required elasticity, leakproofness and resistance to pressure.
- (7) The pipes for loading and unloading shall be fitted with pressure gauges at the pump inlet and outlet.

When these pressure gauges are manometers, the indicator scale shall have a diameter of not less than 0.14 m.

The pressure gauges shall be capable of being read from the control position of the loading pump at any time. The maximum permissible overpressure or vacuum shall be indicated by a red mark.

- (8) (a) When pipes for loading and unloading are used for supplying the cargo tanks with washing or ballast water, the connections of these pipes with water pipes shall be located within the cargo area but outside the cargo tanks.

Where the water inlet of a tank-washing system is so designed that no pipe suction is possible, the pump and associated pipe connections may be placed outside the cargo area.

A spring-loaded non-return valve shall be provided to prevent any gases from escaping from the cargo area through the tank washing system.

- (b) A non-return valve shall be fitted at the junction between the water suction pipe and the loading pipe.
- (9) The maximum permissible loading rate for each cargo tank and for the vessel determined in relation to the design of the cargo tanks, the pipes for loading and unloading, the gas vent header and safety devices shall be indicated in the certificate of approval.

- 321 225 (cont'd)** (10) The stripping system shall be subjected to initial tests before being put into service or thereafter if any alteration has been made to it, using water as test medium. The test and the determination of the residual quantities shall be carried out in accordance with the requirements of model No. 2 of Appendix 3.

In this test, the following residual quantities shall not be exceeded:

- (a) 5 l for each cargo tank;
- (b) 15 l for each pipe system.

The residual quantities obtained in the test shall be entered in the inspection documents referred in marginal 210 381 (2) (c).

321 226 Cargo residue tanks and slop tanks

(1) The vessel shall be provided with at least one cargo residue tank and one slop tank. These tanks shall be located only in the cargo area. Intermediate bulk containers or tank-containers in accordance with marginal 210 401 may be used instead of a fixed cargo residue tank. During filling of these intermediate bulk containers or tank-containers, means for collecting possible leaks shall be placed under the filling connections.

(2) Slop tanks shall be fire resistant and shall be capable of being closed with lids (e.g. drums with lids fastened by hoops). The tanks shall be marked and easy to handle.

(3) The maximum permissible capacity of a cargo residue tank is 30 m³.

The cargo residue tanks shall be equipped with:

- pressure/vacuum valves fitted with a flame-arrester;
- an ullage opening capable of being closed;
- connections, with stop valves, for pipes and hoses.

No connection between the cargo residue tanks and the gas vent header of the cargo tanks is permitted.

The cargo residue tanks, the intermediate bulk containers or tank-containers placed on the deck shall be located at a minimum distance from the hull equal to a quarter of the vessel breadth.

321 227

321 228 Water-spray system

When water-spraying is required in the list of substances of Appendix 4, a water-spray system shall be installed in the cargo area on deck for the purpose of reducing vapours given off by the cargo, and of cooling the tops of cargo tanks by sprinkling water on their whole surface.

321 228 (cont'd) The system shall be fitted with a connection device for supply from the shore. The system shall be capable of being put into operation from the wheelhouse and from the deck.

The capacity of the water-spray system shall be such that when all the spray nozzles are in operation, the outflow is of 50 litres per square metre of deck and per hour.

**321 229-
321 230**

321 231 Machinery

- (1) Only internal combustion engines running on fuel with a flashpoint of more than 55° C are allowed.
- (2) Air intakes of the engines shall be located not less than 2 m away from the cargo area.
- (3) There shall be no sparking within the cargo area.
- (4) The external temperature of the outer parts of engines used during loading or unloading operations, as well as that of their ventilation and exhaust-gas ducts shall not exceed the allowable temperature according to the temperature class.

This provision does not apply to service spaces where engines fully conforming to the provisions of marginal 321 252 (3) (b) are installed.

- (5) The ventilation in the closed engine room shall be designed so that, at an ambient temperature of 20 °C, the average temperature in the engine room does not exceed 40 °C.

321 232 Oil fuel tanks

- (1) Double bottoms within the cargo area may be arranged as oil fuel tanks, provided their depth is not less than 0.60 m.

Oil fuel pipes and openings of such tanks are not permitted in the hold space.

- (2) The ventilation pipes of all oil fuel tanks shall lead to 0.5m above the open deck. Their open ends and the open ends of overflow pipes leading on deck shall be fitted with a protective device consisting of a grid or a perforated plate.

321 233

321 234 Engine exhaust pipes

- (1) Exhausts gases shall be evacuated from the vessel into the open air either upwards through an exhaust pipe or through the shell plating. The exhaust outlet shall be located not less than 2 m from the cargo area. The exhaust pipes of engines shall be arranged so that the exhaust gases are blown away from the vessel.

321 234
(cont'd)

The exhaust pipes shall not be located within the cargo area.

(2) Engine exhaust pipes shall be provided with a device preventing the escape of sparks, such as spark arresters.

321 235

Bilge pumping and ballasting arrangements

(1) Bilge and ballast pumps for spaces within the cargo area shall be installed within such area.

This provision does not apply to double-hull spaces and double bottoms if they do not have a wall common to the cargo tanks, and to cofferdams which may be filled with a ballast pump located in the engine room and emptied with eductors installed in the cargo area.

(2) Where the double bottom is used as an oil fuel tank, it shall not be connected to the bilge piping system.

(3) Where the ballast pump is installed in the cargo area, the fixed piping and its outboard connection for suction of ballast water shall be located within the cargo area.

(4) A cargo pump-room below deck shall be capable of being drained in an emergency by an installation located in the cargo area and independent from any other installation.

321 236-
321 239

321 240

Fire-extinguishing systems

(1) A fire-extinguishing system shall be installed on the vessel.
This system shall comply with the following requirements:

- It shall be supplied by two independent fire or ballast pumps, one of which shall be ready for use at any time. These pumps shall not be installed in the same space;
- It shall be provided with a water main fitted with at least three hydrants in the cargo area above deck. Three suitable and sufficiently long hoses with spray nozzles having a diameter of not less than 12 mm shall be provided. It shall be possible to reach any point of the deck in the protected area simultaneously with at least two jets of water which do not emanate from the same hydrant;

A spring-loaded non-return valve shall be fitted to ensure that no gases can escape through the fire-extinguishing system into the accommodation or service spaces outside the cargo area;

- The capacity of the system shall be at least sufficient for a jet of water to reach a distance of not less than the vessel's breadth from any location on board with two spray nozzles being used at the same time.

**321 240
(cont'd)**

(2) In addition, the engine room, the cargo pump-room and all spaces containing essential equipment under deck (diesel generators, switchboards, compressor, etc.) for the refrigeration equipment, if any, shall be provided with a fixed fire-extinguishing system which can be operated from the deck.

(3) The two hand fire-extinguishers referred to in marginal 210 240 shall be located in the cargo area.

321 241 Fire and naked light

(1) The outlets of funnels shall be located not less than 2 m away from the cargo area. Arrangements shall be provided to prevent the escape of sparks and the entry of water.

(2) Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels. The installation in the engine room or in other separate space of heating appliances fuelled with liquid fuel having a flash-point above 55 °C is, however, permitted. Cooking and refrigerating appliances are permitted only in the accommodation.

(3) Only electrical lighting appliances are permitted.

321 242 Cargo heating system

(1) Boilers which are used for heating the cargo shall be fuelled with a liquid fuel having a flashpoint of more than 55 °C and shall be placed either in the engine room or in other special space below deck and outside the cargo area, which is accessible from the engine room or from the deck.

(2) The cargo heating system shall be designed so that the cargo may not pass into the boiler in the case of a leak in the heating coils. A cargo heating system with artificial draught shall be ignited electrically.

(3) The power of the ventilation system of the engine room shall be determined taking into account the air required for the boilers.

(4) Where the cargo heating system is used during loading, unloading or gas-freeing, the service space which contains this system shall comply entirely with the requirements of marginal 321 252 (3) (b).

**321 243-
321 249**

321 250 Documents concerning electrical installations

(1) In addition to the documents required by the "Recommendations on Technical Requirements for Inland Navigation Vessels"*/, the following documents shall be on board:

- (a) a drawing indicating the boundaries of the cargo area and the location of the electrical machines, appliances or other equipment installed in this area;
- (b) a list of the electrical machines, appliances or other equipment referred to in (a) above including the following particulars:

machine or appliance, location, type of protection, type of protection against explosion, testing body and approval number;

- (c) a list of or general plan indicating the electrical machines, appliances or other electrical equipment outside the cargo area which may be operated during loading, unloading or gas-freeing. All other electrical machines, appliances or equipment shall be marked in red. See marginal 321 252 (3) and (4).

(2) The documents listed above shall bear the stamp of the competent authority issuing the certificate of approval.

321 251 Electrical installations

(1) Only distribution systems without return connection to the hull are permitted:

This provision does not apply to:

- certain limited parts of the installation located outside the cargo area (e.g. connections of starters of diesel engines);
- the device for checking the insulation level referred to in (2) below.

(2) Every insulated distribution network shall be fitted with an independent device with a visual and audible alarm for checking the insulation level.

(3) For the selection of electrical equipment to be used in zones presenting an explosion risk, the explosion groups and temperature classes assigned to the substances carried in the list of substances of Appendix 4 shall be taken into consideration.

