

CHAPTER 9.1

RULES FOR CONSTRUCTION OF DRY CARGO VESSELS

9.1.0 Rules for construction applicable to dry cargo vessels

Provisions of 9.1.0.0 to 9.1.0.79 apply to dry cargo vessels.

9.1.0.0 *Materials of construction*

The vessel's hull shall be constructed of shipbuilding steel or other metal, provided that this metal has at least equivalent mechanical properties and resistance to the effects of temperature and fire.

9.1.0.1-
9.1.0.10 (*Reserved*)

9.1.0.11 **Holds**

9.1.0.11.1 (a) Each hold shall be bounded fore and aft by watertight metal bulkheads.

(b) The holds shall have no common bulkhead with the oil fuel tanks.

9.1.0.11.2 The bottom of the holds shall be such as to permit them to be cleaned and dried.

9.1.0.11.3 The hatchway covers shall be spraytight and weathertight or be covered by waterproof tarpaulins.

Tarpaulins used to cover the holds shall not readily ignite.

9.1.0.11.4 No heating appliances shall be installed in the holds.

9.1.0.12 *Ventilation*

9.1.0.12.1 It must be possible to ventilate each hold by means of two mutually independent extraction ventilators having a capacity of not less than five changes of air per hour based on the volume of the empty hold. The ventilator fan shall be designed so that no sparks may be emitted on contact of the impeller blades with the housing and no static electricity may be generated. The extraction ducts shall be positioned at the extreme ends of the hold and extend down to not more than 50 mm above the bottom. The extraction of gases and vapours through the duct shall also be ensured for carriage in bulk.

If the extraction ducts are movable they shall be suitable for the ventilator assembly and capable of being firmly fixed. Protection shall be ensured against bad weather and spray. The air intake shall be ensured during ventilation.

9.1.0.12.2 The ventilation system of a hold shall be arranged so that dangerous gases cannot penetrate into the accommodation, wheelhouse or engine rooms.

9.1.0.12.3 Ventilation shall be provided for the accommodation and for service spaces.

9.1.0.13-
9.1.0.16 (*Reserved*)

9.1.0.17 ***Accommodation and service spaces***

9.1.0.17.1 The accommodation shall be separated from the holds by metal bulkheads having no openings.

9.1.0.17.2 Gastight closing appliances shall be provided for openings in the accommodation and wheelhouse facing the holds.



9.1.0.17.3 No entrances or openings of the engine rooms and service spaces shall face the protected area.



9.1.0.18-
9.1.0.19 (*Reserved*)

9.1.0.20 ***Water ballast***

The double-hull spaces and double bottoms may be arranged for being filled with water ballast.

9.1.0.21-
9.1.0.30 (*Reserved*)

9.1.0.31 ***Engines***

9.1.0.31.1 Only internal combustion engines running on fuel having a flashpoint above 55 °C are allowed.

9.1.0.31.2 The air vents in the engine rooms and the air intakes of the engines which do not take air in directly from the engine room shall be located not less than 2.00 m from the protected area.



9.1.0.31.3 Sparking shall not be possible in the protected area.

9.1.0.32 ***Oil fuel tanks***

9.1.0.32.1 Double bottoms within the hold area may be arranged as oil fuel tanks provided their depth is not less than 0.6 m. Oil fuel pipes and openings to such tanks are not permitted in the holds.

9.1.0.32.2 The air pipes of all oil fuel tanks shall be led to 0.50 m above the open deck. Their open ends and the open ends of the overflow pipes leading to the deck shall be fitted with a protective device consisting of a gauze grid or by a perforated plate.



9.1.0.33 (*Reserved*)

9.1.0.34 ***Exhaust pipes***

9.1.0.34.1 Exhausts 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 2.00 m from the hatchway openings. The exhaust pipes of engines shall be arranged so that the exhausts are led away from the vessel. The exhaust pipes shall not be located within the protected area.



