

Code of Safety for
**Fishermen and
Fishing Vessels**
2005

Part B
**Safety and Health Requirements for the
Construction and Equipment of Fishing Vessels**



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Preface

1 The Code of Safety for Fishermen and Fishing Vessels originated from a resolution adopted by the International Labour Organization (ILO) in 1962. Subsequent to that resolution, the Food and Agriculture Organization (FAO), ILO and the International Maritime Organization (IMO) entered into an agreement to co-operate, within their respective fields of experience, to elaborate the Code. The agreement acknowledged that the respective areas of competence are:

- FAO – fisheries in general;
- ILO – labour in the fishing industry; and
- IMO – safety of life, vessels and equipment at sea.

The Code was elaborated in two parts:

- 1 part A to be addressed to skippers and crews, containing operational and occupational requirements; and
- 2 part B to be addressed to shipbuilders and owners, containing requirements for the construction and equipment for fishing vessels.

2 Part A of the Code was adopted by the first session of the Joint FAO/ILO/IMO Meeting of Consultants on Safety on Board Fishing Vessels which was held at ILO Headquarters in Geneva in September 1968.

3 Later amendments to part A were approved by the Maritime Safety Committee (MSC) of IMO, at its thirtieth session in the spring of 1973. At the same session, the Committee approved the final text of part B which was endorsed by the FAO Council at its 64th session (autumn 1974) and also endorsed by the Governing Body of the ILO at its 195th session (February 1975).

4 In 1977, an International Conference on the Safety of Fishing Vessels adopted the Torremolinos International Convention for the Safety of Fishing Vessels, 1977 which, for a number of reasons, did not enter into force. Consequently, a further International Conference was convened, also in Torremolinos, Spain, that adopted the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, hereinafter referred to as the Protocol.

5 The Conference also adopted, *inter alia*, resolution 4 in which it is noted that the Protocol does not contain specific requirements for certain safety equipment for fishing vessels of less than 45 m in length, such as life-saving appliances. Consequently, it urged all States, in view of the

inherent risks involved in the operation of fishing vessels, to consider the requirements for safety equipment when deciding, in accordance with article 3(4) of the Protocol, which regulations they should apply, wholly or in part, to fishing vessels of 24 m in length and over but less than the applicable length criteria of the chapter in question.

6 It was also noted that initiatives had been taken by certain States to develop uniform regional standards as called for in article 3(5) of the Protocol to ensure that the safety of fishing vessels covered by article 3(4) thereof is maintained at an acceptable level by determining which regulations, contained in the annex to the Protocol should apply, wholly or in part, to such vessels.

7 In its review of regional standards so developed, the MSC of IMO noted that they had been examined by the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety (SLF) with a view to the desirability of developing a template for other countries or regions (see documents MSC 68/INF.10 and MSC 70/INF.24). It was also noted that, in the examination process, the provisions of these regional standards had provided valuable information in relation to the revision of part B of the Code.

8 The MSC accepted that for certain sizes of vessels, the minimum standards contained in the Protocol should be applied and considered that it would be appropriate to refer to such provisions of the Protocol, where relevant, in the revised text of part B of the Code. It was also accepted by the Committee that any such references must stress the voluntary nature of the Code and substitute the mandatory terms “shall” and “will” with the word “should”.

9 The MSC acknowledged that there had been significant developments in relation to the management of fisheries that contained principles in support of the safety of fishermen and fishing vessels. It noted in particular:

- .1** the agreement for the Interpretation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 1995; and
- .2** the Code of Conduct for Responsible Fisheries adopted by the Conference of FAO in 1995.

10 The MSC recognized that the safety at sea aspects contained within these instruments could be relevant in relation to the revision of part B, in particular:

- .1** the arrangements for the monitoring, control and surveillance of fishing vessels including recommendations for the reporting of the position of a fishing vessel at sea;

- .2** the marking of fishing vessels in accordance with uniform and internationally recognized systems such as the FAO Standard Specifications for the Marking and Identification of Fishing Vessels*; and
- .3** the integration of fishing vessels into search and rescue systems.

11 In entrusting the revision of the Code to the SLF Sub-Committee, the MSC recommended that the recent developments in fishing vessel design and fishing operations should be taken into consideration. The MSC also entrusted the SLF Sub-Committee to revise the Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, that had been approved by MSC in 1979, which addresses vessels of 12 m in length and over but less than 24 m in length. In this regard, IMO was requested to invite FAO and ILO to participate in the revision. Both Organizations responded positively to the subsequent invitation.

12 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.

13 Concerning the procedures for future amendments to the Code and 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.

14 Recognizing that the majority of items covered by the Code and 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 Code 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

* Refer to the FAO Technical Guidelines for Responsible Fisheries – No 1 Fishing Operations. (ISBN 92-5-103914-3) and MSC/Circ.572.

- .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 I

General provisions

1.1 Purpose and scope

1.1.1 The purpose of this part of the Code is to provide information on the design, construction, and equipment of fishing vessels with a view to promoting the safety of fishing vessels and safety and health of the crew. The Code is not a substitute for national laws and regulations nor is it a substitute for the provisions of international instruments in relation to safety of fishing vessels and crew although it may serve as a guide to those concerned with framing such national laws and regulations.

1.1.2 The Code is voluntary. It is wider in scope than the Torremolinos Protocol and only the minimum requirements to ensure the safety of fishing vessels and safety and health of the crew are given in this part of the Code for fishing vessels of 24 m in length and above. Each Competent Authority should take every possible measure to promote the safety of the vessels concerned.

1.1.3 Certain sections of this part of the Code make reference to the minimum standards set out in the provisions of the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, as modified by the Torremolinos Protocol of 1993 relating thereto. For the purpose of this part of the Code, these are considered to be the minimum standards acceptable in relation to the classes of vessels, as prescribed in the Protocol, to which they should be applied.

1.1.4 Regional uniform standards or guidelines that have been submitted to IMO as provided for under article 3, paragraphs (4) and (5) of the Protocol for fishing vessels registered and operating in such regions, prevail over chapters IV, V, VII and IX of this part of the Code. For all other fishing vessels of 24 m in length and over but less than 45 m in length, that are registered in such regions but operate, or are intended for operation outside the region, the whole of this part of the Code would serve as a guide.