*/ Annex to the revised Resolution No.17 of the Principal Working Party on Inland Water Transport of the Inland Transport Committee of the Economic Commission for Europe.

321 252

Type and location of electrical installations

- (1) (a) Only the following equipments are permitted in cargo tanks, cargo residue tanks, and pipes for loading and unloading (comparable to zone 0):
 - measuring, control and alarm devices of the EEx (ia) type of protection;
 - (b) Only the following equipments are permitted in the hold spaces :
 - measuring, control and alarm devices of the "certified safe" type;
 - lighting appliances of the "flame-proof enclosure" or "pressurized apparatus" type of protection;
 - hermetically sealed echo sounding devices the cables of which are led through thick-walled steel tubes with gastight connections up to the main deck;
 - cables for the active cathodic protection of the shell plating in protective steel tubes such as those provided for echo sounding devices;
 - (c) Only the following equipments are permitted in the service spaces in the cargo area below deck (comparable to zone 1):
 - measuring, control and alarm devices of the "certified safe" type;
 - lighting appliances of the "flame-proof enclosure" or "pressurized apparatus" type of protection;
 - motors driving essential equipment such as ballast pumps; they shall be of the "certified safe" type;
 - (d) The control and protective equipment of the installations referred to in paragraphs (a), (b) and (c) above shall be located outside the cargo area if they are not intrinsically safe;
 - (e) The electrical installations in the cargo area on deck (comparable to zone 1) shall be of the "certified safe" type.
- (2) Accumulators shall be located outside the cargo area.
 - (3) (a) Electrical installations used during loading, unloading and gas-freeing during berthing and which are located outside the cargo area shall (comparable to zone 2) be at least of the "limited explosion risk" type.

321 252
(cont'd)

- (b) This provision shall not apply to the electrical installations in the accommodation, the wheelhouse or the service spaces outside the cargo areas if:
- these spaces are fitted with a ventilation system ensuring an overpressure of 0.1 kPa (0.001 bar) and none of the windows is capable of being opened; the air intakes of the ventilation system shall be located as far away as possible, however, not less than 6 m from the cargo area and not less than 2 m above the deck;
 - the spaces are fitted with a gas detection system with sensors
 - at the suction inlets of the ventilation system;
 - directly at the top edge of the sill of the entrance doors of the accommodation and service spaces;
 - the gas concentration measurement is continuous;
 - when the gas concentration reaches 30 % of the lower explosive limit, the ventilators are switched off. In such a case and when the overpressure is not maintained or in the event of failure of the gas detection system, the electrical installations which do not comply with (a) above, shall be switched off. These operations shall be performed immediately and automatically and activate the emergency lighting in the accommodation, the wheelhouse and the service spaces, which shall comply at least with the "limited explosion risk" type. The switch off shall be indicated in the accommodation and wheelhouse by visual and audible signals;
 - the ventilation system, the gas detection system and the alarm of the shut off device fully comply with the requirements of (a) above;
 - the automatic switch off device is set so that no automatic switch off may occur while the vessel is under way.
- (4) The electrical installations which do not meet the requirements set out in (3) above together with their switchgear shall be marked in red. The disconnection of such installations shall be operated from a centralized location on board.
- (5) An electric generator which is permanently driven by an engine and which does not meet the requirements of paragraph (3) above, shall be fitted with a multipolar switch capable of switching off all external circuits and excitation circuits. A notice board with the operating instructions shall be displayed near the switch.
- (6) Sockets for the connection of signal lights and gangway lighting shall be permanently fitted to the vessel close to the signal mast or the gangway. Connecting and disconnecting shall not be possible except when the sockets are not live.

321 252 (cont'd) (7) The failure of the power supply for the safety and control equipment shall be immediately indicated by visual and audible signals at the locations where the alarms are usually actuated.

321 253 Earthing

(1) The metallic parts of electrical appliances in the cargo area which are not live as well as protective metal tubes or metal sheaths of cables in normal service shall be earthed, unless they are so arranged that they are automatically earthed by bonding to metal structure of the vessel.

(2) The provisions of paragraph (1) above apply also to installations having service voltages of less than 50 V.

(3) Independent cargo tanks, metallic intermediate bulk containers and tank-containers shall be earthed.

**321 254-
321 255**

321 256 Electrical cables

(1) All cables in the cargo area shall have a metallic sheath.

(2) Cables and sockets in the cargo area shall be protected against mechanical damage.

(3) Movable cables are prohibited in the cargo area, except for intrinsically safe electric circuits or for the supply of signal lights and gangway lighting.

(4) Cables of intrinsically safe circuits shall only be used for such circuits and shall be separated from other cables not intended for being used in such circuits (e.g. they shall not be installed together in the same string of cables and they shall not be fixed by the same cable clamps).

(5) For movable cables intended for signal lights and gangway lighting, only sheathed cables of type H 07 RN-F in accordance with 245 IEC 66 or cables of at least equivalent design having conductors with a cross-section of not less than 1.5 mm² shall be used.

These cables shall be as short as possible and installed so that accidental damage is not likely to occur.

**321 257-
321 259**

321 260 Special equipment

A shower and an eye and face bath shall be provided on the vessel at a location which is directly accessible from the cargo area.

321 261-
321 270

321 271 Admittance on board

The notice boards displaying the prohibition of admittance in accordance with marginal 210 371 shall be easily legible from either side of the vessel.

321 272-
321 273

321 274 Prohibition of smoking

(1) The notice boards displaying the prohibition of smoking in accordance with marginal 210 374 shall be easily legible from either side of the vessel.

(2) Notice boards shall be fitted at the entrances of spaces where smoking or the use of fire or naked light is sometimes prohibited, indicating in which circumstances the prohibition is applicable.

(3) Ashtrays shall be provided in the accommodation and wheelhouse, close to each exit.

321 275
321 291

321 292 Emergency exit

Spaces the entrances or exits of which are likely to become partly or completely immersed in the damaged condition shall have an emergency exit which is situated not less than 0.10 m above the waterline.

321 293-
330 999

CHAPTER 3

Provisions for Type N Tank Vessels

331 000-
331 099

331 100 **General**

The rules for construction of Chapter 1 of Part III apply to Type N tank vessels.

331 101-
331 199

331 200 **Materials of construction**

- (1) (a) The vessel's hull and the cargo tanks shall be constructed of shipbuilding steel or another metal at least equivalent.

The independent cargo tanks may also be constructed of other materials, provided these are equivalent with respect to mechanical properties and resistance against the effects of temperature and fire.

- (b) Every part of the vessel including any installation and equipment which may come into contact with the cargo shall consist of materials which can neither be dangerously affected by the cargo nor cause decomposition of the cargo or react with it so as to form harmful or hazardous products.
- (2) Except where explicitly permitted in (3) below or in the certificate of approval, the use of wood, aluminium alloys or plastics materials within the cargo area is prohibited.
- (3) (a) The use of wood, aluminium alloys or plastics materials within the cargo area is only permitted for:
- gangways and external ladders;
 - movable items of equipment (aluminium gauging rods are, however, permitted provided that they are fitted with brass feet or protected in another way to avoid sparking);
 - chocking of cargo tanks which are independent of the vessel's hull and chocking of installations and equipment;
 - masts and similar round timber;
 - engine parts;
 - parts of the electrical installation;
 - loading and unloading appliances;
 - lids of boxes which are placed on the deck.

331 200
(cont'd)

- (b) The use of wood or plastics materials within the cargo area is only permitted for:
 - supports and stops of any kind.
 - (c) The use of synthetic materials or rubber within the cargo area is only permitted for:
 - coating of cargo tanks and of pipes for loading and unloading;
 - all kinds of gaskets (e.g. for dome or hatch covers);
 - electric cables;
 - pipes for loading and unloading;
 - insulation of cargo tanks and of pipes for loading and unloading.
 - (d) All materials used for fixed elements in the accommodation or wheelhouse, with the exception of furniture, shall not be readily flammable. They shall not evolve fumes or toxic gases in dangerous quantities, if involved in a fire.
- (4) The paint used in the cargo area shall not be liable to produce sparks in particular in case of shocks.
- (5) The use of synthetic material for vessel's boats is permitted only if the material is not readily flammable.

331 201-
331 207

331 208 Classification

- (1) The tank vessel shall be built under survey of a recognized classification society in accordance with the rules established by that classification society for the highest class, and the tank vessel shall be classed accordingly.

The vessel's class shall be continued.

- (2) The cargo pump-room shall be inspected by a recognized classification society whenever the certificate of approval has to be renewed as well as during the third year of validity of the certificate. The inspection shall comprise at least:

- an inspection of the whole system for its condition, for corrosion, leakage or conversion works which have not been approved;
- a checking of the condition of the gas detection system in the cargo pump-room.

331 208 Inspection certificates signed by the recognized classification society with respect to the

(cont'd) inspection of the cargo pump-room shall be kept on board. The inspection certificates shall at least include particulars of the above inspection and the results obtained as well as the date of the inspection.

(3) The condition of the gas detection system referred to in marginal 331 252 (3) (b) shall be checked by a recognized classification society whenever the certificate of approval has to be renewed and during the third year of validity of the certificate of approval. A certificate signed by the recognized classification society shall be kept on board.

331 209

331 210 Protection against the penetration of gases

(1) The vessel shall be designed so as to prevent gases from penetrating into the accommodation and the service spaces.

