

# Safety Recommendations for Decked Fishing Vessels of Less than 12 metres in Length and Undecked Fishing Vessels



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Courtesy of the International Maritime Organization (IMO).

# Safety Recommendations for Decked Fishing Vessels of Less than 12 metres in Length and Undecked Fishing Vessels

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# Preparation of this document

The *Safety Recommendations for Decked Fishing Vessels of Less than 12 metres in Length and Undecked Fishing Vessels* contained in this publication are the result of the continuing cooperation between the Food and Agriculture Organization of the United Nations (FAO), the International Labour Organization (ILO) and the International Maritime Organization (IMO), in relation to the safety of fishing vessels.

The IMO Sub-Committee on Stability and Load Lines and on Fishing Vessels' Safety (SLF) undertook the development of the Safety Recommendations in collaboration with FAO and ILO in order to provide guidelines to competent authorities for the design, construction, equipment and training of the crews of small fishing vessels, as well as operational safety, and established a correspondence group that commenced work in 2005 to develop recommendations.

The draft Safety Recommendations were submitted to other relevant subcommittees and, following their acceptance, the revised text was submitted to the IMO Maritime Safety Committee (MSC) at its eighty-seventh session (12 to 21 May 2010) at which it was approved. The Governing body of ILO approved the publication of the Safety Recommendations at its 309th session (November 2010). Thereafter, at the twenty-ninth session of the Committee on Fisheries in January 2011, FAO recommended the early publication of the Safety Recommendations.

# Abstract

The purpose of the Safety Recommendations contained in this publication is to provide information on the design, construction, equipment, training and protection of the crews of small fishing vessels with a view to promoting the safety of the vessel and the safety and health of the crews. The Safety Recommendations may also serve as a guide for those concerned with the safety of vessels used in support of aquaculture activities.

They are not intended as a substitute for national laws and regulations but may serve as a guide to those persons concerned with framing such national laws and regulations. Unless otherwise stated, the provisions of the Safety Recommendations are intended to apply to new decked vessels of less than 12 m in length and new undecked vessels intended to operate at sea (as well as on oceans, rivers, lakes and dams, or on any body of water). Nevertheless, even where not otherwise stated, the competent authority should as far as reasonable and practical give consideration to the application of these provisions to existing vessels.

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# Preface

The Safety Recommendations are the result of the continuing cooperation between the Food and Agriculture Organization of the United Nations (FAO), the International Labour Organization (ILO) and the International Maritime Organization (IMO), in relation to the safety of fishing vessels that began with the development of Parts A and B of the *Code of Safety for Fishermen and Fishing Vessels* between 1968 and 1974 (hereinafter referred to as the Code) for decked fishing vessels of 24 m in length and over. The Code was followed by the development of the *Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels* (hereinafter referred to as the Voluntary Guidelines) approved by the Maritime Safety Committee (MSC) at its forty-first session in October 1979 and by FAO in November 1979 for circulation to governments. The ILO Governing Body was informed at its 211<sup>th</sup> session in November 1979 of the intention to publish this document.

On adopting the Torremolinos Protocol of 1993 relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977, the International Conference on the Safety of Vessels recommended revision of the Code. Consequently, IMO undertook a review and invited the participation of FAO and ILO. It also decided, at the same time, to review the Voluntary Guidelines that are directed at decked fishing vessels of 12 m in length and over but less than 24 m in length.

Following the completion of the review of the Code and the Voluntary Guidelines, the revised texts were approved by MSC at its seventy-ninth session (1 to 10 December 2004). Thereafter, at the twenty-sixth session of the Committee on Fisheries held in March 2005, FAO welcomed the revisions and recommended the early publication by IMO of these documents. Later the Governing Body of the ILO approved the revised texts at its 293<sup>rd</sup> session in June 2005.

During the process of revising the Code and the Voluntary Guidelines it became evident that there were no guidelines or recommendations for small fishing vessels of less than 12 m in length that were similar to Part B of the Code or the Voluntary Guidelines. As a consequence, the MSC, at its seventy-ninth session, agreed to include in the work programme of the Sub-Committee on Stability and Load Lines and on Fishing Vessels' Safety (SLF) a new high-priority item on "Safety of small fishing vessels". The aim was to develop safety recommendations for decked vessels of less than 12 m in length and undecked vessels, bearing in mind that the majority of fishing fatalities occur aboard such vessels.

The SLF Sub-Committee undertook the development of the Safety Recommendations in collaboration with FAO and ILO in order to provide guidelines to competent authorities for the design, construction, equipment and training of the crews of small fishing vessels, as well as operational safety, and established a correspondence group that commenced work in 2005 to develop recommendations. In this regard, the importance of addressing the small fishing vessel sector, which includes more than 80 percent of all fishing vessels, was emphasized by the more than 30 entities agreeing to participate in the work of the correspondence group.

The draft Safety Recommendations were submitted to other relevant subcommittees and, following their acceptance, the revised text was submitted to the MSC at its eighty-seventh session (12 to 21 May 2010) at which it was approved. The Governing body of ILO approved the publication of the Safety Recommendations at its 309<sup>th</sup> session (November 2010). Thereafter, at the twenty-ninth session of the Committee on Fisheries in January 2011, FAO recommended the early publication of the Safety Recommendations.

In addition to the IMO competence in relation to safety of life, vessels and equipment at sea, the correspondence group drew heavily on the wide experience of FAO in the design, construction and operation of small fishing vessels, particularly in developing countries where the majority of small fishing vessels operate. It also drew on the competence of ILO regarding conditions of work and service aboard small fishing vessels. The cooperation between FAO and IMO in relation to measures to combat Illegal, Unregulated and Unreported (IUU) fishing was recognized with particular regard to the adverse impact these kinds of fishing activities have on the safety of small fishing vessels in many parts of the world.

The FAO/ILO/IMO *Code of Safety for Fishermen and Fishing Vessels*, 2005, Part A, Safety and Health Practice, provides in Section I, General, and in Section II, Undecked vessels and decked vessels of less than 12 m in length, and in certain of its appendices, guidance that concerns the safety and health of fishermen on small vessels. The Safety Recommendations should be read in conjunction with the Code, Part A. During the preparation of the Safety Recommendations, it was, however, noted that additional operational guidance was needed concerning these vessels. This consideration has been taken into account in the text. It is further recommended that in framing national safety requirements it would be essential to give consideration to local weather and sea conditions and any special operational requirements.

Following the adoption of the ILO *Work in Fishing Convention, 2007 (No. 188) and Recommendation, 2007 (No. 199)*, the draft Safety Recommendations were reviewed to ensure that they were consistent with the ILO standards.

The FAO applied the draft Safety Recommendations in various countries through its field projects. The objective was to confirm their relevance to diverse fishing vessel types and operations. The positive feedback was very useful in further developing the final content of the Safety Recommendations.

Recognizing that the majority of items covered by the Safety Recommendations 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 coordinating proposed amendments to the Safety Recommendations and, in particular, the IMO Secretariat should undertake to receive any proposed amendments, to distribute them to the organizations and to collate their respective comments;
2. any future joint FAO/ILO/IMO meeting should be held, whenever possible, in conjunction with a meeting of the SLF Sub-Committee; and
3. any proposed amendments should always be subject to the final approval of the appropriate bodies of the three organizations.

# Chapter 1

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## General Provisions

### 1.1 Purpose and scope

**1.1.1** The purpose of the Safety Recommendations is to provide information on the design, construction, equipment, training and protection of the crews of small fishing vessels with a view to promoting the safety of the vessel and safety and health of the crews. They are not intended as a substitute for national laws and regulations but may serve as a guide to those concerned with framing such national laws and regulations. Each competent authority responsible for the safety of vessels should ensure that the provisions of the Safety Recommendations are adapted to its specific requirements, having due regard to the size and type of vessels, their intended service and area of operation. Before doing so, competent authorities should consult with the vessel owners and fishermen, and their representative organizations, and other relevant stakeholders such as vessel designers, builders and equipment manufacturers. When adapting the Safety Recommendations, the competent authority should endeavour to ensure a level of safety at least equivalent to the provision or provisions concerned.

**1.1.2** Unless otherwise stated, the provisions of the Safety Recommendations are intended to apply to new decked vessels of less than 12 m in length (L) and new undecked vessels intended to operate at sea. Nevertheless, even where not otherwise stated, the competent authority should as far as reasonable and practical give consideration to the application of these provisions to existing vessels.\*

**1.1.3** In the Safety Recommendations, the use of the word “sea” includes oceans, rivers, lakes and dams, or any body of water.

**1.1.4** The provisions of the Safety Recommendations do not apply to vessels used for sport or recreation.

### 1.2 Definitions

For the purpose of the Safety Recommendations, unless expressly provided otherwise, the following definitions apply:

**1.2.1** *Amidships*\*\* means the mid-length of LOA.

**1.2.2** *Approved* means approved by the competent authority.

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

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

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\* A vessel of less than 12 m in length (L) could be in excess of 15 m in length overall (LOA). See Annex I.

\*\* The dimensions are illustrated in Annex I.

**1.2.5** *Breadth\** (*B*) is the maximum breadth of the vessel, measured at maximum beam 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 material other than metal.

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

**1.2.7** *Competent authority* is the government of the state whose flag the vessel is entitled to fly. The competent authority may delegate certain of its duties to entities authorized by it and that it deems suitably qualified to undertake those duties.

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

**1.2.9** *Cubic Numeral (CuNo)\** is the result of multiplying length overall x breadth x depth (LOA x B x D).

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

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

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

**1.2.13** *Depth (D)\** is the moulded depth amidships.

**1.2.14** *Design categories*

The categories below indicate sea and wind conditions for which a vessel is assessed by this standard to be suitable, provided the vessel is correctly operated and is operating at a speed appropriate to the prevailing sea state.

**.1 Design category A**

Category of vessels considered suitable to operate in seas with significant wave heights above 4 m and wind speeds in excess of Beaufort Force 8 (19 m/s), but excluding abnormal conditions, e.g. hurricanes.

**.2 Design category B**

Category of vessels considered suitable to operate in seas with significant wave heights up to 4 m and winds of Beaufort Force 8 (19 m/s) or less.

**.3 Design category C**

Category of vessels considered suitable to operate in seas with significant wave heights up to 2 m and a typical steady wind force of Beaufort Force 6 (12 m/s) or less.

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\* The dimensions are illustrated in Annex I.

#### .4 Design category D

Category of vessels considered suitable to operate in seas with significant wave heights up to and including 0.30 m with occasional waves of 0.5 m in height, for example from passing vessels, and a typical steady wind force of Beaufort Force 4 (7 m/s) or less.

1.2.15 *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 that 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 that are available at all times when bulkhead openings are closed.

1.2.16 *Existing vessel* is a vessel that is not a new vessel.

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

1.2.18 *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.

1.2.19 *Freeboard (f)* is the actual minimum freeboard and, on a decked vessel, 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. On an undecked vessel, the freeboard (*f*) is the distance from the gunwale or a down-flooding opening, whichever is lower, measured perpendicularly to the waterline. A down-flooding opening is an opening in the hull or superstructures that cannot rapidly be closed watertight.

1.2.20 *GRP* means glass reinforced plastic.

1.2.21 *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.

1.2.22 *Keel line\** is the line parallel to the slope of keel passing amidships through:

- .1 the top of the keel or line of intersection of the inside of shell plating with the keel where a bar keel extends above that line of a vessel with a metal shell; or

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\* The dimensions are illustrated in Annex I.

- .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.

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

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

**1.2.25** *Length overall (LOA)\** should be taken as the distance in a straight line parallel to the design waterline between the foremost point of the bow and the aftermost point of the stern.

**1.2.26** *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 Safety Recommendations.

**1.2.27** *Owner* means any person or entity having assumed the responsibility for the operation of the vessel.

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

**1.2.29** *Recognized organization* means an organization which meets the relevant conditions set forth by resolution A.739(18) adopted by IMO.

**1.2.30** *Skipper* means the person having command of a vessel.

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

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

**1.2.33** *Undecked vessel* is a vessel which is not a decked vessel.

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\* The dimensions are illustrated in Annex I.



**1.2.34** *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.

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

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

### **1.3 Measurements**

In the Safety Recommendations measurements are given in the metric system using the following abbreviations:

m	–	metre
cm	–	centimetre
mm	–	millimetre
t	–	tonne (1 000 kg)
kg	–	kilogram
°C	–	degree Celsius
N	–	Newton
kW	–	kilowatt

### **1.4 Maintenance and surveys**

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

**1.4.2** Where practicable, before the construction of a vessel, plans of and information concerning the vessel should be submitted to the competent authority for approval.

**1.4.3** The competent authority should arrange for appropriate surveys of a vessel during construction and, at regular intervals after completion, to ensure satisfactory condition of the vessel's hull, machinery and equipment, as well as crew accommodation. An appropriate report of each survey should be entered in the record of the vessel.

**1.4.4** After any survey has been completed, no change should be made in the structural arrangements, machinery and equipment, as well as crew accommodation, etc., covered by the survey, without the approval of the competent authority.

**1.4.5** 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.

**1.4.6** Hull, machinery and equipment should be maintained to a standard acceptable to the competent authority and in accordance with manufacturer's recommendations or those of a recognized organization.

## **1.5** **Equivalents**

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

## Chapter 2

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# Construction, watertight integrity and equipment

### Part 1

#### *General*

## 2.1 Purpose and scope

This chapter should apply to all vessels other than wooden vessels of simple construction such as rafts, dugouts, canoes and vessels of proven historical design.

## 2.2 Construction, material and structure

**2.2.1** The strength and construction of the hull and other structures, and the 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. Recommended construction standards for wooden, GRP, steel and aluminium vessels are provided in Annexes II, III, IV and V respectively.

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

## 2.3 Inlets and discharges

**2.3.1** Sea inlets should be fitted with valves that have a positive means of closing from a readily accessible position. The valve should be provided with an indicator, showing whether the valve is open or closed.

**2.3.2** Discharges passing through the hull should be fitted with an automatic non-return valve with a positive means of closing it from a readily accessible position. The valve should be provided with an indicator, showing whether the valve is open or closed.

**2.3.3** The competent authority may accept alternative arrangements, providing that the following requirements are complied with:

- .1 Hull penetrations with openings less than 100 mm above the deepest waterline or below the floor on undecked vessels should be fitted with means of closing.
- .2 Discharges between 100 mm above and 350 mm above the deepest waterline may be fitted with a non-return valve, without a means of closing. In the case of wet exhaust systems, the valve may be of a flap type. Refer to Annex XVI.

- .3 Discharges more than 350 mm above the deepest waterline need not be fitted with a valve.
- 2.3.4 Inlet and discharge valves not accessible in an emergency should be fitted with remote means of operation such as by extended spindle or wire pull device.
- 2.3.5 Fittings attached to the hull, all valves and all pipes between the shell and the valves should be of cast steel, bronze or other ductile material. The competent authority may approve the use of other materials for pipes of non-steel vessels.
- 2.3.6 Any penetration prone to be damaged by fishing gear, equipment or crew should be suitably protected.
- 2.3.7 Where sea inlet piping systems comprise flexible hoses, such hoses should be of an approved type and the connections should be fitted with double, corrosion-resistant hose clips at both ends.
- 2.3.8 When operating experience justifies departure from 2.3.1 to 2.3.7, the competent authority may allow alternatives.

## **Part 2**

### *Undecked Vessels*

#### **2.4 Drainage of partial decks**

Any partial deck either inboard or outboard should be adequately drained.

#### **2.5 Securing of heavy items**

All heavy items of equipment should be securely fastened in position to prevent movement when the vessel is at sea.

#### **2.6 Anchoring and mooring equipment**

Anchoring and mooring equipment designed for quick and safe operation should be to the satisfaction of the competent authority. A recommended practice for anchoring and mooring equipment is provided in Annex VI.

## **Part 3**

### *Decked Vessels*

#### **2.7 Construction**

2.7.1 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 unless the competent authority deems that this requirement is impracticable, and at least with transverse 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.

**2.7.2** Pipes piercing the collision bulkhead should be fitted with suitable valves operable from above the working deck and the valves 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.

**2.7.3** The forepeak should not be used for carrying fuel oil, except where specially approved by the competent authority.

## **2.8 Hull integrity**

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 the vessel's centreline. However, the competent authority may approve different arrangements if satisfied that the safety of the vessel will not be impaired.

## **2.9 Weathertight doors**

**2.9.1** 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.

**2.9.2** The height above deck of sills in those doorways, in companionways, erections and machinery casings that give direct access to parts of the deck exposed to the weather and sea should be at least 380 mm.

**2.9.3** Where operating experience has shown justification and on approval of the competent authority, the height above deck of sills in the doorways specified in 2.9.2, may be reduced to not less than 150 mm. In vessels of design category D the height may be further reduced to 50 mm.

## **2.10 Hatchways**

**2.10.1** The height above deck of hatchway coamings on exposed parts of the working deck should be at least 300 mm.

**2.10.2** Where operating experience has shown justification and on approval of the competent authority the height of hatchway coamings, except those which give direct access to machinery spaces, may be reduced from the height as specified in 2.10.1 or the coamings may be omitted entirely, provided that efficient watertight hatch covers other than wood are fitted. Such hatchways should be kept as small as practicable. On vessels

of design categories A, B, C and D, the covers should be permanently attached by hinges or equivalent means and be capable of being rapidly closed or battened down.

**2.10.3** The hatchway covers should have the same strength as the deck. For guidance on structural strength, reference should be made to Annex VII. On vessels of design categories A, B and C, covers should be fitted with clamping devices and gaskets or other equivalent arrangements sufficient to ensure weathertightness to the satisfaction of the competent authority.

## **2.11 Machinery space openings**

External access machinery space openings should be of sufficient strength and fitted with doors complying with 2.9 or hatch covers complying with 2.10.

## **2.12 Other deck openings**

Where it is essential for fishing operations, flush deck covers may be fitted, provided these are capable of being closed watertight. Such devices on vessels of design categories A, B and C should be permanently attached to the adjacent structure. Having regard to the size and disposition of the openings and the design of the closing devices, metal-to-metal closures may be fitted if the competent authority is satisfied that they are effectively watertight.

## **2.13 Ventilators**

**2.13.1** The coamings of ventilators should be as high as practicable. On the working deck the height above deck of coamings of ventilators other than machinery space ventilators should be not less than 450 mm. When the height of such ventilators may interfere with the fishing operation of the vessel their coaming heights may be reduced to the satisfaction of the competent authority. The height above deck of machinery space ventilator openings should be to the satisfaction of the competent authority.

**2.13.2** Coamings of ventilators should be of equivalent strength to the adjacent structure and capable of being closed weathertight by devices permanently attached to the ventilator or adjacent structure. Ventilators should be arranged as close to the vessel's centreline as possible and, where practicable, should extend through the top of a deck erection or companion-way.

## **2.14 Air pipes**

**2.14.1** Where air pipes to tanks and void spaces below deck extend above the working or superstructure decks, the exposed parts of the pipes should be of a strength equivalent to the adjacent structures and fitted with appropriate protection, including to prevent damage by fishing or lifting gear. Openings of pipes should be provided with means of closing, which are permanently attached to the pipe or adjacent structure. Where the competent authority is satisfied that openings are protected against water trapped on deck, these means of closing may be omitted.

**2.14.2** The height of air pipes above deck to the point where water may have access below should be at least 450 mm on the working deck. When the height of such air pipes may interfere with the fishing operation of the vessel, their heights may be reduced to the satisfaction of the competent authority, provided that they are fitted with a non-return arrangement at the air pipe gooseneck.

**2.14.3** Provision should be made to prevent a vacuum from forming in the pipe or tank.

**2.14.4** Exposed air pipes, in excess of 25 mm in diameter, serving fuel oil and other oil tanks, should be fitted with anti-flame net protection or other equivalent devices.

## **2.15 Sounding devices**

**2.15.1** Sounding devices, to the satisfaction of the competent authority, should be fitted to the bilges of those compartments which are not readily accessible at all times during the voyage and to all tanks.

**2.15.2** Where sounding pipes are fitted, their upper ends should extend to a readily accessible position above the working deck and their openings should be provided with permanently-attached means of closing.

**2.15.3** Where sounding pipes are fitted to fuel service tanks, and their upper ends extend to a readily accessible position above the working deck, in order to prevent spillage through the sounding pipes in the event of tanks being overfilled, their openings should be higher than those of the air pipes from the fuel oil service tanks.

**2.15.4** Where it is not practicable to extend sounding pipes of fuel service tanks to a position above the working deck, their opening should be fitted with automatic self-closing devices.

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

## **2.16 Windows and skylights for decked vessels of design categories A and B**

**2.16.1** Skylights leading to spaces below the working deck should be of a substantial construction and capable of being closed and secured weathertight from the inside, and with provision for adequate means of closing in the event of damage to the transparent inserts that allow light to pass. Skylights leading to machinery spaces should be avoided as far as practicable.

**2.16.2** Toughened safety glass or suitable permanently transparent material of equivalent strength should be fitted in all wheelhouse windows exposed to the weather. The means of securing windows and the width of the bearing surfaces should be adequate, having regard to the window material used. Openings leading to spaces below deck from a wheelhouse whose windows are not provided with the protection required by 2.16.3 should be fitted with a weathertight closing appliance.

**2.16.3** A suitable number of storm shutters should be provided if there is no other method of preventing water from entering the vessel through a broken window.

**2.16.4** The competent authority may accept windows without storm shutters if satisfied that the safety of the vessel will not be impaired.

## **2.17 Freeing ports**

**2.17.1** Care should always be taken to ensure the quick release of water trapped on deck. If freeing ports are fitted with closing devices, the opening mechanism should always be easily accessible and never lockable.

**2.17.2** When the main deck is prepared for carrying deck load by dividing it with pound boards, or any division capable of trapping water, there should be slots between them of suitable size to allow easy flow of water to freeing ports.

**2.17.3** The size, number and location of freeing ports and scuppers should be sufficient to drain water overboard from exposed deck. Guidance on the dimensions of freeing ports can be found in Annex VIII.

## **2.18 Anchoring and mooring equipment**

**2.18.1** Anchoring and mooring equipment designed for quick and safe operation should be to the satisfaction of the competent authority. A recommended practice for anchoring and mooring equipment is provided in Annex VI.

## **2.19 Working spaces within an enclosed superstructure**

Working spaces within an enclosed superstructure should be arranged to the satisfaction of the competent authority, taking into account where practicable:

- .1 efficient drainage
- .2 openings necessary for fishing operations
- .3 means of escape
- .4 stowage of catch
- .5 headroom
- .6 ventilation

## **2.20 Tanks for fish in refrigerated seawater (RSW) or chilled seawater (CSW)**

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



**2.20.2** If such tanks are to be used also for other purposes, the tanks should be arranged with a bilge system and provided with adequate means to avoid ingress of water from the bilge system into the tanks.

## **2.21 Drainage of partial decks**

Means should be provided for any partial decks either inboard or outboard to be adequately drained.

## **2.22 Securing of heavy items**

Means should be provided to secure all heavy items of equipment in position to prevent movement when the vessel is at sea.



## Chapter 3

# Stability and associated seaworthiness

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### 3.1 General

3.1.1 This chapter may be applied to vessels other than those of a multihull design and outrigger canoes.

3.1.2 Vessels of design categories A and B should be so designed and constructed that the recommendations given in this chapter will be satisfied in the operating conditions referred to in 3.8. Calculations of the righting lever curves should be to the satisfaction of the competent authority.\*

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

### 3.2 Stability criteria for decked vessels of all design categories

3.2.1 For decked vessels, the following minimum stability criteria should be met unless the competent authority is satisfied that operating experience justifies departure therefrom:

- .1 The area under the righting lever curve (GZ curve) should not be less than 0.055 m-rad up to 30° angle of heel and not less than 0.090 m-rad up to 40° or the angle of flooding  $\theta_f$  if this angle is less than 40°. Additionally, the area under the righting lever curve (GZ curve) between the angles of heel of 30° and 40° or between 30° and  $\theta_f$ , if this angle is less than 40°, should not be less than 0.030 m-rad.  $\theta_f$  is the angle of heel at which openings in the hull, superstructures or deckhouses which cannot rapidly be closed watertight commence to immerse. In applying this criterion, small openings through which progressive flooding cannot take place need not be considered as open;
- .2 the righting lever GZ should be at least 200 mm at an angle of heel equal to or greater than 30°. The righting lever GZ may be reduced to the satisfaction of the competent authority but in no case by more than 2(24-LOA) percent, where LOA, in m, is as defined in 1.2.24;
- .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.

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

\*\* Refer to an approximate determination of small vessels' stability by means of a rolling period test contained in Annex IX.

**3.2.2** Where ballast is provided to ensure compliance with 3.2.1, its nature and arrangement should be to the satisfaction of the competent authority. Ballast should be secured in the vessel in such a way that it will not move even if the vessel is inclined to 90°.

### 3.3 Alternative stability criteria for decked vessels of all design categories

**3.3.1** For decked vessels for which, by reason of insufficient stability data, 3.2.1 cannot be applied or where the competent authority is satisfied that operating experience justifies departure from the stability criteria in 3.2.1, one of the following criteria should be used as the criterion.

**3.3.2** *Approximate formula for the minimum metacentric height  $GM_{min}$*

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

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

where:

$Lwl$  in metres, is the length of the vessel on the waterline in maximum load condition;

$B, D$  and  $f$ , in metres, are as defined in 1.2.5, 1.2.13 and 1.2.19; and

$l_s$  is the actual length of enclosed superstructure extending from side to side of the vessel, in metres, as defined in 1.2.15.

The formula is applicable for vessels having:

1.  $\frac{f}{B}$  between 0.02 and 0.20;
2.  $\frac{l_s}{Lwl}$  smaller than 0.60;
3.  $\frac{B}{D}$  between 1.75 and 2.15;

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

**3.3.2.2** The above formula is not intended as a replacement for the basic criteria given in 3.2.1, and 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.

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

**3.3.3** *A rolling period test – option 1\*\**

A rolling period test\* should be conducted when the vessel is loaded according to the operating condition as specified in 3.8.1.1. The stability is deemed satisfactory if the rolling period ( $T_r$ ), in seconds, is less than the breadth of the vessel ( $B$ ), in metres.

**3.3.4** *A rolling period test – option 2*

A rolling period test\* should be conducted when the vessel is loaded according to the operating condition as specified in 3.8.1.1. The stability is deemed satisfactory if the rolling period ( $T_r$ ), in seconds, is less than indicated in the following table:

**Maximum rolling periods ( $T_r$ ) in seconds\*\*\***

$D$ (m)	$B$ (in m)														
	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4
0.6	3.2	3.2	3.4												
0.7	3.8	3.5	3.5	3.5											
0.8	4.3	4.0	3.7	3.6	3.6	3.7									
0.9	4.3	4.6	4.3	3.9	3.7	3.7	3.8								
1.0		4.6	4.9	4.5	4.2	4.0	3.8	3.9	4.0						
1.1			4.8	5.1	4.6	4.4	4.2	4.0	4.0	4.1	4.3				
1.2				5.0	5.2	4.8	4.5	4.3	4.2	4.1	4.2	4.3			
1.3					5.1	5.3	5.0	4.7	4.5	4.4	4.2	4.3	4.4		
1.4						5.3	5.5	5.1	4.9	4.7	4.5	4.4	4.4	4.5	4.6
1.5							5.4	5.6	5.3	5.1	4.9	4.7	4.6	4.5	4.6
1.6								5.5	5.7	5.4	5.2	4.9	4.9	4.8	4.7
1.7									5.7	5.9	5.6	5.2	5.2	5.1	5.0
1.8										5.8	6.0	5.5	5.5	5.4	5.2

where:

$B$  and  $D$ , in metres, are as defined in 1.2.5 and 1.2.13.

**3.3.5** *Required metacentric height  $GM_r$  combined with a rolling period test\**

\* Refer to an approximate determination of small vessels' stability by means of the rolling period test contained in Annex IX.

\*\* This method is useful for vessels mainly in European region.

\*\*\* This table is useful for traditionally built vessels in South East Asia region.

**3.3.5.1** The following approximate formulae for required metacentric height  $GM_r$ , in metres, should be used for all operating conditions:

*Design categories A and B*

$$GM_r = 0.117 B \left( \frac{B}{D} - 2.20 \right) + \left[ 1.773 \left( \frac{T}{D} \right)^2 - 2.646 \frac{T}{D} + 1.016 \right] B$$

*Design categories C and D*

$$GM_r = 0.059 B \left( \frac{B}{D} - 2.20 \right) + \left[ 2.085 \left( \frac{T}{D} \right)^2 - 2.857 \frac{T}{D} + 0.990 \right] B$$

where:

$B$  and  $D$ , in metres, are as defined in 1.2.5 and 1.2.13; and

$T$  is the draught, in metres, from the baseline, which is defined in 1.2.3, to the waterline.

**3.3.5.2** A rolling period test\* should be conducted when the vessel is loaded according to the operating conditions as specified in 3.8.1. The actual metacentric height  $GM$ , in metres, in all operating conditions should be calculated according to the following formula:

$$GM = \left( \frac{0.834B}{T_r} \right)^2$$

where:

$B$ , in metres, is as defined in 1.2.5; and

$T_r$ , in seconds, is the rolling period.

**3.3.5.3** The stability is deemed satisfactory when the  $GM$  is not less than  $GM_r$ .

**3.3.6** *Offset load test*

**3.3.6.1** An offset load test should be conducted when the vessel is loaded according to the operating conditions as specified in 3.8.1.2. A weight equivalent to  $25 \times LOA \times B$  (kg) should be distributed along one side of the vessel,

where:

$LOA$  and  $B$ , in metres, are as defined in 1.2.25 and 1.2.5.

\* Refer to an approximate determination of small vessels' stability by means of the rolling period test contained in Annex IX.

3.3.6.2 The stability is deemed satisfactory when the angle of heel does not exceed 15° and the freeboard to the deck is not less than 75 mm at any point.

### 3.4 Stability criteria for undecked vessels

3.4.1 For undecked vessels of design categories A and B, an inclining test, as specified in 3.10 should normally be carried out to establish the metacentric height GM. The initial metacentric height GM<sub>0</sub> should not be less than 350 mm.

3.4.2 Where the competent authority is satisfied that operating experience justifies departure from the requirement in 3.4.1, one of the stability criteria in 3.3 should be used.

3.4.3 For undecked vessels of design category C, one of the stability criteria in 3.3 should be used with the exception of 3.3.6 which is not applicable.

### 3.5 Summary table of stability criteria for decked and undecked vessels

Paragraph		Criteria	Decked vessels			Undecked vessels		
			A/B	C	D	A/B	C	D
3.2.1	Where sufficient stability data exists	IMO criteria	•	•	•			
3.3.2	Where insufficient stability data exists (1)	Approx GM formula or	•	•	•			
3.3.3	Where insufficient stability data exists (1)	Rolling test option 1 or	•	•	•			
3.3.4	Where insufficient stability data exists (1)	Rolling test option 2 or	•	•	•			
3.3.5	Where insufficient stability data exists (1)	GM + rolling test or	•	•	•			
3.3.6	Where insufficient stability data exists (1)	Offset load test	•	•	•			
3.4.1	Where data from an inclining test exists	Min GM=350 mm				•		
3.3.2	Where insufficient stability data exists (2)	Approx GM formula or				•	•	
3.3.3	Where insufficient stability data exists (2)	Rolling test option 1 or				•	•	
3.3.4	Where insufficient stability data exists (2)	Rolling test option 2 or				•	•	
3.3.5	Where insufficient stability data exists (2)	GM + rolling test or				•	•	
3.3.6	Where insufficient stability data exists (2)	Offset load test				•		

Notes: 1) or where operating experience justifies departure from IMO criteria.

2) or where operating experience justifies departure from the min. GM criteria.

### 3.6 Flooding of fish-holds for vessels of design categories A and B

For decked vessels, the angle of heel at which progressive flooding of fish-holds could occur through hatches that remain open during fishing operations and that 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.

### **3.7 Particular fishing methods**

**3.7.1** 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. As an example, guidance on additional stability criteria for beam trawlers is contained in Annex XII.

**3.7.2** Vessels on which equipment for shooting and hauling fishing gear has been installed should not heel more than 10° when the maximum allowable weight (the weight for which the vessel and gear were designed and tested) is being lifted.

### **3.8 Operating conditions for vessels of design categories A and B**

**3.8.1** The number and type of operating conditions to be considered should be to the satisfaction of the competent authority and should include the following as appropriate:

- .1 departure for the fishing grounds with full fuel, stores, ice, fishing gear, etc.;
- .2 departure from the fishing grounds with full catch, 30 percent stores, fuel, etc.;
- .3 arrival at home port with full catch and 10 percent stores, fuel, etc.; and
- .4 arrival at home port with 10 percent stores, fuel, etc., and minimum catch, which should normally be 20 percent of full catch, but may be up to 40 percent of full catch provided the competent authority is satisfied that operating patterns justify such a value.

**3.8.2** In addition to the specific operating conditions given in 3.8.1, the competent authority should also be satisfied that the minimum stability criteria given in 3.2 and 3.4, as appropriate, 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.

**3.8.3** Concerning the conditions referred to in 3.8.1, the calculations should include the following:

- .1 allowance for the weight of the wet fishing nets and tackle, etc., on deck;
- .2 allowance for ice accretion, if anticipated, in accordance with 3.9;
- .3 homogeneous distribution of the catch, unless this is inconsistent with practice;
- .4 catch on deck, if anticipated, in operating conditions referred to in 3.8.1.2, 3.8.1.3 and 3.8.2; and
- .5 allowance for the free surface effect of liquids and, if applicable, catch carried.