1.1.5 Unless otherwise stated, the provisions of this part of the Code are intended to apply to new decked fishing vessels of 24 m in length and above. However, even where not otherwise stated, the Competent Authority should also apply these provisions, as far as reasonable and practicable, to existing decked fishing vessels.

1.1.6 The provisions of this part of the Code do not apply to fishing vessels for sport or recreation or to processing vessels.

1.1.7 Where operating experience has clearly shown that departure from the provisions of this part of the Code is justified, or in applying this part of the Code to any other equivalent area of operation for any vessel covered by this part of the Code, the Competent Authority may permit adequate alterations or substitutions thereof.

1.2 Definitions

For the purpose of this part of the Code, unless expressly provided otherwise, the following definitions apply.

1.2.1 *Amidships* is 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*, defined as the vertical distance at the forward perpendicular between the waterline corresponding to the maximum permissible operating 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 forepart of the vessel which meets the following conditions:

- .1** The bulkhead should be located at a distance from the forward perpendicular:
 - .1.1** not less than $0.05L$ and not more than $0.08L$ for vessels of 45 m and over;
 - .1.2** not less than $0.05L$ and not more than $0.05L$ plus 1.35 m for vessels less than 45 m in length except as may be allowed by the Competent Authority; and
 - .1.3** in no case less than 2 m.
- .2** Where any part of the underwater body extends forward of the forward perpendicular, e.g. a bulbous bow, the distance stipulated in 1.2.6.1 should be measured from a point at mid-length of the extension forward of the forward perpendicular or from a point $0.015L$ forward of the forward perpendicular, whichever is less.

* Definitions are illustrated in [annex I](#) to this part of the Code.

- .3** The bulkhead may have steps or recesses provided they are within the limits prescribed in 1.2.6.1.

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

1.2.8 *Convention* means the International Convention for the Safety of Life at Sea, 1974, as amended.

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

1.2.10 *Deepest operating waterline* is the waterline related to the maximum permissible operating draught.

1.2.11 The *depth (D)* is the moulded depth amidships.

1.2.12 *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.

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

1.2.14 *Fishing vessel* – in the following referred to as “vessel” – is a vessel used commercially for catching fish, whales, seals, walrus, or other living resources of the sea.

1.2.15 The *forward and after perpendiculars* should be taken at the forward and after ends of the length (*L*). The forward perpendicular should be coincident with the foreside of the stem on the waterline on which the length is measured.

1.2.16 *Freeboard ($f_{\min}$)* 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.

1.2.17 *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.

1.2.18 *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;
- .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.

1.2.19 *Least depth** is the depth measured from the keel line to the top of the working deck beam at side at the point where a parallel to the keel line is tangent to the deck line. 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.

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

1.2.21 *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 water and centreline planes passing through amidships.

1.2.22 The *moulded depth* is the vertical distance measured from the keel line to the top of the working deck beam at side. In vessels having rounded gunwales, the moulded depth should be measured to the point of intersection of the moulded lines of deck and side shell plating, the lines extending as though the gunwale were of angular design. Where the working deck is stepped and the raised part of the deck extends over the point at which the moulded depth is to be determined, the moulded depth is measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part.

1.2.23 *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 to this part of the Code.

* Definitions are illustrated in [annex I](#) to this part of the Code.

1.2.24 *Organization* means the International Maritime Organization.

1.2.25 *Place of shelter* is any naturally or artificially protected area easily accessible to the vessel and which can be used for sheltering the vessel in circumstances which are unfavourable to its safety.

1.2.26 *Processing vessel* is a vessel used exclusively for processing fish and other living resources of the sea.

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

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

1.2.29 *Superstructure* is the decked structure on the working deck extending from side to side of the vessel or with the side plating not being inboard of the shell plating more than 0.04B.

1.2.30 *Superstructure deck* is that complete or partial deck or the top of a superstructure, deckhouse or other erections 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 deckhouses or other erections should be treated in the same way as the working deck.

1.2.31 *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.

1.2.32 *Weather deck* is the uppermost deck exposed to weather and sea. Where the deck is not continuous, the uppermost deck at the point in question should be taken as the weather deck.

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

1.2.34 *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.

In this part of the Code 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

1.3 Surveys

1.3.1 The hull, machinery, equipment, and radio installations should be surveyed on completion and thereafter in such manner and at such intervals as the Competent Authority may consider necessary in order to ensure that their condition is in all respects satisfactory. The Competent Authority may, however, entrust the inspections and surveys either to surveyors nominated for the purpose or to organizations recognized by it. The surveys should be such as to ensure that the arrangements, material, and scantlings of the structure, boilers and other pressure vessels and their appurtenances, main and auxiliary machinery, electrical installations as well as crew accommodation and other equipment are in all respects satisfactory for the service for which the vessel is intended.

1.3.2 After any survey has been completed, no change should be made in the structural arrangements, machinery, equipment, etc., covered by the survey, without the sanction of the Competent Authority.

1.3.3 A fishing vessel should carry on board documentation relating to the safety of the vessel issued by the Competent Authority.

1.3.4 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.

1.4 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. Documentation approved by the Competent Authority to the effect that the alternative structures, measures and appliances meet national regulations should be available on board a vessel.

Chapter II

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.

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 Watertight doors fitted in watertight bulkheads should be capable of being opened and closed locally at the door on either side and preferably also from above the working deck. Means of operating doors should be clearly marked, and should indicate whether doors are open or closed. 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 Where a long forward superstructure is fitted, the collision bulkhead should be extended weathertight to the deck next above the working deck. The extension need not be fitted directly over the bulkhead below provided it is located within the limits given in 1.2.6 and the part of the deck which forms the step is made effectively weathertight.

2.1.6 The number of openings in the collision bulkhead above the working deck should be reduced to the minimum compatible with the design and normal operation of the vessel. Such openings should be capable of being closed weathertight.

2.1.7 In vessels of 75 m in length and over, a watertight double bottom should be fitted, as far as practicable, between the collision bulkhead and the afterpeak bulkhead.

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 arrangements 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 In vessels of less than 45 m in length, such doors may be of the hinged type, which should be capable of being operated locally from each side of the door and should normally be kept closed at sea. A notice should be attached to the door on each side to state that the door should be kept closed at sea.