(2) The coamings of doors in the sidewalls of superstructures and of access hatches to under-deck spaces shall have a height of not less than 0.50 m.

This requirement need not be complied with if the wall of the superstructures facing the cargo area extends from one side of the ship to the other and has doors the coamings of which have a height of not less than 0.50 m. In this case, the coamings of doors in the sidewalls of superstructures and of access hatches behind this wall shall have a height of not less than 0.10 m. The coamings of engine room doors and access hatches shall, however, always have a height of not less than 0.50 m.

(3) The bulwarks shall be provided with sufficiently large openings which are located directly above the deck.

331 211 Hold spaces and cargo tanks

(1) (a) The maximum permissible capacity of a cargo tank shall be determined in accordance with the following table:

$L \cdot B \cdot H \text{ (m}^3\text{)}$	Maximum permissible capacity of a cargo tank (m ³)
up to 600	$L \cdot B \cdot H \cdot 0.3$
600 - 3 750	$180 + (L \cdot B \cdot H - 600) \cdot 0.0635$
> 3 750	380

In the table above $L \cdot B \cdot H$ is the product of the main dimensions of the tank vessel in metres (according to the measurement certificate), where:

331 211

L = overall length of the hull, in m;

(cont'd)

B = extreme breadth of the hull, in m;

H = shortest vertical distance between the top of the keel and the lowest point of the deck at the side of the vessel (moulded depth) within the cargo area, in m;

For trunk vessels, H shall be replaced by H', where H' shall be obtained from the following formula:

$$H' = H + (ht \cdot bt/B \cdot lt/L)$$

where:

ht = trunk height, in m (distance between trunk deck and main deck measured on trunk side at L/2);

bt = trunk breadth, in m;

lt = trunk length, in m.

- (b) The relative density of the substances to be carried shall be taken into consideration in the design of the cargo tanks. The maximum relative density shall be indicated in the certificate of approval.
 - (c) When the vessel is provided with pressure cargo tanks, these tanks shall be designed for a working pressure of 400 kPa (4 bar).
 - (d) For vessels with a length of not more than 50 m, the length of a cargo tank shall not exceed 10.00 m; for vessels with a length of more than 50 m, the length of a cargo tank shall not exceed 0.20 L.
- (2) (a) The cargo tanks independent of the vessel's hull shall be fixed so that they cannot float.
 - (b) The capacity of a suction well shall be limited to not more than 0.10 m³.
- (3) (a) The cargo tanks shall be separated by cofferdams of at least 0.60 m in width from the accommodation, engine room and service spaces outside the cargo area below deck or, if there are no such accommodation, engine room and service spaces, from the vessel's ends. Where the cargo tanks are installed in a hold space, a space of not less than 0.50 m shall be provided between such tanks and the end bulkheads of the hold space. In this case an insulated end bulkhead meeting the definition for Class "A-60" according to SOLAS II-2, Regulation 3, shall be deemed equivalent to the cofferdam. For pressure cargo tanks, the 0.50 m distance may be reduced to 0.20 m.

331 211
(cont'd)

- (b) Hold spaces, cofferdams and cargo tanks shall be capable of being inspected.
- (c) All spaces in the cargo area shall be capable of being ventilated. Means for checking their gas-free condition shall be provided.

(4) The bulkheads bounding the cargo tanks, cofferdams and hold spaces shall be watertight. The cargo tanks, cofferdams and the end bulkheads of the hold spaces, as well as the bulkheads bounding the cargo area shall not be fitted with any openings or passages below deck.

Passages through bulkheads between two hold spaces are, however, permitted.

The bulkhead between the engine room and the cofferdam or service space in the cargo area may be fitted with passages provided that these conform to the provisions of marginal 331 217 (5).

The bulkhead between the cargo tank and the cargo pump-room below deck may be fitted with passages provided that these conform to the provisions of marginal 331 217 (6). If the vessel is fitted with a cargo pump-room below deck, the bulkheads between the cargo tanks may be fitted with passages provided that the loading pipes are fitted with shut-off devices in the cargo tank direct at the bulkhead and in the cargo pump-room direct at the bulkhead.

The shut-off devices shall be capable of being activated from the deck.

(5) Double-hull spaces and double bottoms in the cargo area shall be designed for ballasting only. Double bottoms may, however, be used as oil fuel tanks, provided they comply with the provisions of marginal 331 232.

- (6) (a) A cofferdam, the centre part of a cofferdam or another space below deck in the cargo area may be arranged as a service space, provided the walls bounding the service space extend vertically to the bottom.
This service space shall only be accessible from the deck.
- (b) Such a service space shall be watertight with the exception of its access hatch and ventilation inlets.
- (c) No pipes for loading and unloading shall be fitted within the service space referred to under (a) above.

Pipes for loading and unloading may be fitted in the cargo pump-room only when it conforms to the provisions of marginal 331 217 (6).

(7) Where service spaces are located in the cargo area under deck, they shall be arranged so as to be easily accessible and to permit even persons wearing protective clothing and breathing apparatus to safely operate the service equipment contained in them.

331 211

They shall be designed so as to allow injured or unconscious personnel to be removed from

(cont'd) such spaces without difficulties, if necessary by means of fixed installed equipment.

(8) Cofferdams, double-hull spaces, double bottoms, cargo tanks, hold spaces and other accessible spaces within the cargo area shall be arranged so that they may be completely inspected and cleaned in an appropriate manner. The dimensions of openings shall be sufficient to allow a person wearing breathing apparatus to enter or leave the space without difficulties. These openings shall have a minimum cross-section of 0.36 m² and a minimum side length of 0.50 m. They shall be designed so as to allow injured or unconscious personnel to be removed from the bottom of such a space without difficulties, if necessary by means of fixed installed equipment. Cargo tanks may, however, have circular openings with a diameter of not less than 0.70 m.

331 212 Ventilation

(1) Double-hull spaces and double bottoms within the cargo area which are not arranged for ballasting, hold spaces and cofferdams shall be provided with ventilation systems.

(2) Any service spaces located in the cargo area below deck shall be provided with a system of forced ventilation with sufficient power for ensuring at least 20 changes of air per hour based on the volume of the space. The ventilator fan shall be designed so as to prevent sparking on contact of a fan blade with the housing or by electrostatic discharge.

The ventilation exhaust ducts shall extend down to 50 mm above the bottom of the service space. The air shall be supplied through a duct at the top of the service space. The air inlets shall be located not less than 2 m above the deck, at a distance of not less than 2 m from tank openings and 6 m from the outlets of safety valves.

The extension pipes, which may be necessary, may be of the hinged type.

(3) Ventilation of accommodation and service spaces shall be possible.

(4) Ventilators used for gas-freeing of tanks shall be designed so as to prevent sparking on contact of a fan blade with the housing or by electrostatic discharge.

(5) Notice boards shall be fitted at the ventilation inlets indicating the conditions when they shall be closed. Any ventilation inlets of accommodation and service spaces leading outside shall be fitted with fire dampers. Such ventilation inlets shall be located not less than 2 m from the cargo area.

Ventilation inlets of service spaces in the cargo area below deck may be located within such area.

(6) Flame arresters prescribed in marginals 331 220 (4), 331 221 (11), 331 222 (4) and (5) and 331 226 (2) shall be of a type approved for this purpose by the competent authority.

331 213 Stability (general)

(1) Proof of sufficient stability shall be furnished including for stability in damaged condition. This proof is not required for vessels with cargo tanks the width of which is not more than $0.70 \cdot B$.

(2) The basic values for the stability calculation - the vessel's lightweight and location of the centre of gravity - shall be determined either by means of an inclining experiment or by detailed mass and moment calculation. In the latter case the lightweight of the vessel shall be checked by means of a lightweight test with a tolerance limit of $\pm 5\%$ between the mass determined by calculation and the displacement determined by the draught readings.

(3) Proof of sufficient intact stability shall be furnished for all stages of loading and unloading and for the final loading condition.

331 214 Stability (intact)

For vessels with cargo tanks the width of which is more than $0.70 \cdot B$, additional proof shall be furnished that, at an angle of 5° or, when this angle is less, at a heeling angle at which an opening becomes immersed, the righting arm is 0.10 m. The stability-reducing free surface effect in the case of cargo tanks filled to less than 95% of their capacity shall be taken into account.

331 215

331 216 Engine rooms

(1) Internal combustion engines for the vessel's propulsion as well as internal combustion engines for auxiliary machinery shall be located outside the cargo area. Entrances and other openings of engine rooms shall be at a distance of not less than 2 m from the cargo area.

(2) The engine room shall be accessible from the deck; the entrance shall not face the cargo area. Where its door is not located in a recess whose depth is at least equal to the door width, the hinges shall face the cargo area.

331 217 Accommodation and service spaces

(1) Accommodation and the wheelhouse shall be located outside the cargo area forward of the fore vertical plane or abaft the aft vertical plane bounding the part of cargo area below deck. Windows of the wheelhouse which are located not less than 1 m above the bottom of the wheelhouse may tilt forward.

(2) Entrances to spaces and openings of superstructures shall not face the cargo area. Doors openings outward and not located in a recess whose depth is at least equal to the width of the doors shall have their hinges face the cargo area.

(3) Entrances from the deck and openings of spaces facing the outside shall be capable of being closed.