### 3.9 Ice accretion

3.9.1 For vessels operating in areas where ice accretion is likely to occur the following icing allowances should be made in the stability calculations:\*

- .1 30 kg/m<sup>2</sup> on exposed weather decks and gangways;
- .2 7.5 kg/m<sup>2</sup> for the projected lateral area of each side of the vessel above the waterplane; 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 percent and the static moments of this area by 10 percent.

3.9.2 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.

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

- .1 designed to minimize the accretion of ice; and
- .2 equipped with such means for removing ice as the competent authority may require.\*\*

### 3.10 Inclining test for decked vessels

3.10.1 Every decked vessel, for which the stability criteria in 3.2.1 are used, should undergo an inclining test upon its completion and the actual displacement and position of the centre of gravity should be determined for the light ship condition.

3.10.2 Where alterations are made to a vessel affecting its light ship condition and the position of the centre of gravity, the vessel should, if the competent authority considers it necessary, be re-inclined and the stability information revised.

### 3.11 Built-in buoyancy for undecked vessels

3.11.1 Every undecked vessel should be fitted with buoyancy compartments, which are filled with solid buoyancy material, acceptable to the competent authority.

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\* 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 International Conference on the Safety of Fishing Vessels. 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 to the annex to Part A of the *Code of Safety for Fishermen and Vessels*.

\*\* Refer to 2.4 of Appendix 10 to the annex to Part A of the *Code of Safety for Fishermen and Vessels* on a typical list of equipment and hand tools required for combating ice formation.

They should be distributed so that the vessel will stay afloat and on an even keel in order that bailing is possible, without listing if flooded. This buoyancy should be demonstrated by a calculation and/or by a practical test:

- .1 a calculation, using one of the following methods:

**Method 1\***

- A. Establish the hull weight ( $W_H$ ) of the vessel (excluding engine, fittings, equipment, fuel, water, fish, ice, fishing gear, crew and food). This weight can be found by calculation or by using the following approximate formulae:  
 Hull weight of decked vessel = approx  $90 \times CuNo$ ;  
 Hull weight of undecked GRP vessel = approx  $60 \times CuNo$ ;  
 Hull weight of undecked Wood vessel = approx  $75 \times CuNo$ .
- B. Establish the weight of engine(s) and engine related equipment ( $W_E$ ) not included in A.
- C. Establish the weight of fittings and equipment ( $W_F$ ) not included in A.
- D. Establish the weight of the load ( $W_L$ ) that the vessel is designed to carry. (Note: This weight will include fishing gear and other removable items that will contribute weight to the submerged vessel **but not** items that will float when the vessel is submerged such as fuel, water, fish, ice and food. **However**, if such items are stowed above the deck edge and, thus, above the water when the vessel is submerged, then they should be included in the load.)
- E. Establish the weight of the maximum number of crew ( $W_{CR}$ ). (Note: A figure of 75 kg per crew is often used although a competent authority may wish to substitute a different figure. Also it is assumed that the crew will be in or on the vessel but submerged only up to the knee.)
- F. The weights calculated above need to be converted to submerged weight using the buoyancy factors (K) given below:

Material	Specific gravity, SG	Buoyancy factor, K
Heavy wood	0.80	+0.25
Medium wood	0.65	+0.54
Light wood	0.50	+1.00
Steel	7.85	-0.87
Aluminium	2.65	-0.62
Fibreglass	1.50	-0.33
Lead	11.30	-0.91
Concrete	2.40	-0.58
Engines	-	-0.75
Crew	-	-0.10

Notes:

- 1. Other materials may be included by use of the following formula:  
 Buoyancy factor,  $K = (1 - SG) / SG$ .
- 2. It is very important to use the correct sign (+ or -) with the factor K.

\* Method 1 is based on – Canadian Transport Publication 1332 E.

G. Generate a table as follows:

Item	Weight (kg)	Buoyancy factor, K	Submerged weight (kg)
Hull not submerged (10%)	10% $W_H$	-1	10% $W_H \times K$
Hull submerged (90%)	90% $W_H$	From table	90% $W_H \times K$
Engine(s) and engine-related equipment	$W_E$	From table	$W_E \times K$
Hull fittings and equipment	$W_F$	From table	$W_F \times K$
Load	$W_L$	From table	$W_L \times K$
Crew load	$W_{CR}$	-0.1	$W_{CR} \times -0.1$
			Sum submerged weights, $W_S$

H. Calculate the volume of buoyancy required,  $m^3 = W_S / (1000 - D_B)$  where  $D_B$  = density of buoyancy material,  $kg/m^3$ .

### Method 2\*

Volume of buoyancy (litres) = hull (kg) + equipment (kg) + motor (kg) + 250M

where:

$$M = 0.1 \text{ LOA } B; \text{ and}$$

LOA and  $B$ , in m, are as defined in 1.2.25 and 1.2.5.

For a wooden vessel, the calculations may take into account half the volume of the buoyancy of the wood.

.2 completing a practical test as follows.

The vessel should be loaded with a simulation of the equipment and motor weights plus 250M (as above) kg and then be flooded to the point of submergence. The vessel should then bear a weight of 15 kg on the gunwale amidships on one side of the vessel, without capsizing.

3.11.2 Annex XIII shows a practical buoyancy test, which may be used as an alternative.

## 3.12 Stability information

3.12.1 Where practicable, suitable stability information, to the satisfaction of the competent authority, should be supplied to enable the skipper to assess with ease the stability of the vessel under various operating conditions.\*\* Such information should include specific instructions to the skipper warning of those operating conditions which could adversely affect either the stability or the trim of the vessel.\*\*\*

\* Method 2 is based on the New Zealand Maritime Rules Part 40D.

\*\* Refer to Annex XI containing an example of a stability notice. 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 IMO by resolution A.749(18), as amended.

\*\*\* Refer to the Code of Practice Concerning the Accuracy of Stability Information for Fishing Vessels, adopted by IMO by resolution A.267(VIII).

**3.12.2** The stability information, referred to in 3.12.1, should be posted on board, readily accessible at all times and inspected during the periodical surveys of the vessel to ensure that it is still valid.

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

### **3.13 Portable fish-hold divisions**

The catch should be properly secured against shifting, which could cause dangerous trim or heel of the vessel. The scantlings of portable fish-hold divisions, if fitted, should be to the satisfaction of the competent authority. The scantlings of portable fish-hold divisions, if fitted, should be in accordance with the recommended practice on portable fish-hold divisions set out in Annex X.

### **3.14 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 and the design category in which the vessel is intended to operate and its mode of operation.

### **3.15 Maximum permissible operating draught**

The maximum permissible operating draught should be to the satisfaction of the competent authority and should be such that, in the associated operating condition, the stability criteria of this chapter and the provisions of Chapters 2 and 6, as appropriate, are satisfied.

## Chapter 4

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# Machinery and electrical installations

### Part 1

### *Machinery*

#### 4.1 General

**4.1.1** Machinery and electrical installations should be designed, constructed and installed in accordance with good marine engineering practice. Equipment should be installed, protected and maintained so as not to constitute a danger to persons and the vessel.

**4.1.2** Access for persons to machinery spaces should be arranged clear of any moving or heated surfaces and the latter should be sufficiently insulated. Effective guards should protect exposed moving parts such as shafts, drive pulleys and belts. Access ladders should be securely fixed to the vessel's permanent structure and should be of a metal such as steel, where practicable.

**4.1.3** Layout and installation of machinery spaces and propulsion machinery should be designed for safe and efficient operation.

**4.1.4** Light fittings should be watertight, where practicable, and designed to facilitate easy inspection and be unaffected by vibration.

**4.1.5** Ventilation should be provided either by mechanical fans or natural vents to meet the air requirements of the propulsion machinery and to prevent a build-up of fumes and excessive heat.

**4.1.6** Floor plates, where fitted, should be non-slip and securely fastened with accessible fasteners.

**4.1.7** Piping materials, including plastic piping where allowed by the competent authority, should be suitable for their intended purpose; when the material to be used is chosen, it should be ensured that there would be no failure or degradation of the pipe as a result of any reaction with the fluid.

**4.1.8** Tools, spare parts and spare gear required for routine maintenance and simple repairs should be provided for machinery and should be securely stowed in an easily accessible place. Guidance on tools and spare parts to be carried on board is to be found in Annex XIV.

**4.1.9** Valves, piping and flexible hoses should be of sound and efficient construction and installation. All piping systems should be well supported with pipe clips or mounts and protected against vibration and chafing/wear.

**4.1.10** Where pipework is replaced, alignment of the replacement part should be as close as possible to the original alignment.

**4.1.11** Machinery of vessels intended for operation in ice should be appropriate for the anticipated conditions.

## **4.2 Propulsion machinery and stern gear**

**4.2.1** Propulsion engines and associated stern gear should be of a design, type and rating to suit the design and size of the vessel, taking account of the operating conditions and area of operation.

**4.2.2** Inboard engines should, in general, be diesel-powered. However, in the case of undecked vessels, inboard petrol engines may be fitted, provided appropriate safety requirements are followed.

**4.2.3** Flexibly mounted engines should be fitted with short flexible connections of an appropriate type, fitted to associated piping and exhaust systems. Flexible shaft couplings should be suitable for the power to be transmitted, taking into consideration arrangements to cater for thrust, and be of a type that would not create unacceptable torsional vibrations.

**4.2.4** A vessel of design categories A and B fitted with an inboard engine should have adequate means and power for going astern in order to maintain control of the vessel in all foreseeable circumstances.

### *Outboard engines*

**4.2.5** Outboard engines should be securely mounted on a substantial transom; a secondary means of securing the outboard engine to the transom should be provided, such as a chain. Outboard engines with output of more than 15 kW should be surrounded by an overboard drained well, large enough to allow the engine to be tilted entirely above the waterline in parked position. Undecked vessels should have alternative means of propulsion such as oars, paddles or sails.

## **4.3 Shaft and propeller**

**4.3.1** The propeller shaft and any intermediate shaft, together with the stern tube, bearings and bushes, should be properly constructed and operate efficiently. Shaft materials, diameter and eventual free span between bearings should be suitable for the power being transmitted and according to the manufacturer's requirements. Inboard stern glands should be accessible for adjustment.

**4.3.2** As a minimum requirement, the shaft diameter should be:

$$d = k * \sqrt[3]{\frac{p}{r}}$$

where:

- d = shaft diameter in mm
- p = maximum continuous rating in kW
- r = propeller revolutions per second

- k = 30 for carbon steel
- = 23 for AISI 316
- = 22 for AISI 431
- = 21 for AISI 429
- = 18 for CuNi K500

## 4.4 Engine starting

All propulsion engines, except those engines fitted with hand starting arrangements, should be provided with a secondary means of starting.

## 4.5 Controls and instruments

4.5.1 The controls should be properly constructed and operate efficiently. The instrumentation system for the propulsion engine should, where practicable, show the following parameters:

- .1 revolutions per minute (RPM);
- .2 cooling water temperature; and
- .3 lubricating oil pressure.

4.5.2 High water temperature and low lubricating oil pressure alarms should be fitted, where practicable.

4.5.3 Propulsion engines fitted below deck in a machinery space and arranged for remote operation from the wheelhouse or helm position should be provided with an arrangement on or adjacent to the engine to stop it.

## 4.6 Steering gear

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

4.6.2 All parts of the steering gear should be easily accessible for maintenance. For guidance on steering gear refer to Annex XV.

4.6.3 Vessels should be provided with an alternative means of steering which would operate if the main system fails; one of these alternative means may include a steering oar.

## 4.7 Pumping and piping systems

### *Fuel oil installations*

4.7.1 Tanks for fuel oil should be of sound and efficient construction and safe in operation and should be located remote from heated surfaces and not be situated above

hot surfaces and electrical equipment. Tanks and piping should be arranged to minimize in the event of leakage or rupture the possibility that fuel would come into contact with hot surfaces or electrical components. All fuel tanks should either be fitted with a level gauge or be able to be sounded manually. Glass contents gauges, where fitted, should have self-closing valves at the base and be protected by metal rods or slotted covers. Fixed tanks should be fitted with separate filling and air pipes. A closing valve should be fitted on the fuel pipeline, as close as possible to the tank, and should also be closable from outside the engine room. There should be a drain valve as close as possible to the tank's lowest point.

**4.7.2** Piping systems should be of sound construction and suitable for the service intended. Flexible connections should be of an appropriate armoured fire-resistant type, preferably with flange or threaded fastener fittings, and kept as short as practicable. If hose clamps are used, double clamps of an acid-resistant material should be fitted at each coupling.

**4.7.3** Petrol tanks should not be integral with the hull structure. An efficient system should be installed to ensure that petrol does not spill into the hull of the vessel when tanks are being filled. The tanks should not be placed close to any sources of heat or close to electrical machinery that may cause sparking. Petrol filling systems should be effectively bonded or earthed.

**4.7.4** Portable petrol tanks for outboard motors should be secured when in use and arranged in such a way that they can be taken ashore for filling.

#### *Cooling water systems*

**4.7.5** The piping and fittings are to be of sound construction and efficient in operation; and the following requirements should be met:

- .1 Cooling water inlets for main and auxiliary machinery should be kept to a minimum, noting that, where practicable, there should be one on either side of the hull, and should comply with the requirements of sea inlets in 2.3;
- .2 Sea inlet trunks or boxes built into the hull structure should be of such a design that they remain below the waterline at all normal conditions of trim and heel, and should be fitted with arrangements for the purging of trapped air;
- .3 An accessible strainer should be fitted after the sea inlet valve;
- .4 Where a common sea main supplying a number of services is installed, each branch pipe should be fitted with an easily accessible isolating valve with open/closed indication;
- .5 Where two sea inlets are fitted as recommended in .1 above, an interconnecting pipe should be fitted between them; the connections should be inboard of the strainers. The interconnecting pipe should be fitted with a valve complying with the requirement for sea inlets as set out in 2.3; and
- .6 When modifications are made, particular care should be taken in the selection and installation of appropriate materials, and to comply with the requirements in 4.1.9, 4.1.10 and 4.7.17.



*Bilge pumping systems*

**4.7.6** Decked vessels should have an efficient bilge pumping arrangement fitted and, where practicable, each watertight compartment should have a bilge suction fitted with a non-return valve and strainer.

**4.7.7** In the event that it is not practicable to have suction pipes to all watertight compartments, the competent authority may allow means to drain such compartments to the bilge main in the engine room. Each compartment so drained should be fitted with an easily accessible gate valve at the bulkhead of the compartments, to which a screwed cap can be fitted to the outlet side of the valve (the cap to be attached to the valve by a chain) or with a blank flange. However, draining of any other compartment directly through the fish-hold should not be allowed.

**4.7.8** Undecked vessels not fitted with a bilge system should have means of manual bailing such as a bucket, bailer or hand-operated bilge pump.

*Bilge pumps*

**4.7.9** All decked vessels should have at least one hand bilge pump. Decked vessels of design categories A and B fitted with inboard engines should, in addition, have at least one power-driven bilge pump fitted.

**4.7.10** The power-driven pump may be any pump provided that any sea connection to the pump is isolated from the bilge suction main by a switch cock or interlocked valve system, where approved by the competent authority, such that seawater cannot drain into the bilge main.

**4.7.11** Where a deck wash pump is utilized for bilge suction purposes, means should be provided to prevent flooding of any compartment from the sea inlet via the bilge main and to prevent bilge water from being pumped to deck.

**4.7.12** Flexible connections and hoses, where fitted, should be soundly constructed and operate efficiently, and should be readily accessible.

**4.7.13** Where watertight bulkheads are fitted, means should be provided in the piping system to prevent any leakage via the system from one compartment to another and/or from the sea inlet to a compartment.

**4.7.14** Where practicable, an audible and visible bilge level alarm should be fitted to indicate leakage of water into the machinery space. Indication should be at the helm or control position.

**Bilge pump installation**

Vessel size (LOA)	Total number of pumps	Number and type of pumps		Minimum capacity of power pumps (litre/minute)	Minimum total capacity of all pumps (litre/minute)
		Hand	Power		
Less than 6 m	1	1	–	–	70
6 m and over	2	1	1	70	140

*Exhaust systems*

**4.7.15** Engine exhaust systems of the dry or water-injected type, which discharge through the hull below the deck at the side or stern, should be provided with means of preventing back-flooding into the hull or engine through the exhaust system. The means may be by system design, valve or non-return device. See Annex XVI for the recommended practice for exhaust systems.

**4.7.16** The exhaust systems should be of sound construction and hoses should be of a suitable material, well-supported, free from defects, and not in contact with combustible materials.

*Materials for valves and associated piping – seawater systems*

**4.7.17** Valves, pipes and fittings serving as sea inlets and discharges attached directly to the hull of the vessel below the loaded waterline should be of cast steel, bronze or other equivalent, and compatible material. Care should be taken not to use dissimilar metals when joints are required and particularly when lengths of pipe are replaced.

**4.7.18** The sea inlet valve should be as close as possible to the hull. Where the sea inlet valve or fitting is connected to the hull by means of a tube or distance piece, the tube or distance piece should be of a material that is compatible with the hull and valve.

*Hydraulic systems*

**4.7.19** The design and installation of hydraulic piping systems should ensure the lowest possible risk of leakages, noise and pipe failure. This requirement necessitates as few bends in pipes as possible. To enable noise reduction, expansion pieces should be fitted on supply lines.

**4.8 Ventilation of the engine room**

Where fitted, the separate engine room air intake should be of a size capable of meeting the specifications of the engine manufacturer, but not less than 7 cm<sup>2</sup>/kW; this should be increased to 10 cm<sup>2</sup>/kW in tropical climates. The engine room air intake should be located on the opposite side of the vessel to the engine air intake. Ventilation ducts should be provided with means of closing outside the engine room.

**Part 2***Electrical installations***4.9 Main source of electrical supply**

**4.9.1** When electrical power constitutes the only means of maintaining auxiliary services essential for the propulsion and safety of the vessel, a main source of electrical power should be provided.

**4.9.2** Electricity generating and storage system(s) should have sufficient capacity in normal operating conditions to ensure the correct operation of all safety and navigation equipment, including navigation and fishing lights.

## **4.10 Emergency source of electrical power**

**4.10.1** All vessels of design categories A and B should be equipped with an emergency accumulator battery bank capable of supplying the emergency lights, the radio communication equipment and the navigation lights for at least three hours. The same recommendation should be applied to vessels of design categories C and D authorized to operate more than 20 nautical miles from a safe haven.

**4.10.2** The emergency battery should receive constant, not selective, charging from an electrical generating system having sufficient capacity to reach the minimum requirements for radio transmissions within a period of 10 hours. The battery should, where practicable, be located outside the machinery space above deck or as high as possible. It should be so arranged as to ensure functionality in the event of fire or other causes of failure to the main electrical installations.

**4.10.3** Where the main engine of a vessel in design categories A, B and C is arranged for electric starting from a battery and has neither a hand starting facility nor any other mechanical means of starting, such as a spring starter, a second battery bank for emergency starting should be installed with a capacity of not less than that recommended by the engine manufacturer. The installation should be to the satisfaction of the competent authority. The main general electrical services battery bank that supplies other consumers on board could be selected to start the main engine in an emergency provided that it would have sufficient power. If the latter option is selected, there should be a battery bank dedicated to starting the main engine, a battery bank for supplying general electrical services, plus the emergency battery bank specified in 4.10.1.

## **4.11 Precautions against shock, fire and other hazards of electrical origin**

**4.11.1** The design and installation of electrical systems should be such that the risk of fire and the risk of electrical shock to operating personnel are minimized.

**4.11.2** 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 comply with the foregoing.

**4.11.3** 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.

**4.11.4** Where the cables are not metal sheathed or armoured and there might be a risk of fire in case of an electrical fault, special precautions should be taken to the satisfaction of the competent authority.

**4.11.5** Cable installations:

- .1 When cables are being selected, particular attention should be given to environmental factors such as temperature and contact with substances, e.g. polystyrene, that degrade PVC insulation.

- .2 Cables should not be run below floor plate level or in bilges as the case may be, except where this is necessary for connections to underwater equipment, etc.; such cables should be run through a protective pipe/shield or conduit.
- .3 Cables running through fish-holds should be fitted in conduits. Cables should not be secured directly to fuel or oil storage tanks.
- .4 Where cables are not run through conduits in machinery spaces, cable trays should be fitted and the cables should be secured to the trays with suitable clips.
- .5 To the extent practical, all cables from the main switchboard to distribution boxes elsewhere should also be carried on cable trays and securely fastened with suitable clips.

## **4.12 Electrical systems**

**4.12.1** Guidance on the installation of electrical equipment can be found in Annex XVII.\*

**4.12.2** Particular attention should be given to protection against water ingress and the effects of vibration.

**4.12.3** All circuits should be clearly identified on switchboards and distribution boards, including service, protective device rating, current-carrying capacity and voltage values, to the satisfaction of the competent authority. Differing voltages should not be included in any one of the distribution boards unless the competent authority is satisfied that the approved arrangement does not pose a risk to operating or maintenance personnel.

**4.12.4** All circuits for consumers larger than 5A, except the main supply from the battery to the starter motor and motors for steering-gear systems, should be fitted with fuses or circuit-breakers to provide protection against overload and short circuit.

**4.12.5** Piping conveying liquid should not be fitted above or close to switchboards or other electrical equipment. Where such arrangements are unavoidable, provision should be made to prevent leakage from damaging the equipment.

**4.12.6** Taking into consideration the design of the system and the working voltage, the competent authority may require the installation of a system of earth indicator lamps or means of detecting current leakage.

**4.12.7** Batteries should be fitted in enclosed boxes or trays with covers, provided with sufficient ventilation to avoid the risk of explosion and be remote from sources of ignition. Battery boxes should be sited clear of heat sources and where they are least likely to be flooded. If batteries are sited in accommodation spaces, the boxes should be sealed from the accommodation and ventilated to open air.

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\* Further guidance can be found in ISO 10133 Small craft – Electrical systems – Extra-low-voltage DC installations and ISO 13297 Small craft – Electrical systems – Alternating current installations.

**4.12.8** Each battery or bank of batteries should have a spark-proof isolating switch. Systems such as automatic bilge pump or alarm systems should be connected before the cut-off switch, thus ensuring that such systems will also operate when the vessel is unattended.

**4.12.9** A means of checking the charge of the battery should be available.

**4.12.10** Batteries positioned in the engine compartment should be so arranged as not to short circuit when the compartment is flooded to the loaded waterline. The batteries should be securely fastened to avoid movement due to the motion of the vessel.

**4.12.11** Battery installations of more than 5 kWh, equivalent to 208 Ah at 24 V and 416 Ah at 12 V, should be placed in a separate compartment with ventilation to open air. The arrangement should be such that the air circulation is not blocked.

**4.12.12** Where the main and/or auxiliary engines are fitted with electric motor starters, the batteries connected to the system for starting should be separate from the batteries used for other services. The starter batteries should be capable of starting the engine at least six times without recharging.

#### *DC systems*

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

**4.12.14** The competent authority may approve the following direct current generating and distribution systems, providing these are suitable for the intended purpose:

- 12 V
- 24 V
- 32 V
- 110 V

**4.12.15** The two-wire system should be used in steel and aluminium vessels. In GRP and wooden vessels where suitable earthing systems are fitted, the single-wire system may be used.

#### *AC systems*

**4.12.16** The competent authority may approve alternating current systems of over 220 V, providing that these are suitable for the intended purpose.

**4.12.17** Cables for AC systems should be kept separate from DC systems and run in separate trays and conduits, unless approved by the competent authority.

**4.12.18** Switchgear for AC systems should be fitted in switchboards and panels that are separate from those containing DC systems, unless approved by the competent authority. Systems and equipment should be clearly marked.

**4.12.19** Switchgear and sockets should be so arranged as to prevent the fitting of low-voltage equipment and lamps into high-voltage systems.

## **4.13 Earthing and bonding**

**4.13.1** Earthing systems should be sound and efficient and such that no danger to the system or vessel can occur. Hull earth plates, where fitted, should be efficiently connected and not painted over.

**4.13.2** In steel and aluminium vessels, non-conducting exposed metal parts of electrical equipment that are required to be earthed should be effectively earthed to the hull.

**4.13.3** On wood and composite vessels, a continuous ground conductor should be installed to facilitate the grounding of non-conducting exposed metal parts of electronic and communication equipment that are required to be earthed. The conductor should terminate at a point on the main engine or at a copper plate of area not less than 0.2 m<sup>2</sup> fixed to the keel below the light waterline so as to be fully immersed under all conditions of heel. Inside the hull, the earth plate should be connected to a copper bar or rod of at least 64 mm<sup>2</sup>, the length being appropriate to the number of bonding points.

**4.13.4** Every earthing conductor should be of copper or other corrosion-resistant material of low electrical resistance and should be securely installed and protected, where necessary, against damage and against electrolytic corrosion.

**4.13.5** Exposed permanently-fixed metal parts of electrical machines or equipment that are not intended to be “live”, but that are liable under fault conditions to become “live”, should be earthed unless:

- .1 they are supplied at a voltage not exceeding 55 volts direct current or 55 volts, root mean square, between conductors; auto-transformers should not be used for the purpose of achieving this alternative current voltage; or
- .2 they are supplied at a voltage not exceeding 250 volts by safety isolating transformers supplying one consuming device only; or
- .3 they are constructed taking into account the principle of double insulation.

**4.13.6** Lightning conductors should be attached directly to the earth plate.

**4.13.7** Radar, radio and other navigational equipment that are required to be earthed should have a separate earthing point and the connection should be as short as possible.

**4.13.8** Where a flexible non-conducting coupling is fitted between the engine and the propeller shafting, the coupling should be bridged by a piece of braided copper conductor.

## **4.14 Lighting systems**

**4.14.1** Lighting of normally unattended spaces such as fish rooms and net stores should be controlled from outside the space.

**4.14.2** Emergency lighting should be supplied from an accumulator battery. Such emergency lighting should be placed at stairways and exits, in machinery spaces, at control stations and where survival craft are positioned. An emergency source of power should be made available for a signalling lamp if carried.

## 4.15 Electric motors

**4.15.1** Every electric motor should be provided with a means of starting and stopping, so located as to be easily operated by the person controlling the motor.

**4.15.2** The circuit supplying the motor should be fitted with short-circuit and overload protection. In the case of motors in a steering-gear system that are not required to be so protected, an overload alarm should be provided at the helm. However, protection against excess current, if provided, should be set at not less than twice the full load current of the motor or circuit and should be arranged to cater for the appropriate starting current without tripping.

**4.15.3** Fans and pumps driven by electric motors are to be fitted with a remote control. The remote control should be positioned outside the machinery space concerned, for stopping the motors in the event of a fire in the space in which they are located.

## 4.16 Lightning conductors

**4.16.1** Lightning conductors should be fitted on wooden masts. They should be of continuous copper tape or copper rope having a cross-section of not less than 75 mm<sup>2</sup> and secured to a copper spike of 12 mm diameter projecting at least 150 mm beyond the top of the mast.

**4.16.2** In the case of metal hulls, the lower end of the conductor is to be earthed to the hull or, in the case of wooden or other non-metallic hulls, the lower end of the conductor is to be attached to the earth plate. All sharp bends must be avoided and only bolted or riveted joints should be used.

## 4.17 Anodes

Where applicable, vessels should be fitted with adequate numbers of zinc or equivalent anodes suitable for the areas to be protected. Anodes fitted in the propeller aperture should be positioned in such a way that they do not disturb the flow of water to the propeller. Anodes should not be painted over and should not be fitted close to earthing plates.

## 4.18 Equivalency

Electrical installations that do not comply with the requirements of this Part 2 may be accepted, provided that they are unavoidable, that there are justifiable reasons precluding compliance and that the electrical installations are deemed by the competent authority to be equivalent to the requirements specified in this part.





## Chapter 5

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# Fire protection and fire fighting

### Part 1

#### *General*

### 5.1 Structure

5.1.1 Fire-retardant materials should be used in any part of the vessel where the risk of fire is increased due to proximity of heat sources.

5.1.2 Manholes or other openings to fuel oil tanks should not be positioned in the accommodation.

### 5.2 Maintenance of fire-fighting appliances

Fire-fighting appliances should be maintained in the manner as specified by the manufacturer and to the satisfaction of the competent authority.

### 5.3 Heating installations

5.3.1 Where fitted, electric radiators should be fixed in position and so constructed as to reduce fire risks to a minimum. No such radiator should be fitted with an element so exposed that clothing, curtains or other similar materials can be set on fire by heat from the element.

5.3.2 Heating stoves, their flues and other similar appliances should be permanently secured and there should be adequate protection against fire.

5.3.3 Heating by means of open fires should be prohibited.

### 5.4 Storage of gas cylinders

5.4.1 Cylinders that contain flammable or other dangerous gases should be stored, suitably secured, on the open deck and in a shelter designed to protect them from external heat sources, sun and external impact.

5.4.2 It is recommended that gas detectors are carried on board.

5.4.3 All pipes conveying gas from a cylinder to appliances for domestic purposes should be of steel or other material accepted by the competent authority.

5.4.4 The competent authority may permit an alternative arrangement which provides an equivalent measure of safety.

## 5.5 Requirements for fire-fighting appliances

The performance of fire extinguishers should be to the satisfaction of the competent authority.

## 5.6 Miscellaneous items

**5.6.1** The competent authority should ensure that materials used as deck coverings and for fittings do not have low spontaneous combustion temperatures or have explosive qualities when exposed to abnormal heat sources. This requirement would not exclude the use of wood, GRP or other similar materials.

**5.6.2** All reasonable steps should be taken to minimize the emission of harmful vapours in the event of fire.

**5.6.3** In the event of a fire in a space containing machinery, it should be possible to stop the machinery from a location outside the machinery space.

## Part 2

### *Undecked vessels*

## 5.7 Number of fire-fighting appliances

Vessels should be provided with fire extinguisher(s) of a type and size approved by the competent authority. Such extinguishers should be sited near the machinery space. The minimum requirements are as follows:

Propulsion	No engine	Outboard	Inboard
Fire extinguisher	0	0	1 <sup>c)</sup>
Fire bucket	0 <sup>a)</sup>	1 <sup>b)</sup>	1 <sup>b)</sup>

Notes: a) Not required where other water container (e.g. bailer) is carried.

b) Not required where two or more extinguishers are carried.

c) The competent authority may, after consultation with fishermen's representatives and owners' representatives, exempt the smallest vessels from this requirement.

## Part 3

### *Decked vessels*

## 5.8 Number of fire-fighting appliances

**5.8.1** Vessels should carry at least two appropriate fire extinguishers, one of which should be located near the machinery space. Where only two fire extinguishers are provided, a pail or a bucket coloured red for fire-fighting use should also be carried.

**5.8.2** Vessels fitted only with outboard engines may dispense with one of the fire extinguishers required by 5.8.1.

## **5.9 Fire-fighting appliances for machinery spaces**

**5.9.1** Where appropriate, a sufficient number of automatic dispersion-type fire extinguishers or fire extinguishers deemed appropriate by the competent authority should be placed in the machinery spaces, taking into account the volume of the space and arrangement of the machinery.

**5.9.2** When the automatic dispersion-type fire extinguishers or extinguishing equipment are provided in accordance with 5.9.1, one of the extinguishers required by 5.8.1 is not necessary.

## **5.10 Ventilation systems**

Means should be provided for stopping the ventilators and closing the openings in the ventilation system from a location outside the spaces being served.



## Chapter 6

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# Protection of the crew

### 6.1 General protective measures

6.1.1 The identification of hazards and the consequent measures to assess and manage risk as concerns the construction of and equipment for fishing vessels should be taken in the following order of priority:

- .1 elimination of the risk;
- .2 control of the risk at the source;
- .3 minimization of the risk by such means as the design of safe work systems, the introduction of technical and organizational measures and safe practices and training; and
- .4 in so far as the risk remains, provision of the use of personal protective equipment and clothing.

The crew should participate in the identification of measures to address and manage risks.\*

6.1.2 The surfaces of decks and of flooring in working spaces on board, such as machinery spaces, galleys, fish-handling and deck equipment operating areas, and deck areas at the foot and head of ladders should be designed and treated to minimize the possibility of personnel slipping.

6.1.3 Where practicable, an adequate system of lifelines should be provided and it should be complete with the necessary wires, ropes, shackles, eye bolts and cleats.

6.1.4 A means, which should be permanently attached to the vessel, should be provided on every vessel to allow a person to climb on board from the water. On single-handed vessels, the means of reboarding should be accessible by a person in the water.

6.1.5 Where practicable, on single-handed vessels, the competent authority should require an arrangement to ensure that if the operator falls overboard, the engine will stop. Such an arrangement should not constitute a danger to the operator.

6.1.6 Accidents should be reported to and investigated by the competent authority.\*\*

### 6.2 Deck openings and doors

6.2.1 Hinged and sliding covers of hatchways, manholes, doors and other openings should be prevented from swinging or accidental closure.

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\* Refer to Appendix 1 of the annex to Part A of the *Code of Safety for Fishermen and Fishing Vessels*.

\*\* Refer to 3.4 of Section I of Part A of the *Code of Safety for Fishermen and Fishing Vessels*.

**6.2.2** Dimensions of access hatches should be of an adequate size for the intended purpose.

**6.2.3** Having regard to the operation of the vessel, suitable protection should be provided, where practicable, in positions where there is a danger of personnel falling through deck openings.