2.2.3 In vessels of 45 m in length and over, watertight doors should be of the sliding type in:

- 1** spaces where it is intended to open them at sea and if located with their sills below the deepest operating waterline, unless the Competent Authority considers it to be impracticable or unnecessary, taking into account the type and operation of the vessels; and
- 2** the lower part of a machinery space where there is access from it to a shaft tunnel.

Otherwise watertight doors may be of the hinged type.

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

2.2.5 Sliding watertight doors, whether manually operated or otherwise, should be capable of being operated locally from each side of the door; in vessels of 45 m in length and over, these doors should also be capable of being operated by remote control from an accessible position above the working deck except when the doors are fitted in crew accommodation spaces.

2.2.6 Means should be provided at remote operating positions to indicate when a sliding door is open or closed.

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. Where operating experience has shown justification and on approval by the Competent Authority, these heights, except in the doorways giving direct access to machinery spaces, may be reduced to not less than 380 mm and 150 mm respectively.

2.5 Hatchways closed by wood covers

2.5.1 The height above deck of hatchway coamings should be at least 600 mm on exposed parts of the working deck and at least 300 mm on the superstructure deck.

2.5.2 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.

2.5.3 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 the weight of cargo intended to be carried on them or to the following static loads, whichever is the greater:

- .1 10 kN/m² for vessels of 24 m in length;
- .2 17 kN/m² for vessels of 100 m in length and over.

For intermediate lengths, the load values should be determined by linear interpolation. The Competent Authority may reduce the loads to not less than 75% of the above values for covers to hatchways situated on the superstructure deck in a position abaft a point located 0.25L of the length of the vessel measured from the forward perpendicular.

2.6.3 Where covers are made of mild steel, the maximum stress calculated according to 2.6.2 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 ensuring weathertightness under the loads specified in 2.6.2.

2.6.5 Covers should be fitted with clamping devices and gaskets sufficient to ensure weathertightness, or other equivalent arrangements 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 a strength equivalent to the adjacent superstructure. External access openings therein should be fitted with doors complying with the provisions of 2.4.

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 manholes may be fitted provided these are capable of being closed watertight and such devices should be permanently attached to the 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 Openings other than hatchways, machinery space openings, manholes and flush scuttles in the working or superstructure deck should be protected by enclosed structures fitted with weathertight doors or their equivalent. Companionways should be situated as close as practicable to the centreline of the vessel.

2.9 Ventilators

2.9.1 In vessels of 45 m in length and over, the height above deck of ventilator coamings, other than machinery space ventilator coamings, should be at least 900 mm on the working deck and at least 760 mm on the superstructure deck. In vessels of less than 45 m in length, the height of these coamings should be 760 mm and 450 mm respectively. 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 closing appliances permanently attached to the ventilator or adjacent structure. Where the coaming of any ventilator exceeds 900 mm in height it should be specially supported.

2.9.3 Closing appliances in vessels of 45 m in length and over need not be fitted to ventilators the coamings of which extend to more than 4.5 m above the working deck or more than 2.3 m above the superstructure deck unless specifically required by the Competent Authority. In vessels of less than 45 m in length, closing appliances need not be fitted to ventilators the coamings of which extend to more than 3.4 m above the working deck or more than 1.7 m above the superstructure deck. If the Competent Authority is satisfied that it is unlikely that water will enter the vessel through machinery space ventilators, closing appliances to such ventilators may be omitted.

2.10 Air pipes

2.10.1 Where air pipes to tanks and void spaces below deck extend above the working or the superstructure decks, the exposed parts of the pipes should be of strength equivalent to the adjacent structures and fitted with appropriate protection. Openings of air pipes should be provided with means of closing permanently attached to the pipe or adjacent structure.

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 service fuel oil 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 oil tank sounding pipe openings should not be located in crew accommodation, but may exceptionally be installed in passageways, in which case flush deck screwed caps should be fitted.

2.12 Sidescuttles and windows

2.12.1 Sidescuttles to spaces below the working deck and to spaces within the enclosed structures on that 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 Toughened safety glass or its equivalent should be used for the wheelhouse windows.

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

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 accessible 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 an 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 piping is sufficient. The means for operating the positive-action valve should be provided with an indicator showing whether the valve is open or closed.

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

2.13.3 Fittings attached to the shell and the valves required by 2.13.1 should be of steel, bronze or other approved 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 m^2 , 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 the well as follows:

1 $A = 0.07l$

(l need not be taken as greater than $0.7L$).

- 2.1** Where the bulwark is more than 1200 mm in average height, the required area should be increased by $0.004 m^2$ per metre of length of well for each 100 mm difference in height.

- .2.2** Where the bulwark is less than 900 mm in average height, the required area may be decreased by 0.004 m² 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 that the deck is rapidly and effectively freed 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.

2.14.4 Freeing ports should be so arranged along the length of bulwarks as to ensure that the deck is freed of water most rapidly and effectively. Lower edges of freeing ports should be as near the deck as practicable.

2.14.5 Poundboards and means for stowage of the fishing gear should be arranged so that the effectiveness of freeing ports will not be impaired. Poundboards should be so constructed that they can be locked in position when in use and should 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. If devices are considered necessary for locking freeing port covers during fishing operations, they should be to the satisfaction of the Competent Authority and easily operable from a readily accessible position.

2.14.7 In vessels intended to operate in areas subject to icing, covers and protective arrangements for freeing ports should be capable of being easily removed to restrict ice accretion. The size of openings and means provided for removal of these protective arrangements should be 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. Recommended practice for anchor and mooring equipment is given in [annex II](#).

Chapter III

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. A suggested form for such guidance is shown at the appendix to the Memorandum to Administrations in this respect reproduced at appendix 7 of the annex to part A of the Code.

3.2 Stability criteria

3.2.1 The following minimum stability criteria should be applied 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 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 be closed water-

* Refer to the Calculation of stability curves and to 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).

tight 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°;
- .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 GM_0 should not be less than 350 mm for single-deck vessels. In vessels with complete superstructure or vessels of 70 m in length and over, 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 a bilge keel 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 a vessel with L less than 30 m for which, by reason of insufficient stability data, 3.2.1 cannot be applied, the following formula for the minimum metacentric height $GM_{\min}$, in metres, for all operating conditions should be used as the criterion:*

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

where:

L, B, D and $f_{\min}$, in metres, are as defined in 1.2.20, 1.2.5, 1.2.11 and 1.2.16 respectively; and

l_s = Actual length, in metres, of an enclosed superstructure, extending from side to side of the vessel, as defined in 1.2.29.