331 217 The following instruction shall be displayed at the entrance of such spaces:
(cont'd)

**DO NOT OPEN DURING LOADING, UNLOADING OR GAS-FREEING
WITHOUT PERMISSION FROM THE STEERSMAN.
CLOSE IMMEDIATELY.**

- (4) Entrances and windows of superstructures and accommodation which can be opened as well as other openings of these spaces shall be located not less than 2 m from the cargo area. No wheelhouse doors and windows shall be located within 2 m from the cargo area, except where there is no direct connection between the wheelhouse and the accommodation.
- (5) (a) Driving shafts of the bilge or ballast pumps may pass through the bulkhead between the service space and the engine room, provided the arrangement of the service space is in compliance with marginal 331 211 (6).
- (b) The passage of the shaft through the bulkhead shall be gastight. The passage shall have been approved by a recognized classification society.
- (c) The necessary operating instructions shall be displayed.
- (d) Passages through the bulkhead between the engine room and the service space may be provided for electrical cables, hydraulic lines and piping for measuring, control and alarm systems, provided that the passages have been approved by a recognized classification society. The passages shall be gastight.
- (e) Pipes may pass through the bulkhead between the engine room and the service space provided that these are pipes between the mechanical equipment in the engine room and the service space which do not have any openings within the service space and which are provided with shut-off devices at the bulkhead in the engine room.
- (f) Pipes from the engine room may pass through the service space to the outside provided that within the service space they are of the thick-walled type and have no flanges or openings.
- (g) Where a driving shaft of auxiliary machinery passes through a wall located above the deck the passage shall be gastight.
- (6) A service space located within the cargo area below deck shall not be used as a cargo pump-room for the loading and unloading system, except where:
- the pump-room is separated from the engine room or from service spaces outside the cargo area by a cofferdam or a bulkhead with a "A.60" fire protection insulation according to SOLAS Chapter II-2, Regulation 3, or by a service space or a hold space;

331 217
(cont'd)

- the "A-60" bulkhead required above does not include passages referred to in paragraph (5) (a);
- ventilation exhaust ducts' outlets are located not less than 6 m from access to and openings of the accommodation and service spaces outside the cargo area;
- the access hatches and ventilation inlets may be closed from the outside;
- all pipes for loading and unloading as well as those of stripping systems are provided with shut-off devices at the pump suction side in the cargo pump-room immediately at the bulkhead. Operation of the control devices in the pump-room, starting of pumps and compressors and control of the liquid flow rate shall be effected from the deck;
- the bilge of the cargo pump-room is equipped with a gauging device for measuring the filling level which activates a visual and audible alarm in the wheelhouse when liquid is accumulating in the cargo pump-room bilge;
- the cargo pump-room is provided with a permanent gas detection system which automatically indicates the presence of explosive gases or lack of oxygen by means of direct-measuring sensors and which actuates a visual and audible alarm when the gas concentration has reached 30 % of the lower explosive limit. The sensors of this system shall be placed at suitable positions at the bottom and direct below the deck. Measurement shall be continuous;
- the audible and visual alarms are installed in the wheelhouse and in the cargo pump-room and, when the alarm is actuated, the vessel's own gas discharging system is shut down. Failure of the gas detection system shall be immediately signalled in the wheelhouse and on deck by means of audible and visual alarms;
- the ventilation system prescribed in marginal 331 212 (3) has a capacity of not less than 30 changes of air per hour based on the total volume of the service space.

(7) The following instruction shall be displayed at the entrance of the cargo pump-room:

**BEFORE ENTERING THE CARGO PUMP-ROOM CHECK WHETHER
IT IS FREE FROM TOXIC GASES AND CONTAINS SUFFICIENT OXYGEN.
DO NOT OPEN DOORS AND ENTRANCE OPENINGS WITHOUT
THE PERMISSION OF THE STEERSMAN.
LEAVE IMMEDIATELY IN THE EVENT OF GAS OR FIRE ALARM.**

331 218-
331 219

331 220 Arrangement of cofferdams

- (1) Cofferdams or cofferdam compartments remaining after a service space has been arranged in accordance with marginal 331 211 (6) shall be accessible through an access hatch. The access hatches and ventilation inlets shall be located not less than 0.50 m above the deck.
- (2) Cofferdams shall be capable of being filled with water and emptied by means of a pump. Filling shall be effected within 30 minutes. The cofferdams shall not be fitted with filling valves.
- (3) No fixed pipe shall permit connection between a cofferdam and other piping of the vessel outside the cargo area.
- (4) The ventilation openings of cofferdams shall be fitted with a flame arrester.

331 221 Safety and control installations

- (1) Cargo tanks shall be provided with the following equipment:
 - (a) a mark inside the tank indicating the liquid level of 95 %;
 - (b) a liquid-level gauge;
 - (c) a liquid-level alarm device which is activated at the latest when the liquid-level corresponds to a filling ratio of 90 %;
 - (d) a high liquid-level sensor for actuating the overflow valve at the latest when the liquid-level corresponds to a filling ratio of 97.5 %;
 - (e) an instrument for measuring the pressure of the vapour phase inside the cargo tank;
 - (f) when a possibility of heating the cargo is required in the list of substances of Appendix 4 or a maximum temperature is indicated in column 20 of that list, an instrument for measuring the temperature of the cargo;
 - (g) as required in the list of substances of Appendix 4, a sampling device of the closed type or of the partly closed type and/or a sampling opening;
 - (h) an ullage opening.
- (2) When the filling ratio in per cent is determined, an error of not more than 0.5 % is permitted. It shall be calculated on the basis of the total tank capacity including the expansion trunk.
- (3) The liquid-level gauge shall allow readings from the control position of the shut-off devices of the particular cargo tank.

331 221
(cont'd)

(4) The liquid-level alarm device shall give a visual and audible warning on board when actuated.

The liquid-level alarm device shall be independent of the liquid-level gauge.

(5) The high liquid-level sensor referred to in paragraph (1) (d) shall give a visual and audible alarm on board and at the same time actuate an electrical contact which in the form of a binary signal interrupts the electric current loop provided and fed by the shore facility, thus initiating measures at the shore facility against overflowing during loading operations. The signal shall be transmitted to the shore facility via a watertight two-pin plug of a connector device in accordance with IEC Publication No. 309 for direct current of 40 to 50 volts, identification colour white, position of the nose 10 h.

The plug shall be permanently fitted to the vessel close to the shore connections of the loading and unloading pipes.

The high liquid-level sensor shall also be capable of switching off the vessel's own discharging pump.

The high liquid-level sensor shall be independent of the liquid-level alarm device, but it may be connected to the liquid-level gauge.

(6) The visual and audible signals given by the liquid-level alarm device shall be clearly distinguishable from those of the high liquid-level sensor.

The visual alarm shall allow reading from each control position on deck of the cargo tank stop valves. It shall be possible to easily check the functioning of the sensors and electric circuits or these shall be of the "failsafe" design.

(7) When the pressure in the vapour phase or the temperature of the cargo reaches a set value, the instruments for measuring the vacuum or overpressure of the vapour phase in the cargo tank, or the temperature of the cargo, when required, shall activate a visual and an audible alarm in the wheelhouse and in the accommodation if the set pressure or temperature is exceeded. When this set value is reached during loading or unloading these instruments shall, by means of the plug referred to in (5) above, initiate an electrical contact which will interrupt the loading or unloading operation;

When the vessel's own discharge pump is used, it shall be switched off automatically.

The instruments for measuring the vacuum or overpressure in the vapour phase shall be actuated for an overpressure equal to 1.15 times the set pressure of the high-velocity vent valves and for a fall of pressure of 1.5 kPa (0.015 bar). The maximum allowable temperature is indicated in the list of substances of Appendix 4.

The sensors for the alarms referred to above may be connected to the alarm device of the high liquid-level sensor.

331 221
(cont'd)

(8) When the control elements of the shut-off devices of the cargo tanks are located in a control room, reading of the liquid-level gauges shall be possible in the control room and the visual and audible warning given in the control room and on deck by the liquid-level alarm device, the high liquid-level sensor and the instruments for measuring the pressure of the vapour phase and temperature of the cargo shall be noticeable.

Satisfactory monitoring of the cargo area shall be ensured from the control room.

(9) The closed type sampling device passing through the wall of the cargo tank but constituting a part of a closed system shall be designed so that during sampling no gas or liquid may escape for the cargo tank. The installation shall be of a type approved for this purpose by the competent authority.

(10) The partly closed sampling device leading through the wall of the cargo tank shall be such that during sampling only a small quantity of gaseous or liquid cargo can escape into open air. As long as the device is not used it shall be closed completely. The device shall be of a type approved by the competent authority for this purpose.

(11) The sampling opening shall have a diameter of not more than 0.30 m. It shall be fitted with a flame-arrester and it shall be such that the period during which it remains open is as short as possible and that the flame-arrester cannot remain open without external action.

(12) The ullage opening shall be such that the filling level may be measured by means of a gauging rod. The ullage opening shall be fitted with a self-closing lid.

331 222

Cargo tank openings

(1) (a) Cargo tank openings shall be located on deck in the cargo area.

(b) Cargo tank openings with a cross-section of more than 0.10 m² and openings of safety devices shall be located not less than 0.50 m above deck.

(2) The cargo tank openings shall be fitted with gastight closures capable of withstanding the test pressure in accordance with marginal 331 223 (2).

