

Voluntary Guidelines for the
**Design,
Construction and
Equipment of
Small Fishing Vessels
2005**

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Preface

1 A meeting of consultants on safety on board fishing vessels, jointly convened in 1974 by the Food and Agriculture Organization of the United Nations (FAO), the International Labour Organization (ILO) and the International Maritime Organization (IMO), for the purpose of finalizing the text of part B of the Code of Safety for Fishermen and Fishing Vessels, which applies to vessels of 24 metres in length and over, recommended that the three Organizations should continue to co-operate with a view to establishing voluntary guidelines for the design, construction and equipment of vessels of less than 24 metres in length.

2 Subsequently the Maritime Safety Committee (MSC) of IMO took note of the aforementioned recommendation and requested its Sub-Committee on Safety of Fishing Vessels to develop such guidelines in co-operation with FAO and ILO.

3 The International Conference on Safety of Fishing Vessels, 1977, recognizing that the 1977 Torremolinos Convention applies only to fishing vessels of 24 metres in length and over and being conscious that the vast majority of fishing vessels throughout the world are of less than 24 metres in length, adopted a resolution recommending that IMO continue to develop safety standards for the design, construction and equipment of such fishing vessels with a view to promoting the safety of these vessels and their crews.

4 FAO, ILO and IMO finalized the original text of the Voluntary Guidelines at the twenty-first and twenty-second sessions of the IMO Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety (SLF). The Guidelines were approved by the MSC at its forty-first session in October 1979 and by the FAO in November 1979 for circulation to Governments. The ILO Governing Body was informed at its 211th session in November 1979 of the intention to publish this document.

5 It was pointed out, however, that some parts of the Guidelines required further development. These mainly concerned stability criteria, which were considered at that time as being only tentative. Bearing in mind that development of appropriate stability criteria for any type of fishing vessel is a very complex problem, which has not been entirely solved even for larger vessels, the International Conference on Safety of Fishing Vessels, 1977, adopted a resolution recommending that IMO continue studies with the aim of formulating detailed stability standards for fishing vessels.

6 Following the adoption of the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing

Vessels, 1977, the MSC undertook the review of the FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels, part A and part B. At the same time, it also decided to review the Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels. In requesting the SLF Sub-Committee to review the Guidelines, the MSC recommended that the concerns expressed in paragraph 5 above, as well as recent developments in fishing vessel design and fishing operations, should be taken into consideration.

7 The SLF Sub-Committee established a correspondence group to facilitate the revision of the Code and the Voluntary Guidelines and, following clearance by the relevant sub-committees of the IMO, the revised text was submitted to the MSC at its seventy-ninth session (1 to 10 December 2004) at which it was approved. At the twenty-sixth session of the Committee on Fisheries in March 2005, FAO welcomed the revised Code and Voluntary Guidelines and recommended the early publication by IMO of these documents. The Governing Body of ILO approved the revised texts at its 293rd session in June 2005.

8 The purpose of the Voluntary Guidelines is to provide a general guidance on safe practices for the design, construction and equipment of smaller fishing vessels. Nevertheless, discretion should be exercised in using provisions of the Voluntary Guidelines for the purpose of framing national safety requirements when local weather and sea conditions and special operational requirements should be given particular consideration. Furthermore, attention is drawn to part A of the FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels, 2005.

9 Concerning the procedures for future amendments to the Voluntary Guidelines, the MSC considered that any amendments should be effected as expeditiously as possible. It was agreed that non-controversial amendments should be approved by correspondence, but joint meetings of experts might be necessary for other amendments for which no ready agreement by correspondence could be reached.

10 Recognizing that the majority of items covered by the Voluntary Guidelines are within the scope of IMO and noting the different working procedures within the three Organizations and also that the SLF Sub-Committee holds regular meetings, it was agreed that:

- 1** IMO should act as a focal point for co-ordinating proposed amendments to the Voluntary Guidelines and, in particular the IMO Secretariat should undertake to receive any proposed amendments, to distribute them to the Organizations and to collate their respective comments;
- 2** any future joint FAO/ILO/IMO meeting should be held, whenever possible, in conjunction with a meeting of the SLF Sub-Committee; and
- 3** any proposed amendments should always be subject to the final approval of the appropriate bodies of the three organizations.

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Chapter 1

General provisions

1.1 Purpose and scope

1.1.1 The purpose of these Guidelines is to provide information on the design, construction, and equipment of small fishing vessels with a view to promoting the safety of the vessel and safety and health of the crew. They are not intended as a substitute for national laws and regulations but may serve as a guide to those concerned with framing such national laws and regulations. Each Competent Authority responsible for the safety of fishing vessels should ensure that the provisions of these guidelines are adapted to its specific requirements, having due regard to the size and type of vessels, their intended service and area of operation.

1.1.2 Unless otherwise stated, the provisions of these guidelines are intended to apply to new decked fishing vessels of 12 m in length and over, but less than 24 m in length. Nevertheless, even where not otherwise stated, the Competent Authority should, as far as reasonable and practical, give consideration to the application of these provisions to existing decked fishing vessels.

1.1.3 The provisions of these Guidelines do not apply to fishing vessels for sport or recreation or to processing vessels.

1.2 Definitions

For the purpose of these Guidelines, unless expressly provided otherwise, the following definitions apply:

1.2.1 *Amidships* means the mid-length of *L*.

1.2.2 *Approved* means approved by the Competent Authority.

1.2.3 *Baseline* is the horizontal line intersecting at amidships the keel line.

1.2.4 *Bow height* is defined as the vertical distance at the forward perpendicular between the waterline corresponding to the maximum permissible draught and the designed trim and the top of the exposed deck at side.

1.2.5 *Breadth (B)** is the maximum breadth of the vessel, measured amidships to the moulded line of the frame in a vessel with a metal shell and to the outer surface of the hull in a vessel with a shell of any other material.

1.2.6 *Collision bulkhead* is a watertight bulkhead up to the working deck in the fore part of the vessel as approved by the Competent Authority.

1.2.7 *Competent Authority* is the Government of the State whose flag the vessel is entitled to fly.

1.2.8 *Crew* means the skipper and all persons employed or engaged in any capacity on board a vessel on the business of that vessel.

1.2.9 *Decked vessel* is a vessel having a fixed structural deck covering the entire hull above the deepest operating waterline. Where open wells or cockpits are fitted in this deck, the vessel is considered a decked vessel if flooding of the well or cockpit will not endanger the vessel.

1.2.10 *Deck erection* is any decked structure on the working deck.

1.2.11 *Deepest operating waterline* is the waterline related to the maximum permissible operating draft.

1.2.12 *Depth (D)* is the moulded depth amidships.

1.2.13 *Enclosed superstructure* is a superstructure with:

- .1 enclosing bulkheads of efficient construction;
- .2 access openings, if any, in those bulkheads fitted with permanently attached weathertight doors of a strength equivalent to the unpierced structure which can be operated from each side; and
- .3 other openings in sides or ends of the superstructure fitted with efficient weathertight means of closing.

A raised quarter-deck is regarded as a superstructure.

A bridge or poop should not be regarded as enclosed unless access is provided for the crew to reach machinery and other working spaces inside those superstructures by alternative means which are available at all times when bulkhead openings are closed.

1.2.14 *Existing vessel* is a vessel which is not a new vessel.

1.2.15 *Fishing vessel* (hereto referred as "vessel") means any vessel used commercially for catching fish, whales, seals, walrus or other living resources of the sea.

1.2.16 *Forward and after perpendiculars* should be taken at the forward and after ends of the length (*L*). The forward perpendicular should be

* Dimensions are illustrated in annex I.

coincident with the foreside of the stem on the waterline on which the length is measured.

1.2.17 Freeboard (*f*) is the actual minimum freeboard and is the distance from the underside of the working deck at the side to a waterline, measured perpendicularly to the waterline, plus the minimum thickness of decking. When the working deck is stepped, the lowest line of the deck and the continuation of that line parallel to the upper part of the deck should be taken as the working deck.

1.2.18 Height of a superstructure or other erection is the least vertical distance measured at side from the top of the deck beams of a superstructure or an erection to the top of the working deck beams.