The formula is applicable for vessels having:

- .1 $\frac{f_{\min}}{B}$ between 0.02 and 0.20;
- .2 $\frac{l_s}{L}$ smaller than 0.60;

* Refer to the Recommendation for an interim simplified stability criterion for decked fishing vessels under 30 m in length, contained in paragraph 4.2.6 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 $\frac{B}{D}$ 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;
- 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 (see appendix 7 of the annex to part A of the Code), 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

Vessels should be able to withstand, to the satisfaction of the Competent Authority, the effect of severe wind and rolling in associated sea

conditions, 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.*

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.†

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:

- .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;

* 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.

† 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.

- .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;
- .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.[†]

* 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 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.

[†] Refer to paragraph 2.4 of appendix 10 of the annex to part A of the Code on a typical list of equipment and hand tools required for combating ice formation.

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 lightship condition.

3.9.2 Where alterations are made to a vessel affecting its lightship 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 Competent Authority may allow the inclining test of an individual vessel to be dispensed with, provided basic stability data are available from the inclining test of a sister ship, and it is shown to the satisfaction of the Competent Authority that reliable stability information for the exempted vessel can be obtained from such basic data.

3.10 Stability information

3.10.1 Suitable stability information 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. A copy of the stability information should be submitted to the Competent Authority for approval.[‡]

3.10.2 The approved stability information 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 prepared and submitted to the Competent Authority for approval. If the Competent Authority decides that the stability information must be revised, the new information should be supplied to the skipper and the superseded information removed.

* Refer to the Determination of lightship displacement and centres of gravity and the Detailed guidance for the conduct of an inclining test, contained in chapter 7 and annex 1 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.

† 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).

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.

3.11 Portable fish-hold divisions

The catch should be properly secured against shifting which could cause dangerous trim or heel of the vessel. Recommended practice on portable fish-hold divisions is given in [annex III](#) to this part of the Code. The scantlings of portable fish-hold divisions, if fitted, should be to the satisfaction of the Competent Authority.

3.12 Bow height

The bow height should be sufficient, to the satisfaction of the Competent Authority, to prevent the excessive shipping of water and should be determined 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.

3.13 Maximum permissible operating draught

3.13.1 A maximum permissible operating draught should be approved by the Competent Authority and should be such that, in the associated operating condition, the stability criteria of this chapter and the provisions of chapters II and VI as appropriate are satisfied.

3.13.2 The maximum permissible operating draught should be marked on each side of the vessel. Working deck should be marked by working deck line. The location of the maximum permissible operating draught mark and the working deck line should be indicated on one of the safety certificates for the vessel.

3.14 Subdivision and damage stability

Vessels of 100 m in length and over, where the total number of persons carried is 100 or more, should be capable, to the satisfaction of the Competent Authority, of remaining afloat with positive stability after the flooding of any one compartment assumed damaged, having regard to the type of vessel, the intended service and area of operation.*

* Refer to the Guidance on subdivision and damage stability calculations, contained in recommendation 5 of attachment 3 to the Final Act of the 1993 Torremolinos Conference.

Chapter IV

Machinery and electrical installations and periodically unattended machinery spaces

Part A *General*

4.1 Definitions

4.1.1 *Auxiliary means of activating the rudder* is the equipment which is provided for effecting movement of the rudder for the purpose of steering the vessel in the event of failure of the main steering gear.

4.1.2 *Dead vessel condition* is the condition under which the main propulsion plant boilers and auxiliaries are not in operation due to the absence of power.

4.1.3 *Fuel oil unit* is the equipment used for the preparation of fuel oil for delivery to an oil-fired boiler, or equipment used for the preparation of oil for delivery to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure greater than 0.18 N/mm^2 .

4.1.4 *Main steering gear* is the machinery, the steering gear power units, if any, and ancillary equipment and the means of applying torque to the rudder stock (e.g. tiller or quadrant) necessary for effecting movement of the rudder for the purpose of steering the vessel under normal service conditions.

4.1.5 *Main switchboard* is a switchboard directly supplied by the main source of electrical power and intended to distribute electrical energy.

4.1.6 *Maximum ahead service speed* is the greatest speed which the vessel is designed to maintain in service at sea at its maximum permissible operating draught.

4.1.7 *Maximum astern speed* is the speed which it is estimated the vessel can attain at the designed maximum astern power at its maximum permissible operating draught.

4.1.8 *Normal operational and habitable conditions* means conditions under which the vessel as a whole, its machinery services, means of main and auxiliary propulsion, steering gear and associated equipment, aids to safe navigation and to limit the risks of fire and flooding, internal and external means of communicating and signalling, means of escape and winches for rescue boats, are in proper working order and the minimum comfortable conditions of habitability are satisfactory.

4.1.9 *Periodically unattended machinery spaces* means those spaces containing main propulsion and associated machinery and all sources of main electrical supply which are not at all times manned under all operating conditions, including manoeuvring.

4.1.10 *Steering gear power unit* means, in the case of:

- .1 electric steering gear, an electric motor and its associated electrical equipment;
- .2 electro-hydraulic steering gear, an electric motor and its associated electrical equipment and connected pump; and
- .3 other hydraulic steering gear, a driving engine and connected pump.

4.2 General

Machinery installations

4.2.1 Main propulsion, control, steam and hydraulic pipes, fuel oil, compressed air, electrical and refrigeration systems, auxiliary machinery, boilers and other pressure vessels, piping and pumping management, steering equipment and gears, shafts and couplings for power transmission should be designed, constructed, tested, installed and serviced to the satisfaction of the Competent Authority. This machinery and equipment, as well as lifting gear, winches, fish handling and fish processing equipment, should be protected so as to reduce to a minimum any danger to persons on board. Special attention should be paid to moving parts, hot surfaces and other dangers.

4.2.2 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.

4.2.3 Passages of sufficient width but not less than 600 mm should be provided between main engine and auxiliary machinery or main switchboard.