9.1.0.34.2 Exhaust pipes shall be provided with a device preventing the escape of sparks, e.g. spark arresters.

9.1.0.35 ***Stripping installation***



The stripping pumps intended for the holds shall be located in the protected area. This requirement shall not apply when stripping is effected by eductors.

9.1.0.36-
9.1.0.39 (*Reserved*)

9.1.0.40 ***Fire-extinguishing arrangements***

9.1.0.40.1 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 and their means of propulsion and electrical equipment shall not be installed in the same space;
- It shall be provided with a water main fitted with at least three hydrants in the protected 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 protected 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.

A single fire or ballast pump shall suffice on board pushed barges without their own means of propulsion.

9.1.0.40.2 In addition, the engine rooms shall be provided with a permanently fixed fire-extinguishing system meeting the following requirements:



9.1.0.40.2.1 ***Extinguishing agents***

For the protection of spaces in engine rooms, boiler rooms and pump rooms, only permanently fixed fire-extinguishing systems using the following extinguishing agents are permitted:

- (a) CO₂ (carbon dioxide);
- (b) HFC 227 ea (heptafluoropropane);
- (c) IG-541 (52% nitrogen, 40% argon, 8% carbon dioxide);
- (d) FK-5-1-12 (dodecafluoro 2-methylpentane-3-one).

Other extinguishing agents are permitted only on the basis of recommendations by the Administrative Committee.

9.1.0.40.2.2 *Ventilation, air extraction*

- (a) The combustion air required by the combustion engines which ensure propulsion should not come from spaces protected by permanently fixed fire-extinguishing systems. This requirement is not mandatory if the vessel has two independent main engine rooms with a gastight separation or if, in addition to the main engine room, there is a separate engine room installed with a bow thruster that can independently ensure propulsion in the event of a fire in the main engine room.
- (b) All forced ventilation systems in the space to be protected shall be shut down automatically as soon as the fire-extinguishing system is activated.
- (c) All openings in the space to be protected which permit air to enter or gas to escape shall be fitted with devices enabling them to be closed rapidly. It shall be clear whether they are open or closed.
- (d) Air escaping from the pressure-relief valves of the pressurised air tanks installed in the engine rooms shall be evacuated to the open air.
- (e) Overpressure or negative pressure caused by the diffusion of the extinguishing agent shall not destroy the constituent elements of the space to be protected. It shall be possible to ensure the safe equalisation of pressure.
- (f) Protected spaces shall be provided with a means of extracting the extinguishing agent. If extraction devices are installed, it shall not be possible to start them up during extinguishing.

9.1.0.40.2.3 *Fire alarm system*

The space to be protected shall be monitored by an appropriate fire alarm system. The alarm signal shall be audible in the wheelhouse, the accommodation and the space to be protected.

9.1.0.40.2.4 *Piping system*

- (a) The extinguishing agent shall be routed to and distributed in the space to be protected by means of a permanent piping system. Piping installed in the space to be protected and the reinforcements it incorporates shall be made of steel. This shall not apply to the connecting nozzles of tanks and compensators provided that the materials used have equivalent fire-retardant properties. Piping shall be protected against corrosion both internally and externally.
- (b) The discharge nozzles shall be so arranged as to ensure the regular diffusion of the extinguishing agent. In particular, the extinguishing agent must also be effective beneath the floor.

9.1.0.40.2.5 *Triggering device*

- (a) Automatically activated fire-extinguishing systems are not permitted.
- (b) It shall be possible to activate the fire-extinguishing system from a suitable point located outside the space to be protected.
- (c) Triggering devices shall be so installed that they can be activated in the event of a fire and so that the risk of their breakdown in the event of a fire or an explosion in the space to be protected is reduced as far as possible.

Systems which are not mechanically activated shall be supplied from two energy sources independent of each other. These energy sources shall be located outside the space to be protected. The control lines located in the space to be protected shall be so designed as to remain capable of operating in the event of a fire for a minimum of 30 minutes. The electrical installations are deemed to meet this requirement if they conform to the IEC 60331-21:1999 standard.