1.2.19 Keel line is the line parallel to the slope of keel passing amidships through:

- .1 the top of the keel or line of intersection of the inside of shell plating with the keel where a bar keel extends above that line of a vessel with a metal shell; or
- .2 the rabbet lower line of the keel of a vessel with a shell of wood or a composite material; or
- .3 the intersection of a fair extension of the outside of the shell contour at the bottom with the centreline of a vessel with a shell of material other than wood and metal.

1.2.20 Least depth* is the depth measured from the keel line to the top of the working deck beam at side. Where the working deck is stepped and the raised part of the deck extends over the point at which the least depth is to be determined, the least depth should be measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part.

1.2.21 Length (*L*)* should be taken as 96% of the total length on a waterline at 85% of the least depth, or as the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that length is greater. In vessels designed with rake of keel, the waterline on which this length is measured should be parallel to the designed waterline.

1.2.22 Machinery spaces of category A are those spaces which contain internal-combustion type machinery used either:

- .1 for main propulsion; or
- .2 for other purposes where such machinery has in the aggregate a total power output of not less than 750 kW,

or which contains any oil-fired boiler oil unit.

* Dimensions are illustrated in annex I.

1.2.23 *Midship section* is that section of the hull defined by the intersection of the moulded surface of the hull with a vertical plane perpendicular to the waterline and centreline planes passing through amidships.

1.2.24 *New vessel* is a vessel the keel of which is laid, or which is at a similar stage of construction, on or after the date of adoption of the present revision of these Guidelines.

1.2.25 *Organization* means the International Maritime Organization.

1.2.26 *Protocol* means the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as modified by the Torremolinos Protocol of 1993 relating thereto.

1.2.27 *Skipper* means the person having command of a fishing vessel.

1.2.28 *Steel or other equivalent material* means steel or any material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable fire exposure to the standard fires test (e.g. aluminium alloy with appropriate insulation).

1.2.29 *Superstructure deck* is that complete or partial deck forming the top of a deck erection situated at a height of not less than 1.8 m above the working deck. Where this height is less than 1.8 m, the top of such deck erections should be treated in the same way as the working deck.

1.2.30 *Watertight* means capable of preventing the passage of water through the structure in any direction under a head of water for which the surrounding structure is designed.

1.2.31 *Weathertight* means that in any sea conditions water will not penetrate into the vessel.

1.2.32 *Working deck* is generally the lowest complete deck above the deepest operating waterline from which fishing is undertaken. In vessels fitted with two or more complete decks, the Competent Authority may accept a lower deck as a working deck provided that that deck is situated above the deepest operating waterline.

1.3 Measurements

In these Guidelines measurements are given in the metric system using the following abbreviations:

m	–	metre
cm	–	centimetre
mm	–	millimetre
t	–	tonne (1000 kg)
kg	–	kilogram
m·t	–	metre-tonne
°C	–	degree centigrade

s	-	second
N	-	newton
kW	-	kilowatt

1.4 Maintenance, upkeep and surveys

1.4.1 The hull, machinery, equipment and radio installations as well as crew accommodation of every vessel should be constructed and installed so as to be capable of being regularly maintained to ensure that they are at all times, in all respects, satisfactory for the vessel's intended service.

1.4.2 Where practicable, the Competent Authority should arrange for appropriate surveys of a vessel during construction and at regular intervals after completion, to ensure satisfactory condition of the vessel's hull, machinery, equipment, radio installations equipment and radio installations as well as crew accommodation. An appropriate report of the survey should be entered in the record of the vessel.

1.4.3 After any survey has been completed, no change should be made in the structural arrangements, machinery, equipment, and radio installations as well as crew accommodation, etc., covered by the survey, without the approval of the Competent Authority.

1.4.4 Documentation relating to the safety of the vessel should cease to be valid upon transfer of the vessel to the flag of another State. New safety documentation should only be issued when the Competent Authority is fully satisfied that the vessel is in compliance with the requirements of the relevant provisions.

1.5 Equivalents

Where the present provisions require that a particular fitting, material, appliance or apparatus, or type thereof, should be fitted or carried in a vessel, or that any particular provision should be made, the Competent Authority may allow any other fitting, material, appliance or apparatus, or type thereof, to be fitted or carried, or any other provision to be made in that vessel, if it is satisfied by trial thereof or otherwise that such fitting, material, appliance or apparatus, or type thereof, or provision, is at least as effective as that required by the present provisions.

Chapter 2

Construction, watertight integrity and equipment

2.1 Construction

2.1.1 Strength and construction of hull, superstructures, deckhouses, machinery casings, companionways and any other structures and vessel's equipment should be sufficient to withstand all foreseeable conditions of the intended service and should be to the satisfaction of the Competent Authority.

2.1.2 The hull of vessels intended for operation in ice should be strengthened in accordance with the anticipated conditions of navigation and area of operation. Wooden vessels, operating from harbours subject to freezing, should have appropriate ice protection sheathing.

2.1.3 Bulkheads, closing devices and closures of openings in these bulkheads, as well as methods for their testing, should be in accordance with the requirements of the Competent Authority. Vessels constructed of material other than wood should be fitted with a collision bulkhead and at least with watertight bulkheads bounding the main machinery space. Such bulkheads should be extended up to the working deck. In vessels constructed of wood, such bulkheads, which as far as practicable should be watertight, should also be fitted.

2.1.4 Pipes piercing the collision bulkhead should be fitted with suitable valves operable from above the working deck and the valve chest should be secured at the collision bulkhead inside the forepeak. No door, manhole, ventilation duct or any other opening should be fitted in the collision bulkhead below the working deck.

2.1.5 The forepeak should not be used for carrying fuel oil, except where specially approved by the Competent Authority.

2.2 Watertight doors

2.2.1 The number of openings in watertight bulkheads, as required by 2.1.3, should be reduced to the minimum compatible with the general arrangement and operational needs of the vessel; openings should be fitted with watertight closing appliances to the satisfaction of the Competent

Authority. Watertight doors should be of an equivalent strength to the adjacent unpierced structure.

2.2.2 Watertight doors may be of the hinged type, and should be capable of being operated locally from each side of the door. A notice should be attached to the door on each side, stating that the door should be kept closed at sea.

2.2.3 Sliding watertight doors should be capable of being operated when the vessel is listed up to 15° either way.

2.3 Hull integrity

2.3.1 External openings should be capable of being closed so as to prevent water from entering the vessel. Deck openings which may be open during fishing operations should normally be arranged near to the vessel's centreline. However, the Competent Authority may approve different arrangements if satisfied that the safety of the vessel will not be impaired.

2.3.2 Fish flaps on stern trawlers should be power-operated and capable of being controlled from any position which provides an unobstructed view of the operation of the flaps.

2.4 Weathertight doors

2.4.1 All access openings in bulkheads of enclosed superstructures and other outer structures through which water could enter and endanger the vessel should be fitted with doors permanently attached to the bulkhead, framed and stiffened so that the whole structure is of equivalent strength to the unpierced structure, and weathertight when closed. The means for securing these doors weathertight should consist of gaskets and clamping devices or other equivalent means and should be permanently attached to the bulkhead or to the doors themselves, and should be so arranged that they can be operated from each side of the bulkhead. The Competent Authority may, without prejudice to the safety of the crew, permit the doors to be opened from one side only for freezer rooms, provided that a suitable alarm device is fitted to prevent persons being trapped in those rooms.

2.4.2 The height above deck of sills in those doorways, in companionways, erections and machinery casings which give direct access to parts of the deck exposed to the weather and sea should be at least 600 mm on the working deck and at least 300 mm on the superstructure deck.

2.4.3 Where operating experience has shown justification and on approval of the Competent Authority, the height above deck of sills in the doorways specified in 2.4.2, except those giving direct access to machinery spaces, may be reduced to not less than 150 mm on superstructure decks and not less than 380 mm on the working deck for vessels 24 m in length, or not less than 150 mm on the working deck for vessels of 12 m in length. For vessels of intermediate length, the minimum

acceptable reduced height for sills in doorways on the working deck should be obtained by linear interpolation.

2.5 Hatchways closed by wood covers

2.5.1 The height above deck of hatchway coamings on exposed parts of the working deck should be at least 300 mm for vessels of 12 m in length and at least 600 mm for vessels 24 m in length. For vessels of intermediate length, the minimum height should be obtained by linear interpolation. The height above deck of hatchway coamings on exposed parts of the superstructure deck should be at least 300 mm.