(3) Closures which are normally used during loading or unloading operations shall not cause sparking when operated.

(4) (a) Each cargo tank or group of cargo tanks connected to a common vent header shall be fitted with:

- safety devices for preventing unacceptable overpressures or vacuums. These safety devices consist of:

for an open system:

- devices designed to prevent any accumulation of water and its penetration into the cargo tanks;

331 222
(cont'd)

for a protected system:

- devices fitted with flame-arresters and designed to prevent any accumulation of water and its penetration into the cargo tank;

for a closed system:

- devices for preventing unacceptable overpressure or vacuum, where the vacuum valve is fitted with a flame-arrester and the pressure-relief valve is designed as a high-velocity vent valve with a flame-arrester. The gases shall be discharged upwards;
 - a connection for the safe return ashore of gases escaping during loading;
 - a device for the safe depressurization of the tanks consisting of at least a flame-arrester and a stop valve the position of which shall clearly indicate whether it is open or shut;
 - manometers, the indicator scale of which shall have a diameter of not less than 0.14 m. The maximum permissible overpressure or vacuum shall be indicated by a red mark. The manometers shall be capable of being read at any time from the location where it is possible to interrupt loading or unloading.
- (b) The outlets of high-velocity vent valves shall be located not less than 2 m above the deck and at a distance of not less than 6 m from the accommodation and service spaces outside the cargo area. The setting of the high-velocity vent valves shall be such that during the voyage they do not start to discharge until the maximum permissible working pressure of the cargo tanks is reached. If extension pipes are arranged on the high-velocity vent valves, this shall be taken into account for the approval of the valves.
- (5) (a) A vent header connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a flame-arrester capable of withstanding an explosion or detonation inside the header.

Only substances which do not mix and which do not react dangerously with each other may be carried simultaneously in cargo tanks connected to a common vent header.

or:

- (b) A vent header connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a pressure/vacuum relief device provided with a flame-arrester; the gas expelled shall be discharged into the vent header;

Several different substances may be carried simultaneously if they do not react dangerously with each other in the gaseous phase.

331 222

or:

(cont'd)

- (c) Each tank has its own vent header fitted with a vacuum relief valve incorporating a flame-arrester and a high-velocity vent valve incorporating a flame-arrester.

Several different substances may be carried simultaneously on board.

331 223 Pressure tests

- (1) The cargo tanks, cargo residue tanks, cofferdams, pipes for loading and unloading shall be subjected to initial tests before being put into service and thereafter at prescribed intervals.

Where a heating system is provided inside the cargo tanks, the heating coils shall be subjected to initial tests before being put into service and thereafter at prescribed intervals.

- (2) The test pressure for the cargo tanks and cargo residue tanks shall be not less than 1.3 times the working pressure. The test pressure for the cofferdams shall be not less than 10 kPa (0.10 bar) gauge pressure.

- (3) The test pressure for pipes for loading and unloading shall be not less than 1000 kPa (10 bar).

- (4) The maximum intervals for the periodic tests shall be 11 years.

- (5) The procedure for pressure tests shall comply with the provisions established by the competent authority or a recognized classification society.

331 224

331 225 Pumps and piping

- (1) Pumps situated on deck shall be placed in the cargo area. Loading pumps shall be capable of being shut down from the cargo area and, in addition, from a position outside the cargo area.

Cargo pumps shall be located not less than 6 m from entrances to, or openings of, the accommodation and service spaces outside the cargo area.

- (2) (a) Pipes for loading and unloading of cargo tanks shall be independent of any other piping of the vessel. No cargo-conveying lines shall be located below deck, except those inside the cargo tanks and inside the cargo pump-room.
- (b) The pipes for loading and unloading shall be arranged so that, after loading or unloading operations, the liquid remaining in these pipes may be safely removed and may flow either into the vessel tanks or the tanks ashore.

331 225
(cont'd)

- (c) Pipes for loading and unloading shall be clearly distinguishable from other piping, e.g. by means of colour marking.
 - (d) (reserved)
 - (e) The shore connections shall be located not less than 6 m from the entrances to, or openings of, the accommodation and service spaces outside the cargo area.
 - (f) Each shore connection of the vent header and shore connections of the pipes for loading and unloading, through which the loading or unloading operation is carried out, shall be fitted with a shut-off device. However, each shore connection shall be fitted with a blind flange when it is not in operation. Each shore connection of the pipes for loading and unloading through which the loading or unloading operation is carried out shall be fitted with the device intended for the discharge of residual cargo described in Model No.1 of Appendix 3.
 - (g) The vessel shall be equipped with a permanently installed stripping system.
 - (h) The flanges and stuffing boxes shall be provided with a spray protection device. This device is required only for the carriage of corrosive substances (hazard or subsidiary risk of Class 8).
- (3) The distance referred to in (1) and (2) (e) may be reduced to 3 m if a transversal bulkhead complying with 331 210 (2) is situated at the end of the cargo area. The openings shall be provided with doors.

The following notice shall be displayed on the doors:

**DO NOT OPEN DURING LOADING AND UNLOADING WITHOUT
THE PERMISSION OF THE STEERSMAN.
CLOSE IMMEDIATELY.**

- (4) (a) Every component of the pipes for loading and unloading shall be electrically connected to the hull.
- (b) The pipes for loading shall extend down to the bottom of the cargo tanks.
- (5) The position of the stop valves or other shut-off devices of the pipes for loading and unloading shall indicate whether they are open or shut.
- (6) The pipes for loading and unloading shall have, at the working pressure, the required elasticity, leakproofness and resistance to pressure.
- (7) The pipes for loading and unloading shall be fitted with pressure gauges at the pump inlet and outlet.

331 225
(cont'd)

When these pressure gauges are manometers, the indicator scale shall have a diameter of not less than 0.14 m.

The pressure gauges shall be capable of being read from the control position of the loading pump at any time. The maximum permissible overpressure or vacuum shall be indicated by a red mark.

- (8) (a) When pipes for loading and unloading are used for supplying the cargo tanks with washing or ballast water, the connections of these pipes with water pipes shall be located within the cargo area but outside the cargo tanks.

Where the water inlet of a tank-washing system is so designed that no pipe suction is possible, the pump and associated pipe connections may be placed outside the cargo area.

A spring-loaded non-return valve shall be provided to prevent any gases from escaping from the cargo area through the tank washing system.

- (b) A non-return valve shall be fitted at the junction between the water suction pipe and the loading pipe.

- (9) The maximum permissible loading rate for each cargo tank and for the vessel determined in relation to the design of the cargo tanks, the pipes for loading and unloading, the gas vent header and safety devices shall be indicated in the certificate of approval.

- (10) The stripping system shall be subjected to initial tests before being put into service or thereafter if any alteration has been made to it, using water as test medium. The test and the determination of the residual quantities shall be carried out in accordance with the requirements of model No. 2 of Appendix 3.

In this test, the following residual quantities shall not be exceeded:

- (a) 5 l for each cargo tank;
(b) 15 l for each pipe system.

The residual quantities obtained in the test shall be entered in the inspection documents referred in marginal 210 381 (2) (c).

331 226

Cargo residue tanks and slop tanks

- (1) The vessel shall be provided with at least one cargo residue tank and one slop tank. These tanks shall be located only in the cargo area. Intermediate bulk containers or tank-containers in accordance with marginal 210 401 may be used instead of a fixed cargo residue tank. During filling of intermediate bulk containers or tank-containers, means for collecting possible leaks shall be placed under the filling connections.

331 226

- (2) Slop tanks shall be fire resistant and shall be capable of being closed with lids

(cont'd) (e.g. drums with lids fastened by hoops). The tanks shall be marked and easy to handle.

(3) The maximum permissible capacity of a cargo residue tank is 30 m³.

The cargo residue tanks shall be equipped with:

in the case of an open system:

- a device for ensuring pressure equilibrium;
- an ullage opening;
- connections, with stop valves, for pipes and hoses;

in the case of a protected system:

- a device for ensuring pressure equilibrium, fitted with flame arresters;
- an ullage opening;
- connections, with stop valves, for pipes and hoses;

in the case of a closed system:

- pressure/vacuum valves with flame arresters;
- a gauging device;
- connections, with stop valves, for pipes and hoses.

No connection between the cargo residue tanks and the gas vent header of the cargo tanks is permitted.

331 227

331 228 Water-spray system

When water-spraying is required in the list of substances of Appendix 4, a water-spray system shall be installed in the cargo area on deck for the purpose of reducing vapours given off by the cargo, and of cooling the tops of cargo tanks by sprinkling water on their whole surface.

The system shall be fitted with a connection device for supply from the shore. The system shall be capable of being put into operation from the wheelhouse and from the deck.

The capacity of the water-spray system shall be such that when all the spray nozzles are in operation, the outflow is of 50 litres per square metre of deck and per hour.

**331 229-
331 230**

331 231 Machinery

(1) Only internal combustion engines running on fuel with a flashpoint of more than 55° C are allowed.

331 231 (2) Air intakes of the engines shall be located not less than 2 m away from the cargo

(cont'd) area.

(3) There shall be no sparking within the cargo area.

(4) The external temperature of the outer parts of engines used during loading or unloading operations, as well as that of their ventilation and exhaust-gas ducts shall not exceed the allowable temperature according to the temperature class.