When the triggering devices are so placed as not to be visible, the component concealing them shall carry the “Fire-fighting system” symbol, each side being not less than 10 cm in length, with the following text in red letters on a white ground:

Fire-extinguishing system

- (d) If the fire-extinguishing system is intended to protect several spaces, it shall comprise a separate and clearly-marked triggering device for each space;
- (e) The instructions shall be posted alongside all triggering devices and shall be clearly visible and indelible. The instructions shall be in a language the master can read and understand and if this language is not English, French or German, they shall be in English, French or German. They shall include information concerning:
 - (i) the activation of the fire-extinguishing system;
 - (ii) the need to ensure that all persons have left the space to be protected;
 - (iii) The correct behaviour of the crew in the event of activation and when accessing the space to be protected following activation or diffusion, in particular in respect of the possible presence of dangerous substances;
 - (iv) the correct behaviour of the crew in the event of the failure of the fire-extinguishing system to function properly.
- (f) The instructions shall mention that prior to the activation of the fire-extinguishing system, combustion engines installed in the space and aspirating air from the space to be protected, shall be shut down.

9.1.0.40.2.6 *Alarm device*

- (a) Permanently fixed fire-extinguishing systems shall be fitted with an audible and visual alarm device;
- (b) The alarm device shall be set off automatically as soon as the fire-extinguishing system is first activated. The alarm device shall function for an appropriate period of time before the extinguishing agent is released; it shall not be possible to turn it off;
- (c) Alarm signals shall be clearly visible in the spaces to be protected and their access points and be clearly audible under operating conditions corresponding to the highest possible sound level. It shall be possible to distinguish them clearly from all other sound and visual signals in the space to be protected;
- (d) Sound alarms shall also be clearly audible in adjoining spaces, with the communicating doors shut, and under operating conditions corresponding to the highest possible sound level;
- (e) If the alarm device is not intrinsically protected against short circuits, broken wires and drops in voltage, it shall be possible to monitor its operation;

- (f) A sign with the following text in red letters on a white ground shall be clearly posted at the entrance to any space the extinguishing agent may reach:

Warning, fire-extinguishing system!
Leave this space immediately when the ... (description) alarm is activated!

9.1.0.40.2.7 *Pressurised tanks, fittings and piping*

- (a) Pressurised tanks, fittings and piping shall conform to the requirements of the competent authority.
- (b) Pressurised tanks shall be installed in accordance with the manufacturer's instructions.
- (c) Pressurised tanks, fittings and piping shall not be installed in the accommodation.
- (d) The temperature of cabinets and storage spaces for pressurised tanks shall not exceed 50 °C.
- (e) Cabinets or storage spaces on deck shall be securely stowed and shall have vents so placed that in the event of a pressurised tank not being gastight, the escaping gas cannot penetrate into the vessel. Direct connections with other spaces are not permitted.

9.1.0.40.2.8 *Quantity of extinguishing agent*

If the quantity of extinguishing agent is intended for more than one space, the quantity of extinguishing agent available does not need to be greater than the quantity required for the largest of the spaces thus protected.

9.1.0.40.2.9 *Installation, maintenance, monitoring and documents*

- (a) The mounting or modification of the system shall only be performed by a company specialised in fire-extinguishing systems. The instructions (product data sheet, safety data sheet) provided by the manufacturer of the extinguishing agent or the system shall be followed.
- (b) The system shall be inspected by an expert:
 - (i) before being brought into service;
 - (ii) each time it is put back into service after activation;
 - (iii) after every modification or repair;
 - (iv) regularly, not less than every two years.
- (c) During the inspection, the expert is required to check that the system conforms to the requirements of 9.1.0.40.2.
- (d) The inspection shall include, as a minimum:
 - (i) an external inspection of the entire system;
 - (ii) an inspection to ensure that the piping is leakproof;

- (iii) an inspection to ensure that the control and activation systems are in good working order;
 - (iv) an inspection of the pressure and contents of tanks;
 - (v) an inspection to ensure that the means of closing the space to be protected are leakproof;
 - (vi) an inspection of the fire alarm system;
 - (vii) an inspection of the alarm device.
- (e) The person performing the inspection shall establish, sign and date a certificate of inspection.
 - (f) The number of permanently fixed fire-extinguishing systems shall be mentioned in the inspection certificate.