**6.2.4** Where practicable, handholds should be provided above the level of the deck over escape openings.

**6.2.5** In general, external hatches and doors should be closed when the vessel is at sea. All openings occasionally required to be kept open during fishing and which may lead to flooding should be closed immediately if such danger of filling occurs, with subsequent loss of buoyancy and stability.

**6.2.6** Moving parts of machinery, winches, line and net haulers should be adequately guarded.

### **6.3 Bulwarks, rails and guards**

**6.3.1** On decked vessels, efficient bulwarks or guard rails should be fitted to all exposed parts of the working deck and on superstructures and deck erections. On undecked vessels, the height of the gunwales should be sufficient to minimize the risk of persons falling overboard. On every vessel where a fixed bulwark or gunwale is less than 1 m, guardrails should be fitted up to 1 m, but where this would interfere with the fishing operations of the vessel, alternative arrangements may be accepted by the competent authority.

**6.3.2** Clearance below the lowest rail should not exceed 230 mm. Other rails should not be more than 250 mm apart, and the distance between stanchions should not be more than 1.5 m. Rails and bulwarks should be free from sharp edges and corners and should be of adequate strength.

**6.3.3** Satisfactory means in the form of guard rails or lifelines should be provided for the protection of the crew in getting to and from their quarters, machinery spaces and other working spaces. Storm rails should be fitted on the outside of all deckhouses and casings.

**6.3.4** Where equipment is normally incorporated in the structure of a bulwark or rail within the minimum height prescribed for the bulwark, or mounted between stanchions of a guard rail, provision should be made to protect the area when the equipment is not in place.

**6.3.5** Where part of a bulwark or guard rail has to be removed for the purpose of the fishing operation, protection for the crew should be provided at the opening.

### **6.4 Stairways and ladders**

For the safety of the crew, stairways and ladders should be of adequate size and strength, with handrails and anti-slip treads, to the satisfaction of the competent authority.

## **6.5 Safe access**

Means should be provided, wherever necessary and to the extent practicable, to ensure sufficiently safe and convenient access to the vessel when facilities are not provided in the port. Such means should be of safe construction and adequate strength, be well-illuminated and, where practicable, have anti-skid surfaces.

## **6.6 Cooking facilities**

**6.6.1** Cooking facilities should be provided with guard rails and handrails.

**6.6.2** Cooking stoves should be fitted with guards to retain cooking utensils.

## **6.7 Deck machinery, tackle and lifting gear**

**6.7.1** All powered winches and hauling equipment for fishing gear should be fitted with emergency stop safety devices. The emergency stop should be provided at the winch and at other appropriate places in the deck area, as well as in the wheelhouse. Special attention should be given in the case of deck machinery that is belt driven from a power source below deck level.

**6.7.2** Controls of winches, line and net hauling equipment should be so placed that winch operators have ample room for their unimpeded operation and have as unobstructed a view as possible of the working area. Control handles should be provided, where necessary, with a suitable locking device in the stop/neutral position to prevent accidental movements or displacement or unauthorized use.

**6.7.3** Guidance on the safe operation of winches, line haulers and lifting gear is given in Annex XXV.

## **6.8 Lighting in working spaces and areas**

**6.8.1** All passageways, working spaces and working areas on board the vessel should be well-lit. The quality and intensity of the lighting should be sufficient to ensure that work can be carried out with full regard to health and safety.

**6.8.2** The amount of light should be sufficient to distinguish details. The light should create suitable contrast conditions and should not glare.

**6.8.3** Fish-holds should be provided with lighting ensuring adequate lighting in all conditions, both for orientation and during work in the hold.

**6.8.4** The lighting should not interfere with the keeping of a proper lookout.

**6.8.5** Where practicable, provision should be made for some form of emergency lighting.

## 6.9 Ventilation in working spaces

Ventilation in enclosed working spaces should be in accordance with the provisions of 5.10.

## 6.10 Medical services

**6.10.1** Medical supplies, equipment and instructions as required by the competent authority should be provided on all vessels, taking into account the risks to which crew are exposed.\* Guidance on the basic first aid kit can be found in Annex XVIII.

**6.10.2** Vessels should carry an appropriate medical guide or instructions, as required by the competent authority. The medical guide or instructions should be illustrated and should explain how the medical supplies are to be used.

**6.10.3** The medicine chest should contain medical equipment as well as medical supplies that are not expired. The medical equipment and supplies should be suitable for the expected service of the vessel (e.g. unlimited trips; trips of less than a certain distance from the nearest port with adequate medical equipment; service in harbours and very close to shore). They should be sufficient for the number of fishermen on board. At least one person on board should be qualified or trained in first aid and other forms of medical care. This person should have the necessary knowledge to use the medical equipment and supplies concerned.\*

**6.10.4** Appropriate instructions, including contact details, should be provided to enable the crew to consult effectively with medical services ashore.

**6.10.5** When the operating area of the vessel changes, the medical supplies carried should be reviewed.

**6.10.6** All instructions should be in a language understood by the crew and should be accompanied by illustrations to facilitate ease of understanding and communication.

## 6.11 Miscellaneous

**6.11.1** To the extent possible, protective clothing and safety working equipment should be provided to the crew and instruction and training given on its use, as appropriate, to prevent injury or illness to the crew. Refer to Annex XIX for guidelines on appropriate protective equipment for personnel.

**6.11.2** Clothing for crew members working on deck should be capable of supporting the wearer in the water in the event of being washed overboard. A personal flotation device or a self-inflating working lifejacket may be used for this purpose.

**6.11.3** All reasonable steps should be taken to minimize harmful noise and vibration.

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\* International standards relating to first aid at sea laid down in the *International Medical Guide for Ships*, prepared by ILO, IMO and WHO, may serve as a guide. In addition, some regional guidelines have also been developed. Refer to EU Council Directive 92/29/EEC on the minimum safety and health requirements for improved medical treatment on board vessels.



**6.11.4** The competent authority should ensure that the crew are made aware of the health hazards in connection with the carriage of fish in bulk and the depletion of oxygen in the hold, and should advise the crew concerning safe working practices in this regard.

**6.11.5** The competent authority should ensure that crew members joining a vessel are made aware by the skipper of the particular hazards of the working of the vessel.

**6.11.6** The arrangement of the fish-processing equipment should ensure free access for inspection, operation and cleaning of the equipment and, where applicable, be suitably guarded.

**6.11.7** Where practicable, all workstations on deck should be visible from the wheelhouse.

**6.11.8** Where practicable, enclosed working spaces should be provided with an adequate system of heating and/or a supply of fresh air.

**6.11.9** There should be adequate headroom in all working spaces. Where practicable, any deck obstructions and head-height obstructions that are a hazard should be painted with a bright, conspicuous colour.

**6.11.10** In vessels without an enclosed working space, and where practicable, a shelter which does not affect the stability of the vessel, made of tarpaulin or a similar material, should be provided to protect crew from excessive exposure to sun and weather. The shelter may also be used to collect rainwater or as an emergency sail.



## Chapter 7

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# Life-saving appliances

### Part 1

#### *General*

### 7.1 Definitions

**7.1.1** *Buoyant apparatus* means flotation equipment (other than lifeboats, life rafts, lifebuoys and lifejackets) designed to support a specified number of persons who are in the water, and of such construction that it retains its shape and properties. Guidance on the requirements for buoyant apparatus can be found in Annex XX.

**7.1.2** *Float-free launching* is that method of launching a survival craft whereby the craft is automatically released from a sinking vessel and ready for use.

**7.1.3** *Inflatable appliance* is an appliance which depends upon non-rigid, gas-filled chambers for buoyancy and which is normally kept uninflated until ready for use.

**7.1.4** *Launching appliance or arrangement* is the means for transferring a survival craft from its stowed position safely to water.

**7.1.5** *Novel life-saving appliance or arrangement* is a life-saving appliance or an arrangement which embodies new features not fully covered by the provisions of this chapter but which provides an equal or higher standard of safety.

**7.1.6** *Personal flotation device* means flotation equipment that is designed to keep a person afloat and that does not hinder a person's ability to work while wearing it.

**7.1.7** *Retro-reflective material* is material which reflects, in the opposite direction, a beam of light directed at it.

**7.1.8** *Survival craft* is a craft capable of sustaining the lives of persons in distress from the time of abandoning the vessel.

### 7.2 Evaluation, testing and approval of life-saving appliances and arrangements

**7.2.1** Except as provided in 7.2.4, life-saving appliances and arrangements to which this chapter refers should be approved by the competent authority.

**7.2.2** The competent authority should have procedures for the approval of life-saving appliances and novel life-saving appliances and their arrangements. These procedures should also include the conditions whereby approval would continue or would be withdrawn.

**7.2.3** Guidance can be found in Annex XXI on the requirements for life-saving appliances. Part C of Chapter VII of the Protocol may also be used.\*

**7.2.4** Life-saving appliances referred to in this chapter for which specifications are not included in Annex XXI or in the applicable provisions of the Protocol should be to the satisfaction of the competent authority.

### **7.3 Production tests**

The competent authority should require proof that life-saving appliances have been subjected to such production tests as are necessary to ensure that the life-saving appliances are manufactured to the same standard as the approval prototype.

## **Part 2**

### *Vessel requirements*

### **7.4 Number and types of survival craft**

**7.4.1** Every vessel of design categories A and B should be provided with at least one life raft or buoyant apparatus, unless the vessel complies with the requirements for built-in buoyancy in 3.11, having the capacity to accommodate at least the total number of persons on board.

**7.4.2** The competent authority, taking into account the vessel's navigational area, conditions of operation and size, may permit the vessel to carry other survival craft of a type and number to the satisfaction of the competent authority. Such survival craft may be of rigid or semi-rigid construction. The competent authority should consider the local meteorological conditions and area of operations and may require a life raft or buoyant apparatus to be carried on any vessel.

### **7.5 Availability and stowage of survival craft**

**7.5.1** Survival craft should:

- .1 be readily available in case of emergency;
- .2 be capable of being launched safely and rapidly;
- .3 be so stowed that:
  - .1 the marshalling of persons should not be impeded;
  - .2 their prompt handling is not impeded;
  - .3 embarkation can be effected rapidly and in good order; and
  - .4 the operation of any other survival craft is not interfered with.

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\* Chapter III of the *International Convention for the Safety of Life at Sea (SOLAS)*, as well as the *International Life-Saving Appliance (LSA) Code*, may be used.

**7.5.2** Survival craft and launching appliances, if fitted, should be in working order and available for immediate use before the vessel leaves port and kept so at all times when at sea.

**7.5.3** Lashings, if used, should be fitted with an automatic release system of an approved type. Refer to Annex XXIII on the correct securing of hydrostatic release units.

**7.5.4** If satisfied that the constructional features of the vessel and fishing operations render it unreasonable and impractical to apply particular provisions of this paragraph, the competent authority may accept relaxation from such provisions, provided that the vessel is fitted with alternative launching and recovering arrangements adequate for the service intended.

**7.5.5** All survival craft should be marked with the same registration or other identification marks as used for the vessel, as referred to in 7.11.1.

## **7.6 Lifejackets and personal flotation devices\***

**7.6.1** A lifejacket of an approved type or a personal flotation device accepted by the competent authority should be carried for every person on board.

**7.6.2** Lifejackets should comply with the provisions of the recommendations for testing lifejackets, see Annex XXII.

**7.6.3** Lifejackets should be so placed as to be readily accessible and their position should be clearly indicated.

**7.6.4** The competent authority should determine whether lifejackets or personal flotation devices or a combination of both should be carried on board.

## **7.7 Immersion suits**

**7.7.1** For vessels operating in areas where low water or air temperature can be expected, an approved immersion suit of an appropriate size should be provided for every person on board. If the competent authority deems it impractical due to the size of the vessel, consideration should be given to alternate provisions.

**7.7.2** Immersion suits should be so placed as to be readily accessible and their position should be clearly indicated.

## **7.8 Lifebuoys**

**7.8.1** Decked vessels of 7 m or more in LOA should be provided with at least one lifebuoy which should be attached to a buoyant line of not less than 18 m in length.

**7.8.2** All lifebuoys should be so placed as to be readily accessible, should always be capable of being rapidly deployed and should not be permanently secured in any way.

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\* Performance standards for personal flotation devices and small vessel lifejackets can be found in ISO 12402-6 and Canadian General Standards Board standards CAN/CGSB-65.11-M88 and CAN/CGSB-65.7-M88.

**7.8.3** All lifebuoys should be of a bright contrasting colour to the sea and marked with the same registration or other identification marks as used for the vessel, as referred to in 7.11.1.

## **7.9 Distress signals**

**7.9.1** Every vessel should be provided, to the satisfaction of the competent authority, with means of making effective distress signals by day and by night.

**7.9.2** The competent authority, when considering the amount and types of pyrotechnics to be carried, should consider the area and the nature of the fishing operation. As a minimum, the following pyrotechnics should be carried:

- .1 four parachute rockets for vessels of design categories A and B; two of the rockets may be replaced by handheld flares; and
- .2 two handheld flares for vessels of design categories C and D.

**7.9.3** Distress signals should be of an approved type. They should be correctly stored in a dry place and be so placed as to be readily accessible, and their position should be clearly indicated.

## **7.10 Retro-reflective materials on life-saving appliances**

All survival craft, lifejackets, personal flotation devices, immersion suits and lifebuoys should be fitted with retro-reflective material in accordance with the requirements of the competent authority.

## **7.11 Miscellaneous**

**7.11.1** To facilitate aerial rescue operations, wheelhouse tops or other prominent horizontal surfaces should be painted in a highly visible colour and should bear the vessel's registration or other identification marks in letters and/or numerals in contrasting colours to the background. Similar marks on the sides of the wheelhouse would also facilitate search and identification by aircraft.\*

**7.11.2** The competent authority should ensure that the crew receives adequate training in the use and inspection of life-saving appliances and that the skipper regularly inspects the equipment.

**7.11.3** The following additional safety equipment should be carried on all vessels:

- .1 A whistle;

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\* Marking of fishing vessels for identification should be in accordance with uniform and internationally recognizable vessel-marking systems, such as the FAO standard specifications for marking and identification of fishing vessels. Refer to *FAO Technical Guidelines for Responsible Fisheries*. No.1 – Fishing Operations (ISBN 92-5-103914-3) and MSC/Circ. 572.

.2 a mirror; and

.3 a torch.

7.11.4 Handrails or similar means, e.g. a capsize rope,\* should be fitted to the vessel to allow persons to hold on to the vessel in the event of a capsize.

7.11.5 Every vessel should carry adequate means for recovering persons from the water.

7.11.6 Life-saving appliances should be maintained to the satisfaction of the competent authority.

## 7.12 Recommendations to competent authorities

### Life-saving appliances for vessels of different design categories

Distance from safe haven	≤ 5 nm	≤ 20 nm	≤ 100 nm	≤ 200 nm	> 200 nm
Liferaft	A <sup>+</sup> , B <sup>+</sup>	A <sup>+</sup> , B <sup>+</sup>	A, B, C, D <sup>+</sup>	A, B, C, D	A, B, C, D
Buoyant apparatus		C♣ D♣			
Lifejacket♥	A, B, C♦, D♦♣	A, B, C♦, D♦♣	A, B, C♦, D♦♣	A, B, C, D	A, B, C, D
Immersion suit♠	A, B	A, B	A, B	A, B	A, B
Lifebuoy•	A, B, C, D	A, B, C, D	A, B, C, D	A, B, C, D	A, B, C, D
Distress signals: 4 parachute rockets <sup>+++</sup>	A, B	A, B	A, B	A, B	A, B
Distress signals: 2 handheld flares	C, D	C, D	C, D	C, D	C, D
Capsize rope	A, B, C, D	A, B, C, D	A, B, C, D	A, B, C, D	A, B, C, D
Whistle, mirror and torch	A, B, C, D	A, B, C, D	A, B, C, D	A, B, C, D	A, B, C, D

+ The liferaft may be substituted with a buoyant apparatus.

♣ Recommended.

♥ For every person on board.

♦ The lifejacket may be substituted with a personal flotation device.

♠ For every person on board a vessel operating in areas where low water or air temperature can be expected.

• Where the vessel is decked and 7 m in LOA or over.

+++ Two of the rockets may be replaced by handheld flares.

\* The rope should be 1.5 times the length of the vessel and fitted with a snap shackle, or equivalent, at each end, with attachment at each end of the vessel on deck.





## Chapter 8

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# Emergency procedures and safety training

### 8.1 Emergency instructions

The competent authority should ensure that all owners provide clear instructions written, where practicable, for the crew which should be followed in case of emergency. These instructions should be given to a new crew member before sailing on his or her first trip. The duties\* assigned to the crew may include:

- .1 closing of valves, scuppers, overboard shoots, skylights, portholes and other similar openings in the vessel;
- .2 supply of additional equipment to survival craft and other life-saving appliances;
- .3 preparations and launching of survival craft;
- .4 general preparation of other life-saving appliances;
- .5 use of communication equipment; and
- .6 fire fighting.

### 8.2 Abandon ship training

The competent authority should ensure that the crew receives on-board training in the use of the vessel's life-saving appliances, including survival craft equipment. The owner should ensure that training is given as soon as possible after a new crew member joins the vessel. Such training should cover at least the following:

- .1 Operation and use of the vessel's life-saving equipment, including the launching of life rafts, the donning of lifejackets, personal flotation devices and immersion suits, and precaution against injury and damage caused by sharp objects;
- .2 problems of sudden unexpected immersion in cold water and hypothermia, first-aid treatment for cold-water shock/hypothermia and other appropriate first-aid procedures;
- .3 special instructions necessary for use of the vessel's life-saving appliances in severe weather and sea conditions;
- .4 measures for survival when adrift;

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\* Annex XXXIII gives guidance on basic pre-sea safety training.

- .5 precautions against sharks and other biting fish; and
- .6 landing and survival ashore.

### **8.3 Training in emergency procedures**

Crews should be adequately trained, to the satisfaction of the competent authority, in their duties in the event of emergencies.\*

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\* Annex XXI of the Safety Recommendations, the *Code of Safety for Fishermen and Fishing Vessels*, Part A, Section I, 3.2, and Part B, Section 8.3, and the joint FAO/ILO/IMO *Document for Guidance on Training and Certification of Fishing Vessel Personnel*, as amended, may also be used as guidance when determining items to be included in such training.

# Chapter 9

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## Radio communications

### Part 1

#### *General*

### 9.1 Application

9.1.1 Unless expressly provided otherwise, this chapter should apply to vessels of all design categories engaged on voyages exclusively in sea areas A1 or A2 where radio communications or mobile telephone coverage is provided. Where no land-based reception is available, vessels should not operate beyond sight of shore and should have means of signalling distress, as per 7.9.

9.1.2 No provision in this chapter should prevent the use by any vessel or person in distress of any means at its disposal to attract attention, make known its position and obtain help.

### 9.2 Definitions

9.2.1 For the purpose of this chapter, the following terms should have the meanings defined below. All other terms and abbreviations used in this chapter and defined in the Radio Regulations should have the meanings as defined in those regulations.

9.2.2 *Continuous watch* means that the radio watch concerned should not be interrupted other than for brief intervals when the vessel's receiving capability is impaired or blocked by its own communications or when the facilities are under periodical maintenance or checks.

9.2.3 *Digital selective calling (DSC)* means a technique using digital codes that enables a radio station to establish contact with, and transfer information to, another station or group of stations, and comply with the relevant recommendations of the International Telecommunication Union (ITU) radio communications sector (ITU-R).

9.2.4 *Maritime safety information* means navigational and meteorological warnings, meteorological forecasts and other urgent safety related messages broadcasted to vessels.

9.2.5 *Radio Regulations* means the Radio Regulations annexed to, or regarded as being annexed to, the most recent International Telecommunication Convention that is in force at any time.

9.2.6 *Sea area A1* means an area within the radiotelephone coverage of at least one VHF coast station in which continuous DSC alerting is available, as may be defined by the competent authority.

**9.2.7** *Sea area A2* means an area, excluding sea area A1, within the radiotelephone coverage of at least one MF coast station in which continuous DSC alerting is available, as may be defined by the competent authority.

**9.2.8** *Sea area A3* means an area, excluding sea areas A1 and A2, within the coverage of an Inmarsat geostationary satellite in which continuous alerting is available.

**9.2.9** *Sea area A4* means an area outside sea areas A1, A2 and A3.

### **9.3 Watches**

Every vessel equipped with a VHF installation should, while at sea, maintain, when practicable, a continuous listening watch on VHF channel 16.

### **9.4 Sources of energy**

**9.4.1** Where applicable, there should be available at all times, while the vessel is at sea, a supply of electrical energy, complying with the relevant requirements of 4.9.2, sufficient to operate the radio installations and to charge any batteries used as part of a reserve source or sources of energy for the radio installations.

**9.4.2** Where applicable, a reserve source or sources of energy, complying with the relevant requirements of 4.10, should be provided on every vessel to the satisfaction of the competent authority, to supply radio installations for the purpose of conducting distress and safety radio communications in the event of failure of the vessel's main and emergency source of electrical power. The reserve source of energy should be capable of simultaneously operating:

- .1 the VHF radio installation in sea area A1;
- .2 the VHF radio installation and the MF or HF or satellite installation in sea area A2;
- .3 the navigation lights and emergency lighting; and
- .4 for a period of at least three hours.

**9.4.3** Where applicable, the reserve source of energy should be independent of the propulsion machinery of the vessel and the vessel's electrical system.

**9.4.4** Where a reserve source of energy consists of a rechargeable accumulator battery or batteries:

- .1 means of automatically charging such batteries should be capable of recharging them to minimum capacity requirements within ten hours; and
- .2 the capacity of the battery or batteries should be checked using an appropriate method, at intervals not exceeding 12 months.

## 9.5 Performance standards

Equipment relevant to this chapter, except for the domestic radio equipment, its ancillary equipment and mobile telephones, should be of a type approved by the competent authority. Such equipment should conform to appropriate performance standards.

## 9.6 Maintenance requirements

**9.6.1** Adequate tools and spares should be carried to enable the equipment to be maintained.

**9.6.2** The competent authority should ensure that radio equipment required by this chapter is maintained to provide the availability of the functional requirements specified in 9.11, 9.12 and 9.16 and to meet the recommended performance standards\* of such equipment.

**9.6.3** Satellite EPIRBs should be tested at intervals not exceeding 12 months for all aspects of operational efficiency, with particular emphasis on frequency stability, signal strength, coding and registration. The test should be performed within three months prior to or after the expiry date or anniversary date.

**9.6.4** The EPIRBs should be subject to maintenance at intervals not exceeding five years. The maintenance is to be performed by approved personnel preferably at an approved shore-based maintenance facility.

## 9.7 Radio personnel

Where applicable, vessels should carry personnel qualified for distress and safety radio communications to the satisfaction of the competent authority.

## 9.8 Alternative arrangements

In lieu of the equipment required in this chapter, the competent authority may approve a domestic local system of radio communications, provided it is at least as effective as the requirements of this chapter.

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\* Performance standards for shipborne VHF radio installations capable of voice communication and digital selective calling (resolution A.803(19));  
Performance standards for shipborne MF radio installations capable of voice communication and digital selective calling (resolution A.804(19));  
Performance standards for shipborne MF/HF radio installations capable of voice communication, narrow band direct-printing and digital selective calling (resolution A.806(19));  
Performance standards for Float-Free Satellite Emergency Position-Indicating Radio Beacons (EPIRBs) operating on 406 MHz (resolution A.810(19));  
Type approval of Satellite Emergency Position-Indicating Radio Beacons (EPIRBs) operating in the COSPAS-SARSAT System (resolution A.696(17)).

## 9.9 Equipment requirement overview based on design category and area of operation

↓Equipment↓	Design category → Sea area →	A/B				C/D		Notes
		A1	VHF	A2	MF	VHF	MF	
VHF <b>without</b> DSC and watch receiver on ch70			X		X		X	3)
VHF <b>with</b> DSC and watch receiver on ch70		X		X		X		
MF <b>without</b> DSC and watch receiver on 2187.5 kHz					X		X	8)
MF <b>with</b> DSC and watch receiver on 2187.5 kHz				X				
NAVTEX receiver 518/490 kHz		X		X	X	X	X	4)
Float-free satellite EPIRB		X	X	X	X		X	8)
Radar SART or AIS-SART		X	X	X	X		X	5)
Handheld GMDSS VHF transceiver		X	X	X	X	X	X	6)
Mobile (cellular) telephone						X		7)
Radio receiver to receive weather forecasts		X	X	X	X	X	X	4)

- 1) *A1* means an area within the coverage of a VHF coast station **with** DSC.  
*VHF* means an area within the coverage of a VHF coast station **without** DSC.  
*A2* means an area within the coverage of a MF coast station **with** DSC.  
*MF* means an area within the coverage of a MF coast station **without** continuous DSC.
- 2) Vessels should only be permitted to comply with the VHF and MF columns in areas where DSC is not available.
- 3) Vessels of design categories C and D may – based upon operating experiences – replace the VHF without DSC and watch receiver on ch70 with a handheld GMDSS VHF transceiver with sufficient battery capacity for the entire voyage.
- 4) Vessels in VHF and MF areas where NAVTEX is not available, and vessels of design categories C and D should be provided with a radio receiver for reception of weather forecasts, unless such forecasts are transmitted by one or more coast stations.
- 5) Vessels operating in areas visible from the shore need not carry a radar SART or AIS-SART.
- 6) Vessels without life-saving appliances may be exempted from this requirement.
- 7) Where the competent authority is satisfied that local circumstances justify the use of mobile telephones, vessels engaged exclusively within the coverage of a mobile telephone network may carry, in lieu of the equipment required by 9.16.1.1, a mobile telephone.
- 8) For design categories C/D only where practicable.

## Part 2

### *Requirements for vessels of design categories A and B*

## 9.10 Radio installations and equipment for vessels of design categories A and B

9.10.1 Every vessel of design categories A and B should be provided with radio installations throughout its intended voyage and complying with the requirements of 9.11 and, as appropriate for the sea area or areas through which it would pass during its intended voyage, the requirements of 9.12. Annex XXVI provides guidance on the requirements for radio installations.

9.10.2 For an overview of equipment requirements see 9.9.

## **9.11 Radio equipment – Sea area A1 or sea areas within the coverage of a VHF coast station operating on a 24 hours a day, 7 days a week basis**

**9.11.1** Every vessel of design categories A and B should be provided with a:

- .1** VHF radio installation capable of transmitting and receiving:
  - .1** DSC on the frequency 156.525 MHz (channel 70). It should be possible to initiate the transmission of distress alerts on channel 70 from the position from which the vessel is normally navigated; and
  - .2** radiotelephony on the frequencies 156.300 MHz (channel 6), 156.650 MHz (channel 13) and 156.800 MHz (channel 16).
- .2** VHF DSC watch receiver, which may be separate from or combined with that required by 9.11.1.1;
- .3** radio receiver for weather forecasts\*;
- .4** satellite emergency position-indicating radio beacon (satellite EPIRB); and
- .5** search and rescue radar transponder (radar-SART) or an AIS transponder (AIS-SART), if considered necessary by the competent authority.

**9.11.2** The VHF radio installation, required by 9.11.1.1, should also be capable of transmitting and receiving general radio communications using radiotelephony.

**9.11.3** If operating experience justifies a departure from the requirements of 9.11.1, the competent authority may accept that the VHF radio installation and the VHF DSC watch receiver may be replaced with a handheld VHF transceiver, provided that:

- .1** the handheld VHF transceiver is mounted in a bracket;
- .2** the source of power is sufficient for the entire voyage;
- .3** if required by the competent authority, the handheld VHF transceiver is connected to an external antenna; and
- .4** on vessels operating within the coverage of a VHF/DSC coast station, the handheld VHF transceiver is capable of transmitting and receiving DSC distress signals on frequency 156.525 MHz (channel 70).

**9.11.4** For vessels operating in areas without VHF/DSC coverage, the requirement of 9.11.1.1 is not applicable.

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\* Competent authorities should ensure that weather forecasts are broadcast on frequencies that can be received on this type of radio receiver.

## **9.12 Radio equipment - Sea areas A1 and A2 or sea areas within the coverage of an MF coast station providing a continuous watch on 2182 kHz as well as a continuously operating VHF station**

**9.12.1** In addition to meeting the requirements of 9.11, every vessel of design categories A and B engaged on voyages beyond sea area A1, but remaining within sea area A2, should be provided with:

- .1 an MF radio installation capable of transmitting and receiving, for distress and safety purposes, on the frequencies:
  - .1 2 187.5 kHz using DSC; and
  - .2 2 182 kHz using radiotelephony.
2. a radio installation capable of maintaining a continuous DSC watch on the frequency 2 187.5 kHz, which may be separate from or combined with that required by 9.12.1.1; and a means of initiating the transmission of ship-to-shore distress alerts by a radio service other than MF.

**9.12.2** In areas where continuous radio watch is not available on the distress alert frequency 2 187.5 kHz and the emergency frequency 2 182 kHz, the requirement may be fulfilled by a ship-earth station capable of transmitting and receiving distress and safety communications in the Global Maritime Distress and Safety System (GMDSS).

**9.12.3** It should be possible to initiate transmission of distress alerts by the radio installations specified in 9.12.1.1 and 9.12.1.2 from the position from which the vessel is normally navigated.

**9.12.4** If the vessel is operating exclusively within the radiotelephone coverage of at least one MF coast station in which continuous DSC alerting is not available, but is providing a continuous watch on 2 182 kHz, the vessel need not be equipped with the DSC functions in 9.12.1.

**9.12.5** Where operational experience justifies departure from the requirements of 9.12.1, 9.12.2 and 9.12.3, the competent authority may allow the replacement of the MF radio installation with an HF radio installation or a satellite ship earth station capable of transmitting and receiving for distress and safety purposes.

## **9.13 Radio equipment - Sea areas outside the coverage of a VHF coast station operating on a 24 hours a day, 7 days a week basis and an MF coast station providing a continuous watch on 2 182 kHz as well as a continuously operating VHF station**

Vessels engaged on voyages in sea areas A3 or A4 should comply with the requirements related to the GMDSS. Refer to Annex XXVI of the Safety Recommendations for a description of the GMDSS.



## 9.14 Watches

9.14.1 In addition to the requirements of 9.3, every vessel of design categories A and B should, while at sea, maintain either a continuous watch on:

- .1 VHF DSC channel 70, if the vessel, in accordance with the requirements of 9.12.1.2, is fitted with a VHF DSC radio installation;
- .2 the distress and safety DSC frequency 2 187.5 kHz, if the vessel, in accordance with the requirements of 9.12.1, is fitted with an MF DSC radio installation; or
- .3 the radiotelephone frequency 2 182 kHz, if the vessel is operating within the coverage of an MF coast station with a continuous radio watch on this frequency, but within which continuous DSC alerting is not available.

9.14.2 Vessels of design categories A and B should, while at sea, maintain a radio watch for broadcasts of maritime safety information on the appropriate frequency or frequencies on which such information is broadcast for the area in which the vessel is operating.

## 9.15 Position-updating

All two-way communication equipment carried on board a vessel of design categories A and B that is capable of automatically including the vessel's position in the distress alert should be automatically provided with this information from an internal or external navigation receiver, if either is installed. Where a Vessel Monitoring System (VMS) is fitted, it could be used for this purpose. If such a receiver is not installed, the vessel's position and the time at which the position was determined should be manually updated at intervals not exceeding four hours while the vessel is underway, so that it is always ready for transmission by the equipment.

### Part 3

#### *Requirements for vessels of design categories C and D*

## 9.16 Radio installations and equipment for vessels of design categories C and D

9.16.1 Every vessel of design categories C or D should be provided with a:

- .1 VHF radio installation or a handheld VHF apparatus to the satisfaction of the competent authority; and
- .2 radio receiver for weather forecasts.

9.16.2 Where the competent authority is satisfied that local circumstances justify the use of mobile telephones, vessels engaged exclusively within the coverage of a mobile telephone network may carry, in lieu of the equipment required by 9.16.1.1, a mobile telephone.

- .1 The mobile telephone should be pre-programmed for establishing a quick connection to shore-based rescue authorities.
- .2 The battery capacity should be sufficient to operate the mobile telephone during the entire voyage.
- .3 The mobile telephone should, where applicable, be connected to an external antenna.

**9.16.3** Where practicable, in addition to meeting the requirements of 9.16.1, every vessel of design categories C or D engaged on voyages beyond sea areas with a continuously operating VHF station, should be provided with an MF or HF radio installation, as required in 9.12.1 and 9.12.4, or a satellite EPIRB.

**9.16.4** For an overview of equipment requirements see 9.9.

## Chapter 10

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# Navigational equipment

### 10.1 Navigational equipment

**10.1.1** Vessels should be fitted with a compass, which may be handheld or substituted by an alternative acceptable to the competent authority, such as a satellite navigation system. Due to the nature of the voyage or the proximity to land, the competent authority may consider exempting a vessel or group of vessels from this requirement.

**10.1.2** It should be possible to read the compass by day and by night from the steering position. Where applicable, securing devices for the compass and compensators should be made of non-magnetic materials. Fixed compasses should be sited as near the fore-and-aft line of the vessel as practicable, with the lubber line, as accurately as possible, parallel with the fore-and-aft line.

**10.1.3** In vessels equipped with an auto-pilot system actuated by a magnetic sensor that does not indicate the vessel's heading, suitable means should be provided to show this information.