2.5.2 Where operating experience has shown justification and on approval of the Competent Authority, the height of hatchway coamings, except those which give direct access to machinery spaces, may be reduced from the height as specified in 2.5.1 or the coamings may be omitted entirely, provided that efficient watertight hatch covers other than wood are fitted. Such hatchways should be kept as small as practicable, and the covers should be permanently attached by hinges or equivalent means and be capable of being rapidly closed or battened down.

2.5.3 The finished thickness of wood hatchway covers should include an allowance for abrasion due to rough handling. In any case, the finished thickness of these covers should be at least 4 mm for each 100 mm of unsupported span subject to a minimum of 40 mm and the width of their bearing surfaces should be at least 65 mm.

2.5.4 The use of wooden hatchway covers is generally not recommended in view of the difficulty of rapidly securing their weathertightness. However, where fitted, they should be capable of being secured weathertight. Arrangements for securing wood hatchway covers weathertight should be provided to the satisfaction of the Competent Authority.

2.6 Hatchways closed by covers other than wood

2.6.1 The height above deck of hatchway coamings should be as specified in 2.5.1. Where operating experience has shown justification and on the approval by the Competent Authority, the height of these coamings may be reduced, or the coamings omitted entirely, provided that the safety of vessels is not thereby impaired. In this case, the hatchway openings should be kept as small as practicable and the covers be permanently attached by hinges or equivalent means and be capable of being rapidly closed and battened down, or by equally effective arrangements to the satisfaction of the Competent Authority.

2.6.2 For the purpose of strength calculations, it should be assumed that hatchway covers are subjected to static loads of 10 kN/m^2 or the weight of cargo intended to be carried on them, whichever is the greater.

2.6.3 Where covers are made of mild steel, the maximum stress calculated according to 2.6.2 and multiplied by 4.25 should not exceed the minimum ultimate strength of the material. Under these loads the deflections should not be more than 0.0028 times the span.

2.6.4 Covers made of materials other than mild steel should be at least of equivalent strength to those made of mild steel and their construction should be of sufficient stiffness to ensure weathertightness under the loads specified in 2.6.2.

2.6.5 Covers should be fitted with clamping devices and gaskets or other equivalent arrangements sufficient to ensure weathertightness to the satisfaction of the Competent Authority.

2.7 Machinery space openings

2.7.1 Machinery space openings should be framed and enclosed by casings of sufficient strength. External access openings therein should be fitted with doors complying with 2.4 or with hatch covers other than wood complying with 2.6.

2.7.2 Openings other than access openings should be fitted with covers of equivalent strength to the unpierced structure, permanently attached thereto and capable of being closed weathertight.

2.8 Other deck openings

2.8.1 Where it is essential for fishing operations, flush deck scuttles of the screw, bayonet or equivalent type and manhole covers may be fitted, provided these are capable of being closed watertight and such devices should be permanently attached to the adjacent structure. Having regard to the size and disposition of the openings and the design of the closing devices, metal-to-metal closures may be fitted if the Competent Authority is satisfied that they are effectively watertight.

2.8.2 An efficient deck erection or companionway, fitted with weathertight doors or their equivalent, should be provided to protect openings other than hatchways, machinery space openings, manholes and flush scuttles in the working deck. Companionways should be situated as close as practicable to the vessel's centreline.

2.9 Ventilators

2.9.1 The coamings of ventilators should be as high as practicable. On the working deck, the height above deck of coamings of ventilators other than machinery space ventilators should be not less than 760 mm and on superstructure decks not less than 450 mm. When the height of such ventilators may interfere with the working of the vessel, their coaming heights may be reduced to the satisfaction of the Competent Authority. The

height above deck of machinery space ventilator openings should be to the satisfaction of the Competent Authority.

2.9.2 Coamings of ventilators should be of equivalent strength to the adjacent structure and capable of being closed weathertight by devices permanently attached to the ventilator or adjacent structure. Where the coaming of any ventilator exceeds 900 mm in height it should be specially supported. Ventilators should be arranged as close to the vessel's centreline as possible and, where practicable, should extend through the top of a deck erection or companionway.

2.9.3 Closing appliances need not be fitted to ventilators the coamings of which extend more than 2.5 m above the working deck or more than 1 m above a deckhouse top or superstructure deck.

2.10 Air pipes

2.10.1 Where air pipes to tanks and void spaces below deck extend above the working or superstructure decks, the exposed parts of the pipes should be of a strength equivalent to the adjacent structures and fitted with appropriate protection and, as far as is practicable, located close to the vessel's centreline and protected from damage by fishing or lifting gear. Openings of pipes should be provided with means of closing, permanently attached to the pipe or adjacent structure, except that, where the Competent Authority is satisfied that they are protected against water trapped on deck, these means of closing may be omitted.

2.10.2 The height of air pipes above deck to the point where water may have access below should be at least 760 mm on the working deck and at least 450 mm on the superstructure deck. The Competent Authority may accept reduction of the height of an air pipe to avoid interference with the fishing operations.

2.11 Sounding devices

2.11.1 Sounding devices, to the satisfaction of the Competent Authority, should be fitted:

- .1** to the bilges of those compartments which are not readily accessible at all times during the voyage; and
- .2** to all tanks and cofferdams.

2.11.2 Where sounding pipes are fitted, their upper ends should be extended to a readily accessible position and, where practicable, above the working deck. Their openings should be provided with permanently attached means of closing. Sounding pipes which are not extended above the working deck should be fitted with automatic self-closing devices.

2.11.3 Sounding arrangements on fuel service tanks should be such that, in the event of the tanks being overfilled, spillage through the means of sounding cannot occur.

2.11.4 Fuel tank sounding pipe openings should not be located in crew accommodation.

2.12 Sidescuttles and windows

2.12.1 Sidescuttles to spaces below the working deck and to enclosed spaces on the working deck should be fitted with hinged deadlights capable of being closed watertight.

2.12.2 No sidescuttle should be fitted in such a position that its sill is less than 500 mm above the deepest operating waterline.

2.12.3 Sidescuttles fitted less than 1000 mm above the deepest operating waterline should be of the fixed type.

2.12.4 Sidescuttles, together with their glasses and deadlights, should be of an approved construction. Those prone to be damaged by fishing gear should be suitably protected.

2.12.5 Skylights leading to spaces below the working deck should be of substantial construction and capable of being closed and secured weathertight, and with provision for adequate means of closing in the event of damage to the inserts. Skylights leading to machinery spaces should be avoided as far as practicable.

2.12.6 Toughened safety glass or suitably permanently transparent material of equivalent strength should be fitted in all wheelhouse windows exposed to the weather. The means of securing windows and the width of the bearing surfaces should be adequate, having regard to the window material used. Openings leading to spaces below deck from a wheelhouse whose windows are not provided with the protection required by 2.12.7 should be fitted with a weathertight closing appliance.

2.12.7 Deadlights or a suitable number of storm shutters should be provided where there is no other method of preventing water from entering the hull through a broken window or sidescuttle.

2.12.8 The Competent Authority may accept sidescuttles and windows without deadlights in side or aft bulkheads of deck erections located on or above the working deck if satisfied that the safety of the vessel will not be impaired.

2.12.9 The number of openings in the sides of the vessel below the working deck should be the minimum compatible with the design and proper working of the vessel and such openings should be provided with closing arrangements of adequate strength to ensure watertightness and the structural integrity of the surrounding structure.

2.13 Inlets and discharges

2.13.1 Discharges led through the shell either from spaces below the working deck or from within enclosed superstructures or deckhouses on the working deck fitted with doors complying with the requirements of 2.4 should be fitted with means for preventing water from passing inboard. Normally each separate discharge should have an automatic non-return valve with a positive means of closing it from a readily accessible position. Such a valve is not required if the Competent Authority considers that the entry of water into the vessel through the opening is not likely to lead to dangerous flooding and that the thickness of the pipe is sufficient. The means for operating the valve with a positive means of closing should be provided with an indicator, showing whether the valve is open or closed. The open inboard end of any discharge system should be above the deepest operating waterline at an angle of heel satisfactory to the Competent Authority.

2.13.2 In machinery spaces, main and auxiliary sea inlets and discharges essential for the operation of machinery should be controlled locally. Controls should be readily accessible and should be provided with indicators showing whether the valves are open or closed.

2.13.3 Fittings attached to the shell and all valves referred to in 2.13.1 should be of steel, bronze or other ductile material. All pipes between the shell and the valves should be of steel, except that in spaces other than machinery spaces of vessels constructed of material other than steel the Competent Authority may approve the use of other materials.