9.1.0.40.2.10 *Fire-extinguishing system operating with CO₂*

In addition to the requirements contained in 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using CO₂ as an extinguishing agent shall conform to the following provisions:

- (a) Tanks of CO₂ shall be placed in a gastight space or cabinet separated from other spaces. The doors of such storage spaces and cabinets shall open outwards; they shall be capable of being locked and shall carry on the outside the symbol “Warning: general danger,” not less than 5 cm high and “CO₂” in the same colours and the same size;
- (b) Storage cabinets or spaces for CO₂ tanks located below deck shall only be accessible from the outside. These spaces shall have an artificial ventilation system with extractor hoods and shall be completely independent of the other ventilation systems on board;
- (c) The level of filling of CO₂ tanks shall not exceed 0.75 kg/l. The volume of depressurised CO₂ shall be taken to be 0.56 m³/kg;
- (d) The concentration of CO₂ in the space to be protected shall be not less than 40% of the gross volume of the space. This quantity shall be released within 120 seconds. It shall be possible to monitor whether diffusion is proceeding correctly;
- (e) The opening of the tank valves and the control of the diffusing valve shall correspond to two different operations;
- (f) The appropriate period of time mentioned in 9.1.0.40.2.6 (b) shall be not less than 20 seconds. A reliable installation shall ensure the timing of the diffusion of CO₂.

9.1.0.40.2.11 *Fire-extinguishing system operating with HFC-227 ea (heptafluoropropane)*

In addition to the requirements of 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using HFC-227 ea as an extinguishing agent shall conform to the following provisions:

- (a) Where there are several spaces with different gross volumes, each space shall be equipped with its own fire-extinguishing system;

- (b) Every tank containing HFC-227 ea placed in the space to be protected shall be fitted with a device to prevent overpressure. This device shall ensure that the contents of the tank are safely diffused in the space to be protected if the tank is subjected to fire, when the fire-extinguishing system has not been brought into service;
- (c) Every tank shall be fitted with a device permitting control of the gas pressure;
- (d) The level of filling of tanks shall not exceed 1.15 kg/l. The specific volume of depressurised HFC-227 ea shall be taken to be 0.1374 m³/kg;
- (e) The concentration of HFC-227 ea in the space to be protected shall be not less than 8% of the gross volume of the space. This quantity shall be released within 10 seconds;
- (f) Tanks of HFC-227 ea shall be fitted with a pressure monitoring device which triggers an audible and visual alarm in the wheelhouse in the event of an unscheduled loss of propellant gas. Where there is no wheelhouse, the alarm shall be triggered outside the space to be protected;
- (g) After discharge, the concentration in the space to be protected shall not exceed 10.5% (volume);
- (h) The fire-extinguishing system shall not comprise aluminium parts.

9.1.0.40.2.12 *Fire-extinguishing system operating with IG-541*

In addition to the requirements of 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using IG-541 as an extinguishing agent shall conform to the following provisions:

- (a) Where there are several spaces with different gross volumes, every space shall be equipped with its own fire-extinguishing system;
- (b) Every tank containing IG-541 placed in the space to be protected shall be fitted with a device to prevent overpressure. This device shall ensure that the contents of the tank are safely diffused in the space to be protected if the tank is subjected to fire, when the fire-extinguishing system has not been brought into service;
- (c) Each tank shall be fitted with a device for checking the contents;
- (d) The filling pressure of the tanks shall not exceed 200 bar at a temperature of +15 °C;
- (e) The concentration of IG-541 in the space to be protected shall be not less than 44% and not more than 50% of the gross volume of the space. This quantity shall be released within 120 seconds.