**10.1.4** Consideration should be given to fitting vessels with radar. It is recommended that the installation should be capable of operating in the 9 GHz frequency band.

**10.1.5** Decked vessels should be provided with suitable means, to the satisfaction of the competent authority, for determining the depth of water under the vessel. Where fish-finding devices are fitted, they could be used for this purpose.

**10.1.6** If practicable, every vessel should be equipped with a radar reflector meeting the widely accepted performance standards for such devices. See Annex XXIX for the recommended performance standards.

**10.1.7** All equipment fitted in compliance with this section should be to the satisfaction of the competent authority.

### 10.2 Nautical instruments and publications

**10.2.1** Where applicable, suitable nautical instruments, adequate and up-to-date charts and all other nautical publications necessary for the intended voyage should be carried on board, to the satisfaction of the competent authority.

**10.2.2** An Electronic Chart Display and Information System (ECDIS) or electronic chart plotter may be accepted as meeting the chart carriage requirements of 10.2.1.

**10.2.3** Back-up arrangements should be provided to meet the functional requirements of 10.2.2.\*

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\* An appropriate folio of paper nautical charts may be used as a back-up arrangement for ECDIS; other back-up arrangements for ECDIS are acceptable (see Appendix 6 to IMO resolution A.817(19), as amended, and IMO resolution MSC.232(82), respectively).

### **10.3 Signalling equipment**

**10.3.1** Equipment is to be provided to comply in every respect with the requirements of the International Regulations for Preventing Collisions at Sea, 1972, as amended. Refer to Annex XXX for the equipment required.

**10.3.2** Lights, shapes and flags should be provided to indicate that the vessel is engaged in any specific operation for which such signals are used.

**10.3.3** All vessels that are required to carry radio installations should carry, as far as practicable, the table of life-saving signals contained in the International Code of Signals. Refer to Annex XXXI for the International Code of Signals.

**10.3.4** Vessels of design categories A and B should carry a table of distress signals. This table can be found in Annex XXXII.

### **10.4 Navigating bridge visibility**

Power-driven vessels should meet the following requirements:

- .1 The view of the sea surface from the conning position should extend from right ahead to 22.5° abaft the beam on either side of the vessel. Blind sectors caused by any obstruction outside the wheelhouse should be kept as small as possible.
- .2 From each side of the wheelhouse, the horizontal field of vision should extend over an arc of at least 225°, that is from at least 45° on the opposite bow through right ahead and then from right ahead to right astern through 180° on the same side of the vessel.

### **10.5 Navigation lights**

Deck lighting should not impair the visibility of navigation and signal lights required by the International Regulations for Preventing Collisions at Sea (COLREGS), 1972, as amended.

# Chapter 11

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## Crew accommodation

### 11.1 General

11.1.1 Unless expressly provided otherwise, this chapter should apply to decked vessels of design categories A and B that are at sea for more than 24 hours.\*

11.1.2 Accommodation of appropriate size and quality should be provided on vessels of all design categories, bearing in mind the length of the voyage, the weather conditions and size of vessel. There should be adequate headroom in all accommodation spaces.

11.1.3 Location, structure and arrangement of crew accommodation spaces and means of access thereto should be such as to ensure adequate security, protection against weather, sea, heat, cold, condensation, undue noise, vibration, fumes, odours and effluvia from other spaces. Sleeping rooms should be placed aft of the collision bulkhead, if fitted.

11.1.4 In the choice of materials used for construction of accommodation spaces, account should be taken of properties potentially harmful to the health of personnel or likely to harbour vermin and mould.

11.1.5 All practical measures should be taken to protect crew accommodation and furnishings against the admission of insects and other pests.

### 11.2 Lighting, heating and ventilation

11.2.1 All crew accommodation spaces should be adequately lit, as far as possible, by natural light. Such spaces should also be equipped with adequate artificial light. Emergency lighting should be provided, where practicable.

11.2.2 Methods of lighting should not endanger the health or safety of the crew or the safety of the vessel.

11.2.3 Adequate heating facilities in crew accommodation spaces should be provided as required by climatic conditions.

11.2.4 Facilities for heating should be designed so as not to endanger health or safety of the crew or safety of the vessel.

11.2.5 Heating by means of open fires should be prohibited.

11.2.6 Accommodation spaces should be adequately ventilated. Vessels operating in tropical climates should, where practicable, be fitted with mechanical ventilation. The ventilation of galleys and sanitary spaces should be to the open air and, unless fitted with a mechanical ventilation system, be independent from that for other crew accommodation.

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\* Refer to paragraph 2 of Annex III of the ILO *Work in Fishing Convention*, 2007.

### **11.3 Sleeping spaces**

11.3.1 Sleeping spaces should be so planned and equipped as to ensure reasonable comfort for the occupants and to facilitate tidiness.

11.3.2 The minimum number of berths should not be less than half the number of crew on board. The minimum berth size should be determined by the competent authority.

11.3.3 Suitable bedding should be provided for the crew. Mattresses should not be of a type that is liable to develop toxic fumes in case of fire nor of a type that would attract pests or insects. Mattresses should be provided with a cover of fire-retardant material.

11.3.4 Whenever reasonable and practicable, having regard to the size, type or intended service of the vessel, the furnishings of sleeping spaces should include both a fitted cupboard, preferably with an integral lock, and a drawer for each occupant.

### **11.4 Eating spaces and cooking facilities**

11.4.1 Wherever reasonable and practicable, eating spaces and cooking facilities should be provided separate from sleeping spaces.

11.4.2 Cooking facilities should be of adequate dimensions for the purpose and have sufficient storage space and satisfactory drainage. Where possible, refrigerators or other low-temperature storage should be provided to the satisfaction of the competent authority.

11.4.3 The cooking facility should be provided with cooking utensils, the necessary number of cupboards, shelves, sinks and dish racks of rustproof material and with satisfactory drainage.

11.4.4 The cooking facility should be fitted with suitable facilities for the preparation of hot drinks for the crew at all times.

11.4.5 Cooking appliances should be fitted with fail-safe devices in the event of failure of the power source or fuel. Supplies of fuel in the form of gas or oil should not be stored in the cooking facility.

### **11.5 Sanitary facilities**

11.5.1 Sufficient hygienic sanitary facilities, including toilets and washing facilities, should be provided to the satisfaction of the competent authority.

11.5.2 Soil and waste discharge pipes should not pass through:

- .1 freshwater tanks;
- .2 drinking water tanks; and
- .3 provision stores (where practicable),

nor should they (where practicable) pass overhead in:

- .4 eating spaces;
- .5 sleeping spaces; and
- .6 cooking facilities.

Such pipes should be fitted with anti-siphon closures.

**11.5.3** In general, toilets should be situated convenient to, but separate from, sleeping spaces and eating spaces.

## **11.6 Water facilities**

**11.6.1** Filling, storage and distribution arrangements for drinking water should be designed to preclude any possibility of water contamination. Tanks should be designed to allow internal cleaning.

**11.6.2** In every vessel, a dedicated supply of at least 2.5 litres of drinking water per person per day should be provided for drinking and cooking purposes.

**11.6.3** Where the washing facilities use saltwater, additional freshwater should be carried to allow the crew to rinse themselves.

## **11.7 Vessels of design categories A and B, spending less than 24 hours at sea, and design categories C and D**

Vessels should have adequate facilities relating to:

- .1 lighting, heating and ventilation;
- .2 sleeping spaces;
- .3 eating spaces and cooking facilities;
- .4 sanitary facilities;
- .5 water facilities; and
- .6 protection from the elements (refer to 6.11.10).





## Chapter 12

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# Manning, training and competence

### 12.1 Manning and rest

The competent authority should ensure that vessels are sufficiently and safely manned with a crew necessary for the safe navigation and operation of the vessel, and under the control of a competent skipper. When deciding on the manning, the competent authority should take into account:

- .1 seasonal weather conditions;
- .2 sea states in which the vessel could operate;
- .3 the type of vessel;
- .4 the range and risk of the fishing operation;
- .5 the length of time the vessel is at sea;
- .6 the distance from shore;
- .7 the training and experience of the fishermen;
- .8 the need to minimize fatigue; and
- .9 the need to ensure fishermen are given regular periods of rest.

### 12.2 Certification of skippers

12.2.1 Where practicable, the skipper should be certificated by the competent authority.

12.2.2 Where applicable, the certificate should be granted following an examination. Where practicable, the examination may consist of a written and oral examination together with practical demonstration. In the event that it would not be practical to set a written paper, the examination may be limited to an oral examination and/or a practical demonstration of understanding and ability.

### 12.3 Skippers' standard of competence

The skipper should be sufficiently competent to keep the vessel safe and well-managed at all times. This includes:

- .1 operating and maintaining machinery and systems;
- .2 handling emergencies and using communications to seek help;

- .3 administering first aid;
- .4 manoeuvring a vessel, at sea, in port and during fishing operations;
- .5 having a knowledge of navigation;
- .6 following weather conditions and forecasting;
- .7 having a knowledge of stability;
- .8 knowing how to use signals;
- .9 having a knowledge of pollution prevention;
- .10 knowing how to apply the collision regulations; and
- .11 understanding and minimizing the risks of fishing operations.

## **12.4 Skipper and other crew training**

The skipper and other crew should be trained in:

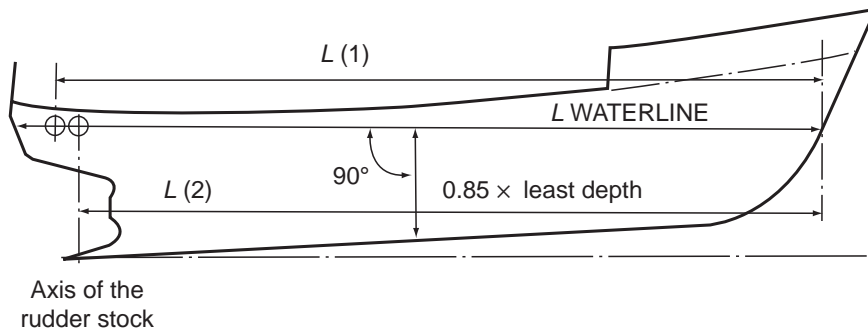
- .1 the use of fire extinguishers, lifejackets and personal flotation devices;
- .2 workplace safety, including understanding the dangers associated with fatigue and the consumption of alcohol and drugs;
- .3 the safe handling of the fishing gear;
- .4 the safe operation of deck equipment;
- .5 basic pre-sea safety training and familiarization (guidance on basic pre-sea safety training can be found in Annex XXXIII);
- .6 pollution prevention; and
- .7 the prevention of on-board accidents, applying the principles of risk assessment.

# Annex I

## Illustration of terms used in the definitions

Figure 1  
Length ( $L$ )

1.  $L = 0.96$  OF THE TOTAL LENGTH ON A WATERLINE AT 85 PER CENT OF LEAST DEPTH



2.  $L =$  LENGTH ON A WATERLINE AT 85 PER CENT OF LEAST DEPTH BETWEEN THE STEM AND THE AXIS OF THE RUDDER STOCK

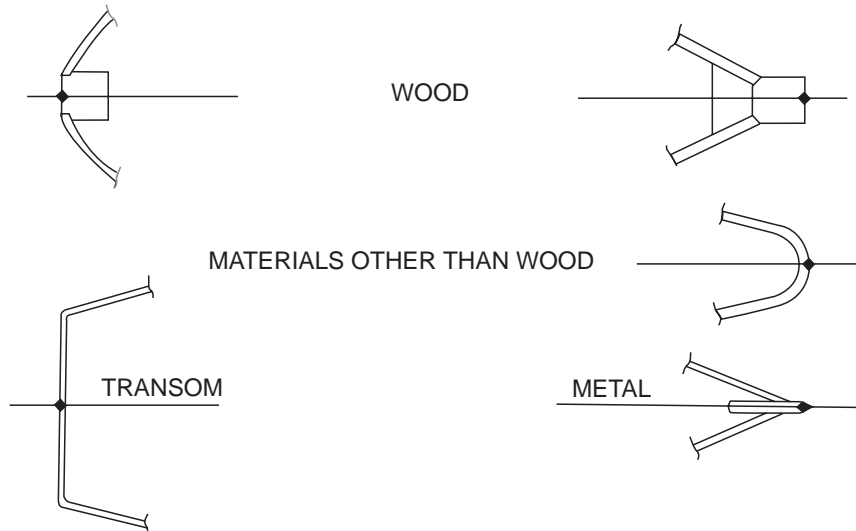


Figure 2  
Least depth

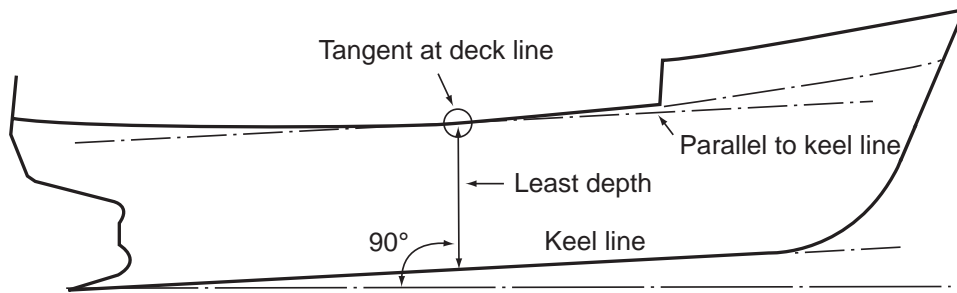


Figure 3  
Keel line

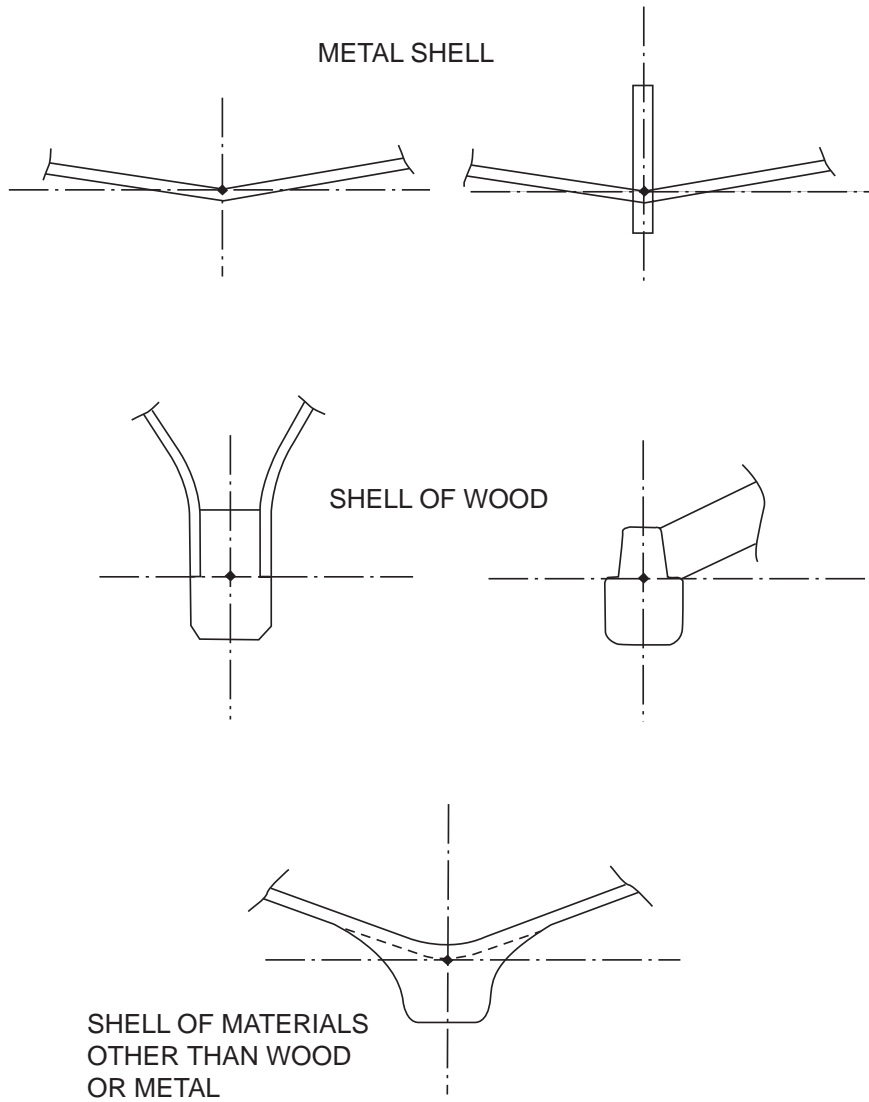


Figure 4  
Decked boats - measurements

LENGTH OVER ALL (LOA)  
BREADTH (B)  
DEPTH (D)

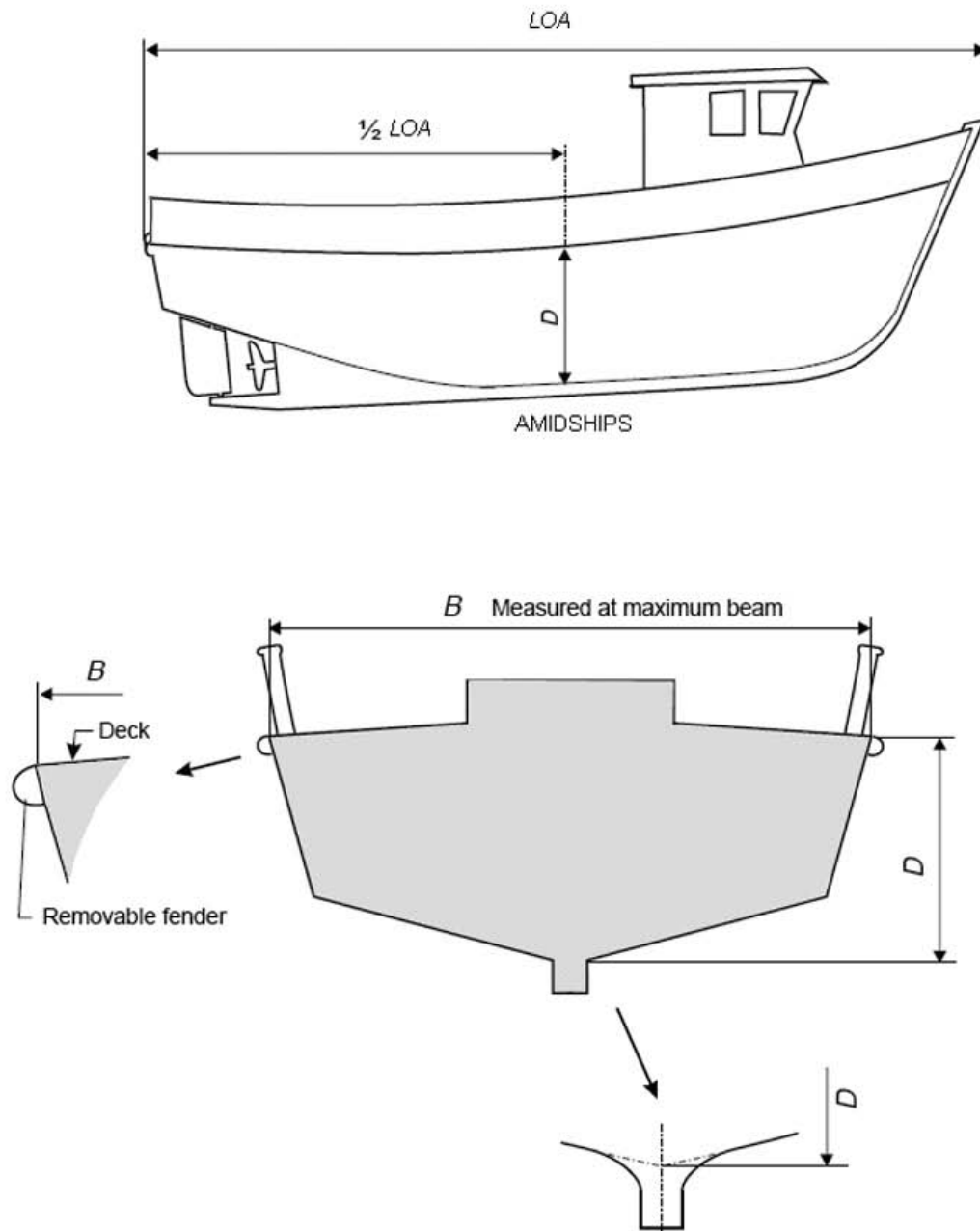


Figure 5  
Open boats - measurements

LENGTH OVER ALL (LOA)  
BREADTH (B)  
DEPTH (D)

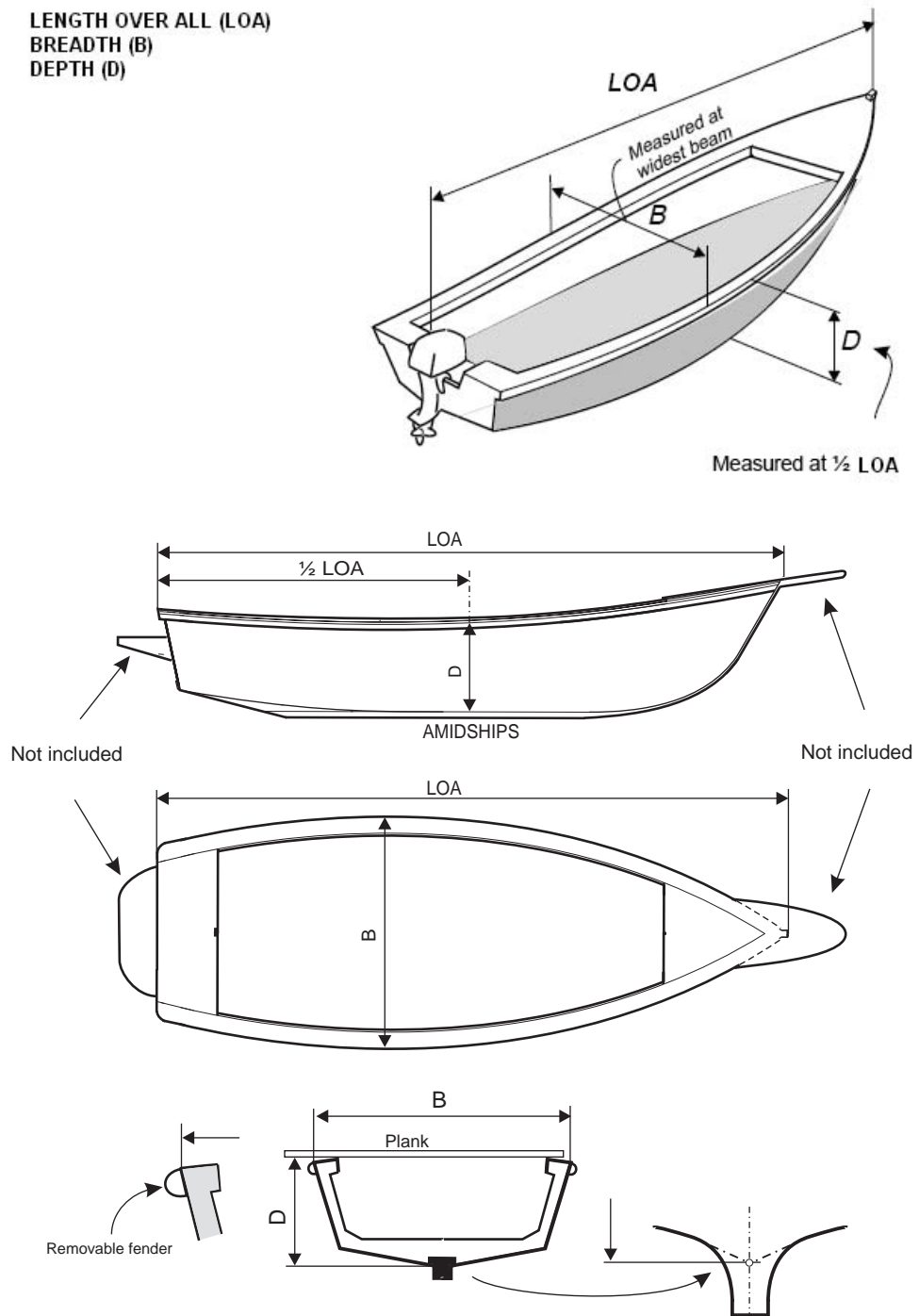
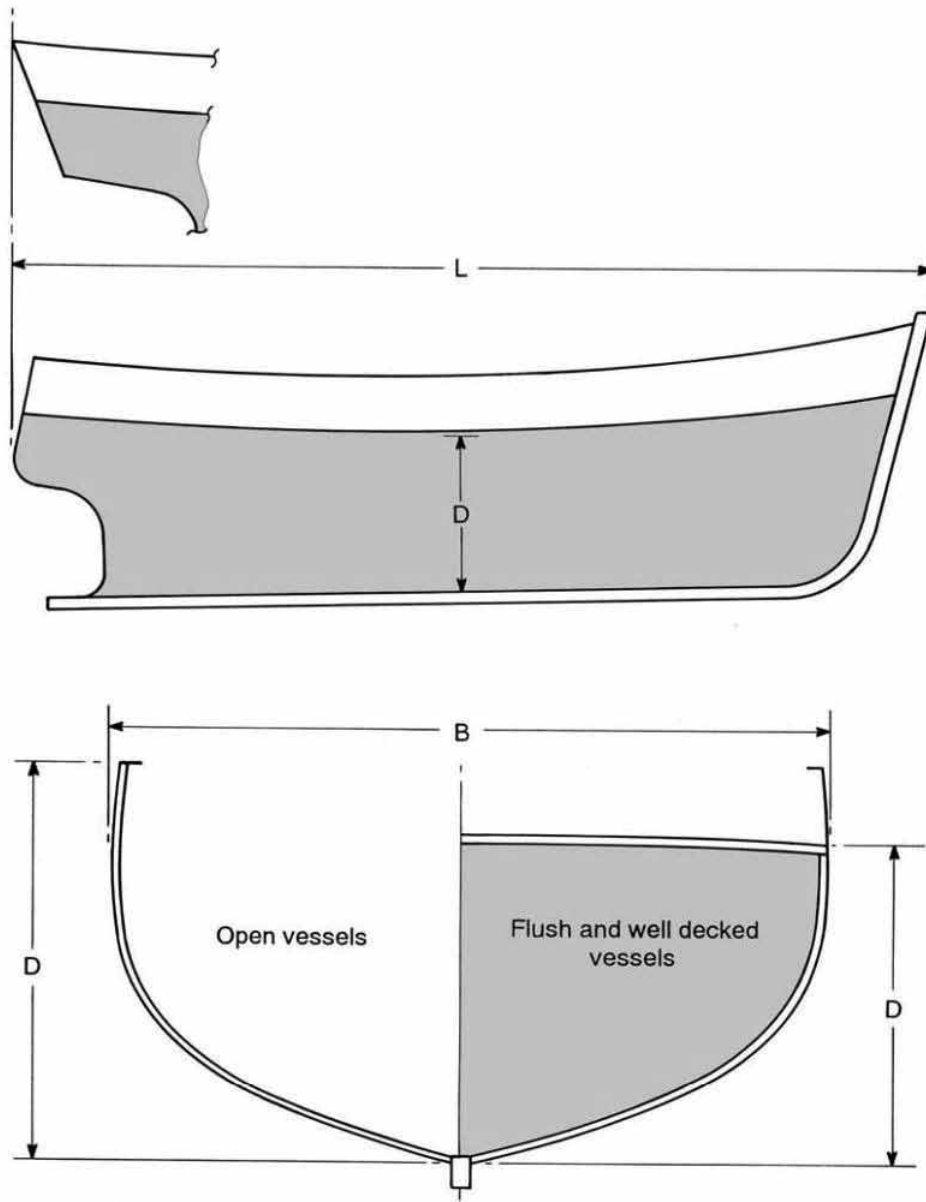


Figure 6  
Cubic numeral



$$LOA \times B \times D = \text{Cubic numeral (CuNo)}$$





## Annex II

# Recommended construction standards for wooden fishing vessels

## Part 1

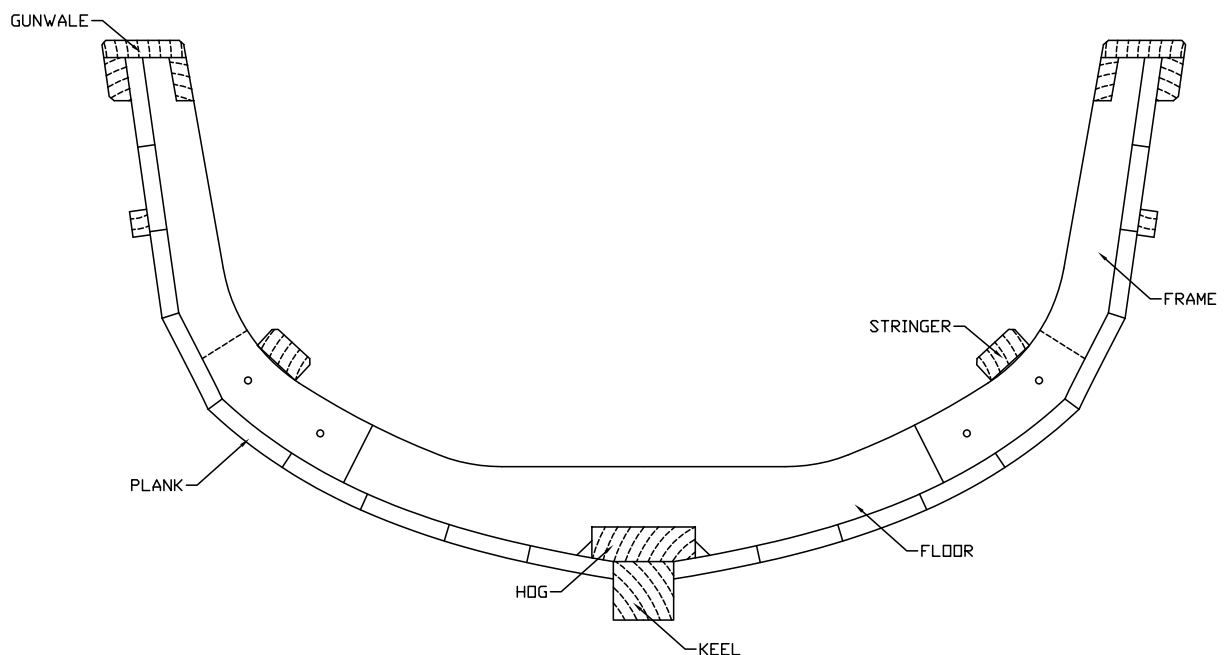
### General

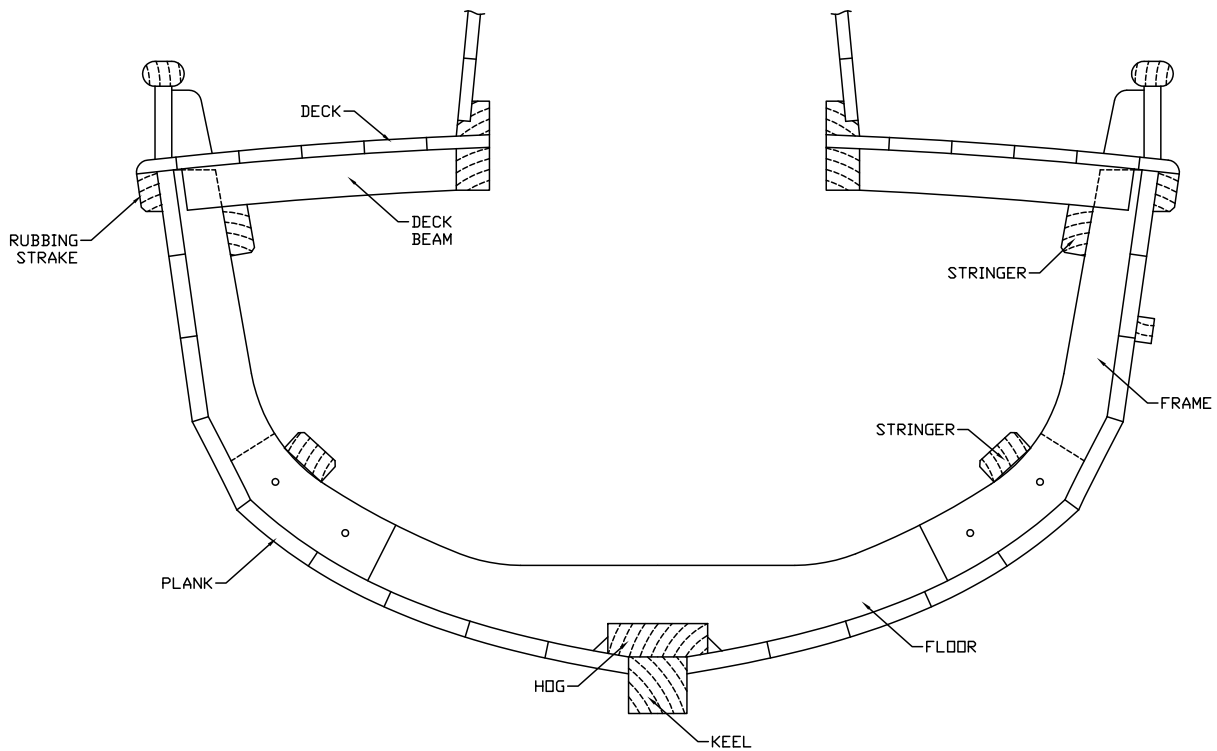
## 1 Scope

1.1 These construction standards apply to decked fishing vessels of less than 12 m in length and undecked vessels.

1.2 In general, the construction standards apply to fishing vessels of conventional form and wooden construction; that is, single-hull vessels of plank on frame construction with hot-dipped galvanized fastenings. The construction, in general, should consist of:

- .1 a substantial backbone structure;
- .2 close spaced transverse frames;
- .3 fore and aft carvel planking fastened to frames with hot-dipped galvanized fasteners;
- .4 undecked, partial deck or full deck; and
- .5 a longitudinal structure, including gunwale for open vessels and beam stringer for decked vessels and a bilge stringer for vessels of 10 m or more in LOA.