This provision does not apply to service spaces where engines conforming completely to the provisions of marginal 331 252 (3) (b) are installed.

(5) The ventilation in the closed engine room shall be designed so that, at an ambient temperature of 20 °C, the average temperature in the engine room does not exceed 40 °C.

331 232 Oil fuel tanks

(1) Double bottoms within the cargo area may be arranged as oil fuel tanks, provided their depth is not less than 0.60 m.

Oil fuel pipes and openings of such tanks are not permitted in the hold space.

(2) The ventilation pipes of all oil fuel tanks shall lead to 0.5m above the open deck. Their open ends and the open ends of overflow pipes leading on deck shall be provided with a protective device consisting of a grid or a perforated plate.

331 233

331 234 Engine exhaust pipes

(1) Exhaust gases shall be evacuated from the vessel into the open air either upwards through an exhaust pipe or through the shell plating. The exhaust outlet shall be located not less than 2 m from the cargo area. The exhaust pipes of engines shall be arranged so that the exhaust gases are blown away from the vessel.

The exhaust pipes shall not be located within the cargo area.

(2) Engine exhaust pipes shall be provided with a device preventing the escape of sparks, such as spark arresters.

331 235 Bilge pumping and ballasting arrangements

(1) Bilge and ballast pumps for spaces within the cargo area shall be installed within such area.

This provision does not apply to double-hull spaces and double bottoms if they do not have a wall common to the cargo tanks, and to cofferdams which may be filled with a ballast pump located in the engine room and emptied with eductors installed in the cargo area.

331 235
(cont'd)

- (2) Where the double bottom is used as an oil fuel tank, it shall not be connected to the bilge piping system.
- (3) Where the ballast pump is installed in the cargo area, the fixed piping and its outboard connection for suction of ballast water shall be located within the cargo area.
- (4) A cargo pump-room below deck shall be capable of being drained in an emergency by an installation located in the cargo area and independent from any other installation.

331 236-
331 239

331 240 **Fire-extinguishing systems**

- (1) A fire-extinguishing system shall be installed on the vessel.
This system shall comply with the following requirements:
- It shall be supplied by two independent fire or ballast pumps, one of which shall be ready for use at any time. These pumps shall not be installed in the same space;
 - It shall be provided with a water main fitted with at least three hydrants in the cargo area above deck. Three suitable and sufficiently long hoses with spray nozzles having a diameter of not less than 12 mm shall be provided. It shall be possible to reach any point of the deck in the protected area simultaneously with at least two jets of water which do not emanate from the same hydrant;
- A spring-loaded non-return valve shall be fitted to ensure that no gases can escape through the fire-extinguishing system into the accommodation or service spaces outside the cargo area;
- The capacity of the system shall be at least sufficient for a jet of water to reach a distance of not less than the vessel's breadth from any location on board with two spray nozzles being used at the same time.
- (2) In addition the engine room, the cargo pump-room and all spaces containing essential equipment under deck (diesel generators, switchboards, compressor, etc.) for the refrigeration equipment, if any, shall be provided with a fixed fire-extinguishing system which can be operated from the deck.
- (3) The two hand fire-extinguishers referred to in marginal 210 240 shall be located in the cargo area.

331 241 Fire and naked light

- (1) The outlets of funnels shall be located not less than 2 m away from the cargo area. Arrangements shall be provided to prevent the escape of sparks and the entry of water.
- (2) Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels. The installation in the engine room or in other separate space of heating appliances fuelled with liquid fuel having a flash-point above 55 °C is, however, permitted. Cooking and refrigerating appliances are permitted only in the accommodation.
- (3) Only electrical lighting appliances are permitted.

331 242 Cargo heating system

- (1) Boilers which are used for heating the cargo shall be fuelled with a liquid fuel having a flashpoint of more than 55 °C and shall be placed either in the engine room or in other special space below deck and outside the cargo area, which is accessible from the engine room or from the deck.
- (2) The cargo heating system shall be designed so that the cargo may not pass into the boiler in the case of a leak in the heating coils. A cargo heating system with artificial draught shall be ignited electrically.
- (3) The power of the ventilation system of the engine room shall be determined taking into account the air required for the boilers.
- (4) Where the cargo heating system is used during loading, unloading or gas-freeing, the service space which contains this system shall comply entirely with the requirements of marginal 331 252 (3) (b).

**331 243-
331 249**

331 250 Documents concerning electrical installations

- (1) In addition to the documents required by the "Recommendations on Technical Requirements for Inland Navigation Vessels"^{*/}, the following documents shall be on board:
 - (a) a drawing indicating the boundaries of the cargo area and the location of the electrical machines, appliances or other equipment installed in this area;
 - (b) a list of the electrical machines, appliances or other equipment referred to in (a) above including the following particulars:

^{*/} Annex to the revised Resolution No.17 of the Principal Working Party on Inland Water Transport of the Inland Transport Committee of the Economic Commission for Europe.

**331 250
(cont'd)**

machine or appliance, location, type of protection, type of protection against explosion, testing body and approval number;

- (c) a list of or general plan indicating the electrical machines, appliances or other electrical equipment outside the cargo area which may be operated during loading, unloading or gas-freeing. All other electrical machines, appliances or equipment shall be marked in red. See marginal 331 252 (3) and (4).
- (2) The documents listed above shall bear the stamp of the competent authority issuing the certificate of approval.

331 251 Electrical installations

- (1) Only distribution systems without return connection to the hull are permitted:

This provision does not apply to:

- certain limited parts of the installation located outside the cargo area (e.g. connections of starters of diesel engines);
 - the device for checking the insulation level referred to in (2) below.
- (2) Every insulated distribution network shall be fitted with an independent device with a visual and audible alarm for checking the insulation level.
- (3) For the selection of electrical equipment to be used in zones presenting an explosion risk, the explosion groups and temperature classes assigned to the substances carried in the list of substances of Appendix 4 shall be taken into consideration.

331 252 Type and location of electrical installations

- (1) (a) Only the following equipments are permitted in cargo tanks, cargo residue tanks, and pipes for loading and unloading (comparable to zone 0):
- measuring, control and alarm devices of the EEx (ia) type of protection;
- (b) Only the following equipments are permitted in the hold spaces :
- measuring, control and alarm devices of the "certified safe" type;
 - lighting appliances of the "flame-proof enclosure" or "pressurized apparatus" type of protection;
 - hermetically sealed echo sounding devices the cables of which are led through thick-walled steel tubes with gastight connections up to the main deck;

331 252
(cont'd)

- cables for the active cathodic protection of the shell plating in protective steel tubes such as those provided for echo sounding devices;
- (c) Only the following equipments are permitted in the service spaces in the cargo area below deck (comparable to zone 1):
 - measuring, control and alarm devices of the "certified safe" type;
 - lighting appliances of the "flame-proof enclosure" or "pressurized apparatus" type of protection;
 - motors driving essential equipment such as ballast pumps; they shall be of the "certified safe" type;
- (d) The control and protective equipment of the installations referred to in paragraphs (a), (b) and (c) above shall be located outside the cargo area if they are not intrinsically safe;
- (e) The electrical installations in the cargo area on deck (comparable to zone 1) shall be of the "certified safe" type.
- (2) Accumulators shall be located outside the cargo area.
- (3) (a) Electrical installations used during loading, unloading and gas-freeing during berthing and which are located outside the cargo area shall (comparable to zone 2) be at least of the "limited explosion risk" type;
- (b) This provision shall not apply to the electrical installations in the accommodation, the wheelhouse or the service spaces outside the cargo areas if:
 - these spaces are fitted with a ventilation system ensuring an overpressure of 0.1 kPa (0.001 bar) and none of the windows is capable of being opened; the air intakes of the ventilation system shall be located as far away as possible, however, not less than 6 m from the cargo area and not less than 2 m above the deck;
 - the spaces are fitted with a gas detection system with sensors:
 - at the suction inlets of the ventilation system;
 - directly at the top edge of the sill of the entrance doors of the accommodation and service spaces;
 - the gas concentration measurement is continuous;
 - when the gas concentration reaches 30 % of the lower explosive limit, the ventilators are switched off. In such a case and when the overpressure is not maintained or in the event of failure of the gas detection system, the electrical installations which do not comply with (a) above, shall be switched off. These operations shall be performed immediately and automatically and activate the emergency lighting in the accommodation, the wheelhouse and the

331 252
(cont'd)

service spaces, which shall comply at least with the "limited explosion risk" type. The switch off shall be indicated in the accommodation and wheelhouse by visual and audible signals;

- the ventilation system, the gas detection system and the alarm of the shut off device shall comply completely with the requirements of (a) above;
- the automatic switch off device is set so that no automatic switch off may occur while the vessel is under way.

(4) The electrical installations which do not meet the requirements set out in (3) above together with their switchgear shall be marked in red. The disconnection of such installations shall be operated from a centralized location on board.

(5) An electric generator which is permanently driven by an engine and which does not meet the requirements of paragraph (3) above, shall be fitted with a multipolar switch capable of switching off all external circuits and excitation circuits. A notice board with the operating instructions shall be displayed near the switch.

(6) Sockets for the connection of signal lights and gangway lighting shall be permanently fitted to the vessel close to the signal mast or the gangway. Connecting and disconnecting shall not be possible except when the sockets are not live.