9.1.0.40.2.13 *Fire-extinguishing system operating with FK-5-1-12*

In addition to the requirements of 9.1.0.40.2.1 to 9.1.0.40.2.9, fire-extinguishing systems using FK-5-1-12 as an extinguishing agent shall comply with the following provisions:

- (a) Where there are several spaces with different gross volumes, every space shall be equipped with its own fire-extinguishing system;
- (b) Every tank containing FK-5-1-12 placed in the space to be protected shall be fitted with a device to prevent overpressure. This device shall ensure that the contents of

the tank are safely diffused in the space to be protected if the tank is subjected to fire, when the fire-extinguishing system has not been brought into service;

- (c) Every tank shall be fitted with a device permitting control of the gas pressure;
- (d) The level of filling of tanks shall not exceed 1.00 kg/l. The specific volume of depressurized FK-5-1-12 shall be taken to be 0.0719 m³/kg;
- (e) The volume of FK-5-1-12 in the space to be protected shall be not less than 5.5% of the gross volume of the space. This quantity shall be released within 10 seconds;
- (f) Tanks of FK-5-1-12 shall be fitted with a pressure monitoring device which triggers an audible and visual alarm in the wheelhouse in the event of an unscheduled loss of extinguishing agent. Where there is no wheelhouse, the alarm shall be triggered outside the space to be protected;
- (g) After discharge, the concentration in the space to be protected shall not exceed 10.0%.


9.1.0.40.2.14 *Fixed fire-extinguishing system for physical protection*

In order to ensure physical protection in the engine rooms, boiler rooms and pump rooms, permanently fixed fire-extinguishing systems are accepted solely on the basis of recommendations by the Administrative Committee.

9.1.0.40.3 The two hand fire-extinguishers referred to in 8.1.4 shall be located in the protected area.

9.1.0.40.4 The fire-extinguishing agent in the permanently fixed fire-extinguishing system shall be suitable and sufficient for fighting fires.

9.1.0.41 *Fire and naked light*

9.1.0.41.1  The outlets of funnels shall be located not less than 2 m from the hatchway openings. Arrangements shall be provided to prevent the escape of sparks and the entry of water.

9.1.0.41.2 Heating, cooking and refrigerating appliances shall not be fuelled with liquid fuels, liquid gas or solid fuels. The installation in the engine room or other separate space of heating appliances fuelled with liquid fuel having a flashpoint above 55 °C is, however, permitted.

Cooking and refrigerating appliances are permitted only in wheelhouses with metal floor and in the accommodation.

9.1.0.41.3 Electric lighting appliances only are permitted outside the accommodation and the wheelhouse.

9.1.0.42-
9.1.0.51 *(Reserved)*

9.1.0.52 *Type and location of electrical equipment*

9.1.0.52.1 It shall be possible to isolate the electrical equipment in the protected area by means of centrally located switches except where:

- in the holds it is of a certified safe type corresponding at least to temperature class T4 and explosion group II B; and

- in the protected area on the deck it is of the limited explosion risk type.

The corresponding electrical circuits shall have control lamps to indicate whether or not the circuits are live.

The switches shall be protected against unintended unauthorized operation. The sockets used in this area shall be so designed as to prevent connections being made except when they are not live. Submerged pumps installed or used in the holds shall be of the certified safe type at least for temperature class T4 and explosion group II B.

9.1.0.52.2 Electric motors for hold ventilators which are arranged in the air flow shall be of the certified safe type.

9.1.0.52.3 Sockets for the connection of signal lights and gangway lighting shall be solidly fitted to the vessel close to the signal mast or the gangway. Sockets intended to supply the submerged pumps, hold ventilators and containers shall be permanently fitted to the vessel in the vicinity of the hatches.

9.1.0.52.4 Accumulators shall be located outside the protected area.

9.1.0.53-
9.1.0.55 (*Reserved*)

9.1.0.56 *Electric cables*

9.1.0.56.1 Cables and sockets in the protected area shall be protected against mechanical damage.

9.1.0.56.2 Movable cables are prohibited in the protected area, except for intrinsically safe electric circuits or for the supply of signal lights and gangway lighting, for containers, for submerged pumps, hold ventilators and for electrically operated cover gantries.