1.3 Standards are given for vessels operating at speeds up to 16 knots as shown in Table 2.9.1 in Part 3. Vessels operating at higher speeds would require special consideration by the competent authority.

1.4 A number of vessel types are not covered by the requirements of these construction standards, including the following:

- .1 vessels constructed of plywood or glued wood;
- .2 vessels of simple construction, including vessels such as rafts and dugout canoes; and
- .3 vessels judged by the competent authority to be outside the scope of this standard.

## 2 Design categories

These construction standards are based on the division of vessels into appropriate design categories; the categories indicate sea and wind conditions for which a vessel is considered to be suitable, provided that the vessel is correctly operated and at a speed appropriate to the prevailing sea state. Design categories are defined in 1.2.14.

## 3 Construction standards

3.1 The appropriate standards of construction for wooden vessels should conform to the standards outlined in Parts 1 to 3.

Design category	Part 1	Part 2	Part 3
A	✓	✓	
B	✓	✓	
C	✓		✓
D	✓		

3.2 Vessels fitted with sails should be considered to operate in design categories C and D only, unless given special consideration by the competent authority.

3.3 Consideration should be given by the competent authority to increasing the scantlings given in the standards in parts of a vessel where special conditions may arise, including:

- .1 operation of fishing gear likely to damage structure by impact or abrasion; and
- .2 landing and hauling out of vessels on beaches and riverbanks.

## 4 Construction standard for wooden vessels of all design categories

### 4.1 Introduction

This part of the standard is applicable to vessels in all design categories.

### 4.2 Timber

4.2.1 Timber should be well-seasoned with a moisture content of 15 percent to 20 percent. It should be of good quality and free from splits, sap wood and significant knots.

4.2.2 Timber should be selected according to where it will be used in the vessel. Part 4 – Boatbuilding Timbers of the World, grouped according to the EN 338 strength class system, provides information on strength classes, natural durability of heartwood and movement in service.

Part of vessel	Strength classes, natural durability of heartwood and movement in service
Hull and deck planking	Strength classes: C30, D25 to D40 of moderately durable or preferably durable timber. Small movements in service.
Keel, deadwood and stem	Strength classes: D30 to D70 of durable or preferably very durable timber.
Frames and engine beds	Strength classes: D30 to D60 of durable or preferably very durable timber.

4.2.3 Timber should be selected from available species known to have a locally-proven record in boatbuilding, with good resistance to rot. Keel and underwater planking should have some resistance to marine borers.

### 4.3 Planking

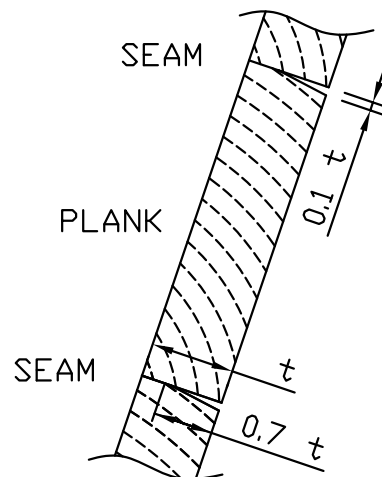
4.3.1 Hull planking should be from long or continuous lengths where possible.

4.3.2 The width of planks should be kept as small as practical, preferably less than four times plank thickness but not more than eight times plank thickness.

4.3.3 Planks up to 150 mm wide should have two fastenings at each frame; planks over 150 mm wide should have three fastenings at each frame.

4.3.4 Hull planking should be of a thickness which is suitable for the size of the vessel and the frame spacing. In general, planking of 15 mm or less should not be used unless special arrangements are made for framing.

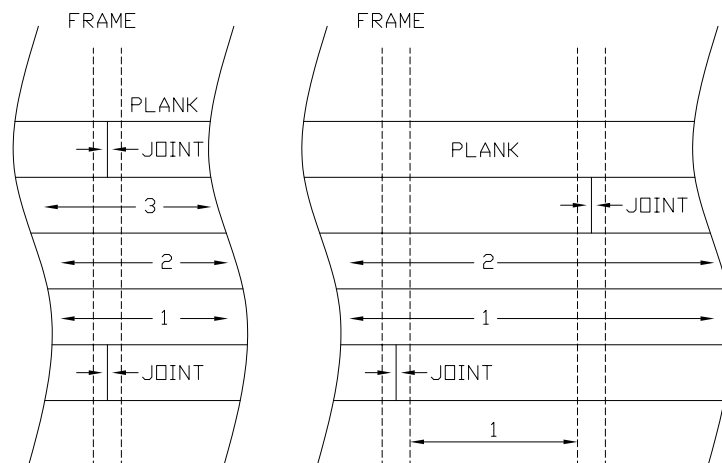
4.3.5 Planks should be fitted tightly together; the gap between planks should be less than 1 mm. There should be a caulking seam of width approximately one-tenth of the planking thickness, tapering to zero at a depth of about two-thirds of the planking thickness.

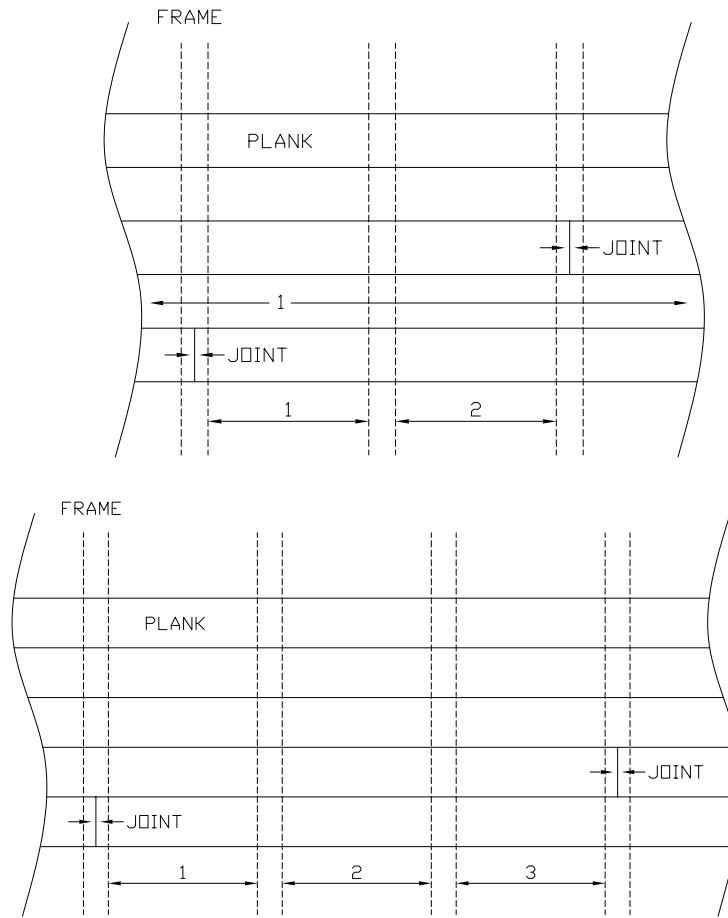


4.3.6 Seams between planks should be caulked with an organic material such as oakum and then filled with flexible waterproof filler. Synthetic fibres should not be used for caulking.

4.3.7 Butt joints between planks should be staggered; the minimum spacing between butt joints should be as follows:

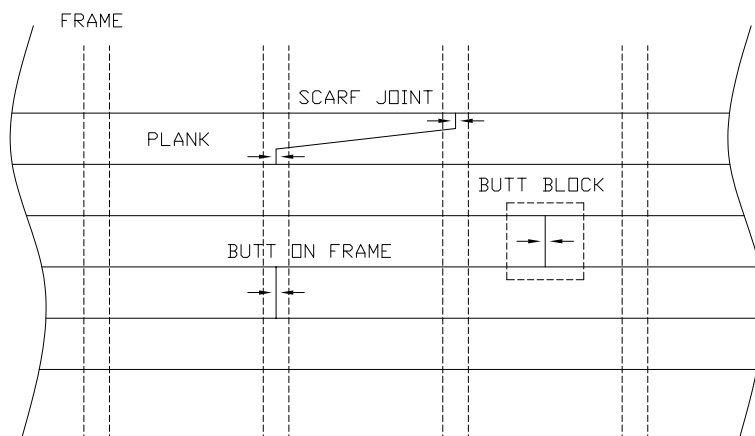
Number of frame spaces between joints	Planks between joints
3 frame spaces	Joints on adjacent planks
2 frame spaces	1 plank between joints
1 frame space	2 planks between joints
On same frame	3 planks between joints





**4.3.8** Joints in planks may be made by one of the following methods:

- .1 on a frame. This joint may be made where planks and frames are sufficiently large, generally a frame width of 125 mm or more;
- .2 between frames using butt blocks on the inside of the planking. Butt blocks should have the same thickness as the planking and be 25 mm wider than the planking so that they overlap the adjacent planks. Plank ends should be bolted to the butt blocks with galvanized coach bolts of diameter 6 mm for planking thickness below 20 mm, 8 mm for planking thickness 20 mm to 30 mm and 10 mm for thicker planks; or
- .3 by scarf joint spanning two frames.



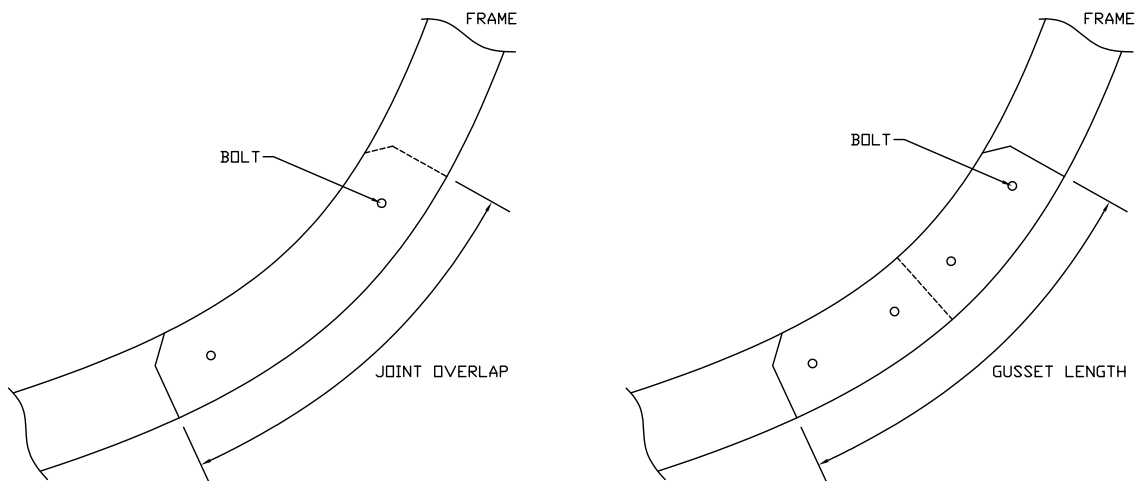
## 4.4 Frames

4.4.1 Frames should preferably be sawn from timber where the grain follows the curvature of the frame. Grain sloping with an angle of more than 1 in 5 to the direction of the frame should not be allowed.

4.4.2 The bottom frames or floors should be bolted to the keel. Large washers should be used under the head of the bolt and the nut.

4.4.3 Where there are overlaps in frame construction, these should be fixed with two bolts. Butt joints in frames should preferably be fixed with double gussets each of half of the frame thickness and with four bolts. The table below gives minimum dimensions:

Bolt diameter(mm)	Overlap joint minimum length of overlap (mm)	Butt joint minimum length of gusset (mm)
8	180	360
10	210	420
12	260	510

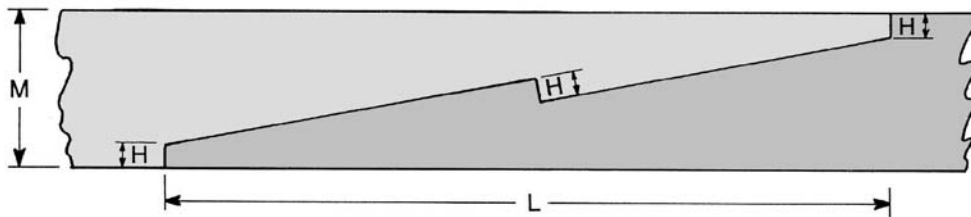


4.4.4 All frame components, especially the end grain, should be painted with primer before assembly.

## 4.5 Keel and other components

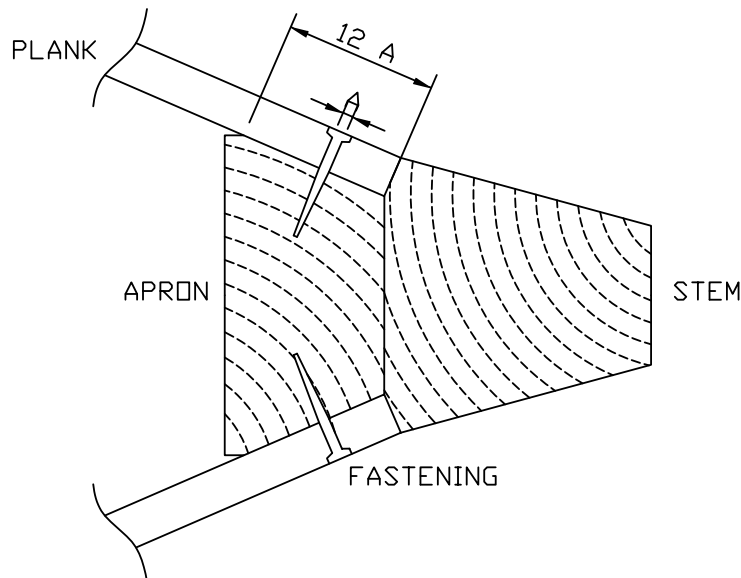
4.5.1 For vessels up to 7 m in LOA, the keel should preferably be in one length. For larger vessels, the keel can be joined with a scarph of length 5 x keel height with end notches of depth 0.2 x keel height. The scarph should be bolted together.

### KEEL SCARPH



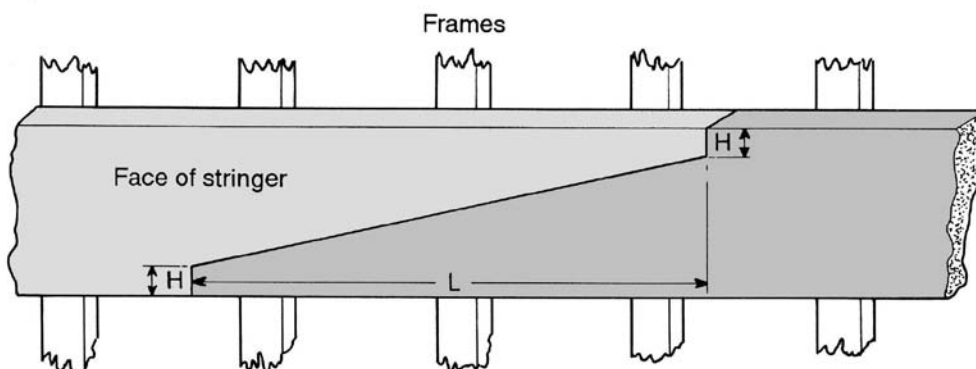
M = Keel moulding  
 L = Length of scarph = 5 x M  
 H = 0.2 x M

4.5.2 The width of the stem should be the same width as the keel. The landing of the planking on the stem should have a length of 12 x diameter of planking fastenings to avoid splitting the end of the planks. To achieve this, an apron or inner stem may have to be fitted to the inside of the stem.

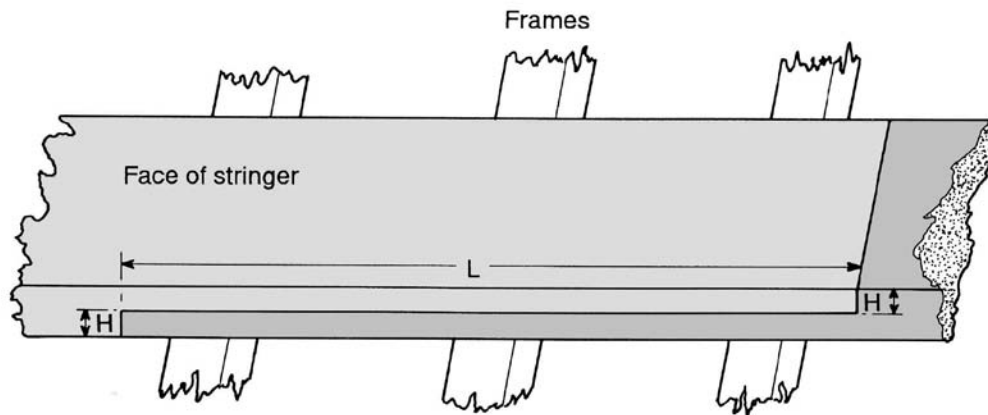


4.5.3 Beam and bilge stringers should run continuously from stem to transom and, where possible, be of a single length of timber; where joints are required, the illustrations below show the requirements. It is good practice for the bilge stringer to be bolted in place.

### BEAM STRINGER SCARPHS



## BILGE STRINGER SCARPHS



- L shall not be less than two frame spaces.
- H shall not be less than 0.15 x the moulding for beam stringers.
- H shall not be more than 0.15 x siding for bilge stringers.

4.5.4 The transom should be constructed in the same manner as the hull. Generally the transom should be connected to the backbone by the use of a knee bolted in place. Special arrangements should be made where there are large loads from fishing gear or where damage by gear is possible.

4.5.5 The engine beds should be supported by substantial floors over at least three frame spaces and should be bolted in place.

4.5.6 A gunwale and rubbing strake should be fitted and should be made from timber at least 25 mm thick. Special arrangements should be made where there are large loads from fishing gear or where damage by gear is possible.

4.5.7 A substantial knee should be used at the keel to stem joint; for vessels less than 6 metres in length, it is recommended that the knee should extend at least 150 mm along each joint and should be bolted in place. For vessels of 6 m in length and above, the knee length should be increased to at least 250 mm.

4.5.8 All components should be primed before assembly.

## 4.6 Deck

4.6.1 Where a full or partial deck is fitted, it should be watertight and of sufficient strength to support any loads placed upon it.

4.6.2 Deck planking should be from long lengths where possible and the width of planks should be kept as narrow as practical; 125 mm or less is recommended.

4.6.3 Deck planking should be of the same thickness as the hull sides. Planking of 19 mm or less should not be used unless special arrangements are made.

4.6.4 Planks should be fitted tightly together; the maximum gap between planks should be 1 mm. The width of the caulking seam should be approximately one-tenth of



the planking thickness, tapering to zero at a depth of about two-thirds of the planking thickness.

**4.6.5** The seams between planks should be caulked with an organic material such as oakum and then filled with flexible waterproof filler. The use of synthetic fibres for caulking is not recommended.

**4.6.6** Butt joints between planks should be staggered; refer to 4.3.7 for the minimum spacing between joints.

**4.6.7** The deck should be supported by beams; it is good practice for these beams to be curved (cambered) by at least 20 mm per m of length. The beams may be spaced at the same centres as the hull framing and their ends should be supported by a stringer.

**4.6.8** Vessels having features such as a deckhouse, heavy deck gear or large deck hatches should be fitted with larger main beams on each side of these. Main beams should have width increased by at least 50 percent over deck beams. Main beams should also be used to support the ends of partial decks.

**4.6.9** It is good practice to support main deck beams, highly-loaded areas and the transom by horizontal knees. These knees would increase the rigidity and strength of the structure and would contribute to a more watertight and longer-lasting deck.

## **4.7 Fastenings**

**4.7.1** Hot-dipped galvanized nails and bolts should be used throughout the vessel; alternatively, stainless steel grade AISI 316 fastenings may be used, except for planks under the waterline. Electroplated fastenings should not be used.

**4.7.2** Bolts should preferably have a hexagonal head and nut fitted with large washers. The minimum bolt size used should be 6 mm.

**4.7.3** The bolts in the keel assembly should be at least 8 mm in diameter.

**4.7.4** To avoid splitting timber, the minimum distances to the end and edge of timber parts should be as follows:

<b>Bolt diameter (mm)</b>	<b>Minimum end distance (mm)</b>	<b>Minimum edge distance (mm)</b>
up to 8	60	35
10	70	40
12	85	50

**4.7.5** Planks should be fastened to the frames with nails of round or square section of the following dimensions.

Planking thickness (mm)	16	19	25	29	35
Minimum nail diameter (mm)	4	4	5	6	6
Minimum nail length (mm)	50	60	75	75	100

**4.7.6** Nails should have a head of diameter of at least 2 x nail diameter.

4.7.7 Nails should be countersunk 3 mm to 5 mm and the head covered with waterproof, flexible compound.

4.7.8 Planks up to 150 mm wide should have two fastenings at each frame; planks over 150 mm wide should have three fastenings at each frame.

4.7.9 Bolts that pass through the hull should have caulking grommets under their heads.

## **4.8 Timber treatment**

4.8.1 Timber exposed to seawater or freshwater should be treated with a suitable paint or preservative to ensure ongoing structural strength and good longevity.

4.8.2 All components should be primed with suitable paint or preservative before final assembly. This ensures that water does not enter into and remain in structural parts.

4.8.3 Some suitable paints and preservatives include:

- .1 oil-based marine paint;
- .2 oil-based paint not intended for marine use but which is suitable for external use such as in housing;
- .3 locally-made petroleum oil-based treatments, including diesel and oil mixtures. Note: such mixtures may be harmful to both the environment and humans; local regulations should be consulted; and
- .4 locally made natural oil-based treatments, including vegetable, fish and other natural oils.

4.8.4 Paints and preservatives should be applied on a regular basis, especially in areas where abrasion from fishing operations is common.

## **Part 2**

### *Recommended construction standards for wooden vessels of design categories A and B*

## **1 Introduction**

The construction standards described here should be applied to all decked vessels in design categories A and B.

## **2 Construction**

2.1 In general, the requirements of Part 1 should be complied with in addition to the requirements below.

**2.2** The strength and construction of the hull, deck and other structures should be sufficient to withstand all foreseeable conditions of the intended service.

**2.3** All vessels should meet requirements that are compatible with a recognized wooden vessel construction standard\* or an equivalent standard and be built to the satisfaction of the competent authority.

### **Part 3**

## *Recommended construction standards for wooden vessels of design category C*

### **1 Introduction**

**1.1** The construction standards described here should be applied to all decked and undecked vessels in design category C.

**1.2** The construction standards described here should **always** be read in conjunction with Part 1 of this annex.

**1.3** The hull construction standard is based on maximum operating speeds according to vessel length; the operating speeds are shown in Table 2.9.1.

**1.4** The hull construction standard is based on the loaded displacement of the vessel, including vessel, crew, fishing gear, fuel, fish and ice, stores and equipment. Where this value is not known, an approximation can be made from the Cubic Numeral (CuNo) of the vessel; approximate values are shown in Tables 2.9.2 and 2.9.3.

### **2 Construction**

#### **2.1 Planking**

Hull planking should be of a thickness that is suitable for the size of the vessel and the spacing of the frames; Table 2.9.4 shows the relationship between plank thickness and frame spacing. Table 2.9.5 shows the standard timber dimensions.

#### **2.2 Frames**

The frame dimensions should be suitable for the size of the vessel and the spacing of the frames; Table 2.9.6 shows typical frame dimensions.

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\* The standards include:

1. the Nordic Boat Standard;
2. the construction rules of the United Kingdom Sea Fish Industry Authority (Seafish); and
3. the construction rules of recognized organizations.

## **2.3 Keel**

The size of the keel and the hog should be suitable for the size of the vessel; Table 2.9.7 shows the recommended keel and hog dimensions. The hog may be omitted where this is the convention with local construction methods; in such cases, the depth of the keel should be increased. Table 2.9.6 shows the minimum requirements for bolt size for fastening the keel and the hog to the frames.

## **2.4 Stem**

The stem and apron should have the same width as the keel. Refer to 4.5.2 in Part 1 for details of plank landing dimensions.

## **2.5 Transom**

The transom planking should be at least the same thickness as the hull planking.

## **2.6 Stringers**

The size and number of stringers should be suitable for the size of the vessel. Generally, the stringers should be fitted at the bilge and the top of the frames or deck. Table 2.9.10 shows the recommended dimensions.

## **2.7 Deck**

**2.7.1** The deck planking should be the same thickness as the hull planking.

**2.7.2** The size and spacing of the deck beams should be suitable for the size of the vessel; Table 2.9.9 shows the recommended deck beam dimensions. The spacing of the deck beams may be equal to or less than the hull frame spacing.

## **2.8 Fastenings**

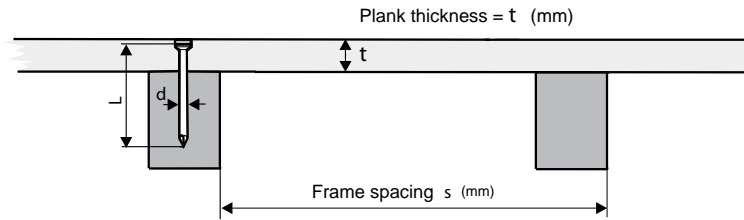
**2.8.1** Table 2.9.4 shows the requirements for the fastening of the planking to the frames.

**2.8.2** Table 2.9.6 shows the minimum requirements for bolt size for fastening the keel and the hog to the frames.

## 2.9 Tables of dimensions and scantlings

MAXIMUM SPEED - LOADED DISPLACEMENT																																																																													
<p style="text-align: center;">Table 2.9.1 - MAXIMUM SPEED <math>V_{MAX}</math></p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Length over all <math>L_H</math> m</th> <th style="padding: 5px;">4</th> <th style="padding: 5px;">6</th> <th style="padding: 5px;">8</th> <th style="padding: 5px;">10</th> <th style="padding: 5px;">12</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"><math>V_{MAX}</math> knots</td> <td style="padding: 5px;">9</td> <td style="padding: 5px;">11</td> <td style="padding: 5px;">13</td> <td style="padding: 5px;">15</td> <td style="padding: 5px;">16</td> </tr> </tbody> </table>						Length over all $L_H$ m	4	6	8	10	12	$V_{MAX}$ knots	9	11	13	15	16																																																												
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<p>Light displacement: <math>m_{LCC}</math> = Weight of the boat ready for use but without load                      Loaded displacement: <math>m_{LDC}</math> = Weight of the boat with maximum allowed load</p> <p style="text-align: center;">Table 2.9.2 - DISPLACEMENT OF UNDECKED WOODEN BOATS</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Cubic Number CUNO <math>L_H \times B_H \times D_H</math> <math>m^3</math></th> <th style="padding: 5px;">Light displacement <math>m_{LCC}</math> kg</th> <th style="padding: 5px;">Loaded displacement <math>m_{LDC}</math> kg</th> </tr> </thead> <tbody> <tr><td style="padding: 5px;">4</td><td style="padding: 5px;">300</td><td style="padding: 5px;">600</td></tr> <tr><td style="padding: 5px;">6</td><td style="padding: 5px;">500</td><td style="padding: 5px;">900</td></tr> <tr><td style="padding: 5px;">8</td><td style="padding: 5px;">650</td><td style="padding: 5px;">1200</td></tr> <tr><td style="padding: 5px;">10</td><td style="padding: 5px;">800</td><td style="padding: 5px;">1500</td></tr> <tr><td style="padding: 5px;">12</td><td style="padding: 5px;">950</td><td style="padding: 5px;">1700</td></tr> <tr><td style="padding: 5px;">14</td><td style="padding: 5px;">1100</td><td style="padding: 5px;">2000</td></tr> <tr><td style="padding: 5px;">16</td><td style="padding: 5px;">1300</td><td style="padding: 5px;">2300</td></tr> <tr><td style="padding: 5px;">18</td><td style="padding: 5px;">1400</td><td style="padding: 5px;">2600</td></tr> <tr><td style="padding: 5px;">20</td><td style="padding: 5px;">1600</td><td style="padding: 5px;">2900</td></tr> <tr><td style="padding: 5px;">24</td><td style="padding: 5px;">1900</td><td style="padding: 5px;">3500</td></tr> <tr><td style="padding: 5px;">28</td><td style="padding: 5px;">2200</td><td style="padding: 5px;">4000</td></tr> </tbody> </table> <p style="text-align: center;">Open boats: Light displacement = 80 x CUNO                      Loaded displacement = 145 x CUNO</p> <p style="text-align: center;">Table 2.9.3 - DISPLACEMENT OF DECKED WOODEN BOATS</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="padding: 5px;">Cubic Number CUNO <math>L_H \times B_H \times D_H</math> <math>m^3</math></th> <th style="padding: 5px;">Light displacement <math>m_{LCC}</math> kg</th> <th style="padding: 5px;">Loaded displacement <math>m_{LDC}</math> kg</th> </tr> </thead> <tbody> <tr><td style="padding: 5px;">20</td><td style="padding: 5px;">2500</td><td style="padding: 5px;">5500</td></tr> <tr><td style="padding: 5px;">25</td><td style="padding: 5px;">3500</td><td style="padding: 5px;">7000</td></tr> <tr><td style="padding: 5px;">30</td><td style="padding: 5px;">4000</td><td style="padding: 5px;">8500</td></tr> <tr><td style="padding: 5px;">35</td><td style="padding: 5px;">4500</td><td style="padding: 5px;">10000</td></tr> <tr><td style="padding: 5px;">40</td><td style="padding: 5px;">5000</td><td style="padding: 5px;">11000</td></tr> <tr><td style="padding: 5px;">45</td><td style="padding: 5px;">6000</td><td style="padding: 5px;">13000</td></tr> <tr><td style="padding: 5px;">50</td><td style="padding: 5px;">6500</td><td style="padding: 5px;">14000</td></tr> <tr><td style="padding: 5px;">60</td><td style="padding: 5px;">8000</td><td style="padding: 5px;">17000</td></tr> <tr><td style="padding: 5px;">70</td><td style="padding: 5px;">9000</td><td style="padding: 5px;">20000</td></tr> <tr><td style="padding: 5px;">80</td><td style="padding: 5px;">10500</td><td style="padding: 5px;">22000</td></tr> <tr><td style="padding: 5px;">90</td><td style="padding: 5px;">12000</td><td style="padding: 5px;">25000</td></tr> </tbody> </table> <p style="text-align: center;">Decked boats: Light displacement = 130 x CUNO                      Loaded displacement = 280 x CUNO</p> <p style="text-align: center;">For a detailed calculation of loaded displacement, see Annex XX</p>						Cubic Number CUNO $L_H \times B_H \times D_H$ $m^3$	Light displacement $m_{LCC}$ kg	Loaded displacement $m_{LDC}$ kg	4	300	600	6	500	900	8	650	1200	10	800	1500	12	950	1700	14	1100	2000	16	1300	2300	18	1400	2600	20	1600	2900	24	1900	3500	28	2200	4000	Cubic Number CUNO $L_H \times B_H \times D_H$ $m^3$	Light displacement $m_{LCC}$ kg	Loaded displacement $m_{LDC}$ kg	20	2500	5500	25	3500	7000	30	4000	8500	35	4500	10000	40	5000	11000	45	6000	13000	50	6500	14000	60	8000	17000	70	9000	20000	80	10500	22000	90	12000	25000
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90	12000	25000																																																																											

### PLANK THICKNESS AND FRAME SPACING



#### 2.9.4 PLANK THICKNESS AND FRAME SPACING - Category C

Loaded displacement $m_{LCD}$ kg	FRAME SPACING $s$ - centre to centre						
	Planking thickness $t$ mm						
	16	19	22	25	29	32	35
Nail $d \times L$	4 x 50	4 x 60	5 x 60	5 x 75	6 x 75	6 x 90	6 x 100
500	290	350					
1000	270	330					
2000		310	370				
3000		300	350				
4000			340	400			
5000			330	380			
6000			320	370			
7000				360	420		
8000				360	430		
9000				360	420		
10000				350	410		
15000					390	440	
20000						420	460
25000						400	450

#### 2.9.5 STANDARD TIMBER DIMENSIONS

Sawn dimension		Dimension surfaced on two sides mm
mm	Inch	
19	¾	16
22	⅞	19
25	1	22
28	1⅛	25
32	1¼	29
35	1⅝	32
38	1½	35
41	1⅞	38
44	1¾	41
47	1⅞	44
50	2	47
63	2½	60
75	3	72
90	3½	87
100	4	97
125	5	120
150	6	144
175	7	169
200	8	194
225	9	219
250	10	244
300	12	294

Adjustment for design categories:

Plank thickness the same. Frame spacing adjusted:

Design category D: Tabular frame spacing x 1.15

Design category B: Tabular frame spacing x 0.92

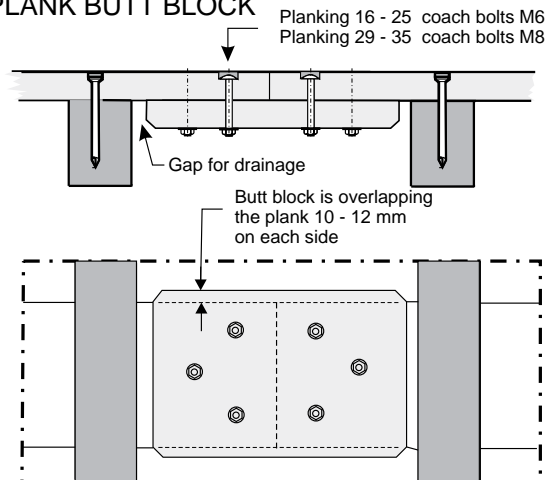
Design category A: Tabular frame spacing x 0.85

Same plank thickness for timber

in strength classes: C30, C40, D25, D30 and D35

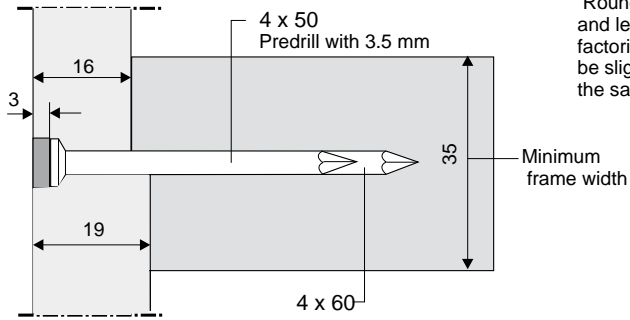
For wood in class D40 use one standard thickness lower with the same frame spacing.