2.14 Freeing ports

2.14.1 Where bulwarks on weather parts of the working deck form wells, the minimum freeing port area (A), in square metres, on each side of the vessel for each well on the working deck should be determined in relation to the length (l) and height of bulwark in this well as follows:

.1 $A = K \cdot l$

where:

$K = 0.07$ for vessels of 24 m in length

$K = 0.05$ for vessels of 12 m in length

for intermediate lengths the value of K should be obtained by linear interpolation (l need not be taken as greater than 70% of the length of a vessel).

- .2 Where the bulwark is more than 1.2 m in average height, the required area in .1 should be increased by 0.004 m^2 per metre of length of well for each 100 mm difference in height.
- .3 Where the bulwark is less than 900 mm in average height, the required area may be decreased by 0.004 m^2 per metre of length of well for each 100 mm difference in height.

2.14.2 The freeing port area calculated according to 2.14.1 should be increased where the Competent Authority considers that the vessel's sheer is not sufficient to ensure rapid and effective freeing of the deck of water.

2.14.3 Subject to the approval of the Competent Authority, the minimum freeing port area for each well on the superstructure deck should be not less than one half the area (A) given in 2.14.1 except that, where the superstructure deck forms a working deck for fishing operations, the minimum area each side should be not less than 75% of the area (A).

2.14.4 Freeing ports should be so arranged along the length of bulwarks as to provide the most rapid and effective freeing of the deck from water. Lower edges of freeing ports should be as near the deck as practicable. Two thirds of the total freeing port area per side should be provided in the half of the well nearest the lower point of the sheer curve, and some freeing port area should be placed as near the ends of the well as practicable.

2.14.5 Poundboards and means for stowage and working the fishing gear should be arranged so that the effectiveness of the freeing ports will not be impaired or water trapped on deck and prevented from easily reaching the freeing ports. Poundboards should be so constructed that they can be locked in position when in use and will not hamper the discharge of shipped water.

2.14.6 Freeing ports over 300 mm in depth should be fitted with bars spaced not more than 230 mm nor less than 150 mm apart or provided with other suitable protective arrangements. Freeing port covers, if fitted, should be of approved construction. It should not be possible to lock freeing ports, but they may be fitted with external top-hinged flaps/shutters and internal gratings. Such arrangements may, however, not lead to a considerable reduction of the effective freeing port area. Any shutter or external rubber flaps in freeing ports should be fastened with hinges in the upper edge. The shutters should fit freely so that they cannot get stuck. The hinges should be made of materials that are not susceptible to corrosion. There should not be any arrangements for the locking of freeing port shutters.

2.14.7 In vessels intended to operate in areas subject to icing, covers and protective arrangements from freeing ports should be capable of being easily removed to restrict ice accumulation. The size of opening and means provided for removal of these protective arrangements should be to the satisfaction of the Competent Authority.

2.14.8 Where wells or cockpits are fitted in the working deck or superstructure deck with their bottoms above the deepest operating waterline, efficient non-return means of drainage overboard should be provided. Where bottoms of such wells or cockpits are below the deepest operating waterline, drainage to the bilges should be provided. Alternatively, the drainage of the wells could be by pumps to the satisfaction of the Competent Authority.

2.15 Anchor and mooring equipment

Anchor equipment designed for quick and safe operation should be provided which should consist of anchoring equipment, anchor chains or wire ropes, stoppers and a windlass or other arrangements for dropping and hoisting the anchor and for holding the vessel at anchor in all foreseeable service conditions. Vessels should also be provided with adequate mooring equipment for safe mooring in all operating conditions. Anchor and mooring equipment should be to the satisfaction of the Competent Authority. A recommended practice for anchor and mooring equipment is provided in annex II.

2.16 Working decks within an enclosed superstructure

2.16.1 Such decks should be fitted with an efficient drainage system having an appropriate drainage capacity to dispose of water or fish waste which may occur from deck washing, fish processing or from the sea through openings that may be open during fishing operations, to the satisfaction of the Competent Authority.

2.16.2 All openings necessary for fishing operations should be provided with means for quick and efficient closures by one person, to the satisfaction of the Competent Authority.

2.16.3 Where the catch is brought onto such decks for handling and processing, the catch should be placed in a pound, to the satisfaction of the Competent Authority. An efficient drainage system should be fitted. Adequate protection against inadvertent influx of water to the working deck should be provided.

2.16.4 At least two exits from such decks should be provided.

2.16.5 The clear headroom in the working space should at all points be to the satisfaction of the Competent Authority.

2.16.6 A fixed ventilation system providing sufficient changes of air per hour should be provided.

2.17 Tanks for fish in refrigerated (RSW) or chilled (CSW) seawater

2.17.1 If RSW or CSW tanks or similar tank systems are used, such tanks should be provided with a separate permanently fitted arrangement for the filling and emptying of seawater.

2.17.2 If such tanks are to be used also for carrying dry cargo, the tanks should be arranged with a bilge system and provided with adequate means to avoid ingress of water from the bilge system into the tanks.

Chapter 3

Stability and associated seaworthiness

3.1 General

3.1.1 Vessels should be so designed and constructed that the requirements of this chapter will be satisfied in the operating conditions referred to in 3.7. Calculations of the righting lever curves should be to the satisfaction of the Competent Authority.*

3.1.2 Wherever practicable, guidance should be provided for an approximate determination of the vessel's stability by means of the rolling period test including values of rolling coefficients particular to the vessel.†

3.2 Stability criteria

3.2.1 The following minimum stability criteria should be met unless the Competent Authority is satisfied that operating experience justifies departure therefrom:

- 1** The area under the righting lever curve (GZ curve) should not be less than 0.055 m·rad up to 30° angle of heel and not less than 0.090 m·rad up to 40° or the angle of flooding θ_f if this angle is less than 40°. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and θ_f , if this angle is less than 40°, should not be less than 0.030 m·rad. θ_f is the angle of heel at which openings in the hull, superstructures or deckhouses which cannot

* Refer to the Calculation of stability curves and the Effect of free surfaces of liquids in tanks contained in paragraphs 3.6 and 3.3 respectively of the Code on Intact Stability for all Types of Ships covered by IMO Instruments, adopted by the Organization by resolution A.749(18), as amended, and the Code of Practice concerning the Accuracy of Stability Information for Fishing Vessels, adopted by the Organization by resolution A.267(VIII).

† Refer to An approximate determination of vessel's stability by means of the rolling period tests (for vessels up to 70 metres in length), contained in appendix 7 of the annex to part A of the Code of Safety for Fishermen and Fishing Vessels, 2005, and Approximate determination of small fishing vessel's stability by means of the rolling period tests, contained in appendix 6 of the annex to part A of the Code of Safety for Fishermen and Fishing Vessels, 2005.

rapidly be closed watertight commence to immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open;

- 2 the righting lever GZ should be at least 200 mm at an angle of heel equal to or greater than 30°. The righting lever GZ may be reduced to the satisfaction of the Competent Authority but in no case by more than 2(24 - L)%, where L, in metres, is as defined in 1.2.21;
- 3 the maximum righting lever GZ_{max} should occur at an angle of heel preferably exceeding 30° but not less than 25°; and
- 4 the initial metacentric height GM₀ should not be less than 350 mm for single-deck vessels. In vessels with complete superstructure the metacentric height may be reduced to the satisfaction of the Competent Authority, but in no case should be less than 150 mm.

3.2.2 Where arrangements other than bilge keels are provided to limit the angles of roll, the Competent Authority should be satisfied that the stability criteria given in 3.2.1 are maintained in all operating conditions.

3.2.3 Where ballast is provided to ensure compliance with 3.2.1, its nature and arrangement should be to the satisfaction of the Competent Authority.

3.2.4 It should be ensured that stability characteristics of the vessel will not produce acceleration forces which could be prejudicial to the safety of the vessel and crew.

3.2.5 For decked vessels for which, by reason of insufficient stability data, 3.2.1 cannot be applied, the following approximate formula for the minimum metacentric height GM_{min}, in metres, for all operating conditions should be used as the criterion:

$$GM_{min} = 0.53 + 2B[0.075 - 0.37(\frac{f}{B}) + 0.82(\frac{f}{B})^2 - 0.014(\frac{B}{D}) - 0.032(\frac{l_s}{L})]$$

where:

L, B, D and f, in metres, are as defined in 1.2.21, 1.2.5, 1.2.12 and 1.2.17; and

l_s is the actual length of enclosed superstructure extending from side to side of the vessel, in metres, as defined in 1.2.13.