9.1.0.56.3 For movable cables permitted in accordance with 9.1.0.56.2 above, only rubber-sheathed cables of type H07 RN-F in accordance with standard IEC-60 245-4:1994 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 damage is not likely to occur.

9.1.0.57-
9.1.0.69 (*Reserved*)

9.1.0.70 *Metal wires, masts*

All metal wires passing over the holds and all masts shall be earthed, unless they are electrically bonded to the metal hull of the vessel through their installation.

9.1.0.71 *Admittance on board*

The notice boards displaying the prohibition of admittance in accordance with 8.3.3 shall be clearly legible from either side of the vessel.

9.1.0.72-
9.1.0.73 (*Reserved*)

9.1.0.74 ***Prohibition of smoking, fire and naked light***

9.1.0.74.1 The notice boards displaying the prohibition of smoking in accordance with 8.3.4 shall be clearly legible from either side of the vessel.

9.1.0.74.2 Notice boards indicating the circumstances under which the prohibition applies shall be fitted near the entrances to the spaces where smoking or the use of fire or naked light is not always prohibited.

9.1.0.74.3 Ashtrays shall be provided close to each exit of the accommodation and the wheelhouse.

9.1.0.75-
9.1.0.79 (*Reserved*)

9.1.0.80 ***Additional rules applicable to double-hull vessels***

The rules of 9.1.0.88 to 9.1.0.99 are applicable to double-hull vessels intended to carry dangerous goods of Classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9, except those for which label No. 1 is prescribed in column (5) of Table A of Chapter 3.2, in quantities exceeding those of 7.1.4.1.1.

9.1.0.81-
9.1.0.87 (*Reserved*)

9.1.0.88 ***Classification***

9.1.0.88.1 Double-hull vessels intended to carry dangerous goods of Classes 2, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 7, 8 or 9 except those for which label No. 1 is prescribed in column (5) of Table A of Chapter 3.2, in quantities exceeding those referred to in 7.1.4.1.1 shall be built or transformed under survey of a recognised 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.

9.1.0.88.2 Continuation of class is not required.

9.1.0.88.3 Future conversions and major repairs to the hull shall be carried out under survey of this classification society.

9.1.0.89-
9.1.0.90 (*Reserved*)

9.1.0.91 ***Holds***

9.1.0.91.1 The vessel shall be built as a double-hull vessel with double-hull spaces and double bottom within the protected area.

9.1.0.91.2 The distance between the sides of the vessel and the longitudinal bulkheads of the hold shall be not less than 0.80 m. Regardless of the requirements relating to the width of walkways on deck, a reduction of this distance to 0.60 m is permitted, provided that, compared with the scantlings specified in the rules for construction published by a recognised classification society, the following reinforcements have been made:

- (a) Where the vessel's sides are constructed according to the longitudinal framing system, the frame spacing shall not exceed 0.60 m.

The longitudinals shall be supported by web frames with lightening holes similar to the floors in the double bottom and spaced not more than 1.80 m apart. These intervals may be increased if the construction is correspondingly reinforced;

- (b) Where the vessel's sides are constructed according to the transverse framing system, either:
- two longitudinal side shell stringers shall be fitted. The distance between the two stringers and between the uppermost stringer and the gangboard shall not exceed 0.80 m. The depth of the stringers shall be at least equal to that of the transverse frames and the cross-section of the face plate shall be not less than 15 cm².
- The longitudinal stringers shall be supported by web frames with lightening holes similar to plate floors in the double bottom and spaced not more than 3.60 m apart. The transverse shell frames and the hold bulkhead vertical stiffeners shall be connected at the bilge by a bracket plate with a height of not less than 0.90 m and thickness equal to the thickness of the floors; or
- web frames with lightening holes similar to the double bottom plate floors shall be arranged on each transverse frame;
- (c) The gangboards shall be supported by transverse bulkheads or cross-ties spaced not more than 32 m apart.