#### PLANK BUTT BLOCK



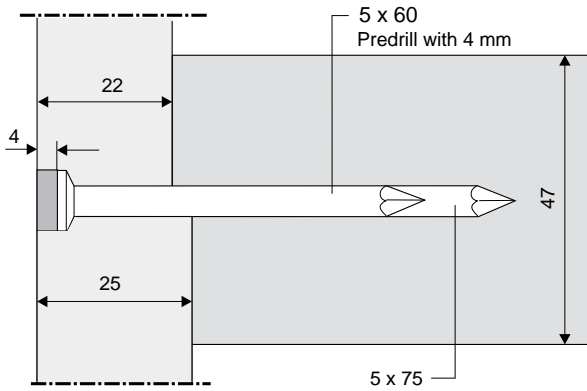
PLANK THICKNESS - NAILS

ALL NAILS MUST BE HOT DIPPED GALVANIZED  
Electroplated nails have low rust protection

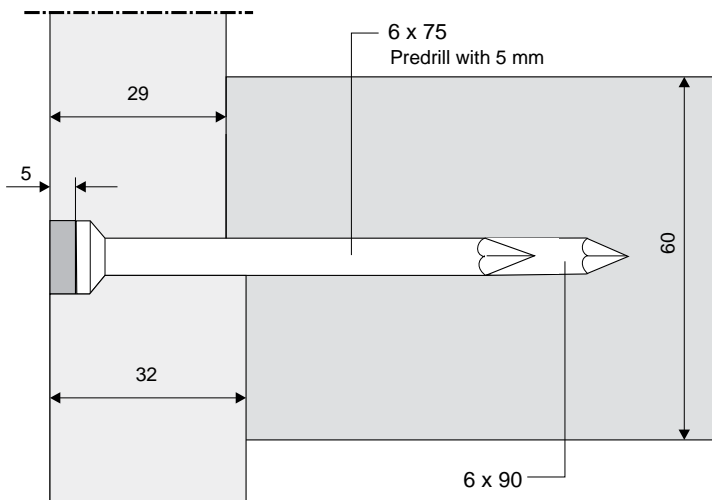


Round wire nails of the correct diameter and length can be ordered from nail factories in most countries. They have to be slightly thicker than square nails for the same holding power

ROUND NAILS	SQUARE NAILS
mm	mm
4	3.6
5	4.4
6	5.3



The nails must be countersunk as shown and the head covered with a suitable putty



### FRAMES

NOTE: Important with good contact where the side frame butt up against the bottom frame

Good contact in butt!

**ROUND BOTTOM**                      **V - BOTTOM**

**2.9.6 FRAME DIMENSIONS AND BOLT SIZE**

Loaded displacement $m_{LDC}$ kg	TIMBER DIMENSION			BOLTS					
	① Floor mm	② Frame mm	③ Gussets mm	④		⑤		⑥ Keel bolt mm	⑦ Chine bolt mm
				d mm	No of bolts	d mm	No of bolts		
500	35 x 97	35 x 60	16	6	2	6	2	8	6
1000	35 x 97	35 x 60	19	6	2	6	2	8	6
2000	47 x 120	35 x 72	19	8	2	8	2	10	8
3000	47 x 120	47 x 72	25	8	3	8	2	10	8
4000	47 x 144	47 x 87	25	8	3	8	2	10	8
5000	47 x 144	47 x 87	25	10	3	10	2	10	8
6000	47 x 144	47 x 97	25	10	3	10	2	12	10
7000	47 x 144	47 x 97	25	10	3	10	2	12	10
8000	60 x 144	60 x 97	32	10	3	10	2	12	10
9000	60 x 144	60 x 97	32	10	3	10	2	12	10
10000	60 x 144	60 x 97	32	10	3	10	2	12	10
15000	60 x 144	60 x 97	32	10	3	10	2	12	10
20000	60 x 144	60 x 97	32	10	3	10	2	12	10
25000	60 x 144	60 x 97	32	10	3	10	2	12	10

Frame timber is strength category D30 or higher  
Same dimensions for all design categories.



**KEEL**

**WASHER DIMENSIONS**

Keel bolt diameter mm	Washer dimensions mm
6	3 x 20 x 20
8	3 x 25 x 25
10	3 x 30 x 30
12	4 x 40 x 40

FOR KEEL BOLT DIAMETER  
SEE TABLE 2.9.6

**2.9.7 KEEL AND HOG DIMENSIONS**

Light displacement $m_{LC}$ kg	KEEL		HOG	
	Width B mm	Height H mm	Width b mm	Height h mm
250	60	60	120	47
500	60	72	120	47
1000	72	72	120	47
2000	72	97	144	60
3000	72	97	144	60
4000	97	120	169	60
5000	97	144	169	60
6000	97	144	169	60
7000	97	169	194	72
8000	120	169	219	72
9000	120	194	219	72
10000	120	194	219	87
11000	120	194	219	87
12000	120	194	219	87

**NOTE** — From tables 2.9.2 and 2.9.3

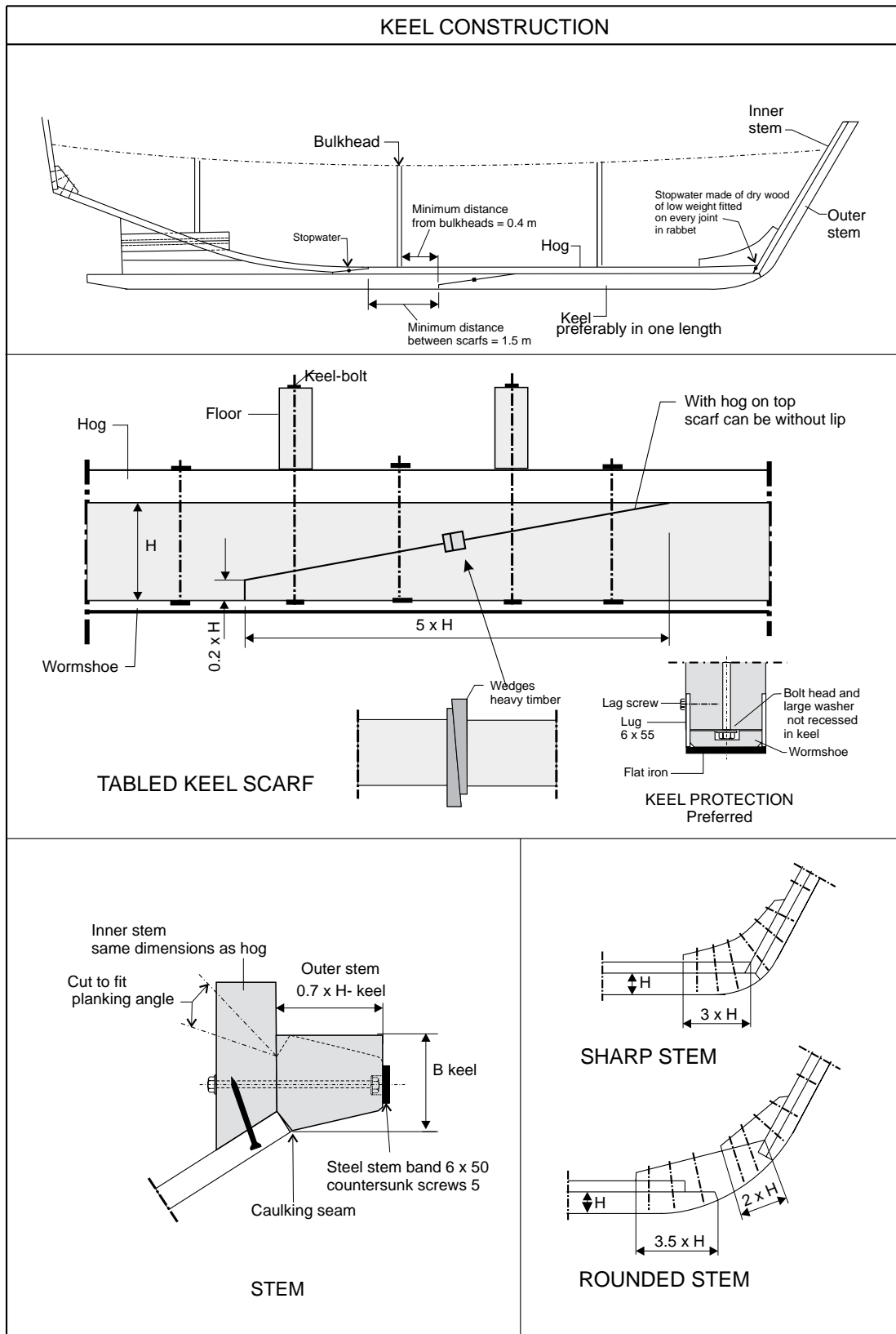
Same dimensions for all design categories  
Timber is in strength category D30 or higher

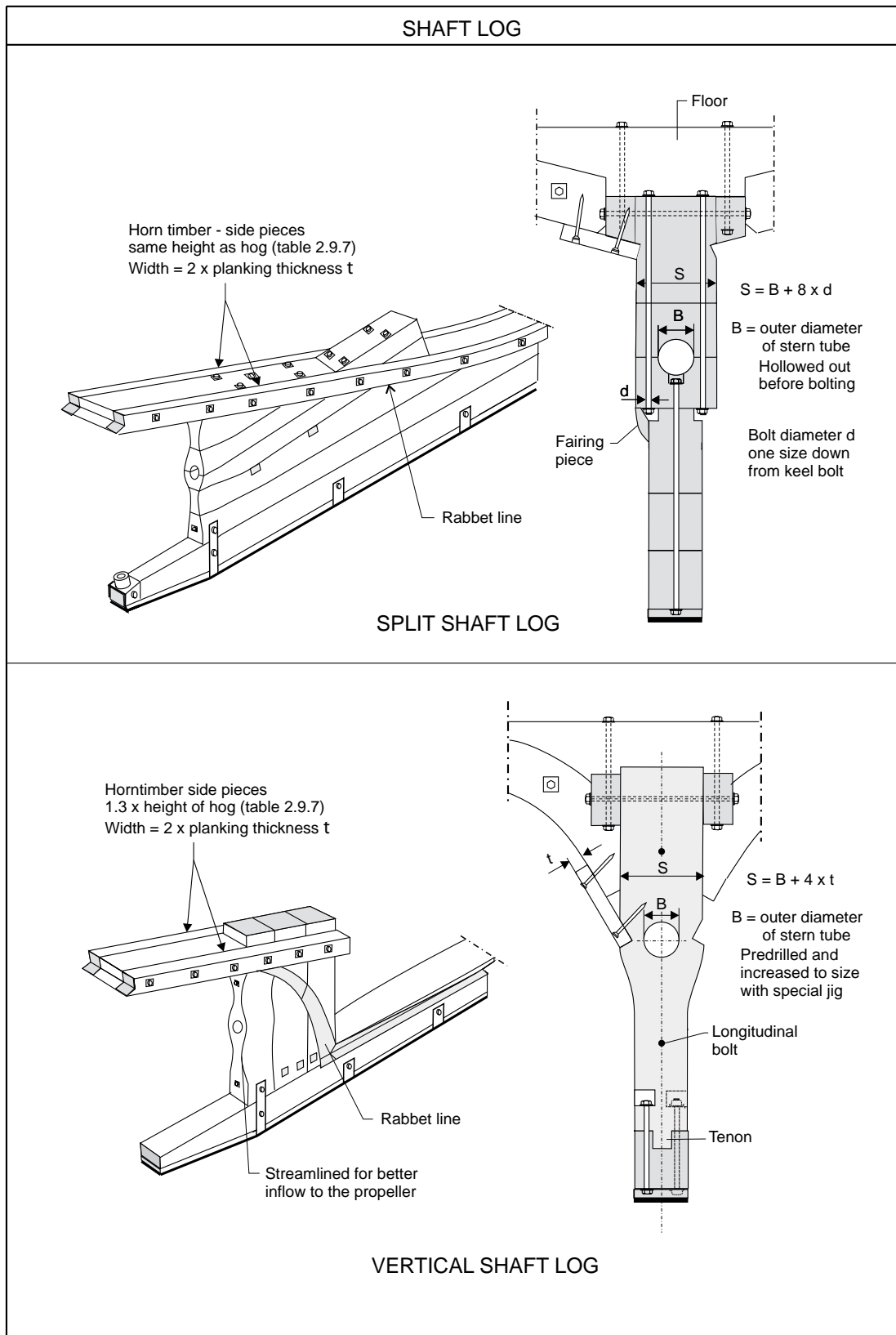
**2.9.8 BOTTOM ANGLE FACTOR**

Bottom angle degrees	Keel factor $f_k$
0	1.20
15	1.07
20	1.0
30	0.9
40	0.7

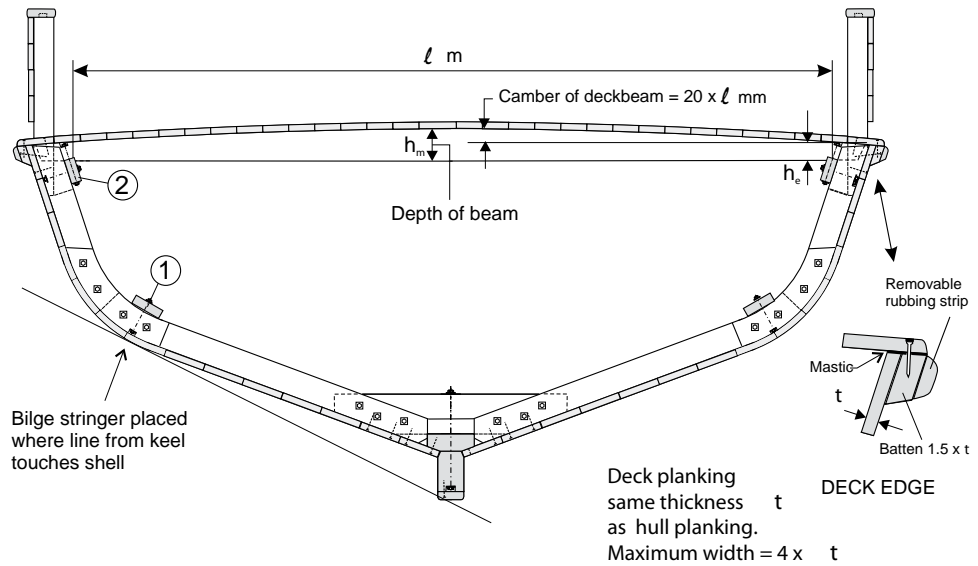
Keel height adjusted for bottom angle:

$$H_k = f_k \times H$$



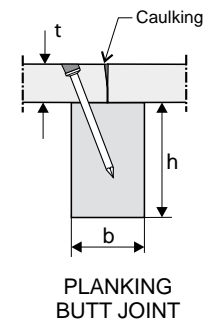


DECK, BILGE STRINGER AND BEAM STRINGER



2.9.9 DECK BEAM DIMENSIONS

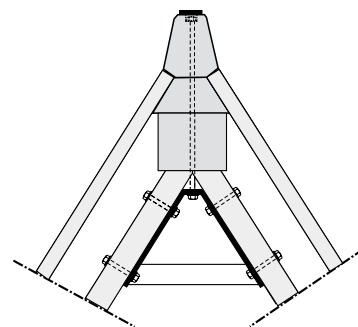
Width of beam b mm	Beam spacing s mm	DEPTH OF BEAM $h_m$ = depth at mid beam $h_e$ = depth at end				
		$l$ 2.0 m	$l$ 2.5 m	$l$ 3.0 m	$l$ 3.5 m	$l$ 4.0 m
		$h_m/h_e$ mm	$h_m/h_e$ mm	$h_m/h_e$ mm	$h_m/h_e$ mm	$h_m/h_e$ mm
47	350	75/65	90/65	110/75	130/75	
	400	80/65	95/65	120/75	140/75	
60	350	65/65	80/65	100/75	115/75	130/90
	400	70/65	85/65	110/75	120/75	140/90



Same dimensions for all design categories  
 Timber of strength group D30 or higher.  
 Beams at edge of deck openings increased in width =  $b \times 1.5$

2.9.10 BILGE STRINGER AND BEAM STRINGER

Loaded displacement mLDC kg	① Bilge stringer mm	② Beam stringer mm
4000		47 x 72
6000		47 x 97
8000		47 x 97
10000		47 x 97
15000	35 x 144	47 x 97
20000	34 x 144	47 x 120
25000	35 x 144	47 x 120



STEEL KNEE TO CONNECT BILGE AND BEAM STRINGER TO STEM

All bolting of bilge stringer and deck beam = M10 with large washers

## Part 4

## Boatbuilding timbers of the world

(grouped according to EN 338 strength class system)

AFRICAN TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name  Scientific name	Local name	Durability of heartwood	Movement in service
<b>D60</b> 840 kg/m <sup>3</sup>	<b>Ekki</b> <i>Lophira alata</i>	Kaku (Ghana), Azobé (Ivory Coast) Bongossi (Cameroon), Eba (Nigeria)	Very durable	Medium
<b>D50</b> 780 kg/m <sup>3</sup>	<b>Afrormosia</b> <i>Pericopsis elata</i>	Kokrodua (Ghana, Ivory Coast)	Very durable	Small
	<b>Afzelia</b> <i>A. africana</i> , <i>A. bipindensis</i> <i>A. pachyloba</i>	Papao (Ghana), Apa (Nigeria), Pau Conta (Guinea Bissau) Doussié (Cameroon, Ivory Coast)	Very durable	Small
	<b>Danta</b> <i>Nesegordonia papaverifera</i>	Otutu (Nigeria), Kotibé (Ivory Coast)	Durable	Medium
	<b>Opepe</b> <i>Nauclea didirichii</i>	Bilinga (Cameroun), Kusia (Ghana), Badi (Ivory Coast) Bundui brunston (Sierra Leone)	Very durable	Medium
<b>D40</b> 700 kg/m <sup>3</sup>	<b>Afzelia, East African</b> <i>A. quanzensis</i>	Chamfuta (Mozambique), Mbembakofi, Mkora (Tanzania)	Very durable	Small
	<b>Guarea</b> <i>G. Thomsonii</i>	Obobonekwi (Nigeria), Bossé (France and Ivory Coast)	Very durable	Small
	<b>Guarea, scented</b> <i>G. Cedrata</i>	Obobobonufua (Nigeria), Bossé (Ghana, Ivory Coast) Scented guarea (Great Britain)	Very durable	Small
	<b>Iroko</b> <i>Chlorophora excelsa</i>	Odum (Ghana, Ivory Coast), Bang (Cameroon), Moreira (Angola) Mvule (East Africa), Tule, Intule (Mozambique), Kambala (Zaire)	Very durable	Small
	<b>Mahogany, Dry zone</b> <i>Khaya Senegalensis</i>	Cailcedrat (Senegal), Bissilon (Guinea Bissau)	Durable	Medium
	<b>Makoré</b> <i>Tieghemella heckelii</i>	Agamokwe (Nigeria), Baku, Abaku (Ghana) Douka (Cameroon)	Very durable	Small
	<b>Padauk, African</b> <i>Pterocarpus soyauxii</i>	Camwood, Barwood	Very durable	Small
	<b>Teak (plantation)</b> <i>Tectona grandis</i>		Durable	Small
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Muninga</b> <i>Pterocarpus angolensis</i>	Mninga (Tanzania), Ambila (Mozambique) Mukwa (Zambia), Kiaat, kajat (S. Africa)	Very durable	Small
	<b>Idigbo</b> <i>Terminalia Ivorensis</i>	Emeri (Ghana), Framiré (Ivory Coast)	Durable	Medium
	<b>Niangon</b> <i>Tarrietia utilis</i>	Ogoué, (Ivory Coast, Gabon), Nyankom (Ghana)	Durable	Small
	<b>Sapele</b> <i>Etandrophragma cylindricum</i>	Aboudikro (Ivory Coast), Sapelli (Cameroon)	Moderately durable	Small
	<b>Utile</b> <i>Etandrophragma utile</i>	Sipo (Ivory Coast), Assié (Cameroun)	Durable	Small
<b>D30</b> 640 kg/m <sup>3</sup>				
<b>D25</b> Not included in EN 338 570 kg/m <sup>3</sup>	<b>Mahogany, African</b> <i>Khaya ivorensis</i> <i>Khaya anthotheca</i> <i>Khaya nyasica</i>	Mbawa (Malawi), Mkangazi (Uganda) Acajou d'Afrique (Ivory Coast, France) Khaya (USA)	Moderately durable	Small
<b>D15</b> Not included in EN 338 400 kg/m <sup>3</sup>	<b>Obeche</b> <i>Triplochiton scleroxylon</i>	Wawa (Ghana), Arare (Nigeria), Samba (Ivory Coast) Ayous (Cameroon)	Non durable	Small
	<b>Gaboon - Okoumé</b> <i>Aucomea klaineana</i>	Mofoumou (Equatorial Guinea)	Non durable	Small

SOUTHERN ASIA TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D70</b> 1080 kg/m <sup>3</sup>	<b>Sal, Burma</b> <i>Shorea obtusa</i>	Thitya (Burma)	Very durable	Medium
<b>D60</b> 840 kg/m <sup>3</sup>	<b>Sal</b> <i>Shorea Robusta</i>	Shal, sakwa, sala	Moderately durable	Medium
	<b>Hora</b> <i>Dipterocarpus Zeylanicus</i>		Moderately durable	Medium
<b>D50</b> 780 kg/m <sup>3</sup>	<b>Babul</b> <i>Acacia Arabica</i>	Jali, babbar, tuma,babli, kikar	Durable	Small
	<b>Gurjun</b> <i>Dipterocarpus spp.</i>	Yang	Moderately durable	Medium
	<b>Sissoo</b> <i>Dalbergia sissoo</i>	Shisham (Pakistan)	Very durable	Small
<b>D40</b> 700 kg/m <sup>3</sup>	<b>Chuglam, white</b> <i>Terminalia bialata</i>	Indian silver grey wood, lein	Moderately durable	Small
	<b>Padauk, Andaman</b> <i>Pterocarpus dalbergioides</i>	Andaman redwood	Very durable	Small
	<b>Teak</b> <i>Tectona grandis</i>	Sagwan, teku, teka, kyun	Very durable	Small
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Aini</b> <i>Artocarpus hirsuta</i>	Anjili, ainii, pejata	Very durable	Small
	<b>Benteak</b> <i>Lagerstroemia lanceolata</i>	Venteak, nana, vevala	Moderately durable	Medium
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Pyinma</b> <i>Lagerstoemia speciosa</i>	Jarul (India, Pakistan) Intanin (Thailand) Banglang (Vietnam)	Moderately durable	Medium
Not included in EN 338 <b>D25</b> 570 kg/m <sup>3</sup>	<b>Amari</b> <i>Amoora wallichii</i> <i>A. spectabilis</i>	Lachini, galinglibor	Moderately durable	Low
	<b>Champak</b> <i>Mechila champaka</i>	Saga, sanga, sagawa	Non durable	Medium
	<b>Chaplash</b> <i>Artocarpus chaplasha</i>	Taung-peinne (Burma)	Moderately durable	Medium
	<b>Gumhar</b> <i>Gmelina arborea</i>	Gomari, shiwan, yemane, gambari, gmelina	Durable	Low
	<b>Mango</b> <i>Mangifera indica</i>	Amba, mamid (India), Etamba (Sri Lanka)	Non durable	Low
Not included in EN 338 <b>D15</b> 370 kg/m <sup>3</sup>	<b>Lunumidella</b> <i>Melia composita</i>	Malabar nimwood, nimbarra Used for floats in Sri Lanka	Perishable	Low
	<b>Royya</b> <i>Albizia stipulata</i>	Used for kattumarams in India	Perishable	Low
	<b>Bombax, Indian</b> <i>Bombax malabaricum</i>	Semul, cottonwood, letpan, simbal Used for kattumarams in India	Perishable	Low
Softwood (Conifer species)				
<b>C30</b> 460 kg/m <sup>3</sup>	<b>Cedar</b> <i>Cedrus deodara</i>	Deodar, diar, dadar	Very durable	Small

SOUTH EAST ASIA TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D70</b> 1080 kg/m <sup>3</sup>	<b>Balau</b> <i>Shorea spp.</i> of high densities	Selangan batu, gopasa batu	Very durable	Medium
	<b>Bankirai</b> <i>Shorea laevifolia</i>		Durable	Medium
	<b>Belian</b> <i>Eusideroxylon zwageri</i>	Tambulian, boelian	Very durable	Medium
	<b>Bitis</b> <i>Madhuca utilis</i> <i>Palaquium ridleyi</i>		Very durable	Large
	<b>Chengal</b> <i>Balanocarpus heimii</i>		Very durable	Small
<b>D60</b> 840 kg/m <sup>3</sup>	<b>Giam</b> <i>Hopea spp.</i>		Very durable	Medium
	<b>Kempas</b> <i>Koompassia malaccensis</i>	Tualang (Malaysia), Kayu raja (Sarawak), Mengaris (Borneo)	Durable	Medium
	<b>Kapur</b> <i>Dryobalanops spp.</i>		Durable	Small
<b>D50</b> 780 kg/m <sup>3</sup>	<b>Keruing</b> <i>Dipterocarpus spp.</i>	Apitong (Philippines)	Moderately durable	Medium
	<b>Merawan</b> <i>Hopea spp.</i>	Selangan (Sarawak and Sabah)	Durable	Medium
	<b>Merbau</b> <i>Intsia palembanica</i>	Mirabow (Sabah), Tjengal	Durable	Small
	<b>Resak</b> <i>Vatica</i> , <i>Cotylelobium spp.</i>		Durable	Medium
	<b>Vitex</b> <i>Vitex spp.</i>		Durable	Small
<b>D40</b> 700 kg/m <sup>3</sup>	<b>Mengkulang</b> <i>Heritiera spp.</i>	Chumprak (Thailand), Kembang (Sabah), Dungun	Moderately durable	Medium
	<b>Teak</b> <i>Tectona grandis</i>		Very durable	Small
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Bitangor</b> <b>Calophyllum spp.</b> <i>excluding C. inophyllum</i>		Moderately durable	Medium
	<b>Meranti, dark red</b> <i>Shorea spp.</i>	Dark red seraya, Nemusu (Malaysia), Oba suluk (Sabah)	Durable	Small
	<b>Meranti, white</b> <i>Shorea spp.</i>	Lun, lunputeh (Sarawak), Gopasa putik	Moderately durable	Small
	<b>Meranti, yellow</b> <i>Shorea spp.</i>	Meranti damar hitam (Malaysia), Lun kuning (Sarawak)	Moderately durable	Small
	<b>Meranti gerutu</b> <i>Parashorea spp.</i>		Moderately durable	Small
	<b>Mersawa and Krabak</b> <i>Anisoptera spp.</i>		Moderately durable	Small
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Melunak</b> <i>Pentace triptera</i>		Moderately durable	Small
	<b>Meranti, light red</b> <i>Shorea spp.</i>	Lauan, Light red seraya, Perawan, Serya merah	Moderately durable	Small
<b>D25</b> Not included in EN 338 570 kg/m <sup>3</sup>	<b>Serya, white</b> <i>Parashorea Malaanonan</i>	Urut mata (Sabah), Bagtikan (Philippines)	Non durable	Small

PACIFIC AREA TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12% MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D70</b> 1080 kg/m <sup>3</sup>	<b>Hopea, heavy</b> <i>Hopea</i> spp. including: <i>H. iriana</i> , <i>H. parvifolia</i>		Very durable	Medium
	<b>Ironbark, grey</b> <i>Eucalyptus</i> spp.		Very durable	
<b>D60</b> 840 kg/m <sup>3</sup>	<b>Gum, blue</b> <i>Eucalyptus camaldulensis</i>	Red river gum	Very durable	Medium
	<b>Gum, spotted</b> <i>Eucalyptus maculata</i>		Moderately durable	Medium
	<b>Kempas</b> <i>Koompassia malaccensis</i>		Durable	Medium
<b>D50</b> 780 kg/m <sup>3</sup>	<b>Karri</b> <i>Eucalyptus diversicolor</i>	Vesi (Fiji)	Durable	Medium
	<b>Kwila</b> <i>Intsia bijuga</i>		Durable	Medium
<b>D40</b> 700 kg/m <sup>3</sup>	<b>Vitex (heavy)</b> <i>Vitex Cofassus</i>	Vasa, vata (Solomons)	Durable	Small
	<b>Jarrah</b> <i>Eucalyptus marginata</i>		Very durable	Medium
	<b>Taun</b> <i>Pometia pinnata</i>	Kasai, awa, ako (Solomons), Ohabu (Papua)	Moderately durable	Small
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Damanu</b> <i>Calophyllum kajewski</i>	Koilo (Solomons), Tamanu (Samoa)	Moderately durable	Medium
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Padauk, Solomon</b> <i>Pterocarpus indicus</i>	Rosewood (Papua)	Very durable	Small
	<b>Cedar, Australian</b> <i>Toona australis</i> <i>Cedrela toona</i>	Red Cedar	Moderately durable	Small
SOFTWOOD (Coniferous species)				
<b>C30</b> 460 kg/m <sup>3</sup>	<b>Dakua makadre</b> <i>Agathis vitiensis</i>		Non durable Pressure treated:Durable	Small
	<b>Kauri, New Zealand</b> <i>Aghatis australis</i>		Moderately durable	Small
	<b>Pine, Hoop</b> <i>Araucaria cunninghamii</i>	Quensland pine	Non durable	Small
<b>C24</b> 420 kg/m <sup>3</sup>	<b>Pine, Klinki</b> <i>Araucaria klinkii</i>		Non durable Pressure treated:Durable	Small



SOUTH AMERICAN TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D70</b> 1080 kg/m <sup>3</sup>	<b>Greenheart</b> <i>Ocotea rodiaei</i>		Very durable	Medium
	<b>Ipé</b> <i>Tabebuia serratifolia</i>	Hakia, ironwood (Guyana), Groenhart, wassiba (Surinam) Ipé tabaco (Brazil), Bethabara (Caribbean)	Very durable	Medium
	<b>Jatai peba</b> <i>Dialium guianense</i>	Guapaque, tamarindo, jatai mirim	Very durable	Medium
	<b>Manbarlak</b> <i>Eschweilera spp.</i>	Black cacaralli (Guyana), Mahoe noir, Barklak, kakaralli, toledo wood, Guatekare	Very durable	Medium
	<b>Massaranduba</b> <i>Manikara bidentata</i>	Balata (Guyana), Bolletrie (Surinam), Mapabaruda (Brazil) Nispero (Panama)	Durable	Medium
	<b>Mora</b> <i>Mora excelsa</i>	Prakue (Guyana), Peto, witte mora (Surinam), Mahot rouge	Very durable	Large
<b>D60</b> 840 kg/m <sup>3</sup>	<b>Purpleheart</b> <i>Peltogyne spp.</i>	Koroborelli, saka (Guyana), Pau roxo, amarante (Brazil) Amaranth (US)	Very durable	Medium
	<b>Courbaril</b> <i>Hymenaea spp.</i>	Jatoba, jatai, farinheira, jatai amarelo, jatai vermehlo (Brazil) Locust (Caribbean)	Durable	Medium
<b>D50</b> 780 kg/m <sup>3</sup>	<b>Angelique</b> <i>Dicorynia guianensis</i>	Basralocus	Very durable	Medium
	<b>Kabukalli</b> <i>Goupia glabra</i>	Cupiuba (Brazil), Goupie (Guyana), Kopie (Surinam)	Durable	Medium
	<b>Piquia</b> <i>Cariocar villosum</i>	Pequia, pequia bravo, vinagreira	Durable	Medium
	<b>Suradan</b> <i>Hieronyma spp.</i>	Urucurana (Brazil), Surdanni, pilon (Guyana) Sorodon, anoniwana (Surinam), Nancito (Nicaragua)	Very durable	Medium
	<b>Tatajuba</b> <i>Bagassa guianensis</i> <i>B. tiliaefolia</i>	Bagasse (Guyana), Gele bagasse (Surinam)	Durable	Small
	<b>White peroba</b> <i>Paratecoma peroba</i>	Peroba de campos, ipé peroba, peroba amarella, peroba branca, ipé claro (Brazil)	Very durable	Small
<b>D40</b> 700 kg/m <sup>3</sup>	<b>Pakuri</b> <i>Platonia insignis</i>	Bacropary, pacaru (Brazil), Matozama (Ecuador) Pakoelie (Surinam)	Durable	Medium
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Cerejeira</b> <i>Amburana carensis</i>	Amburana, emburana, cumaré, cerejeira rajada (Brazil)	Durable	Medium
	<b>Freijo</b> <i>Cordia goeldiana</i>	Frei jorge (Brazil), Cordia wood, jenny wood (US) Araputanga, cedro-i, acajou, mogno, aguano	Durable	Small
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Louro, Red</b> <i>Ocotea rubra</i>	Louro vermelho (Brazil, ) Determa (Guyana) Wane, teteroma, bewana (Surinam), Grignon rouge	Durable	Small
	<b>Jequitiba</b> <i>Cariniana spp.</i>	Jequitiba rosa (Brazil), Abarco (Colombia) Bacu (Venezuela)	Durable	Small
<b>D25</b> Not included in EN 338 570 kg/m <sup>3</sup>	<b>Cedar, South American</b> <i>Cedrela spp. but mainly: C. fissilis</i>	Cedro, cedro batata, Cedro rosa, cedro vermehlo (Brazil)	Durable	Small
	<b>Mahogany, Brazilian</b> <i>Swietenia macrophylla</i>		Durable	Small