The formula is applicable for vessels having:

- 1 $\frac{f}{B}$ between 0.02 and 0.20;
- 2 $\frac{l_s}{L}$ smaller than 0.60;
- 3 $\frac{B}{D}$ between 1.75 and 2.15;
- 4 sheer fore and aft at least equal to or exceeding the standard sheer prescribed in Regulation 38(8) of the International Convention on Load Lines, 1966; and
- 5 height of superstructure included in the calculation not less than 1.8 m.

For vessels with parameters outside of the above limits, the formula should be applied with special care.

3.2.6 The above formula is not intended as a replacement for the basic criteria given in 3.2.1 and 3.5, but should be used only if circumstances are such that cross-curves of stability, KM curve and subsequent GZ curves are not and cannot be made available for judging a particular vessel's stability.

3.2.7 The calculated value of GM_{min} should be compared with actual GM values of the vessel in all loading conditions. If a rolling test, an inclining experiment based on estimated displacement, or another approximate method of determining the actual GM is used, a safety margin should be added to the calculated GM_{min} .*

3.3 Flooding of fish-holds

The angle of heel at which progressive flooding of fish-holds could occur through hatches which remain open during fishing operations and which cannot rapidly be closed should be at least 20° unless the stability criteria of 3.2.1 can be satisfied with the respective fish-holds partially or completely flooded.

3.4 Particular fishing methods

Vessels engaged in particular fishing methods where additional external forces are imposed on the vessel during fishing operations should meet the stability criteria of 3.2.1, increased, if necessary, to the satisfaction of the Competent Authority.

3.5 Severe wind and rolling

For vessels intended for operation in areas where exceptionally adverse weather conditions may be experienced, special attention should be given to the capability to withstand the capsizing effects of breaking waves. In order to demonstrate ability to withstand such effects, the Competent Authority should give consideration to the benefits of enclosed deck erections which may provide an improved range of positive stability to larger angles of heel with openings assumed closed weathertight. A positive range of stability up to an angle of 80° may be used as a criterion. Alternatively, the Severe wind and rolling criterion (weather criterion) for fishing vessels may be used.†

* Refer to appendices 6 and 7 of the annex to part A of the Code of Safety for Fishermen and Fishing Vessels, 2005.

† Refer to the Severe wind and rolling criterion (weather criterion) for fishing vessels, contained in paragraph 4.2.4 of the Code on Intact Stability for all Types of Ships covered by IMO Instruments, adopted by the Organization by resolution A.749(18), as amended.

3.6 Water on deck

Vessels should be able to withstand, to the satisfaction of the Competent Authority, the effect of water on deck, taking account of the seasonal weather conditions, the sea states in which the vessel will operate, the type of vessel and its mode of operation. The Guidance on a method of calculation of the effect of water on deck may be used.*

3.7 Operating conditions

3.7.1 The number and type of operating conditions to be considered should be to the satisfaction of the Competent Authority and should include the following as appropriate:

- .1** departure for the fishing grounds with full fuel, stores, ice, fishing gear, etc.;
- .2** departure from the fishing grounds with full catch;
- .3** arrival at home port with full catch and 10% stores, fuel, etc.; and
- .4** arrival at home port with 10% stores, fuel, etc., and a minimum catch, which should normally be 20% of full catch but may be up to 40% provided the Competent Authority is satisfied that operating patterns justify such a value.

3.7.2 In addition to the specific operating conditions given in 3.7.1 the Competent Authority should also be satisfied that the minimum stability criteria given in 3.2 are met under all other actual operating conditions, including those which produce the lowest values of the stability parameters contained in these criteria. The Competent Authority should also be satisfied that those special conditions associated with a change in the vessel's mode or areas of operation which affect the stability considerations of this chapter are taken into account.

3.7.3 Concerning the conditions referred to in 3.7.1, the calculations should include the following:

- .1** allowance for the weight of the wet fishing nets and tackle, etc., on deck;
- .2** allowance for ice accretion, if anticipated, in accordance with 3.8;
- .3** homogeneous distribution of the catch, unless this is inconsistent with practice;
- .4** catch on deck, if anticipated, in operating conditions referred to in 3.7.1.2, 3.7.1.3 and 3.7.2;

* Refer to the Guidance on a method of calculation of the effect of water on deck, contained in recommendation 1 of attachment 3 to the Final Act of the 1993 Torremolinos Conference.

- .5 water ballast if carried either in tanks which are especially provided for this purpose or in other tanks also equipped for carrying water ballast; and
- .6 allowance for the free surface effect of liquids and, if applicable, catch carried.

3.8 Ice accretion

3.8.1 For vessels operating in areas where ice accretion is likely to occur, the following icing allowance should be made in the stability calculations:*

- .1 30 kg/m² on exposed weather decks and gangways;
- .2 7.5 kg/m² for the projected lateral area of each side of the vessel above the water-plane; and
- .3 the projected lateral area of discontinuous surfaces of rail, spars (except masts) and rigging of vessels having no sails and the projected lateral area of other small objects should be computed by increasing the total projected area of continuous surfaces by 5% and the static moments of this area by 10%.

3.8.2 The height of the centre of gravity of ice accretion should be calculated according to the position of corresponding parts of the decks and gangways and other continuous surfaces on which ice can accumulate.

3.8.3 Vessels intended for operation in areas where ice accretion is known to occur should be:

- .1 designed to minimize the accretion of ice; and
- .2 equipped with such means for removing ice as the Competent Authority may require.[†]

3.9 Inclining test

3.9.1 Every vessel should undergo an inclining test upon its completion and the actual displacement and position of the centre of gravity should be determined for the light ship condition.

* For sea areas where ice accretion may occur and modifications of the icing allowance are suggested, refer to the Guidance relating to ice accretion, contained in recommendation 2 of attachment 3 to the Final Act of the 1993 Torremolinos Conference. Refer also to the Icing consideration and to the Recommendation for skippers of fishing vessels on ensuring a vessel's endurance in conditions of ice formation, contained in appendix 10 of the annex to part A of the Code of Safety for Fishermen and Fishing Vessels, 2005.

[†] Refer to 2.4 of appendix 10 of the annex to part A of the Code of Safety for Fishermen and Fishing Vessels, 2005 for a typical list of equipment and hand tools required for combating ice formation.

3.9.2 Where alterations are made to a vessel affecting its light ship condition and the position of the centre of gravity, the vessel should, if the Competent Authority considers this necessary, be re-inclined and the stability information revised.

3.9.3 The inclining test of an individual vessel may be omitted provided basic stability data are available from the inclining test of a sister ship, and it is demonstrated, to the satisfaction of the Competent Authority, that reliable stability information for the vessel can be obtained from such basic data.

3.10 Stability information

3.10.1 Suitable stability information, to the satisfaction of the Competent Authority, should be supplied to enable the skipper to assess with ease and certainty the stability of the vessel under various operating conditions.* Such information should include specific instructions to the skipper warning him of those operating conditions which could adversely affect either the stability or the trim of the vessel.†

3.10.2 The stability information, referred to in 3.10.1, should be kept on board, readily accessible at all times and inspected at the periodical surveys of the vessel to ensure that it has been approved for the actual operating conditions.

3.10.3 Where alterations are made to a vessel affecting its stability, revised stability calculations should be undertaken to the satisfaction of the Competent Authority. If the Competent Authority requires that the stability information should be revised, the new information should be supplied to the skipper and the superseded information removed.

3.10.4 Scales indicating the vessel's draught should be permanently marked on both sides of the stem and stern. These scales should be measured perpendicularly from a datum line which will lie along, or be a projection of, the lower extremity of the keel or other appendage. Numbers 0.1 m in the vertical plane should be marked on the scale, the lower edge of each number indicating the draught in metres. Between the numbers, lines should be marked, parallel to the datum, at intervals of 0.1 m. The skipper should be provided with information defining the position of the datum line and instructions regarding the use of observed draughts.