As an alternative to compliance with the requirements of (c) above, a proof by calculation, issued by a recognised classification society confirming that additional reinforcements have been fitted in the double-hull spaces and that the vessel's transverse strength may be regarded as satisfactory.

- 9.1.0.91.3 The depth of the double bottom shall be at least 0.50 m. The depth below the suction wells may, however, be locally reduced, but the space between the bottom of the suction well and the bottom of the vessel floor shall be at least 0.40 m. If spaces are between 0.40 m and 0.49 m, the surface area of the suction well shall not exceed 0.5 m².

The capacity of the suction wells must not exceed 0.120 m³.



9.1.0.92 *Emergency exit*

Spaces the entrances or exits of which are partly or fully immersed in damaged condition shall be provided with an emergency exit not less than 0.10 m above the waterline. This does not apply to forepeak and afterpeak.

9.1.0.93 *Stability (general)*

- 9.1.0.93.1 Proof of sufficient stability shall be furnished including stability in the damaged condition.

- 9.1.0.93.2 The basic values for the stability calculation - the vessel's lightweight and the 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 shall be checked by means of a lightweight test with a resulting difference of not more than $\pm 5\%$ between the mass determined by the calculation and the displacement determined by the draught readings.

- 9.1.0.93.3 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 stages of flooding may be accepted only if the continued range of curve of righting lever in damaged condition indicates adequate positive values of stability.

9.1.0.94 *Stability (intact)*

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

9.1.0.94.2 For the carriage of containers, proof of sufficient stability shall also be furnished in accordance with the provisions of the Regulations referred to in 1.1.4.6.

9.1.0.94.3 The most stringent of the requirements of 9.1.0.94.1 and 9.1.0.94.2 above shall prevail for the vessel.

9.1.0.95 *Stability (damaged condition)*

9.1.0.95.1 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: 0.59 m;
vertical extent: from the baseline 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 0.49 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 athwartships compartments shall be assumed as flooded;
- The lower edge of any openings that cannot be closed watertight (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 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%

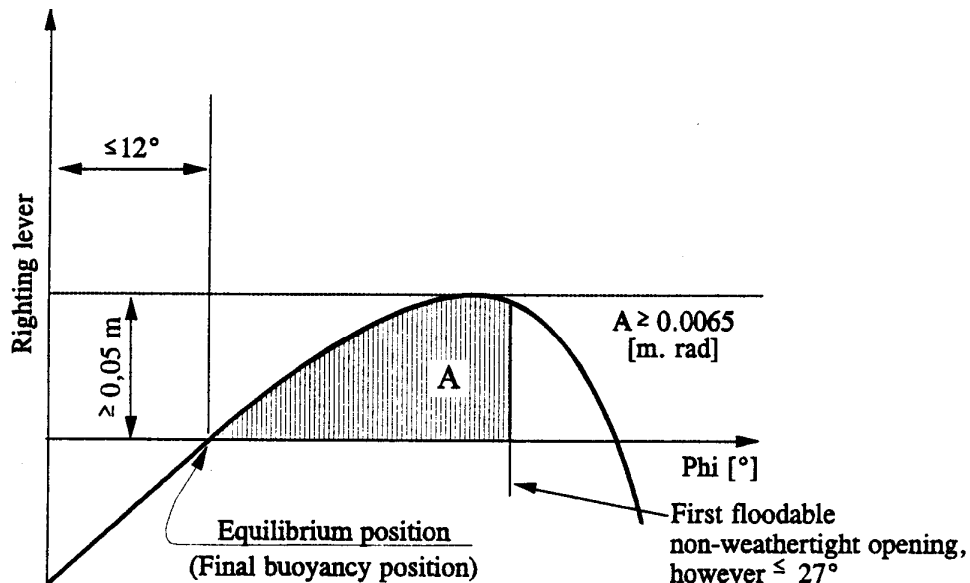
For the main engine room only the one-compartment standard needs to be taken into account, i.e. the end bulkheads of the engine room shall be assumed as not damaged.