CENTRAL AMERICA and the CARIBBEAN TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D70</b> 1080 kg/m <sup>3</sup>	<b>Balata</b> <i>Mimusops bidentata</i> <i>Manilkara bidentata</i>	Ausubo (Puerto Rico), Nispero (Panama) Bulletwood (St. Lucia)	Very durable	Large
	<b>Bois gris</b> <i>Licania ternatensis</i>	Bois diable (Dominica), Bois de masse (St. Lucia)	Very durable	Medium
	<b>Tonka</b> <i>Dipteryx odorata</i>	Koemaroe (Surinam), Kumaru (Guyana)	Very durable	Medium
<b>D60</b> 840 kg/m <sup>3</sup>	<b>Angelin</b> <i>Andira inermis</i>	Kuraro, koraro (Guyana), Rode kabbes (Surinam), Yaba (Cuba) Pheasant wood, corn wood, almendro, chaperno cuja, quira, quinillo, macaya (Caribbean)	Very durable	Small
	<b>Courbaril</b> <i>Hymenaea courbaril</i>	Locus, rode locus (Surinam), Algarrobo (Puerto Rico)	Moderately durable	Medium
<b>D50</b> 780 kg/m <sup>3</sup>	<b>Nargusta</b> <i>Terminalia amazonia</i>	Fukadi, coffee morta (Guyana), Almendro (Belize) Cochun (Mexico), White oliver (Trinidad), Guyabo (Venezuela)	Durable	Medium
	<b>Angelique</b> <i>Dicorynja guianensis</i> <i>D. paraensis</i>	Basralocus, teck de la Guyana	Very durable	Medium
<b>D40</b> 700 kg/m <sup>3</sup>	<b>Laurier poivre</b> <i>Hieronyma caribae</i> <i>H. alcoeroides</i>	Tapana (Grenada), Horseflesh mahogany (St. Vincent) Bois d'amande (St. Lucia)	Durable	Medium
	<b>Manni</b> <i>Symphonia globulifera</i>	Matakkie (Surinam) Waika, chewstick (Belize), Bois cochon Maniballi, brick-wax tree (Guyana) Mangle blanc (Dominica)	Durable	Medium
	<b>Teak</b> <i>Tectonia grandis</i>	Teca (Spanish), Teck (French)	Durable	Small
	<b>Yokewood</b> <i>Catalpa longissima</i>	French oak, Haitian oak, Jamaica oak, Bois chêne (Caribbean)	Durable	Medium
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Andiroba</b> <i>Carapa guianensis</i>	Crabwood (Guyana), Figueroa, tangare (Ecuador) Krappa (Surinam), Carapote (Guadeloupe)	Moderately durable	Medium
	<b>Roble</b> <i>Tabebuia spp.</i>	Apamate, pink poui, poirier rouge, poirier blanc	Durable	Small
	<b>Tabebuia, white</b> <i>Tabebuia stenocalix</i>		Moderately durable	Small
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Bois bande</b> <i>Richeria grandes</i>	Zabricot grandes feuilles (Grenada)	Moderately durable	Small
<b>D25</b> Not included in EN 338 570 kg/m <sup>3</sup>	<b>Mahogany, Central American</b> <i>Swietenia macrophylla</i>	Caoba, caoba hondurena (Spanish), Acajou (French) Zopilote gateado (Mexico)	Durable	Small
	<b>Cedar, Central American</b> <i>Cedrela odorata</i>	Commonly called: Acajou rouge, but this is confusing	Durable	Small
	<b>Cordia, American light</b> <i>Cordia alliodora</i>	Salmwood (Belize), Ecuador laurel	Moderately durable	Small
	<b>Saman</b> <i>Pithecellobium saman</i>	Algarobbo (Mexico), Raintree (Haiti)	Durable	Small
SOFTWOOD (coniferous species)				
<b>C40</b> 500 kg/m <sup>3</sup>	<b>Pitch pine, Caribbean</b> <i>Pinus caribaea</i> <i>Pinus occarpa</i>	Ocote pine (Central America) Caribbean longleaf pitch pine (UK)	Moderately durable	Small

NORTH AMERICAN TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D35</b> 670 kg/m <sup>3</sup>	<b>Oak, white</b> <i>Quercus alba</i>		Durable	Medium
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Ash, white</b> <i>Fraxinus americana</i>		Non durable	Medium
	<b>Birch, yellow</b> <i>Betula alleghaniensis</i>		Non durable	Medium
	<b>Elm, rock</b> <i>Ulmus thomasi</i>		Non durable	Medium
<b>D25</b> Not in EN 338 570 <sup>3</sup> kg/m <sup>3</sup>	<b>Elm, American</b> <i>Ulmus americana</i>		Non durable	Medium
SOFTWOOD (Coniferous species)				
<b>C30</b> 460 kg/m <sup>3</sup>	<b>Pine, dense southern longleaf</b> <i>Pinus palustris</i>	Pitch pine	Moderately durable	Medium
	<b>Fir, Douglas</b> <i>Pseudotsuga menziesii</i>	Oregon pine	Moderately durable	Medium
<b>C24</b> 420 kg/m <sup>3</sup>	<b>Cedar, Alaska</b> <i>Chamaecyparis nootkatensis</i>		Durable	Small
	<b>Cedar, Port-Orford</b> <i>Chamaecyparis lawsoniana</i>		Durable	Small
	<b>Redwood, old growth</b> <i>Sequoia sempervirens</i>	Coast redwood, California redwood	Durable	Small
<b>C18</b> 380 kg/m <sup>3</sup>	<b>Cedar, Western red</b> <i>Thuja plicata</i>		Durable	Small
	<b>Pine, Eastern white</b> <i>Pinus strobus</i>		Moderately durable	Medium
	<b>Pine, Western white</b> <i>Pinus monticola</i>	Idaho white pine	Moderately durable	Medium
	<b>Spruce, sitka</b> <i>Picea sitchensis</i>		Non durable	Medium
<b>C16</b> 370 kg/m <sup>3</sup>	<b>Cedar, Atlantic white</b> <i>Chamaecyparis thyoides</i>	Southern white cedar, swamp, cedar, boat cedar	Durable	Small
	<b>Cedar, Northern white</b> <i>Thuja occidentalis</i>	Arborvitae	Durable	Small

EUROPEAN TIMBERS				
HARDWOOD (deciduous species)				
Strength class Average weight at 12 % MC	Trade name <i>Scientific name</i>	Local name	Durability of heartwood	Movement in service
<b>D30</b> 640 kg/m <sup>3</sup>	<b>Ash, European</b> <i>Fraxinus excelsior</i>		Perishable	Medium
	<b>Beech, European</b> <i>Fagus sylvatica</i>		Perishable Durable under water	Large
	<b>Elm, European</b> <i>Ulmus glabra</i>		Non durable	Medium
	<b>Oak, European</b> <i>Quercus robur</i> <i>Q. petraea</i>		Durable	Medium
SOFTWOOD (Coniferous species)				
<b>C35</b> 480 kg/m <sup>3</sup>	<b>Larch, European</b> <i>Larix decidua</i>		Moderately durable Durable under water	Medium
	<b>Larch, Siberian</b> <i>Larix sibirica</i>		Moderately durable Durable under water	Medium
<b>C30</b> 460 kg/m <sup>3</sup>	<b>Redwood, European</b> <i>Pinus sylvestris</i>	Norway pine	Moderately durable	Medium
	<b>Spruce, Baltic</b> <i>Picea abies</i>	Whitewood	Non durable	Medium

## Annex III

# Recommended construction standards for GRP fishing vessels

## Part 1

### General

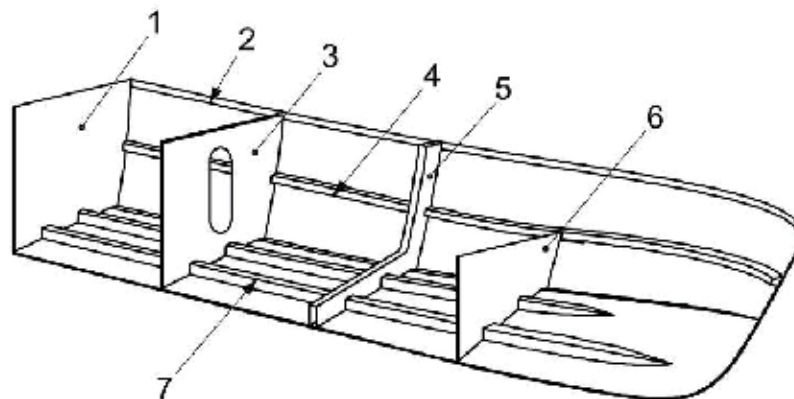
## 1 Scope

1.1 These construction standards apply to decked vessels of less than 12 m in length and undecked vessels.

1.2 In general, the standards apply to vessels of conventional form and of glass reinforced plastic construction (GRP); that is, single-hull vessels of glass rovings and mat and polyester resin construction, which, in general, should consist of:

- .1 a moulded hull of single-skin construction;
- .2 a deck of GRP sheathed plywood, GRP or traditional timber construction;
- .3 transverse framing;
- .4 a longitudinal structure, including gunwale, stringers, engine beds; and
- .5 in small vessels, internal furniture and hull form which may provide adequate stiffening.

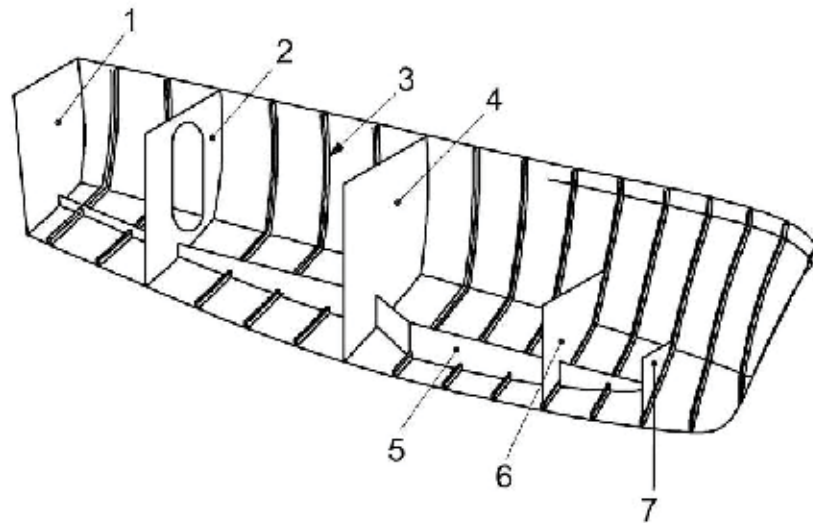
Typical longitudinal framing in a GRP vessel



#### Key

- 1 transom
- 2 gunwale stringer
- 3 bulkhead
- 4 side longitudinal stiffener (stringer)
- 5 web frame
- 6 deep floor
- 7 bottom longitudinal stiffener (girder or stringer)

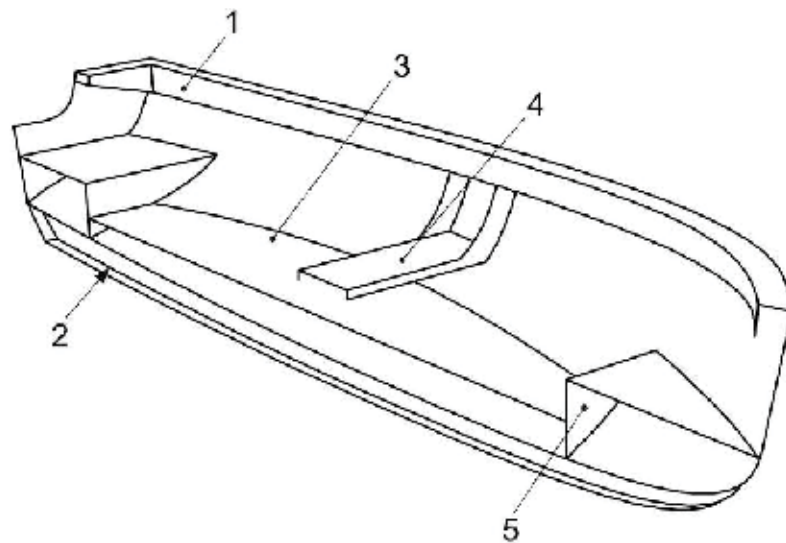
Typical transverse framing in a GRP vessel



**Key**

- |            |                 |
|------------|-----------------|
| 1 transom  | 5 bottom girder |
| 2 bulkhead | 6 deep floor    |
| 3 frame    | 7 deep floor    |
| 4 bulkhead |                 |

Typical framing in a small GRP vessel



**Key**

- |                    |
|--------------------|
| 1 gunwale stringer |
| 2 keel             |
| 3 structural sole  |
| 4 thwarts          |
| 5 deep floor       |

1.3 Standards are given for vessels operating at speeds up to 16 knots, as shown in Table 1 in Part 3. Vessels operating at higher speeds would require special consideration by the competent authority.

1.4 A number of vessel types are not covered by the requirements of these construction standards, including the following:

- .1 vessels constructed of other materials such as Kevlar reinforcements and epoxy resins;
- .2 vessels of sandwich construction; and
- .3 vessels judged by the competent authority to be outside the scope of this standard.

## 2 Design categories

These construction standards are based on the division of vessels into appropriate design categories; the categories indicate sea and wind conditions for which a vessel is considered to be suitable, provided that the vessel is correctly operated and moving at a speed appropriate to the prevailing sea state. Design categories are defined in 1.2.14.

## 3 Construction standards

3.1 The appropriate standards of construction for GRP vessels should be determined as set out in Parts 1 to 3.

Design category	Part 1	Part 2	Part 3
A	✓	✓	
B	✓	✓	
C	✓		✓
D	✓		

3.2 Vessels fitted with sails should be considered to operate in design categories C and D only, unless given special consideration by the competent authority.

3.3 Consideration should be given by the competent authority to increasing the scantlings given in the standards in parts of a vessel where special conditions may arise, including:

- .1 operation of fishing gear likely to damage structure by impact or abrasion; and
- .2 landing and hauling out of vessels on beaches and riverbanks.

Information on appropriate factors is given in Table 5.

## 4 Construction standards for GRP vessels of all design categories

### 4.1 Materials

4.1.1 Resins should be approved for marine use and be mixed and used in accordance with the manufacturer's recommendations.

**4.1.2** Glass reinforcements should be approved for marine use and may be in the form of chopped strand mat, woven rovings, fabric, powder-bound mat or other approved materials.

**4.1.3** Colour pigment may be used in the gel coat sufficient to give a satisfactory colour; the amount used should be in accordance with the manufacturer's recommendations. No pigment should be used in the lay-up resin of the hull laminates.

**4.1.4** Formers for stiffeners should be of rigid foam, timber, metal or other approved materials. Where timber is used, it should have a moisture content of not more than 15 percent. A common type of former for top-hat stiffeners is made of one layer of mat in a mould of the required stiffener dimensions.

**4.1.5** Careful attention should be paid to the manufacturer's recommendations concerning the storage and expiration dates of the materials to be used.

## **4.2 Workshop practice**

**4.2.1** All building activities should be carried out under a fixed roof and preferably in an enclosed workshop.

**4.2.2** The cleanliness of the workshop is important for the health of workers and to prevent the contamination of the resin and reinforcements.

**4.2.3** Waste material, dust, sand and other contaminants should be removed from the workshop immediately.

**4.2.4** The moulding area should be kept clear of dust and accumulations of waste material that could contaminate the mould surfaces.

**4.2.5** The recommended humidity and temperature ranges under which laminating may take place are: temperature 15 °C to 25 °C, humidity 70 percent. The moulding process should cease if the following limits are reached: temperature <13 °C or >32 °C, humidity >80 percent.

**4.2.6** The workshop should be as free as practicable from dust and fumes to allow comfortable and safe working conditions. Styrene fumes are heavier than air and should be removed from moulds by the use of mechanical ventilation systems.

**4.2.7** Completed mouldings should not be taken outside the workshop environment for seven days from the start of the moulding process. Where mouldings are moved outside after this period, they should be protected from rain.

**4.2.8** The addition of a catalyst to polyester products should be strictly controlled within the limits set by the manufacturers. Tables giving the amounts of catalyst/resin should be provided in the workshop.

**4.2.9** The catalyst must be properly dispersed through the resin by very thorough mixing.

**4.2.10** Where a primary bond would be achieved, little preparation of the surface is required prior to further laminating or bonding. A primary bond is generally achieved



if the surface has cured for about 24 hours to 48 hours and is still chemically active, allowing a chemical bond.

**4.2.11** Where a secondary bond would be achieved, additional surface preparation is required in the form of abrasion and cleaning. A secondary bond is achieved when the surface has cured for over 48 hours and is no longer chemically active; in this case the bond relies on the adhesive properties of the resin.

### **4.3 Laminate lay-up**

**4.3.1** The outside surface of all laminates should have a layer of gel coat or be treated with equivalent surface protection after completion of moulding. This layer should be 0.4 mm to 0.6 mm thick.

**4.3.2** The gel coat should only be left exposed in accordance with the manufacturer's recommendations; generally this would be a maximum of 24 hours.

**4.3.3** Heavy reinforcements should not be applied directly to the gel coat; the first two layers should consist of a light chopped strand mat of maximum weight 300 g/m<sup>2</sup>, unless the competent authority is satisfied that manufacturing experience justifies variation from this figure.

**4.3.4** Where woven rovings are incorporated, these should be alternated with layers of chopped strand mat.

**4.3.5** A suitable top coat should be applied in the bilge and keel areas where water would accumulate, unless the competent authority is satisfied that manufacturing experience justifies variation.

**4.3.6** Laminates should be locally increased in thickness in way of fittings and equipment; the increase is to be gradually reduced to the normal thickness by stepped layers.

**4.3.7** Any holes or openings cut in laminates should be sealed with resin or other suitable material.

**4.3.8** The overlap of mats or woven rovings should be at least 50 mm and the shift of subsequent reinforcement overlaps should be at least 100 mm.

**4.3.9** Laminate should be laid up in accordance with a documented sequence.

**4.3.10** Laminates should be worked in such a way that they are fully consolidated; that is, thoroughly wetted out, free from blisters, air gaps, delamination, resin-starved areas or excess resin.

**4.3.11** The interval between layers is to be carefully timed to enable proper completion of each laminate.

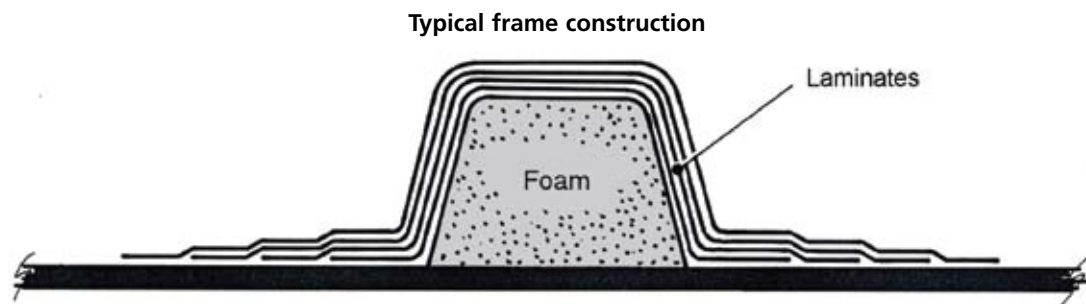
**4.3.12** The time lapse between the completion of the hull or deck laminate and the bonding of structural members should be kept within the limits of the manufacturer's recommendations.

## 4.4 Hull construction

4.4.1 The hull bottom should be a solid laminate of glass reinforcements in resin, laid up to a satisfactory weight. The keel and sheerstrake areas of the hull should have additional reinforcements. See Table 6 for hull additional reinforcement weight and width.

4.4.2 Hulls should be adequately stiffened; this reinforcement may be in the form of longitudinal or transverse stiffeners or a combination of both. Small vessels may make use of internal structures and features for stiffening.

4.4.3 Stiffeners may be constructed by moulding over foam or hollow formers which should be bonded to the inside hull laminate; see 4.2.10 and 4.2.11 for a description of primary and secondary bonding. Frame formers may be of top-hat or rectangular section. Where frames have gunwales or through-bolted stringers, the core of the frames is to be of timber.



4.4.4 Floors moulded over formers are to be fitted to the tops of the frames at the centre line and bonded to the frames.

4.4.5 Stringers, where fitted, may use foam or hollow formers and should be bonded to the hull shell; see 4.2.10 and 4.2.11 for a description of primary and secondary bonding. Alternatively, these may be formed of a combination of other longitudinal structural members, such as soles, decks and lockers.

4.4.6 In vessels below 7 m in LOA where a combination of bonding of internal furniture and hull form provides adequate stiffening, the framing may be omitted, subject to the approval of the competent authority.

4.4.7 In undecked vessels, the required bottom stiffening may be provided wholly or partly formed by the bonded-in flooring arrangement.

4.4.8 Where through-bolting connections are required, e.g. for gunwales or beam stringers, fastenings should be hot-dipped galvanized or of stainless steel. The edges of the laminate and the fastening holes should be sealed with resin or other suitable material.

4.4.9 The hull surface gel coat is to be adequately protected in way of all fishing gear hauling positions by GRP sheathing, metal, hard rubber or plastic, to prevent damage.

4.4.10 Discontinuities and hard points in the structure should be avoided. Where the strength of a stiffener may be reduced by attachment of fittings, openings, etc., additional laminates should be included.

**4.4.11** Transoms not subjected to loads from outboard engines or steering arrangements should have scantlings as required for the shell laminate.

**4.4.12** The glass weight at the corner of the transom and hull shell should be increased to provide additional reinforcement. See Table 6 for hull additional reinforcement weight and width.

**4.4.13** Transoms that are to be used for the mounting of outboard engines should be constructed to include a marine-grade plywood panel of sufficient dimension and of adequate strength for the proposed installation.

**4.4.14** The stem should be moulded to include a gradual reduction from the keel weight to that required for the sheer.

**4.4.15** The centre of the hull aft of the keel to the transom is to be stiffened by lay-ups as required for the keel.

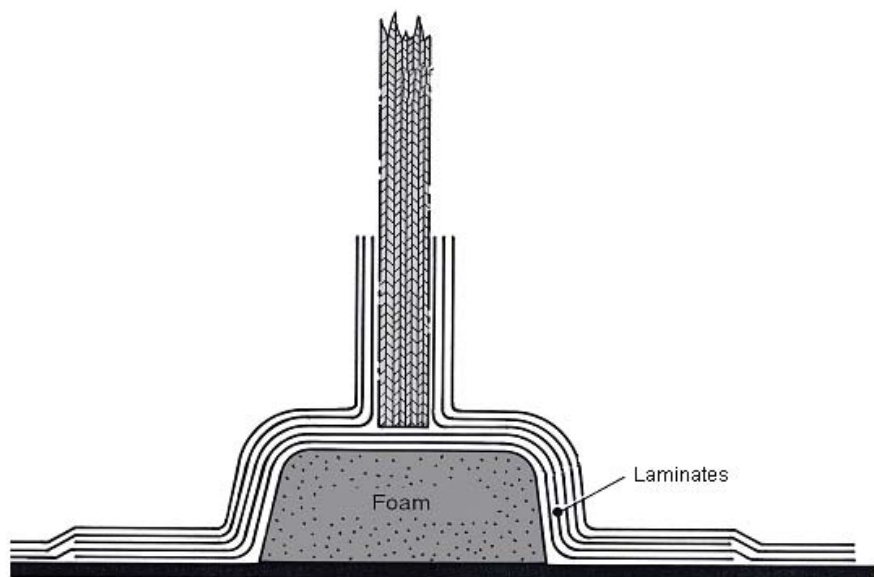
**4.4.16** Where fitted, rubbing strakes may be of hardwood, rubber or plastic; securing bolts should be hot-dipped galvanized and sealed to prevent leakage.

**4.4.17** Engine seatings should generally be continuous structures and, where space permits, the seatings should extend at least twice the length of the engine, unless the competent authority is satisfied that manufacturing experience justifies variation.

**4.4.18** The seatings should be bonded to the hull and stiffened transversely with floor sections and side support brackets. A continuous flat steel plate of adequate thickness and width is to be fitted to the top of the seating in way of the engine and gearbox and bonded to the seating.

**4.4.19** Where included, it is recommended that bulkheads are fitted to a rigid foam core seating or frame section. When not practical to fit on a frame position, the bulkhead should be bonded to the shell with double angles of a satisfactory weight.

**Typical bulkhead installation**



**4.4.20** Bolt connections should be well-sealed and glassed over to prevent leakage.

4.4.21 Consideration should be given to including easily replaceable sacrificial structures and additional layers of laminate in locations where impact or abrasion could occur. These include areas subject to wear, such as gunwales and keels, and areas subject to impact or abrasion by fishing gear.

## 4.5 Deck construction

4.5.1 Decks may be of GRP sheathed plywood, GRP or traditional timber construction.

4.5.2 A beam shelf or stringer is to be bonded to the hull shell to support the deck beams. A system combining through-bolting and bonding is recommended.

4.5.3 Deck beams should be fitted at each frame position, with longitudinal stiffening provided by hatches and carlings as required.

4.5.4 Decks in way of gallows, warp leads, deck machinery and heavy work positions should have additional stiffening and pillars to the approval of the competent authority.

4.5.5 Main beams should be fitted in way of all deck openings, machinery and deckhouse casings, and in way of masts and heavy deck machinery.

4.5.6 Where deck beams of timber are fitted, reference should be made to Annex II.

4.5.7 Where decks and deck beams are of GRP construction, openings in the deck may be stiffened by forming continuously moulded flanges, the weight of which should be 25 percent greater than the laid-up deck laminate weight. Deck openings over 500 mm in length should be fitted with longitudinal stiffening.

4.5.8 Plywood decks should be bolted and bonded to the beam shelf and bonded to the hull. The complete deck area should be sheathed with a GRP laminate. Special attention should be paid to the sheathing in way of working areas that may require extra protection.

4.5.9 Where laid timber planked decking is used for decks, reference should be made to Annex II.

## Part 2

### *Recommended construction standards for GRP vessels of design categories A and B*

## 1 Introduction

The construction standards described here should be applied to all decked vessels of design categories A and B.

## 2 Construction

2.1 In general, the requirements of Part 1 should be complied with in addition to the requirements below.

2.2 The strength and construction of the hull, deck and other structures should be sufficient to withstand all foreseeable conditions of the intended service.

2.3 All vessels should meet requirements that are compatible with a recognized GRP vessel construction standard\* or an equivalent standard, and be built to the satisfaction of the competent authority.

## Part 3

### *Recommended construction standards for GRP vessels of design category C*

## 1 Introduction

1.1 The construction standards described here should be applied to all decked and undecked vessels of design category C.

1.2 The tables and figures given in this part are based on the ISO standards 12215-5 – *Small craft hull construction and scantlings – Part 5: Design pressures for monohulls, design stresses, scantlings determination* and 12215-6 – *Small craft hull construction and scantlings – Part 6: Structural arrangements and details*.

1.3 The construction standards described here should always be read in conjunction with Part 1 of this annex.

1.4 The hull construction standards are based on maximum operating speeds according to vessel length; the operating speeds are shown in Table 1.

1.5 The hull construction standards are based on the loaded displacement of the vessel, including vessel, crew, fishing gear, fuel, fish and ice, stores and equipment. Where this is not known, an approximation can be made from the Cubic Numeral (CuNo) of the vessel; approximate values are shown in Table 2.

## 2 Construction

### 2.1 Hull and deck

2.1.1 Hull laminate should be of a thickness that is suitable for the size of the vessel and the spacing of the framing. Table 3 shows the minimum required laminate weight (w) and equivalent thickness (t).

2.1.2 Deck laminate should be of a thickness that is suitable for the loaded displacement of the vessel and the spacing of the frames (or panel size). Table 4 shows the minimum required laminate weight (w) and equivalent thickness (t).

2.1.3 Additional factors should be applied to the minimum laminate weight according to the intended use of the vessel; appropriate factors are shown in Table 5. The factors

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\* The standards include:

1. the Nordic Boat Standard;
2. the construction rules of the United Kingdom Sea Fish Industry Authority (Seafish); and
3. the construction rules of recognized organizations.

account for the design and use of the vessel and should be applied as considered necessary by the competent authority.

**2.1.4** The following areas should be reinforced by additional laminates: keel, stem, chine and deck edge. Table 6 gives the total laminate weight required and the width of the reinforcement.

## 2.2 Stiffeners

**2.2.1** Hull and deck stiffeners should be of a size that is suitable for the size of the vessel, the spacing of stiffeners or panel size. Tables 7 and 8 show the required section modulus.

**2.2.2** The section modulus can be modified by the application of factors to the table values. Table 9 shows the factors for stiffener curvature and glass mat/roving content. If there is doubt about what factor to use, the table figures without factors should be used.

**2.2.3** The properties of various top hat type stiffeners are given in Tables 10 and 11.

Table 1

### Maximum operating speeds

Length overall LOA (m)	4	6	8	10	12
Maximum speed (knots)	9	11	13	15	16

Table 2

### Cubic numeral and loaded displacement

Cubic numeral (CuNo) (m <sup>3</sup> )	Undecked vessel approximate loaded displacement (kg)	Decked vessel approximate loaded displacement (kg)
4	600	–
6	900	–
8	1 200	–
10	1 500	–
12	1 800	–
14	2 100	–
16	2 400	–
18	2 700	–
20	3 000	4 800
25	3 750	6 000
30	4 500	7 200
35	–	8 400
40	–	9 600
45	–	10 800
50	–	12 000
60	–	14 400
70	–	16 800
80	–	19 200
90	–	21 600
100	–	24 000

Note: The figures given are approximate and, where possible, it is better to obtain accurate displacement figures from calculations and measurements.

Table 3  
Minimum hull laminate weight

Panel width (mm)	500	500	600	600	800	800	1 000	1 000	1 200	1 200	1 400	1 400
Loaded displ. (kg)	t (mm)	w (min.) (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )
250	3.9	1 670	4.4	1 880	5.2	2 250	6.6	2 810	7.9	3 370	9.2	3 930
500	4.3	1 860	4.9	2 090	5.8	2 490	6.9	2 960	8.3	3 550	9.7	4 140
1 000	4.8	2 070	5.4	2 330	6.5	2 780	7.7	3 280	9.2	3 930	10.7	4 580
2 000	5.4	2 330	6.1	2 620	7.3	3 130	8.6	3 690	10.3	4 400	12.0	5 140
4 000	6.2	2 640	6.9	2 960	8.3	3 540	9.8	4 180	11.5	4 930	13.4	5 760
6 000	6.6	2 840	7.5	3 190	8.9	3 820	10.5	4 500	12.3	5 280	14.4	6 160
8 000	7.0	3 000	7.9	3 370	9.4	4 030	11.1	4 750	12.9	5 530	15.1	6 450
10 000	7.3	3 130	8.2	3 520	9.8	4 200	11.6	4 960	13.4	5 740	15.6	6 700
12 000	7.6	3 240	8.5	3 650	10.2	4 360	12.0	5 140	13.8	5 920	16.1	6 900
15 000	7.9	3 390	8.9	3 810	10.6	4 550	12.5	5 370	14.3	6 140	16.7	7 160
18 000	8.2	3 510	9.2	3 950	11.0	4 720	13.0	5 570	14.8	6 330	17.2	7 380
20 000	8.4	3 590	9.4	4 030	11.3	4 820	13.3	5 680	15.1	6 470	17.5	7 510
22 000	8.5	3 660	9.6	4 110	11.5	4 910	13.5	5 790	15.4	6 590	17.8	7 630
25 000	8.8	3 750	9.8	4 220	11.8	5 040	13.9	5 950	15.8	6 770	18.2	7 790

Note: The figures listed for a 500 mm panel width are the minimum figures to be used and weights below this should not be used after the application of factors.