4.2.4 Means should be provided whereby the operational capability of the propulsion machinery can be sustained or restored even though one of the

essential auxiliaries becomes inoperative. Special consideration should be given to the functioning of:

- .1 the arrangements which supply fuel oil pressure for main propulsion machinery;
- .2 the normal sources of lubricating oil pressure;
- .3 the hydraulic, pneumatic and electrical means for the control of main propulsion machinery, including controllable-pitch propellers;
- .4 the sources of water pressure for main propulsion cooling systems; and
- .5 an air compressor and an air receiver for starting or control purposes,

provided that the Competent Authority may, having regard to overall safety considerations, accept a partial reduction in capability in lieu of full normal operation.

4.2.5 To the extent practicable, means should be provided whereby the machinery can be brought into operation from dead vessel condition without external aid.

4.2.6 Main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the vessel should, as fitted, be capable of operating whether the vessel is upright or listed up to 15° either way under static conditions and up to 22.5° either way under dynamic conditions, i.e. when rolling either way and simultaneously pitching (inclined dynamically) up to 7.5° by bow or stern. The Competent Authority may permit deviation from these angles, taking into consideration the type, size and service conditions of the vessel.

4.2.7 Special consideration should be given to the design, construction and installation of propulsion machinery systems so that any mode of their vibrations should not cause undue stresses in such machinery systems in the normal operating ranges.

4.2.8 All controls for operating the machinery and equipment, measuring devices, pumping systems and arrangements, valves, cocks, air pipes, inlets, sounders, switches, etc. should be permanently marked with appropriate inscriptions clearly showing their purpose. Pipes should preferably be marked by appropriate colours to indicate their purpose. All handwheels should be marked with pointers showing the direction of turning, which generally should be clockwise for closure.

4.2.9 Steam fittings, steam pipes and exhaust pipes and other hot surfaces within reach of personnel should be properly insulated or otherwise protected to prevent accidents or burns. Hot surfaces which could cause ignition should be protected from all possible contacts with combustible liquid.

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

4.2.11 Railings on gratings in the machinery spaces should consist of a handrail and guard rail where practicable; toe boards approximately 60 mm high should be affixed to the edge of all gratings where appropriate.

4.2.12 Openings to machinery space bilges should be properly guarded with handrails and toe boards or gratings.

4.2.13 Floor plates should be properly fitted and secured in place and should have a non-slip surface where practicable.

4.2.14 Machinery space ladders should be fitted with non-slip treads and well maintained. Adequate handrails should be provided.

4.2.15 Spare parts and stores should be provided to the satisfaction of the Competent Authority. Adequate facilities should be provided for the safe stowage of spare parts and stores.

4.2.16 Information on operation and maintenance of machinery and boilers, usage of fuels and lubricating oils should be provided.

4.2.17 Water-level indicators, pressure gauges and other measuring devices should be so installed and illuminated as to be readily visible.

Electrical installations

4.2.18 The design and construction of electrical installations should be such as to provide:

- .1** the services necessary to maintain the vessel in normal operational and habitable conditions without having recourse to an emergency source of power;
- .2** the services essential to safety when failure of the main source of electrical power occurs; and
- .3** protection of the crew and vessel from electrical hazards.

4.2.19 The Competent Authority should be satisfied that the provisions of 4.15 to 4.17 are uniformly implemented and applied.

Periodically unattended machinery spaces

4.2.20 In addition to 4.2 to 4.17 and chapter V, the provisions of 4.18 to 4.23 should apply to vessels with periodically unattended machinery spaces.

4.2.21 Measures should be taken to the satisfaction of the Competent Authority to ensure that all equipment is functioning in a reliable manner in all operating conditions, including manoeuvring, and that arrangements to the satisfaction of the Competent Authority are made for regular inspections and routine tests to ensure continuous reliable operation.

4.2.22 Vessels should be provided with documentary evidence, to the satisfaction of the Competent Authority, of their fitness to operate with periodically unattended machinery spaces.

Part B

Machinery installations

(See also [section 4.2](#))

4.3 Machinery

4.3.1 Main and auxiliary machinery essential for the propulsion and safety of the vessel should be provided with effective means of control.

4.3.2 Where main or auxiliary machinery, including pressure vessels or any parts of such machinery, are subject to internal pressure and may be subject to dangerous overpressure, means should be provided, where applicable, which will protect against such excessive pressure.

4.3.3 All gearing and every shaft and coupling used for transmission of power to machinery essential for the propulsion and safety of the vessel or the safety of persons on board should be so designed and constructed that it will withstand the maximum working stresses to which it may be subjected in all service conditions. Due consideration should be given to the type of engines by which it is driven or of which it forms part.

4.3.4 Main propulsion machinery and, where applicable, auxiliary machinery should be provided with automatic shut-off arrangements in the case of failures, such as lubricating oil supply failure, which could lead rapidly to damage, complete breakdown or explosion. An advance alarm should also be provided so that warning is given before automatic shut-off but the Competent Authority may permit provisions for overriding automatic shut-off devices. The Competent Authority may also permit relaxation of the provisions of this paragraph, giving consideration to the type of vessel or its specific service.

4.3.5 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.

4.4 Means of going astern

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

4.4.2 The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time and so to bring the vessel to rest within a reasonable distance from maximum ahead service speed should be demonstrated at sea.

4.5 Steam boilers, feed systems and steam piping arrangements

4.5.1 Every steam boiler and every unfired steam generator should be provided with not less than two safety valves of adequate capacity. However, the Competent Authority may, having regard to the output or any other features of any steam boiler or unfired steam generator, permit only one safety valve to be fitted if satisfied that adequate protection against overpressure is thereby provided.

4.5.2 Every oil-fired steam boiler which is intended to operate without manual supervision should have safety arrangements which shut off the fuel supply and give an alarm in the case of low water level, air supply failure or flame failure.

4.5.3 The Competent Authority should give special consideration to steam boiler installations to ensure that feed systems, monitoring devices, and safety provisions are adequate in all respects to ensure the safety of boilers, steam pressure vessels and steam piping arrangements.

4.5.4 Auxiliary boilers operating on fuel oil which are located outside any enclosures on the platforms or 'tween-decks should be protected with oil-tight coamings of a height of approximately 200 mm.