* Refer to the Guidance on stability information contained in recommendation 3 of attachment 3 to the Final Act of the 1993 Torremolinos Conference. See also the General provisions against capsizing and information for the master, contained in chapter 2 of the Code on Intact Stability for all Types of Ships covered by IMO Instruments, adopted by the Organization by resolution A.749(18), as amended.

† Refer to the Code of practice concerning the accuracy of stability information for fishing vessels, adopted by the Organization by resolution A.267(VIII).

Chapter 4

Machinery and electrical installations

Part A *General*

4.1 General

4.1.1 Machinery and electrical installations should be designed, constructed and installed in accordance with good engineering practice, applying, where applicable, the requirements of the Competent Authority or rules of recognized classification societies or other equivalent standards as appropriate. Equipment should be so installed, protected and maintained as not to constitute a danger to persons and the vessel.

4.1.2 Machinery spaces should be so designed as to provide safe and free access to all machinery and its controls as well as to any other parts which may require servicing. Such spaces should be adequately ventilated.

4.1.3 Means should be provided whereby the machinery can be brought into operation from dead vessel condition without external aid.

4.1.4 All controls for operating the machinery and equipment, such as measuring devices, pumping systems and arrangements, valves, cocks, air pipes, inlets, sounders, switches, should be permanently marked with appropriate inscriptions clearly showing their purpose. Pipes should preferably be marked by appropriate colours to indicate their purpose. All valves should have indicators showing whether they are open or closed and should have handwheels so marked as to indicate the direction of turning, which should generally be clockwise for closing.

4.1.5 Exhaust pipes and other hot surfaces within reach of personnel should be properly insulated or otherwise protected to prevent accidents or burns. Likewise, hot surfaces which could cause ignition should be protected from all possible contacts with combustible materials.

4.1.6 Plastic piping should not be used for any purpose in the machinery spaces where its destruction by fire would present a safety hazard.

4.1.7 Moving external parts of engines and mechanical and electrical equipment should be suitably protected to prevent injury to attendant personnel.

4.1.8 Platforms and gratings in machinery spaces and openings to machinery space bilges should be provided with adequate handrails or handholds and toeboards.

4.1.9 Walking surfaces should be properly fitted and secured in place and should have a non-slip surface.

4.1.10 Machinery space ladders should be fitted with non-slip treads.

4.1.11 Machinery spaces require extensive ventilation and due regard should be given to climatic conditions in the area of intended service and the air requirements of internal-combustion engines installed.

4.1.12 Where air-cooled internal-combustion engines are installed, special consideration should be given to the provision of adequate volumes of cooling air and to the removal of hot air from the machinery spaces.

4.1.13 Where water-cooled internal-combustion engines are installed, provision should be made for an emergency means of supplying cooling water. Strainers should be capable of being cleaned without interrupting the flow of cooling water. Where keel coolers are installed, provision should be made to isolate them by fitting valves inside the hull at the inlet and outlet connections.

4.1.14 Tools, spare parts and spare gear required for routine maintenance and simple repairs should be provided for main and auxiliary machinery, mechanical and electrical equipment and installations, and should be securely stowed in an easily accessible space.

4.1.15 Information on operation and maintenance of machinery, usage of fuel and lubricating oils should be provided.

4.1.16 Measuring devices should be so installed as to be readily visible.

Part B

Machinery installations

(See also section 4.1)

4.2 Machinery

4.2.1 Bars used on flywheels to turn machinery over by hand should be so constructed as to facilitate easy withdrawal from the flywheel's recess if the engine should recoil. Hand cranks for engines should be designed to be thrown out instantly when the engine starts.

4.2.2 Where a forward power take-off is fitted to an engine for auxiliary drives, the power to be taken off should not exceed the engine manufacturer's limits for forward end drives.

4.2.3 Where a layshaft is driven from the power take-off shaft by either pulley or chain, the shaft should be fitted with a bearing on both sides of the pulley or chain sprocket.

4.2.4 Hydraulic installations for fishing equipment should have a means of disengaging the hydraulic pump from the driving engine.

4.2.5 Belt drives should be arranged with a method of tensioning in order that each belt drive can be adjusted individually.

4.2.6 The main engine instrument panel should, where applicable, have the following gauges:

- .1 engine revolution counter;
- .2 engine lubricating oil pressure gauge;
- .3 engine reverse/reduction gearbox oil pressure gauge;
- .4 engine cooling water temperature gauge;
- .5 ammeters for batteries; and
- .6 exhaust temperature gauge (on engines of 250 kW and above).

4.2.7 Audible and visual alarms should be fitted for low lubricating oil pressure and high cooling water temperatures. Taking into consideration the configuration of the vessel and the mode of operation, the Competent Authority may require the alarms to be visible and heard in the machinery space and in the wheelhouse.

4.2.8 Outboard engines should be capable of being easily and securely fastened to the hull, and be provided with a safety chain or cable.

4.2.9 Where outboard engines are fitted in a well, this should be fitted with a drain pipe of not less than 50 mm in diameter; the well should be long enough to allow for the engine to be tilted up; remote control and fuel hoses should be led into the well through a hole provided with an effective bushing.

4.2.10 Auxiliary engines should be securely mounted in rigid seats and should be fully independent of all other systems.

4.3 Means of going astern

Vessels should have sufficient power for going astern to secure proper control of the vessel in all normal circumstances.

4.4 Air pressure systems

4.4.1 Air intakes for air compressors should be so located that the air is as pure and clean as possible and free from flammable or toxic gases or fumes. Air filters should be fitted. Air discharge pipes of compressors should, where necessary, be insulated to protect personnel from burns.

4.4.2 All discharge pipes from starting air compressors should lead directly to the starting air receivers and all starting pipes from the air receivers to main or auxiliary engines should be entirely separate from the compressor discharge pipe system.

4.4.3 Means to drain oil and water should be fitted to the lowest part of air receivers.

4.5 Arrangements for fuel oil, lubricating oil and other flammable oils

4.5.1 Fuel tanks, their filling systems, valves and associated piping should be carefully installed and be maintained so as to prevent the leakage of fuel or fumes within the hull.

4.5.2 Vents and filling connections of fuel tanks should be located in a safe, open-air position and remote from any ventilation intake. The cross-sectional area of vents should be determined having regard to the filling arrangements. Vent openings should be fitted with suitable wire gauze screens or equivalent protective devices.

4.5.3 A valve capable of shutting off the supply to the engine should be mounted on or adjacent to the fuel tank and control of this valve should be accessible from outside the machinery space.

4.5.4 Wherever fuel might escape and come into contact with hot surfaces, suitable guards or screens should be installed.

4.5.5 Fuel storage tanks should be located remote from heated surfaces and should not be situated above stairways and ladders, boilers, hot surfaces and electrical equipment. Tanks and piping should be arranged so as to eliminate, in the event of overflow, and to minimize, in the event of leakage or rupture, the possibility that fuel will come into contact with hot surfaces or electrical components which may cause ignition of the fuel.

4.5.6 Safe and efficient means of ascertaining the amount of fuel oil contained in any oil tank should be provided. If sounding pipes are installed, their upper ends should terminate in safe positions and should be fitted with suitable means of closure. Gauges made of glass of substantial thickness and protected with a metal case may be used, provided that automatic closing valves are fitted. Other means of ascertaining the amount of fuel oil contained in any fuel oil tank may be permitted providing their failure or overfilling of the tanks will not permit release of fuel.

4.5.7 Where practicable, fuel oil piping should not be led through accommodation spaces.

4.5.8 Fuel tank sounding pipe openings should not be located in crew accommodation.

4.5.9 Fuel return pipes should be connected to the fuel oil service tank in use or to the suction side of the fuel pump.

4.5.10 Fuel pipes of internal-combustion engines should be of steel or other equivalent material and preferably of a jacketed design. All fuel pipes should be adequately secured and protected.

4.5.11 Fuel oil pipes and their valves and fittings should be of steel or other equivalent material, provided that restricted use of flexible pipes may be permitted in positions where the Competent Authority is satisfied that they are necessary. Such flexible pipes and end attachments should be of adequate strength and should, to the satisfaction of the Competent Authority, be constructed of approved fire-resistant materials or have fire-resistant coatings. Where necessary, fuel oil and lubricating oil pipelines should be screened or otherwise suitably protected to avoid, as far as practicable, oil spray or oil leakage on heated surfaces or into machinery air intakes. The number of joints in piping systems should be kept to a minimum.