(7) The failure of the power supply for the safety and control equipment shall be immediately indicated by visual and audible signals at the locations where the alarms are usually actuated.

331 253

Earthing

(1) The metallic parts of electrical appliances in the cargo area which are not live as well as protective metal tubes or metal sheaths of cables in normal service shall be earthed, unless they are so arranged that they are automatically earthed by bonding to metal structure of the vessel.

(2) The provisions of paragraph (1) above apply also to installations having service voltages of less than 50 V.

(3) Independent cargo tanks, metallic intermediate bulk containers and tank-containers shall be earthed.

331 254-
331 255

331 256 Electrical cables

- (1) All cables in the cargo area shall have a metallic sheath.
- (2) Cables and sockets in the cargo area shall be protected against mechanical damage.
- (3) Movable cables are prohibited in the cargo area, except for intrinsically safe electric circuits or for the supply of signal lights and gangway lighting.
- (4) Cables of intrinsically safe circuits shall only be used for such circuits and shall be separated from other cables not intended for being used in such circuits (e.g. they shall not be installed together in the same string of cables and they shall not be fixed by the same cable clamps).
- (5) For movable cables intended for signal lights and gangway lighting, only sheathed cables of type H 07 RN-F in accordance with 245 IEC 66 or cables of at least equivalent design having conductors with a cross-section of not less than 1.5 mm² shall be used.

These cables shall be as short as possible and installed so that accidental damage is not likely to occur.

331 257-**331 259****331 260 Special equipment**

A shower and an eye and face bath shall be provided on the vessel at a location which is directly accessible from the cargo area.

331 261-**331 270****331 271 Admittance on board**

The notice boards displaying the prohibition of admittance in accordance with marginal 210 371 shall be easily legible from either side of the vessel.

331 272-**331 273****331 274 Prohibition of smoking**

- (1) The notice boards displaying the prohibition of smoking in accordance with marginal 210 374 shall be easily legible from either side of the vessel.
- (2) Notice boards shall be fitted at the entrances of spaces where smoking or the use of fire or naked light is sometimes prohibited, indicating in which circumstances the prohibition is applicable.
- (3) Ashtrays shall be provided in the accommodation and wheelhouse, close to each exit.

331 275**331 999**

ANNEX B.2
APPENDICES

APPENDIX 1

Model 1

Model for a certificate of approval

Competent authority :
 Space reserved for the emblem and name of the State

Certificate of approval No:

According to Annex B.2, marginal 210 282, ADN

1. Name of vessel

2. Official number

3. Type of vessel

4. Type of tank vessel

5. Types of cargo tanks 1. Independent cargo tanks 1/ 2/
 2.
 3.

6. Types of cargo tanks 1. Pressure cargo tanks 1/ 2/
 2.
 3.
 4.

7. Opening pressure of high-velocity vent valves kPa 1/ 2/

8. Additional equipment:

- Sampling device

closed yes/no 1/ 2/
 partly closed yes/no 1/ 2/
 sampling opening .. yes/no 1/ 2/

- Water-spray system yes/no 1/ 2/

- Cargo heating system:

possibility of cargo heating from shore
 cargo heating installations on board

- Cargo refrigeration system yes/no 1/ 2/

- Cargo pump-room below deck yes/no 1/ 2/

9. Electrical installations:

- Temperature class:

- Explosion group:

10. Loading rate: m³/h

11. Permitted relative density:

12. Permitted derogations :

1/ Delete as appropriate.

2/ If the tanks are not all of the same type, see page 3.

13. The validity of this certificate of approval expires on (date)
14. The previous certificate of approval No was issued on
by (competent authority)
15. The vessel is approved for the carriage of dangerous goods listed in the attestation attached to this certificate following:
- inspection on 1/ (date)
 - certification by a recognized classification society 1/
 - Name of the classification society 1/ (date)
16. Subject to permitted equivalences: 1/
.....
.....
17. Subject to special authorizations: 1/
.....
.....
18. Issued at: on
(place) (date)
19. (Stamp)

1/ Delete as appropriate.

Extension of the validity of the certificate of approval

20. The validity of this certificate is extended under marginal 210 282 (4) of Annex B.2 of ADN
Until
(date)
21. on
(place) (date)
22. (Stamp)

[illegible]

APPENDIX 1
Model 2

Model for a provisional certificate of approval

Competent authority :
Space reserved for the emblem and name of the State

Provisional certificate of approval No:

According to Annex B.2, marginal 210 283, ADN

1. Name of vessel

2. Official number

3. Type of vessel

4. Type of tank vessel

5. Types of cargo tanks 1. Independent cargo tanks 1/ 2/
2.
3.

6. Types of cargo tanks 1. Pressure cargo tanks 1/ 2/
2.
3.
4.

7. Opening pressure of high-velocity vent valves kPa 1/ 2/

8. Additional equipment:

- Sampling device

closed yes/no 1/ 2/
partly closed yes/no 1/ 2/
sampling opening .. yes/no 1/ 2/

- Water-spray system yes/no 1/ 2/

- Cargo heating system:

possibility of cargo heating from shore
cargo heating installations on board

- Cargo refrigeration system yes/no 1/ 2/

- Cargo pump-room below deck yes/no 1/ 2/

9. Electrical installations:

- Temperature class:

- Explosion group:

10. Loading rate: m³/h

11. Permitted relative density:

12. Permitted derogations :
.....

1/ Delete as appropriate.

2/ If the tanks are not all of the same type, see page 3.

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) e

NOTE : *This model provisional certificate of approval may be replaced by a single certificate model combining a provisional certificate of inspection and the provisional certificate of approval, provided that this single certificate model contains the same particulars as the model below and is approved by the competent authorities.*

If the cargo tanks of the vessel are not all of the same type or the equipment is not the same, their type and their equipment should be indicated below.

[illegible]

Certificate of special knowledge of ADN according to
marginals 10 315, 210 315, 210 317 or 210 318

(see next page)
(Format: A6, Colour: orange)

(Space reserved for the emblem of State, competent
authority)

ADN certificate
of special knowledge of ADN

No of certificate:

Name:

First name(s):

Born on:

Nationality:

Signature of holder:

The holder of this certificate has special knowledge of ADN.

The certificate is valid for special knowledge of ADN according
to marginals 10 315/210 315, 210 317, 210 318 ^{*}/

until:

if it has not been extended during the period of validity following
participation in a refresher or advanced training course

Issued by:

Date:

(Stamp)

Signature of holder:

^{*}) Delete as appropriate.

(Recto)

(Verso)

Checklist ADN
(Marginal 210 410)

Concerning the observance of safety provisions and the implementation of the necessary measures for loading/unloading.

Particulars of vessel

.....
(name of vessel)

No
(official number)

.....
(vessel type)

Particulars of loading or unloading operations

.....
(shore loading or unloading installation)

.....
(place)

.....
(date)

.....
(time)

Particulars of the cargo

Quantity m³	Name of product	Identification number	Class/item number
.....
.....
.....

Particulars of last cargo */

Name of product	Identification number	Class/item number
.....
.....
.....

*/ To be filled in only if vessel is to be loaded.

Loading rate

Loading rate (not to be filled in if vessel is to be loaded with gas)							
Name of substance	Cargo tank number	agreed rate of loading/unloading					
		start		half way		end	
		rate m ³ /h	quantity m ³	rate m ³ /h	quantity m ³	rate m ³ /h	quantity m ³
.....					
.....					
.....					

Will the cargo piping be drained after loading or unloading by stripping or by blowing residual quantities to the shore installation ?

by blowing YES / NO */

by stripping YES / NO */

If drained by blowing, how ?

.....

(e.g. air, inert gas)

..... kPa

(pressure to be supplied)

Questions to the steersman and the person in charge at the loading/unloading place

Loading/unloading may only be started after all questions on the checklist have been checked off by "X", i.e. answered with YES and the list has been signed by both persons.

Non applicable questions have to be deleted.

If not all questions can be answered with YES, loading/unloading is only allowed with consent of the local competent authorities.

*/ Delete as appropriate.

	vessel	loading/unloading place
1. Is the vessel permitted to carry this cargo?	o */	o */
2. Did the steersman receive the instructions in writing referred to in marginal 210 385 from the consignor ?	o */	o */
3. Is the vessel well moored in view of local circumstances ?	o	-
4. Have suitable means been provided at the fore and at the aft of the vessel, for boarding or leaving, including in cases of emergency ?	o	o
5. Are the escape routes and the loading/unloading place adequately lighted ?	o	o
6. Vessel/shore connection		
6.1 Are the cargo hoses between vessel and shore in satisfactory condition?	-	o
Are these hoses correctly connected?	o	o
6.2 Are all the connecting flanges fitted with suitable gaskets ?	-	o
6.3 Are all the connecting bolts fitted and tightened ?	o	o
6.4 Are the shoreside loading arms free to move in all directions and do the hoses have enough room for easy movement ?	-	o
7. Are all flanges of the connections of the pipes for loading and unloading and of the vent header not in use, correctly blanked off ?	o	o
8. Are suitable means of collecting leakages placed under the pipe connections which are in use ?	o	o
9. Are the movable connecting pieces between the ballast and bilge piping on the one hand and the pipes for loading and unloading on the other hand disconnected ?	o	-
10. Is continuous and suitable supervision of loading/unloading ensured for the whole period of the operation ?	o	o
11. Is communication between vessel and shore ensured ?	o	o
12.1 Is the vent header, where required, or if it exists, connected with the shore gas return line ?	o	o
12.2 Is it ensured that the shore installation is such that the pressure at the connecting point cannot exceed the opening pressure of the high-velocity vent valves (...kPa) ?	o	o
13. Is it known what actions are to be taken in the event of an "Emergency-stop" and an "Alarm" ?	o	o