4.5.5 Copper pipes used in steam supply and exhaust systems should be seamless.

4.5.6 Main and auxiliary steam stop valves should be arranged to seat against boiler pressure.

4.5.7 Steam supply and exhaust pipes should not be led through coal bunkers or dry cargo spaces unless approved by the Competent Authority, in which case they should be substantially encased for protection against mechanical injury. In vessels built of material other than steel, steam supply and exhaust piping should be insulated so that materials adjacent thereto are neither ignited nor rendered ineffective by heat.

4.5.8 Where more than one power boiler is fitted, the auxiliary steam piping should be so arranged that steam for whistle, steering gear, and electric lighting plant can be supplied from any power boiler.

4.5.9 Suitable drains should be provided at low points of piping systems.

4.5.10 Where positive shut-off valves are fitted in exhaust lines of machinery and the exhaust lines are not designed for the maximum inlet pressure, relief valves of sufficient capacity should be fitted between machinery exhaust and shut-off valves.

4.5.11 A sentinel relief valve or other warning device fitted on the engine or turbine exhaust may be permitted by the Competent Authority as a substitute for a relief valve, provided that a backpressure trip device is installed which will close the inlet valve when the exhaust side of the system is subjected to pressure exceeding the maximum allowable working pressure.

4.5.12 Shore steam connections should, where necessary, be fitted with reduction and relief valves set at a pressure not exceeding the design pressure of the piping.

4.5.13 Hot water heating systems should be designed as independent systems and approved by the Competent Authority.

4.6 Communication between the wheelhouse and machinery space

Two separate means of communication between the wheelhouse and the machinery space control platform should be provided; one of the means should be an engine-room telegraph. However, in vessels of less than 45 m in length, where the propulsion machinery is directly controlled from the wheelhouse, the Competent Authority may accept only one means of communication other than an engine-room telegraph. Due account should be taken of the noise level in the engine-room when selecting and locating these means of communication.

4.7 Wheelhouse control of propulsion machinery

4.7.1 Where remote control of propulsion machinery is provided from the wheelhouse, the following should apply:

- .1** under all operating conditions, including manoeuvring, the speed, direction of thrust and, if applicable, the pitch of the propeller should be fully controllable from the wheelhouse;
- .2** the remote control referred to in 4.7.1.1 should be performed by means of a control device to the satisfaction of the Competent Authority with, where necessary, means of preventing overload of the propulsion machinery;
- .3** the main propulsion machinery should be provided with an emergency stopping device in the wheelhouse and independent from the wheelhouse control system referred to in 4.7.1.1;
- .4** remote control of the propulsion machinery should be possible only from one station at a time; at any control station interlocked control units may be permitted. There should be at each station an indicator showing which station is in control of the propulsion machinery. The transfer of control between the wheelhouse and machinery spaces should be possible only in the machinery space or control room. The Competent

Authority may permit the control station in the machinery space to be an emergency station only, provided that the monitoring and control in the wheelhouse is adequate;

- .5** for vessels of 37 m in length and over, indicators should be fitted in the wheelhouse for:
 - .5.1** propeller speed and direction in the case of fixed propellers;
 - .5.2** propeller speed and pitch position in the case of controllable-pitch propellers; and
 - .5.3** advance alarm as required in 4.3.4;
- .6** it should be possible to control the propulsion machinery locally even in the case of failure in any part of the remote control system;
- .7** unless the Competent Authority considers it impracticable, the design of the remote control system should be such that, if it fails, an alarm will be given and the pre-set speed and direction of thrust will be maintained until local control is in operation; and
- .8** special arrangements should be provided to ensure that automatic starting should not exhaust the starting possibilities. An alarm should be provided to indicate low starting possibilities. An alarm should be provided to indicate low starting air pressure and should be set at a level which will still permit main engine starting operations.

4.7.2 Where the main propulsion and associated machinery, including sources of main electrical supply, are provided with various degrees of automatic or remote control and are under continuous manned supervision from a control room, the control room should be so designed, equipped and installed that the machinery operation will be as safe and effective as if it were under direct supervision.

4.7.3 In general, automatic starting, operational and control systems should include means for manually overriding the automatic means, even in the case of failure of any part of the automatic and remote control system.

4.8 Air pressure system

4.8.1 Means should be provided to prevent excess pressure in any part of compressed air systems and wherever water-jackets or casings of air compressors and coolers might be subjected to dangerous excess pressure due to leakage into them from air pressure parts. Suitable pressure-relief arrangements should be provided.

4.8.2 The main starting air arrangements for main propulsion internal-combustion engines, if their cylinder diameters are more than 300 mm,

should be adequately protected against the effects of backfiring and internal explosion in the starting air pipes.

4.8.3 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.

4.8.4 Provision should be made to reduce to a minimum the entry of oil into the air pressure systems and to drain these systems.

4.8.5 Air intakes for air compressors should be so located that the air is as pure and clean as possible and free from inflammable 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.

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

4.9.1 Fuel oil which has a flashpoint of less than 60°C (closed-cup test) as determined by an approved flashpoint apparatus should not be used as fuel, except in emergency generators, in which case the flashpoint should be not less than 43°C. Provided that the Competent Authority may permit the general use of fuel oil having a flashpoint of not less than 43°C subject to such additional precautions as it may consider necessary and on condition that the temperature of the space in which such fuel is stored or used should not rise to within 10°C below the flashpoint of the fuel.

4.9.2 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.

4.9.3 Provision should be made to prevent overpressure in any oil tank or in any part of the fuel oil system including the filling pipes. Relief valves and air or overflow pipes should discharge to a position and in a manner which is safe.

4.9.4 Subject to the satisfaction of the Competent Authority, fuel oil pipes which, if damaged, would allow oil to escape from a storage, settling or daily service tank situated above the double bottom should be fitted with a cock or valve on the tank capable of being closed from a safe position outside the space concerned in the event of a fire arising in the space in which such tanks are situated.

4.9.5 Pumps forming part of the fuel oil system should be separated from any other system and the connections of any such pumps should be provided with an efficient relief valve which should be in closed circuit. Where fuel oil tanks are alternatively used as liquid ballast tanks, proper means should be provided to isolate the fuel oil and ballast systems.

4.9.6 No oil tank should be situated where spillage or leakage therefrom can constitute a hazard by falling on heated surfaces. Precautions should be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces.

4.9.7 Fuel oil pipes and their valves and fittings should be 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.

4.9.8 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.