4.5.12 Where the Competent Authority has permitted the use of a petrol engine which is installed within a closed, decked compartment, such compartment should be ventilated with a mechanical exhaust and a natural supply system. Exhaust ventilation trunks from compartments containing petrol engines or other sources of concentrated petrol fumes should be isolated from other ventilation systems. The mechanical exhaust system should include an intake located as close as practicable to a position beneath the engine it serves or where petrol fumes are most likely to accumulate, and it should be above normal bilge water levels. Mechanical exhaust fans and trunks fitted in accordance with the requirements of this section should be suitable for use in an atmosphere containing petrol fumes.

4.5.13 There should be a permanent notice at each petrol engine starting position requiring:

- .1** that the ventilation system be operated for at least 2 min before an engine is started; and
- .2** that during fuelling all windows and doors are closed and smoking is prohibited.

4.5.14 Petrol tanks should not be integral with the hull structure. An efficient system should be installed to ensure that petrol does not spill into the hull of the vessel when tanks are being filled.*

* Attention is drawn to the use of aluminium mesh inside petrol tanks to reduce the risk of explosion.

4.5.15 Portable petrol tanks for outboard motors should be taken ashore for filling.

4.5.16 Petrol filling systems should be effectively bonded or earthed.

4.5.17 Emergency controls should be provided, preferably on deck outside machinery and accommodation spaces, for stopping every fuel pressure pump and every fan supplying air to machinery spaces and for closing all suction from fuel tanks above double bottom. Such controls should be at positions not likely to be cut off in the event of a fire in the machinery spaces.

4.5.18 Where fuel of a flashpoint of less than 60°C (closed-cup test) is used, the temperature of the space in which such fuel is stored should not rise to within 10°C below the flashpoint of the fuel.

4.5.19 Lubricating oil tanks, their associated piping and valves should be carefully installed and maintained so as to prevent leakage of lubricating oil within the hull.

4.5.20 Adequate means should be provided for indicating failure of the lubricating oil system.

4.5.21 Where tubular gauge glasses are fitted to lubricating oil tanks they should be of substantial construction, adequately protected and fitted with self-closing arrangements on the tank.

4.5.22 Lubricating oil pipes should be of steel or other equivalent material and should be adequately secured and protected.

4.6 Bilge and ballast systems

4.6.1 Arrangements should be provided for draining any watertight compartment (other than small buoyancy compartments) under all service conditions.

4.6.2 Valves and cocks not forming part of a piping system should not normally be permitted in watertight bulkheads.

4.6.3 Bilge suctions should be fitted with suitable strainers.

4.6.4 Bilge and ballast pumping systems should be arranged so as to prevent water passing from the sea or from water ballast spaces into holds or into machinery spaces or from one watertight compartment to another. The bilge connection to any pump which draws from the sea or from water ballast spaces should be fitted with either a non-return valve or a cock which cannot be opened simultaneously either to the bilges and to the sea or to the bilges and water ballast spaces. Valves in bilge distribution boxes should be of a non-return type.

4.6.5 At least two bilge pumps should be provided, one of which should be manually operated. A ballast pump or other general service pump of sufficient capacity may be used as a power-driven bilge pump. Power bilge

pumps should be capable of giving a speed of water of at least 2 m/s through the main bilge pipe, which should have an internal diameter of at least:

$$d = 25 + 1.68\sqrt{L(B + D)}$$

where d is the internal diameter in millimetres, and L , B and D are in metres.

However, the actual internal diameter of the bilge main may be rounded off to the nearest standard size acceptable to the Competent Authority. The manually operated pump should be fitted outside the machinery space. In no case should the capacity of the bilge pump(s) be less than the capacity of the installed fire pump(s).

4.6.6 The inside diameter of the bilge main and bilge suction pipe directly connected to the pump should be not less than the inside diameter of the bilge pump suction inlet.

4.6.7 Bilges in machinery spaces should be provided with a high-level alarm in such a way that the accumulation of liquids is detected at normal angles of trim and heel. The detection system should initiate an audible and visual alarm in the places where continuous watch is maintained.

4.7 Exhaust systems

4.7.1 Exhaust pipes from engines and from heating and cooking appliances should be permanently mounted and lead to the open air through the uppermost deck or canopy or through the hull. Where exhaust pipes pass through the uppermost deck or canopy, they should be of sufficient height to ensure that no exhaust gases can pass back into the vessel. Where an exhaust pipe passes through the hull of the vessel, the hull connection should be watertight and provision should be made so that the engine cannot be flooded.

4.7.2 All exhaust pipes should be assembled with the minimum number of bends and of a diameter as specified by the engine manufacturers. All joints should be gastight, the pipes well secured and supported by hangers or brackets and fitted with a section of flexible pipe or a bellows pipe; exhaust pipes should be led clear of all woodwork and other combustible material and where necessary they should be effectively insulated.

4.7.3 Where exhaust pipes pass through a wooden deck or other structures of wood or other combustible material, suitable protection should be provided to the structure to avoid the risk of fire.

4.7.4 Where a wet exhaust system is fitted, water from the engine cooling system should be introduced into the exhaust pipe near to the manifold and a “U” bend or other suitable water trap should be incorporated in the exhaust line to avoid the flow-back of water into the engine.

4.8 Steering gear

4.8.1 The steering arrangements, including the rudder and associated fittings, should be of adequate strength and capable of steering the vessel at maximum speed and should be so designed and constructed that they are not damaged at maximum astern speed or by manoeuvring during fishing operations.

4.8.2 Where the main steering device is mechanically operated, an emergency means of steering should be provided which should be easily accessible.

4.8.3 Where a steering device other than a rudder is fitted, its construction and operation should be adequate and suitable for its intended purpose and should comply with the provisions of 4.3.

4.8.4 Where the steering device is remotely operated, a rudder angle indicator should be provided at the steering position. The rudder angle indicator for power-operated steering gear should be independent of the steering gear control system.

4.8.5 The wheelhouse should be so arranged that the person steering the vessel has clear view ahead and that, as far as practicable, an all-round vision is possible from within the wheelhouse.

4.9 Refrigeration systems for the preservation of the catch

4.9.1 Refrigeration systems should be so designed, constructed, tested and installed as to take account of the safety of the system and also the emission of refrigerants held in quantities or concentrations which are hazardous to human health or to the environment, and should be to the satisfaction of the Competent Authority.

4.9.2 Refrigerants to be used in refrigeration systems should be to the satisfaction of the Competent Authority. However, methyl chloride or CFCs whose ozone-depleting potential is higher than 5% of CFC-11 should not be used as refrigerants.

4.9.3 If ammonia is to be used as the refrigerant gas, the refrigerating plant should be at least arranged so as to take account of the recommended practice at annex III.

4.9.4 Refrigerating installations should be adequately protected against vibration, shock, expansion, shrinkage, etc., and should be provided with an automatic safety control device to prevent a dangerous rise in temperature and pressure.

4.9.5 Refrigeration systems in which toxic or flammable refrigerants are used should be provided with drainage devices leading to a place where the refrigerant presents no danger to the vessels or to persons on board.

4.9.6 Any space containing refrigerating machinery, including condensers and gas tanks, utilizing toxic refrigerants should be separated from any adjacent space by gastight bulkheads. Any space containing the refrigerating machinery, including condensers and gas tanks, should be fitted with a leak detection system having an indicator outside the space adjacent to the entrance and should be provided with an independent ventilation system.

4.9.7 Spaces containing condensers, gas tanks and refrigeration machinery utilizing toxic refrigerants, such as ammonia, should be provided with a water spray system.

4.9.8 When it is not practicable to contain refrigeration machinery in a separate place due to the size of the vessel, the refrigeration system may be installed in the machinery space provided that the quantity of refrigerant used will not cause danger to persons in the machinery space, should all the gas escape, and provided that an alarm is fitted to give warning of a dangerous concentration of gas should any leakage occur in the compartment.

4.9.9 In refrigerating machinery spaces and refrigerating rooms, alarms should be connected to the wheelhouse or control stations or escape exits to prevent persons being trapped. At least one exit from each such space should be capable of being opened from the inside. Where practicable, exits from the spaces containing refrigerating machinery using toxic or flammable gas should not lead directly into any accommodation spaces.