9.1.0.95.2

At the stage of equilibrium (final stage of flooding) the angle of heel shall not exceed 12°. Non-watertight openings shall not be immersed 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 positive range of the righting lever curve beyond the position of equilibrium shall have a righting lever of ≥ 0.05 m in association with an area under the curve of ≥ 0.0065 m.rad. The minimum values of stability shall be satisfied up to immersion of the first non-weathertight opening and in any event up to an angle of heel $\leq 27^\circ$. If non-weathertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purposes of stability calculation.

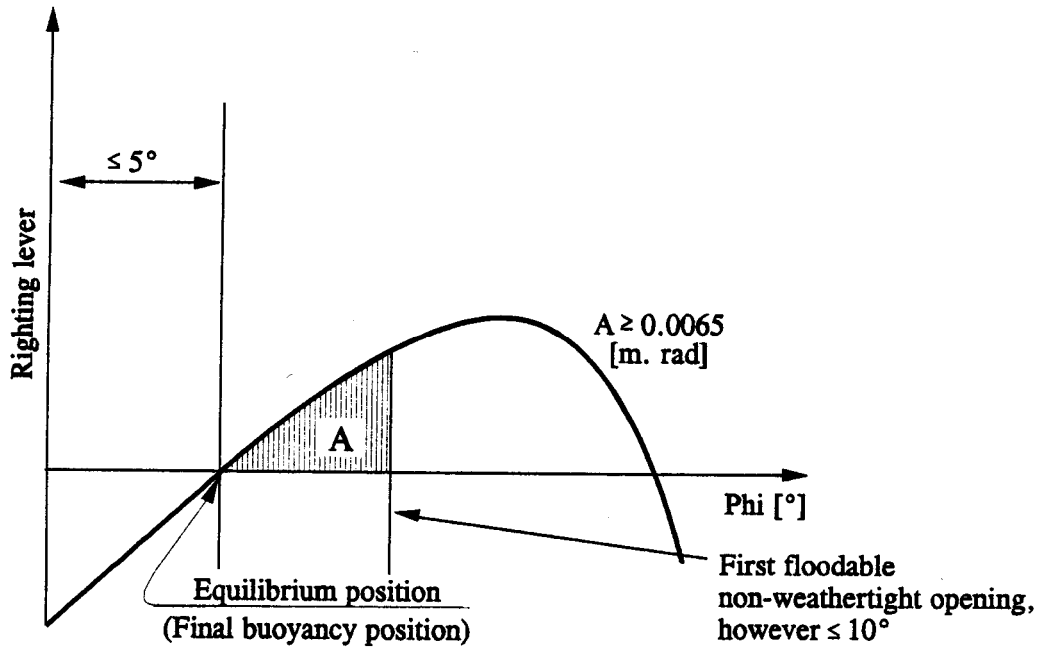


9.1.0.95.3

Inland navigation vessels carrying containers which have not been secured shall satisfy the following damage stability criteria:

At the stage of equilibrium (final stage of flooding) the angle of heel shall not exceed 5°. Non-watertight openings shall not be immersed 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 positive range of the righting lever curve beyond the position of equilibrium shall have an area under the curve of ≥ 0.0065 m.rad. The minimum values of stability shall be satisfied up to immersion of the first non-weathertight opening and in any event up to an angle of heel $\leq 10^\circ$. If non-weathertight openings are immersed before that stage, the corresponding spaces shall be considered as flooded for the purposes of stability calculation.



- 9.1.0.95.4 If openings through which undamaged compartments may become additionally flooded are capable of being closed watertight, the closing devices shall be appropriately marked.
- 9.1.0.95.5 Where cross- or down-flooding openings are provided for reduction of unsymmetrical flooding, the time for equalisation shall not exceed 15 minutes if during the intermediate stages of flooding sufficient stability has been proved.
- 9.1.0.96-
9.1.0.99 (*Reserved*)