4.9.9 As far as practicable, fuel oil tanks should be part of the vessel's structure and should be located outside machinery spaces of category A. Where fuel oil tanks, other than double-bottom tanks, are necessarily located adjacent to or within machinery spaces of category A, at least one of their vertical sides should be contiguous to the machinery space boundaries, and should preferably have a common boundary with the double-bottom tanks where fitted and the area of the tank boundary common with the machinery space should be kept to a minimum. For fuel oil tanks having capacity of not more than 15-hour continuous running of the vessel at maximum continuous rating of main propulsion machinery, the above requirements are relaxed. When such tanks are sited within the boundaries of machinery spaces of category A, if the vessel is not less than 37 m in length or the capacity of the tank is more than 1 m³, they should not contain fuel oil having a flashpoint of less than 60°C (closed-cup test). In general, the use of freestanding fuel oil tanks should be avoided in fire hazard areas, and particularly in machinery spaces of category A. When freestanding fuel oil tanks are permitted, they should be placed in an oil-tight spill tray of ample size having a suitable drain pipe leading to a suitably sized spill oil tank.

4.9.10 The ventilation of machinery spaces should be sufficient under all normal conditions to prevent accumulation of oil vapour.

4.9.11 The arrangements for the storage, distribution and use of oil employed in pressure lubrication systems should be to the satisfaction of the Competent Authority. Such arrangements in machinery spaces of category A and, wherever practicable, in other machinery spaces should at least comply with the provisions of 4.9.1, 4.9.3, 4.9.6 and 4.9.7 and, insofar as the Competent Authority may consider necessary, with those of 4.9.2 and 4.9.4. This does not preclude the use of sight flow glasses in lubrication systems provided they are shown by test to have a suitable degree of fire resistance.

4.9.12 The arrangements for the storage, distribution and use of flammable oils employed under pressure in power transmission systems other than oils referred to in 4.9.11 in control and activating systems and heating systems should be to the satisfaction of the Competent Authority. In locations where means of ignition are present, such arrangements should at least comply with the provisions of 4.9.2 and 4.9.6 and with the provisions of 4.9.3 and 4.9.7 in respect of strength and construction.

4.9.13 Fuel oil, lubricating oil and other flammable oils should not be carried in forepeak tanks.

4.9.14 Oil storage tanks should not be situated above stairways and ladders, boilers, hot surfaces and electrical equipment. Oil storage tanks and piping should be arranged to minimize the possibility, in the event of overflow, leakage or rupture, that fuel will come into contact with hot surfaces or electrical components which may cause ignition of the fuel.

4.9.15 Vent pipes from fuel oil tanks should have a net cross-section not less than 1.25 times that of the filling pipes, and should be led from the top of the tank to the open air in a space where no danger will result from overflow or the discharge of oil vapours. The vent pipe outlets should be fitted with U bends (or other protective arrangements) and metal flame screens easily removable for cleaning. The open area of the screens should be not less than the cross-section area of the vent pipe.

4.9.16 Fuel oil tank sounding pipe openings should not be located in crew accommodation, but may exceptionally be installed in passageways, in which case flush deck screwed caps should be fitted.

4.9.17 Fuel oil filling stations should be outside the machinery spaces and so arranged that any overflow cannot come into contact with any hot surface where it might be ignited.

4.9.18 Removable oil burners of boilers should be so constructed as to be removable only after the burner's fuel oil valve has been closed. To ensure the correct sequence for turning on and off fuel oil burners of boilers, fuel oil valves and air dampers should be so arranged that fuel oil inlet valves can be opened only after air inlet dampers have been opened, and that in turning off oil burners, air inlet dampers can be closed only after fuel oil inlet valves have been secured. Fuel oil filters should be so placed as to minimize the danger of spraying oil on to hot surfaces and it should not be

possible to remove the covers of any such filter until that filter has been properly isolated from the supply.

4.9.19 Overflow pipes from daily service tanks/settling tanks to double-bottom and/or bunker tanks should be fitted with a sight glass and an audible alarm.

4.10 Bilge pumping arrangements

4.10.1 An efficient bilge pumping plant should be provided which, under all practical conditions, should be capable of pumping from and draining any watertight compartment which is neither a permanent oil tank nor a permanent water tank, whether the vessel is upright or listed. Arrangements should be provided for easy flow of water to the suction pipes. Provided the Competent Authority is satisfied that the safety of the vessel is not impaired, the bilge pumping arrangements may be dispensed with in particular compartments.

4.10.2 At least two independently driven bilge pumps should be provided, one of which may be driven by the main engine. 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. In no case should the capacity of the bilge pump(s) be less than the capacity of the installed fire pump(s).

4.10.3 No bilge suction should have an inside diameter of less than 50 mm. The arrangement and sizing of the bilge system should be such that the full rated capacity of the pump specified above can be applied to each of the watertight compartments located between the collision and afterpeak bulkheads.

4.10.4 A bilge ejector in combination with an independently driven high-pressure seawater pump may be installed as a substitute for one independently driven bilge pump required by 4.10.2, provided this arrangement is to the satisfaction of the Competent Authority.

4.10.5 In vessels where fish handling or processing may cause quantities of water to accumulate in enclosed spaces, adequate drainage should be provided.

4.10.6 Bilge pipes should not be led through fuel oil, ballast or double-bottom tanks, unless these pipes are of heavy gauge steel construction.

4.10.7 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.

4.10.8 Any bilge pipe piercing a collision bulkhead should be fitted with a positive means of closing at the bulkhead with remote control from the working deck with an indicator showing the position of the valve, provided that, if the valve is fitted on the after side of the bulkhead and is readily accessible under all service conditions, the remote control may be dispensed with.

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

4.10.10 Bilge suction should be fitted with suitable strainers having an open area not less than three times the area of the bilge pipe.

4.10.11 One of the bilge pumps should have direct bilge suction from the compartment where the pump is situated.

4.10.12 In vessels of 45 m in length and over, the largest available power water pump in the engine-room suitable for use as a bilge pump should be fitted with an emergency bilge suction.

4.10.13 If fuel tanks are used to carry water ballast for ensuring stability or trim of the vessel, reliable devices should be provided for cutting off the ballast system from the tanks containing fuel as well as for cutting off the fuel system from fuel tanks containing water.