4.9.10 Where any refrigerant harmful to persons is used in a refrigeration system, at least two sets of breathing apparatus should be provided, one of which should be placed in a position not likely to become inaccessible in the event of leakage of refrigerant. Breathing apparatus provided as part of the vessel's fire-fighting equipment may be considered as meeting all or part of this provision provided its location meets both purposes. Where self-contained breathing apparatus is used, spare cylinders should be provided.

4.9.11 Adequate guidance for the safe operation and emergency procedures for the refrigeration system should be provided by suitable notices displayed on board the vessel.

Part C

Electrical installations

4.10 Main source of electrical power

Where electrical power constitutes the only means of maintaining auxiliary services essential for the propulsion and safety of the vessel, a

main source of electric power should be provided which should, as far practicable, include two generating sets, one of which may be driven by the main engine. The Competent Authority may accept other arrangements having equivalent electrical capacity.

4.11 Emergency source of electrical power

4.11.1 A self-contained emergency source of electrical power should be located outside the machinery spaces above the main deck. It should be so arranged as to ensure that it would function in the event of fire or other causes of failure of the main electrical installations.

4.11.2 The emergency source of electrical power, which may be either a generator or an accumulator battery, should be capable, having regard to starting current and the transitory nature of certain loads, of serving simultaneously, for a period of at least three hours:

- .1 a VHF radio installation or an MF radio installation or a ship-earth station or an MF/HF radio installation depending on the sea area for which the vessel is to be equipped;
- .2 internal communication equipment, fire-detecting systems and signals which may be required in an emergency; and
- .3 the navigational lights, if solely electrical, and the emergency lights:
 - .3.1 at launching stations and over the side of the vessel;
 - .3.2 in all alleyways, stairways and exits;
 - .3.3 in spaces containing machinery or the emergency source of power;
 - .3.4 in control stations; and
 - .3.5 in fish-handling and fish-processing spaces.

4.11.3 The arrangements for the emergency source of electrical power should comply with the following:

- .1 Where the emergency source of electrical power is a generator, it should be provided with an independent fuel supply and with efficient starting arrangements. Unless a second independent means of starting the emergency generator is provided, the single source of stored energy should be protected to preclude its complete depletion by the automatic starting system.
- .2 Where the emergency source of electrical power is an accumulator battery, it should be capable of carrying the emergency load without recharging whilst maintaining the voltage of the battery throughout the discharge period within plus or minus 12% of its nominal voltage. In the event of failure of the main power supply, this accumulator battery should be automatically connected to the emergency switchboard and should immediately supply at least those services specified in 4.11.2. The

emergency switchboard should be provided with an auxiliary switch allowing the battery to be connected manually in case of failure of the automatic connection system.

4.11.4 The emergency switchboard should be installed as near as is practicable to the emergency source of power and should be located in accordance with 4.11.1. Where the emergency source of power is a generator, the emergency switchboard should be located in the same place unless the operation of the emergency switchboard would thereby be impaired.

4.11.5 Any accumulator battery should be installed in a well-ventilated space, but not in the space containing the emergency switchboard. An indicator should be mounted in a suitable space on the main switchboard or in the machinery control room to indicate when the battery constituting the emergency source of power is being discharged. The emergency switchboard should be supplied in normal operation from the main switchboard by an inter-connector feeder protected at the main switchboard against overload and short circuit. The arrangement at the emergency switchboard should be such that, in the event of a failure of the main power supply, an automatic connection of emergency supply would be provided. When the system is arranged for feedback operation, the inter-connector feeder should also be protected at the emergency switchboard against short circuit.

4.11.6 An emergency generator and its prime mover and any accumulator battery should be so arranged as to ensure that they will function at full rated power when the vessel is upright and when rolling up to an angle of 22.5° either way and simultaneously pitching 10° by bow or stern, or is in any combination of angles within those limits.

4.11.7 Battery level indicators should be mounted in a highly visible position on the on the main switchboard or in the machinery control room to facilitate monitoring of the condition of batteries constituting the emergency source of supply as well as any batteries required for the starting of an independent, power driven emergency generator.

4.11.8 The emergency source of electrical power and automatic starting equipment should be so constructed and arranged as to enable adequate testing to be carried out by the crew while the vessel is in operating condition.

4.12 Precautions against shock, fire and other hazards of electrical origin

4.12.1 Electrical equipment and installations should be such that the vessel and all persons on board are protected against electrical hazards.

4.12.2 Cable systems and electrical equipment should be so installed as to avoid or reduce interference with radio operation.

4.12.3 Cables should be capable of carrying the maximum rated current for the circuit. The cross-sectional area should be sufficient to ensure that the voltage drop will not exceed 6% of the nominal rating under maximum rated load for the circuit. Electrical wiring should be of marine grade multi-strand tinned copper wire cores with an approved insulated cover.

4.12.4 All electrical cables should be at least of a flame-retardant type and should be so installed as not to impair their original flame-retarding properties. The Competent Authority may permit the use of special types of cables when necessary for particular applications, such as radio cables, which do not comply with the foregoing.

4.12.5 Electric cables should be supported in such a manner as to avoid chafing or other damage and should not be located close to hot surfaces such as engine exhausts. Except as permitted by the Competent Authority in exceptional circumstances, all metal sheaths and armour of cables should be electrically continuous and should be earthed.

4.12.6 Where cables are not metal-sheathed or armoured and there might be a risk of fire in case of an electrical fault, special precautions should be taken to the satisfaction of the Competent Authority.

4.12.7 Electrical wiring and electrical equipment installed in fishing vessels should be of marine grade materials only and should conform to the best marine practices of installation and workmanship. Electrical equipment exposed to the weather should be protected from dampness and corrosion as well as mechanical damage.

4.12.8 Lighting fittings should be arranged to prevent temperature rises which could damage the wiring and to prevent surrounding material from becoming excessively hot.

4.12.9 In spaces where flammable mixtures are liable to collect, and in any compartment assigned principally to the containment of an accumulator battery, no electrical equipment should be installed unless the Competent Authority is satisfied that it is:

- .1 essential for operational purposes;
- .2 of a type which will not ignite the mixture concerned;
- .3 appropriate to the space concerned; and
- .4 appropriately certified for safe usage in the dusts, vapours or gases likely to be encountered.

4.12.10 Where a potential explosion risk exists in or near any space, all electrical equipment and fittings installed in those spaces should be either explosion-proof or intrinsically safe to the satisfaction of the Competent Authority.

4.13 Electrical systems

4.13.1 Direct-current installations should be wired as insulated return systems. The hull should not be used to carry current.

4.13.2 Main and emergency switchboards should be so arranged as to give easy access as may be needed to apparatus and equipment, without danger to attendants. The sides and backs and, where necessary, the fronts of switchboards, should be suitably guarded. Exposed “live” parts having voltages to earth exceeding a voltage to be specified by the Competent Authority should not be installed on the front of such switchboards. There should be non-conducting mats or gratings at the front and rear.

4.13.3 All outgoing circuits from the switchboards should be double pole and open-circuit protected. Lighting circuits should be separate from power circuits. Secondary distribution boards should be fitted with double-pole switches and open-circuit protection whereas final sub-circuits may be fitted with single-pole switches.

4.13.4 Main switchboards should be fitted with voltmeters and ammeters for each generator and with earth lamps. The emergency switchboard should also be fitted with a voltmeter, ammeter and earth lamps.

4.13.5 Where electrical power, other than a low-voltage supply, constitutes the only means of maintaining auxiliary services essential for the propulsion and the safety of the vessel, the main switchboard should be designed to allow preferential tripping of non-essential services to reduce the risk of overload and premature actuation of the emergency source of supply.

4.13.6 Electric circuits and the current-carrying capacity of each circuit should be permanently indicated, together with the rating or setting of the appropriate overload protective device and should be clearly identified on switchboards and, where appropriate, on distribution boxes.

4.13.7 Each separate circuit should be protected against short circuit as well as against overload to the satisfaction of the Competent Authority.

4.13.8 Piping conveying liquid should not be fitted above or close to switchboards or other electrical equipment. Where such arrangements are unavoidable, provision should be made to prevent leakage damaging the equipment. The current-carrying capacity of each circuit should be permanently indicated, together with the rating or setting of the appropriate overload protective device.

4.13.9 Where the main source of supply is an accumulator battery system only, the batteries should be suitably housed and compartments used primarily for their storage should be properly constructed and ventilated. However, accumulator batteries should not be housed in crew accommodation spaces unless installed in a hermetically sealed container.