*/ To be filled in only if vessel is to be loaded.

	vessel	loading/unloading place
<p>14. Check on the most important operational requirements:</p> <ul style="list-style-type: none"> - Are the required fire extinguishing systems and appliances operational ? - Have all valves and other closing devices been checked for correct open - or closed position ? - Has smoking been generally prohibited ? - Are the flame-operated heating, cooking and cooling appliances on board turned off ? - Are the liquefied gas installations shut off at the main check valve ? - Are all the sockets of electrical appliances disconnected from the electric circuit ? - Is the voltage cut off from the radar installations ? - Are all electrical installations marked red switched off ? - Are all windows and doors closed ? 	<p>o</p> <p>o</p> <p>o</p> <p>o</p> <p>o</p> <p>o</p> <p>o</p> <p>o</p>	<p>o</p> <p>o</p> <p>o</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p> <p>-</p>
15. Has the starting working pressure of the vessel's cargo discharge pump been adjusted to the permissible working pressure of the shore installation ?	o	-
16. Is the liquid level alarm-installation operational ?	o	-
17. Is the level control device activating the overflowing prevention system plugged-in, in working order and tested ?	o	o
<p>18. To be filled in only in the case of loading or unloading of substances for the carriage of which a vessel of the closed type or a vessel of the open type with flame arrester is required.</p> <p>Are the cargo tank hatches and cargo tank inspection, gauging and sampling openings closed or protected by flame arresters in good condition ?</p>	o	-
<p>Checked, filled in and signed</p> <p>for the vessel:</p> <p>.....</p> <p>name (in capital letters)</p> <p>.....</p> <p>(signature)</p>		
<p>.....</p> <p>name (in capital letters)</p> <p>.....</p> <p>(signature)</p>		

Explanation

Question 3

"Well moored" means that the vessel is fastened to the pier or the cargo transfer station in such a way that, without intervention of a third person, movements of the vessel in any direction that could hamper the operation of the cargo transfer gear will be prevented. Established or predictable variations of the water-level at that location and special factors have to be taken into account.

Question 4

It must be possible to board or escape from the vessel at any time. If there is none or only one protected escape route available at the shoreside for a quick escape from the vessel in case of emergency, a suitable means of escape has to be provided on the vessel side (e.g. a lowered dinghy).

Question 6

A valid inspection certificate for the loading/unloading hoses must be available on board. The material of the hoses must be able to withstand the expected loads and be suitable for cargo transfer of the respective substances. The term cargo hoses includes hoses as well as the shoreside loading/discharging arms. The cargo transfer hoses between vessel and shore must be placed so that they cannot be damaged by variations of the water-level, passing vessels and/or loading/unloading operations.

All flange connections are to be fitted with appropriate gaskets and sufficient bolt connections in order to exclude the possibility of leakage.

Question 10

Loading/unloading must be supervised on board and ashore so that dangers which may occur in the vicinity of cargo hoses can be recognized immediately.

Question 11

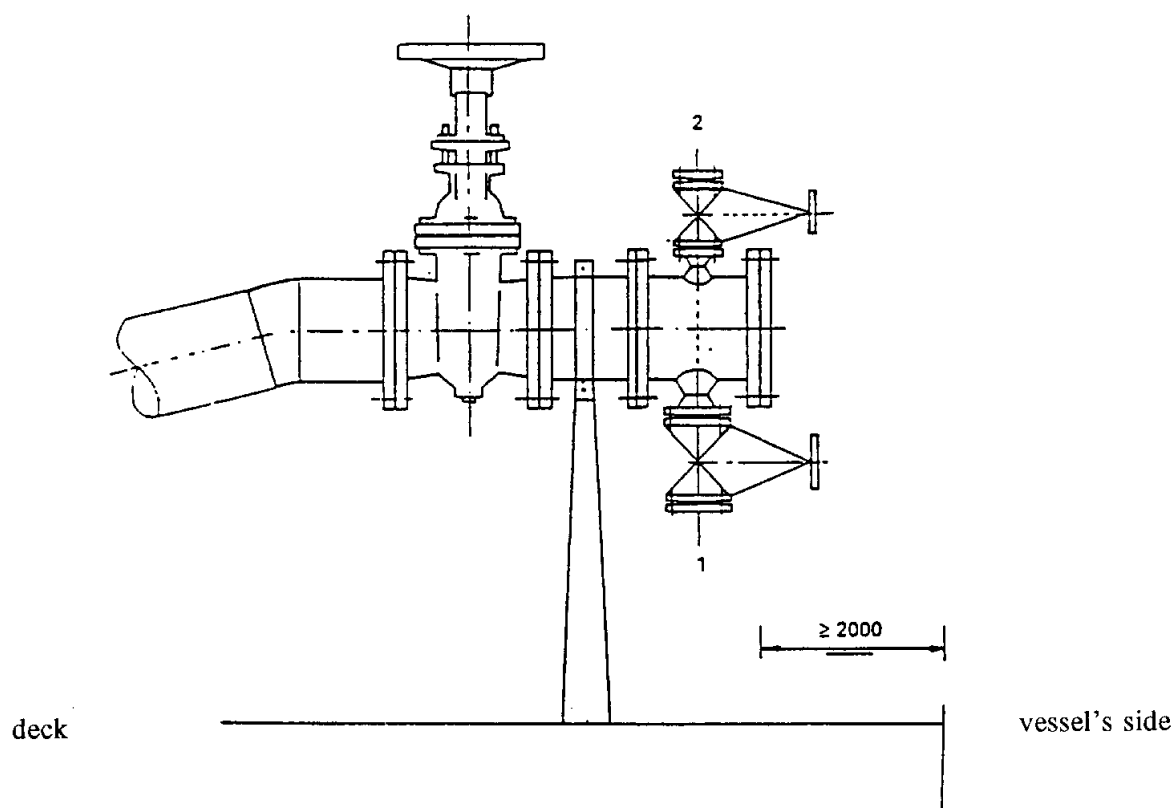
For a safe loading/unloading operation good communications between vessel and shore are required. For this purpose telephone and radio equipment may be used only if of an explosion protected type and located within reach of the supervisor.

Question 13

Before the start of the loading/unloading operation the representative of the shore installation and the master must agree on the applicable procedure. The specific properties of the substances to be loaded/unloaded have to be taken into account.

APPENDIX 3
Model 1

DEVICE FOR THE DISCHARGE OF RESIDUAL QUANTITIES



1. Connection for the discharge of residual quantities
Connection conforming to CEFIC
2. Connection of the shore installation intended for blowing residual quantities to the shore installation
by means of a gas under pressure
Connection conforming to CEFIC

Test of the stripping system

- (1) Before the start of the test, the cargo tanks and their piping shall be clean. The cargo tanks shall be safe for entry.
- (2) During the test, the trim and list of the vessel shall not exceed normal operating values.
- (3) During the test, a back pressure of not less than 300 kPa (3 bar) shall be maintained at the device for discharge of residual quantities fitted on the pipe for unloading.
- (4) The test shall comprise :
 - (a) The filling of the cargo tank with water until the suction intake inside the tank is submerged;
 - (b) The pumping out of the water and the emptying of the cargo tank and the corresponding piping by means of the tank's stripping system;
 - (c) The collection of the remaining water at the following points:

The cargo tank suction intake;

The bottom of the cargo tank where water has collected;

The lowest point drain of the cargo pump;

At all the lowest points of the piping associated with the cargo tank up to the device for the discharge of residual quantities.
- (5) The quantity of water collected as described in paragraph (4) (c) shall be measured precisely and noted in the test certificate.
- (6) The competent authority or the recognized classification society shall set out all the operations required for the test in the test certificate.

This certificate shall include at least the following data:

trim of the vessel during the test;

list of the vessel during the test;

tank unloading order;

back pressure at the device for the discharge of residual quantities;

residual quantity per tank;

residual quantity per piping system;

duration of the stripping operation;

cargo tank plan, duly completed.

APPENDIX 3
Model 3

Certificate for the test of the stripping system

1. Name of vessel:
2. Official number:
3. Type of tank vessel:
4. Number of certificate of approval:
5. Date of test:
6. Place of test:
7. Number of cargo tanks:
8. The following residual quantities were measured during the test

Tank 1:	litres	Tank 2:	litres
Tank 3:	litres	Tank 4:	litres
Tank 5:	litres	Tank 6:	litres
Tank 7:	litres	Tank 8:	litres
Tank 9:	litres	Tank 10:	litres
Tank 11:	litres	Tank 12:	litres
Slop tank 1:	litres	Slop tank 2:	litres
Slop tank 3:	litres		
Piping system 1:	litres		
Piping system 2:	litres		
9. During the test, the back pressure at the device for the discharge of residual quantities was bar.
10. The tanks were discharged in the following order:

tank, tank, tank, tank, tank,
tank, tank, tank, tank, tank,
11. During the test, the trim of the vessel was
and the list of the vessel was
12. The total duration of the stripping operation was h.

.....
(date)

)