4.11 Protection against noise

Measures should be taken to reduce the effects of noise upon personnel in machinery spaces to levels satisfactory to the Competent Authority.

4.12 Steering gear

4.12.1 Vessels should be provided with a main steering gear and an auxiliary means of actuating the rudder to the satisfaction of the Competent Authority. The main steering gear and the auxiliary means of actuating the rudder should be arranged so that, so far as is reasonable and practicable, a single failure in one of them will not render the other one inoperative.

4.12.2 Where the main steering gear comprises two or more identical power units, an auxiliary steering gear need not be fitted if the main steering gear is capable of operating the rudder as required by 4.12.10 when any one of the units is out of operation. Each of the power units should be operated from a separate circuit.

4.12.3 The position of the rudder, if power-operated, should be indicated in the wheelhouse. The rudder angle indication for power-operated steering gear should be independent of the steering gear control system.

4.12.4 In the event of failure of the power-operated steering gear units, a visible and audible alarm should be given in the wheelhouse.

4.12.5 Indicators for running indication of the motors of electric and electrohydraulic steering gear should be installed in the wheelhouse. Short-circuit protection, an overload alarm and a no-voltage alarm should be provided for these circuits and motors. Protection against excess current, if provided, should be for not less than twice the full load current of the motor or circuit so protected, and should be arranged to permit the passage of the appropriate starting currents.

4.12.6 The main steering gear should be of adequate strength and sufficient to steer the vessel at maximum service speed. The main steering gear and rudder stock should be so designed that they will not be damaged at maximum speed astern or by manoeuvring during fishing operations.

4.12.7 The main steering gear should, with the vessel at its maximum permissible operating draught, be capable of putting the rudder over from 35° on one side to 35° on the other side with the vessel running ahead at maximum service speed. The rudder should be capable of being put over from 35° on either side to 30° on the other side in not more than 28 s, under the same conditions. The main steering gear should be operated by power, where necessary, to fulfil these requirements.

4.12.8 The main steering gear power unit should be arranged to start either by manual means in the wheelhouse or automatically when power is restored after a power failure.

4.12.9 The auxiliary means for actuating the rudder should be of adequate strength and sufficient to steer the vessel at navigable speed and capable of being brought speedily into action in an emergency.

4.12.10 The auxiliary means for actuating the rudder should be capable of putting the rudder over from 15° on one side to 15° on the other side in not more than 60 s with the vessel running at one half of its maximum service speed ahead or 7 knots, whichever is the greater. The auxiliary means for actuating the rudder should be operated by power where necessary to fulfil these requirements.

4.12.11 Electric or electro-hydraulic steering gear in vessels of 75 m in length and over should be served by at least two circuits fed from the main switchboard and these circuits should be as widely separated as possible.

4.13 Engineers' alarm

In vessels of 75 m in length and over, an engineers' alarm should be provided to be operated from the engine control room or at the manoeuvring platform as appropriate, and should be clearly audible in the engineers' accommodation.

4.14 Refrigeration systems for the preservation of the catch

4.14.1 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.

4.14.2 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.

4.14.3 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 set out in [annex IV](#) to this part of the Code.

4.14.4 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.

4.14.5 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.

4.14.6 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.

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

4.14.8 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.

4.14.9 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.

4.14.10 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.

4.14.11 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

(See also [section 4.2](#))

4.15 Main source of electrical power

Where electrical power constitutes the only means of maintaining auxiliary services essential for the propulsion and the safety of the vessel, a main source of electrical power should be provided which should include at least two generating sets, one of which may be driven by the main engine. The Competent Authority may accept other arrangements having equivalent electrical capability.

4.16 Emergency source of electrical power

4.16.1 A self-contained emergency source of electrical power should be provided and 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.

4.16.2 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 3 h:

- .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;
- .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 the operation of the emergency fire pump, if any.

4.16.3 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 4.16.2.2 and 4.16.2.3. 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.

4.16.4 The emergency switchboard should be installed as near as is practicable to the emergency source of power and should be located in accordance with 4.16.1. 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.

4.16.5 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 place 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.

4.16.6 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.

4.16.7 Battery level indicators should be mounted in a highly visible position 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.

4.16.8 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.

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

4.17.1 Electric circuits should be clearly identified on switchboards.

4.17.2 Electrical equipment exposed to the weather should be protected from dampness and corrosion as well as mechanical damage.

4.17.3 Piping conveying steam or liquid should not be fitted above or in the vicinity of switchboards or other electrical equipment. Where such arrangements are unavoidable, provision should be made to prevent leakage damaging the equipment.

4.17.4 Exposed permanently fixed metal parts of electrical machines or equipment which are not intended to be “live”, but which are liable under fault conditions to become “live” should be earthed (grounded) unless:

- .1** they are supplied at a voltage not exceeding 55 V direct current or 55 V root mean square, between conductors; autotransformers should not be used for the purpose of achieving this voltage; or

- .2 they are supplied at a voltage not exceeding 250 V by safety isolating transformers supplying one consuming device only; or
- .3 they are constructed taking into account the principle of double insulation.

4.17.5 Portable electrical equipment should operate at a safe voltage; exposed metal parts of such equipment which are not intended to have a voltage, but which may have such under fault conditions, should be earthed. The Competent Authority may require additional precautions for portable electric lamps, tools or similar apparatus for use in confined or exceptionally damp spaces, where particular risks due to conductivity may exist.

4.17.6 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, where necessary.

4.17.7 In vessels of 75 m in length and over, the hull-return system of distribution should not be used for power, heating or lighting in general. However, the requirement does not preclude, under conditions approved by the Competent Authority, the use of:

- .1 impressed current cathodic protective system;
- .2 limited locally earthed systems; or
- .3 insulation level monitoring devices, provided the circulation current does not exceed 30 mA under the most unfavourable conditions.

Where the hull-return system is used, all final sub-circuits (all circuits fitted after the last protective device) should be two wires, and special precautions should be taken to the satisfaction of the Competent Authority.

4.17.8 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.

4.17.9 Where the cables are neither sheathed nor armoured and there might be a risk of fire in the event of an electrical fault, special precautions should be taken to the satisfaction of the Competent Authority.

4.17.10 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 frequency cables, which do not apply with the foregoing.