Table 4  
Minimum deck laminate weight

Panel width (mm)	500	500	600	600	700	700
Length overall (m)	t (mm)	w (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )	t (mm)	w (g/m <sup>2</sup> )
4	3.3	1 420	3.8	1 650	4.5	1 920
5	3.5	1 510	3.8	1 650	4.5	1 920
6	3.8	1 650	3.8	1 650	4.5	1 920
7	4.0	1 700	4.0	1 700	4.5	1 920
8	4.2	1 790	4.2	1 790	4.5	1 920
9	4.4	1 880	4.4	1 880	4.5	1 920
10	4.6	1 970	4.6	1 970	4.6	1 970
11	4.8	2 060	4.8	2 060	4.8	2 060
12	5.0	2 150	5.0	2 150	5.0	2 150
13	5.2	2 240	5.2	2 240	5.2	2 240
14	5.5	2 340	5.5	2 340	5.5	2 340
15	5.7	2 430	5.7	2 430	5.7	2 430

- Notes: 1) The figures given show w, the minimum required weight in g/m<sup>2</sup> of dry laminate to be used in construction.  
2) The table shows weights of laminates where chopped strand mat is 90 percent to 100 percent of the total glass weight. Correction for other combinations of mat and roving are accounted for in Table 5.  
3) The figures listed for a 500 mm panel width are the minimum figures to be used and weights below this should not be used after the application of factors.

Table 5  
Factors applied to minimum laminate

Panel curvature factor, Fc						
c/b	0.03 and below	0.06	0.09	0.12	0.15	0.18 and above
Fc	1	0.90	0.80	0.70	0.60	0.50

where c and b are illustrated in figures entitled Design details at the end of this annex.

Glass mat/roving factor, Fw							
R	0.30	0.40	0.50	0.60	0.70	0.80	0.90–1.00
Fibreglass content	0.41	0.39	0.37	0.35	0.33	0.32	0.30
Mat/roving factor Fw	0.89	0.91	0.93	0.95	0.97	0.98	1.00

where  $R = \frac{\text{Weight of chopped strand mat (CSM) in g/m}^2}{\text{Total weight of glass fibre in g/m}^2}$

Usage factor			
Usage factor	Type	Conditions	Factor
Fv Vessel landing	River landing	Calm water	1.00
	Harbour landing	Impact on quays, walls, etc.	1.05
	Beach landing	Small surf	1.10
	Beach landing	Large surf	1.20
Fg Fishing gear	Light fishing gear (nets and lines)	Damage unlikely	1.00
	Heavy fishing gear (trawl)	Impact structure	1.10

Usage factor = Fv x Fg

- Notes: 1) The minimum required weight in g/m<sup>2</sup> of dry laminate should be multiplied by the relevant factors from the table above. Thus the required weight of dry laminate = minimum weight x Fc x Fw x Fv x Fg.  
2) The total factor applied (Fc x Fw x Fv x Fg) need not be greater than 1.2.

Table 6  
Hull additional reinforcement weight and width

Loaded displacement (kg)	Width of additional reinforcement (mm)	Keel	Stem	Chine & deck edge
		Multiply minimum fibre weight by	Multiply minimum fibre weight by	Multiply minimum fibre weight by
250	50	2.2	2.0	1.7
500	60			
1 000	70			
2 000	90			
4 000	110			
6 000	120			
8 000	130			
10 000	140			
12 000	150			
15 000	160			
18 000	170			
20 000	180			
22 000	190			
25 000	200			

Note: The width of additional reinforcement is distributed either side of the keel/stem/chine; see the illustrations below.



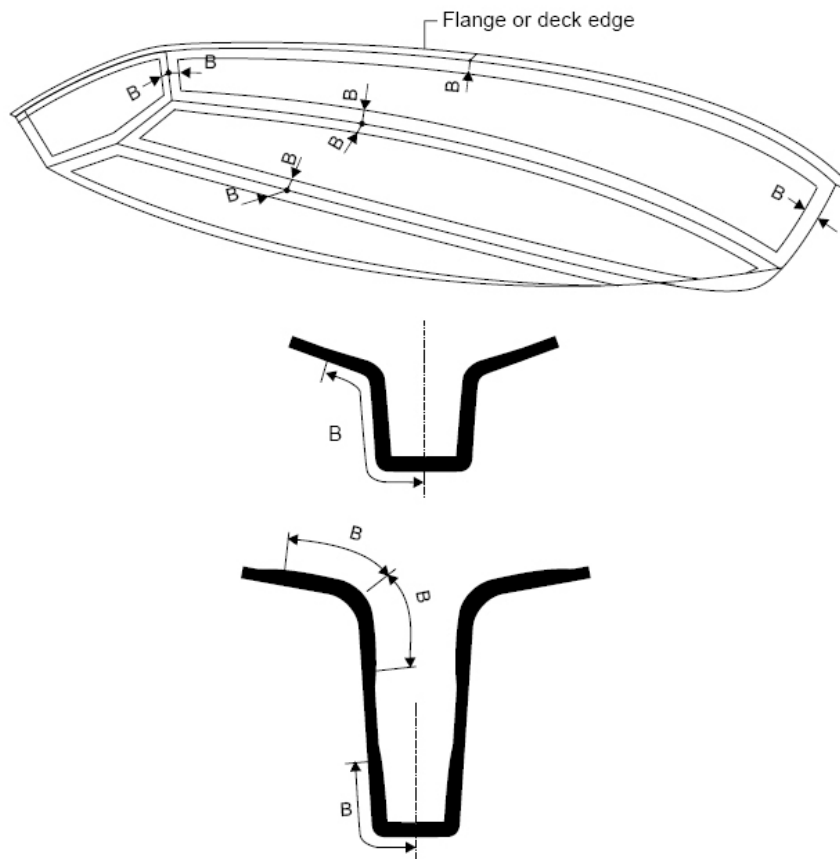


Table 7  
Hull stiffeners – section modulus SM cm<sup>3</sup>

Loaded displacement $m_{LDC}$ (kg)	Stiffener spacing $s = 500$ mm						
	Stiffener span $l$ (mm)						
	500	750	1000	1250	1500	1750	2000
500	2.5	4.6	7.1	11	16	22	28
1000	3.1	5.9	9.0	13	19	26	34
5000	5.4	10	16	21	30	41	54
10000	7.0	13	20	28	38	52	68
15000	8.2	15	24	33	44	60	78
20000	9.2	17	27	36	48	65	86
25000	10	19	29	40	52	70	92

Loaded displacement $m_{LDC}$ (kg)	Stiffener spacing $s = 600$ mm						
	Stiffener span $l$ (mm)						
	500	750	1000	1250	1500	1750	2000
500	2.8	5.3	8.5	13	19	26	34
1000	3.5	6.6	10	16	23	32	41
5000	6.1	12	18	25	37	50	65
10000	8.0	15	23	32	46	63	82
15000	9.3	18	27	37	53	71	93
20000	10	20	30	41	58	79	103
25000	11	22	33	45	62	85	110

Loaded displacement $m_{LDC}$ kg	Stiffener spacing $s = 700$ mm						
	Stiffener span $l$ (mm)						
	500	750	1000	1250	1500	1750	2000
500	3.1	5.9	10	16	22	31	40
1000	3.9	7.3	12	19	27	37	48
5000	6.8	13	21	32	46	63	82
10000	9.0	17	26	37	54	73	95
15000	10	20	30	43	61	83	109
20000	12	22	34	47	67	92	120
	13	24	37	50	72	99	129

Loaded displacement $m_{LDC}$ kg	Stiffener spacing $s = 800$ mm						
	Stiffener span $l$ (mm)						
	500	750	1000	1250	1500	1750	2000
500	3.4	6.4	11	18	26	35	46
1000	4.3	8.0	14	22	31	42	55
5000	7.5	14	22	34	49	66	87
10000	9.7	18	28	43	61	83	109
15000	11	21	33	49	70	95	124
20000	13	24	37	53	77	105	137
25000	14	26	40	58	83	112	147

Table 8  
Deck stiffeners – section modulus SM cm<sup>3</sup>

Stiffener spacing $s = 500$ mm						
Stiffener span $l$ (mm)						
1000	1500	2000	2500	3000	3500	4000
7.0	16	28	44	64	87	113

Stiffener spacing $s = 600$ mm						
Stiffener span $l$ (mm)						
1000	1500	2000	2500	3000	3500	4000
9	19	34	53	77	104	136

Stiffener spacing $s = 700$ mm						
Stiffener span $l$ (mm)						
1000	1500	2000	2500	3000	3500	4000
9.8	20	36	56	81	110	143

Table 9  
Stiffener – curvature and roving factors

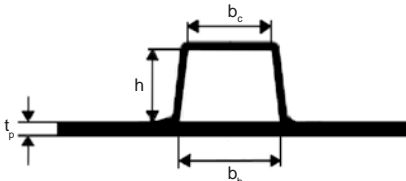
STIFFENER - CURVATURE FACTOR-  $f_{cs}$

$\frac{c}{l}$	0.03 and below	0.06	0.09	0.12	0.15	0.18 and above
$f_{cs}$	1.0	0.90	0.80	0.70	0.60	0.50

STIFFENER MAT - ROVING FACTOR  $f_{ws}$

R	0.3	0.4	0.5	0.6	0.7	0.8	0.9 - 1.0
Glass fibre content	0.32	0.31	0.30	0.28	0.27	0.26	0.25
$f_{ws}$	0.72	0.75	0.78	0.87	0.91	0.96	1.00

Table 10  
Top hat stiffeners

TOP HAT STIFFENERS						
<p style="text-align: center;">LOW TOP HAT STIFFENER</p>  <p style="text-align: center;">Glass content: <math>g = 0.30</math> (Chopped strand mat CSM)</p>	Dimensions of former		Plating thickness $t$ mm	Stiffener glass weight $w$ g/m <sup>2</sup>	Section modulus $SM_{MIN}$ cm <sup>2</sup>	
	$h$ mm	$b_b$ mm				$b_c$ mm
	25	36	30	5	600	1.8
				10	600	2.7
				15	600	5.1
	40	60	50	5	600	4.5
				10	600	5.4
				15	600	7.5
	50	75	65	5	900	10
				10	900	12
				15	900	14
	60	90	75	5	1200	19
				10	1200	21
				15	1200	24
	75	100	85	5	1200	27
				10	1200	30
				15	1200	33
	100	150	125	5	1800	73
				10	1800	81
				15	1800	87
125	175	150	5	2100	125	
			10	2100	140	
			15	2100	149	
150	220	190	5	2700	230	
			10	2700	260	
			15	2700	280	

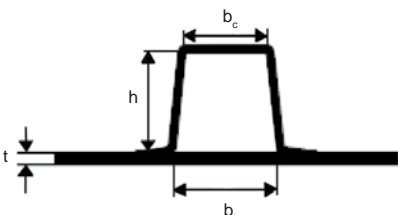
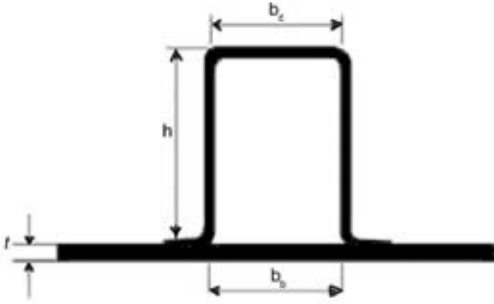
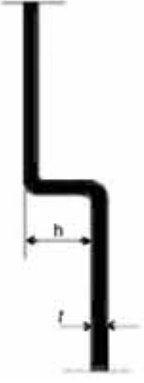
SQUARE TOP HAT STIFFENER						
<p style="text-align: center;">SQUARE TOP HAT STIFFENER</p>  <p style="text-align: center;">Glass content: <math>g = 0.30</math> (Chopped strand mat CSM)</p>	Dimensions of former		Plating thickness $t$ mm	Stiffener glass weight $w$ g/m <sup>2</sup>	Section modulus $SM_{MIN}$ cm <sup>3</sup>	
	$h$ mm	$b_b$ mm				$b_c$ mm
	25	25	20	5	600	1.5
				10	600	2.2
				15	600	4.6
	40	40	35	5	600	3.6
				10	600	4.4
				15	600	6.3
	50	50	45	5	900	8.2
				10	900	9.5
				15	900	12
	60	60	50	2	1200	15
				10	1200	17
				15	1200	19
	75	75	65	5	1200	23
				10	1200	26
				15	1200	28
	100	100	85	5	1800	56
				10	1800	65
				15	1800	69
125	125	105	5	2100	98	
			10	2100	112	
			15	2100	112	
150	150	125	5	2700	173	
			10	2700	198	
			15	2700	213	

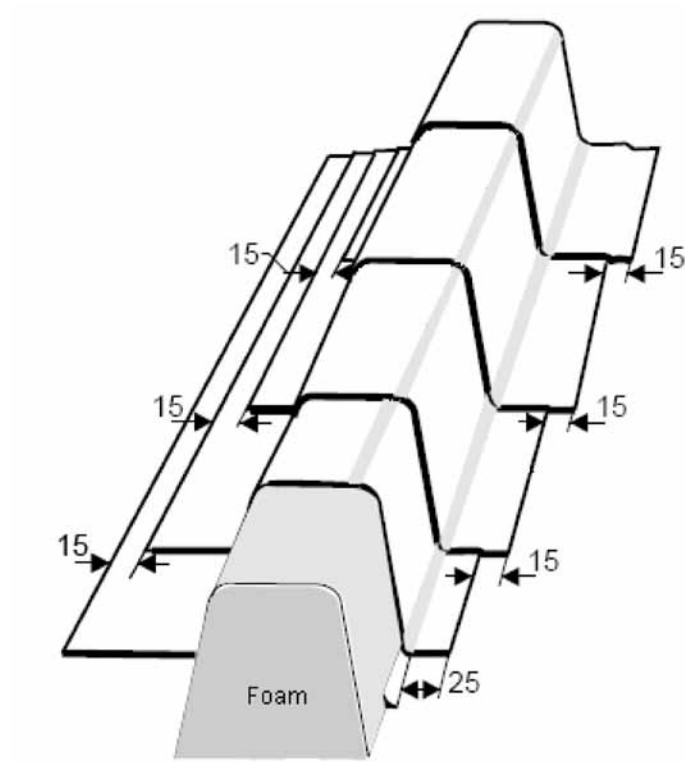
Table 11  
Top hat stiffener and laminate step stiffener

TOP HAT STIFFENERS AND LAMINATE STEP STIFFENER						
<p style="text-align: center;"><b>TALL TOP HAT STIFFENER</b></p>  <p style="text-align: center;"><b>Glass content: g = 0.30 (Chopped strand mat CSM)</b></p>	Dimensions of former			Plating thickness t mm	Stiffener glass weight w kg/m <sup>2</sup>	Section modulus SM <sub>MIN</sub> cm <sup>3</sup>
	h mm	b <sub>b</sub> mm	b <sub>c</sub> mm			
	100	50	50	5	1.800	41
				10	1.800	48
				15	1.800	53
	125	50	50	5	2.100	65
				10	2.100	77
				15	2.100	84
	150	50	50	5	2.700	104
				10	2.700	126
				15	2.700	139
	150	75	75	5	2.700	126
				10	2.700	150
				15	2.700	163
	175	75	75	5	3.000	161
10				3.000	194	
15				3.000	213	
200	75	75	5	3.600	240	
			10	3.600	290	
			15	3.600	322	
200	100	100	5	3.600	277	
			10	3.600	331	
			15	3.600	364	
250	100	100	5	4.200	433	
			10	4.200	518	
			15	4.200	576	

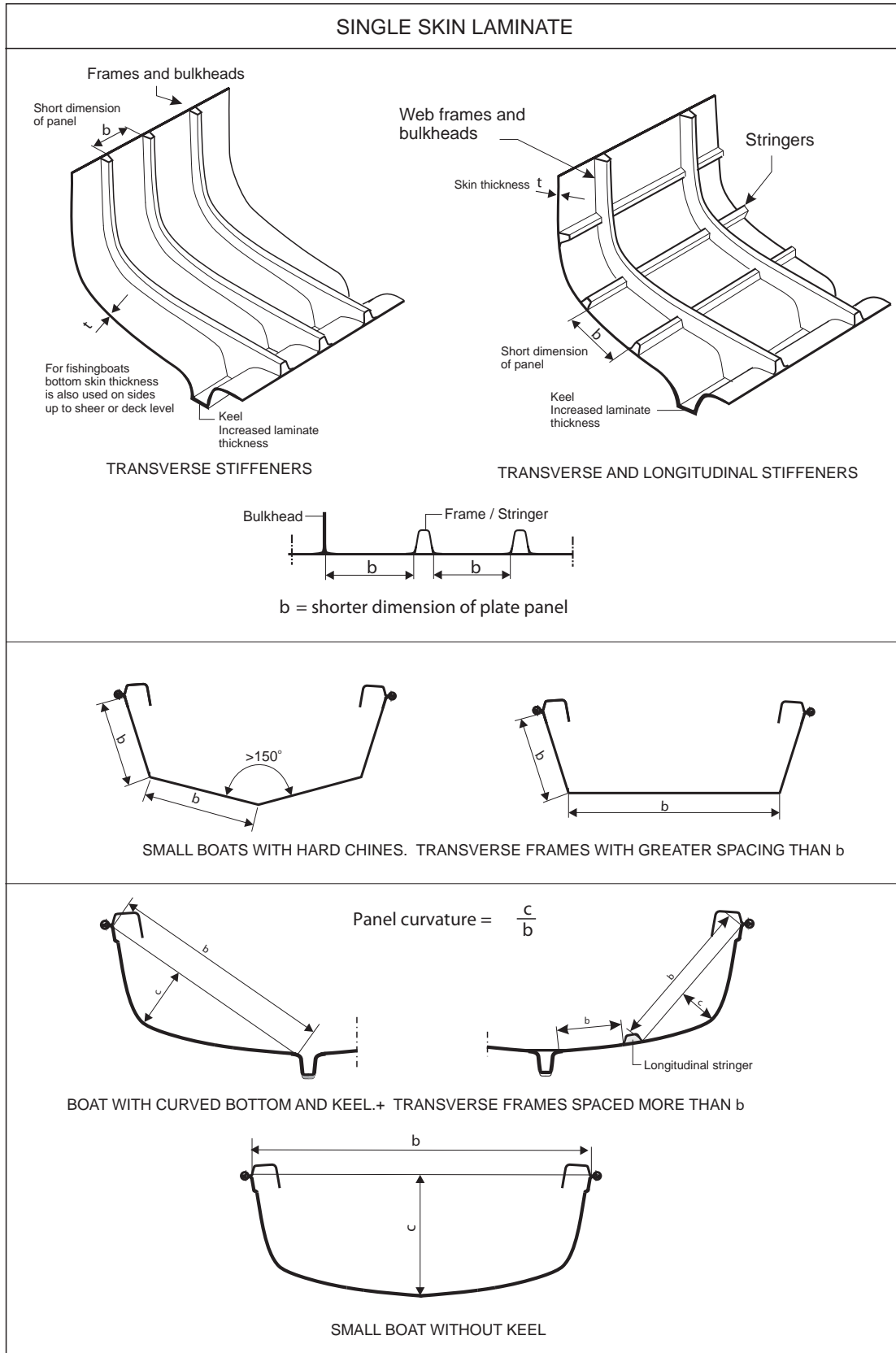
  

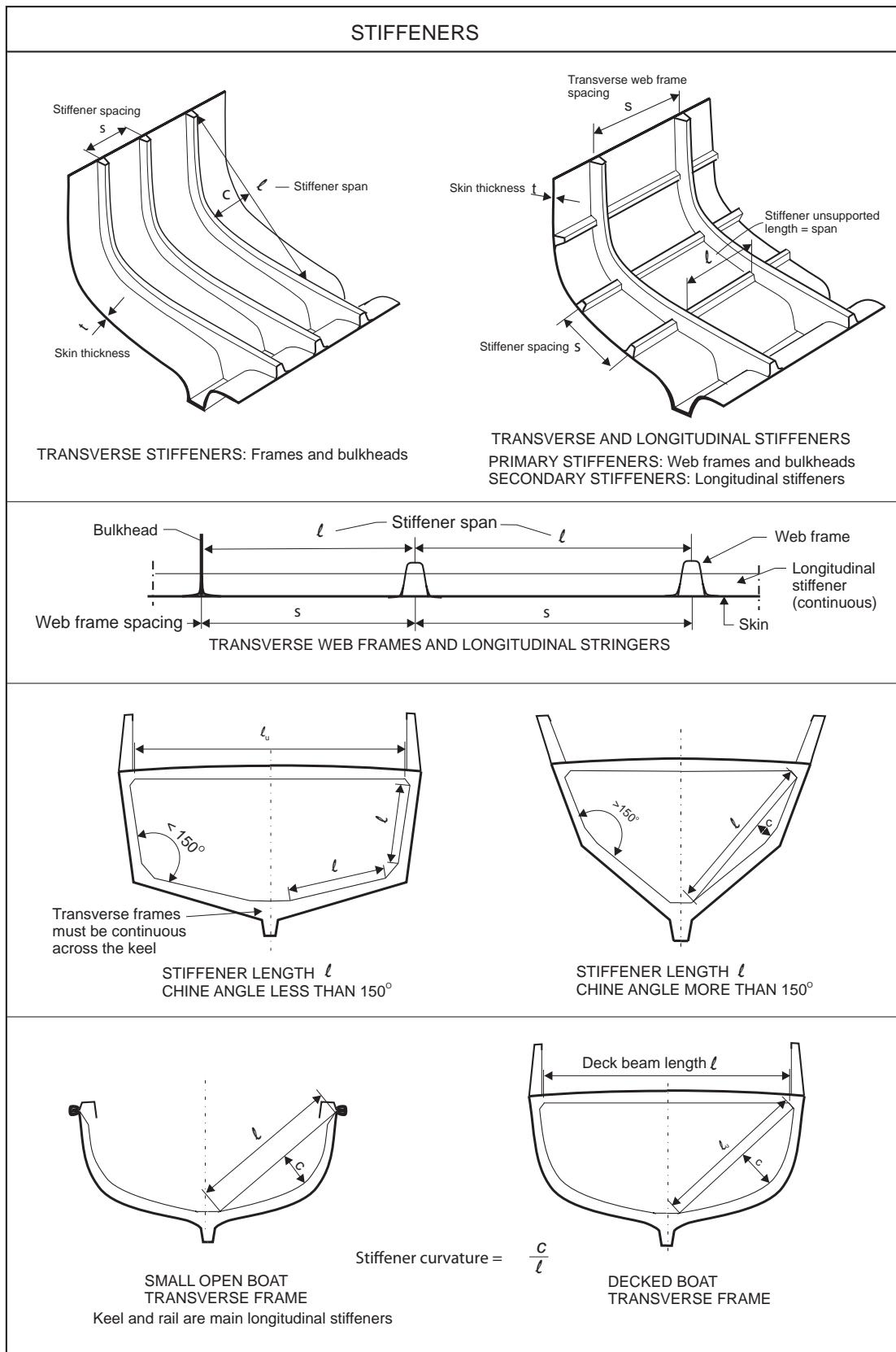
LAMINATE STEP STIFFENER				
<p style="text-align: center;"><b>LAMINATE STEP STIFFENER</b></p>  <p style="text-align: center;"><b>Glass content: g = 0.30 (Chopped strand mat CSM)</b></p>	Height of step h mm	Laminate thickness t mm	Laminate glass weight w kg/m <sup>2</sup>	Section modulus SM cm <sup>3</sup>
	15	5	2.100	1.0
		10	4.300	2.2
		15	6.400	3.6
	20	5	2.100	2.9
		10	4.300	3.4
		15	6.400	5.2
	30	5	2.100	4.4
		10	4.300	8.0
		15	6.400	11
	40	5	2.100	8.2
		10	4.300	14
		15	6.400	20
	50	5	2.100	14
		10	4.300	23
15		6.400	32	
60	5	2.100	20	
	10	4.300	34	
	15	6.400	46	

### Bonding Stiffeners



### Design details – Single skin laminate







## Annex IV

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# Recommended construction standards for steel fishing vessels

## Part 1

### *General*

## 1 Scope

These construction standards apply to single-hull, steel vessels of conventional shape operating at moderate speed, that is, up to a maximum of 15 knots. Vessels of unusual design or shape and those operating at higher speeds will require special consideration by the competent authority.

## 2 Design categories

These construction standards are based on the division of vessels into appropriate design categories; the categories indicate sea and wind conditions for which a vessel is considered to be suitable, provided that the vessel is correctly operated and moving at a speed appropriate to the prevailing sea state. Design categories are defined in 1.2.14.

## 3 Construction standards

3.1 The appropriate standards of construction for steel vessels should be determined as set out in the table below:

Design category	Part 1	Part 2	Part 3
A	✓	✓	
B	✓	✓	
C	✓		✓
D	✓		

3.2 Vessels fitted with sails should be considered to operate in design categories C and D only, unless given special consideration by the competent authority.

## 4 Construction standards for steel vessels of all design categories

### 4.1 Materials

4.1.1 During construction of the vessel, documents should be kept to demonstrate that the materials used are of shipbuilding quality, have certificates issued by recognized organizations or a competent authority and have the following properties:

- .1 minimum yield stress 240 N/mm<sup>2</sup>;
  - .2 tensile strength 410 N/mm<sup>2</sup>; and
  - .3 ultimate strain 22 percent.
- 4.1.2 The materials used should be dry and free from corrosion.
- 4.1.3 All plates used should have a mean thickness which corresponds to the nominal thickness of the plate.
- 4.1.4 Plates and sections should be stored horizontally so that the materials are not damaged or deformed.

## **4.2 Alignment of materials**

- 4.2.1 The construction and welded joints in the material should be such that there is good accessibility for welding.
- 4.2.2 The alignment of plates and profiles should be such that correct scantlings are maintained across all connections and welded joints.
- 4.2.3 The cutting and preparation of plates should be such that good welded connections can be achieved.

## **4.3 Welding**

- 4.3.1 All welding work should be carried out by suitably qualified persons. Any failure or unsatisfactory piece of work should be corrected before final painting.
- 4.3.2 The welding of the hull should be carried out under supervision and be inspected upon completion by an approved welder.
- 4.3.3 When welding during low temperatures or damp weather, preheating of the steel should be arranged.
- 4.3.4 When welding plates are thicker than 4 mm, either a 30° joint should be used or also welding on the back side.
- 4.3.5 Double continuous welding should always be used in the case of:
- .1 foundations; and
  - .2 end connections and brackets for stiffeners.
- 4.3.6 Continuous welding should always be used for plates in:
- .1 the hull plating;
  - .2 deck and superstructures;

- .3 tanks; and
- .4 the bulkhead connection to bottom and sides.

4.3.7 Double intermittent welding may be used in other cases. The interruptions should not be longer than the length of the weld and the total length of welding should at least correspond to that of a continuous welding.

4.3.8 One-sided intermittent welding may be used for fastening of stiffeners that are not subjected to a load, e.g. buckling stiffeners.

4.3.9 Fillet welds should normally have an a-measure (throat measurement) of at least 3.5 mm.

## **4.4 Detailed construction**

4.4.1 Structural continuity is to be maintained at all primary structural members.

4.4.2 Knee plates should be used where necessary in order to achieve sufficient fastening area.

4.4.3 Stiffeners should be welded to the web frames and girders also where the stiffeners are all continuous through.

## **4.5 Inspection and testing**

4.5.1 The scantlings table, where applicable, and the material documentation for and workmanship of each vessel should be subject to inspections at key stages of its construction.

4.5.2 The testing of welded joints by x-ray or similar method may be carried out where considered necessary.

## **Part 2**

### *Recommended construction standards for steel vessels of design categories A and B*

## **1 Introduction**

The construction standards described here should be applied to all decked vessels of design categories A and B.

## **2 Construction**

2.1 The requirements of Part 1 should be complied with in addition to the requirements below.

**2.2** The strength and construction of the hull, deck and other structures should be sufficient to withstand all foreseeable conditions of the intended service.

**2.3** All vessels should meet requirements that are compatible with a recognized steel vessel construction standard\* or an equivalent standard and be built to the satisfaction of the competent authority.

### **Part 3**

## *Recommended construction standards for steel vessels of design category C*

### **1 Introduction**

**1.1** The construction standards described here should be applied to all decked and undecked vessels of design category C.

**1.2** The construction standards described here should always be read in conjunction with Part 1.

### **2 Scantlings\*\*,\*\***

Minimum scantlings should be in accordance with the table below. Figures may be based on interpolation for vessels with a length overall between 8 m and 15 m.

LOA (m)	8	9	10	11	12	15	Remarks
Frame spacing (mm)	Max. 500	500	500	500	500	500	
<b>Bar keel</b>							
Sectional area (cm <sup>2</sup> )	15	15	15	15	15	15	Where bar keel is omitted, keelplate = 1.5 x t bottom. Total breadth 30 x LOA mm
<b>Centre keel</b>							
Sectional area (cm <sup>2</sup> )	15	16	17	17	18	20	Required only where the bar keel is omitted.
Min. thickness (mm)	6.5	6.5	6.5	6.5	6.5	6.5	

\* The standards include:

1. the Nordic Boat Standard;
2. the construction rules of the United Kingdom Sea Fish Industry Authority (Seafish); and
3. the construction rules of recognized organizations.

\*\* The scantlings are based on the Simplified Strength Requirements for Steel Boats from the Nordic Boat Standard.

\*\*\* The scantlings are corrected by the factors applicable to fishing vessels set out in the Nordic Boat Standard.

LOA (m)	8	9	10	11	12	15	Remarks
<b>Floor</b>							
Height (mm)	200	210	215	225	230	250	Required only at every third frame on the other frames skeleton floors.
Thickness (mm)	4	4	4.5	4.5	5	5	
Flange (mm)	50 x 3.5	50 x 4	50 x 4.5	50 x 4.5	50 x 5	50 x 6	May be omitted where cement is inserted up to the top of the floors.
<b>Keelson</b>	UPN 100	UPN 100	UPN 100	UPN 100	UPN 120	UPN 120	(Channel) Required only where centre keel is omitted.
<b>Frames</b>							
Web (mm)	90 x 6.5	90 x 6.5	100 x 6.5	100 x 6.5	100 x 7	100 x 7	
Section mod. (cm <sup>3</sup> )	10	11.6	12.6	14.7	15.8	19	
<b>Bottom plates (mm)</b>	5	5.5	6	6.5	6.5	7.5	Keel plates and stem plates to be increased by 1 mm.
<b>Shell plates (mm)</b>	4.5	5	5.5	5.5	6	6.5	
<b>Bulkheads</b>							
Plates (mm)	5	5.5	5.5	6	6	6.5	Max. spacing 750 mm.
Stiffener web (mm)	50 x 6.5	50 x 6.5	50 x 6.5	50 x 7	50 x 7	50 x 7	
Stiffener sec. mod. (cm <sup>3</sup> )	6.5	6.5	6.5	7.5	7.5	7.5	
<b>Deck</b>							
Plates (mm)	4.5	5	6	6	7	7	Max. spacing 300 mm. Max. span 3.5 m.
Beam web (mm)	90 x 9	90 x 9	90 x 9	90 x 9	90 x 9	90 x 9	
Beam sec. mod. (cm <sup>3</sup> )	25	25	25	25	25	25	
<b>Bulwark (mm)</b>	4.5	4.5	4.5	5	5.5	5.5	Stiffener 50 x 6 mm. Max. spacing 500 mm.
<b>Superstructure/ deckhouse (mm)</b>	4.5	4.5	4.5	5	5.5	5.5	Stiffener 50 x 6 mm. Max. spacing 500 mm.



## Annex V

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# Recommended construction standards for aluminium fishing vessels

## Part 1

### *General*

## 1 Scope

These construction standards apply to single hull, aluminium vessels of conventional shape operating at moderate speed, that is, up to a maximum of 15 knots. Vessels of unusual design or shape and those operating at higher speeds will require special consideration by the competent authority.

## 2 Design categories

These construction standards are based on the division of vessels into appropriate design categories; the categories indicate sea and wind conditions for which a vessel is considered to be suitable, provided that the vessel is correctly operated and moving at a speed appropriate to the prevailing sea state. Design categories are defined in 1.2.14.

## 3 Construction standards

3.1 The appropriate standards of construction for aluminium vessels should be determined as set out in the table below:

Design category	Part 1	Part 2	Part 3
A	✓	✓	
B	✓	✓	
C	✓		✓
D	✓		

3.2 Vessels fitted with sails should be considered to operate in design categories C and D only, unless given special consideration by the competent authority.

## 4 Construction standards for aluminium vessels of all design categories

### 4.1 General

Vessels may be built in accordance with this section providing that:

- .1 the speed of the vessel is not greater than 15 knots; and
- .2 all structural elements are accessible for inspection and measurement.

## **4.2 Materials**

**4.2.1** During construction, documents should be kept to indicate that the materials used are seawater-resistant aluminium, have certificates issued by a recognized organization or a competent authority and have at least the following properties:

$$\sigma_2 = 170 \text{ N/mm}^2$$

**4.2.2** Plates, profiles and other aluminium materials should be stored horizontally so that the materials are not damaged or deformed.

**4.2.3** The material used should be straight and undamaged and have the required scantlings.

**4.2.4** Storage premises for welding equipment and electrodes should be kept dry and clean.

**4.2.5** Aluminium materials should not be stored together with other metallic materials.

**4.2.6** Plates used for the hull should be seawater-resistant and should normally have the following material composition:

- .1 Cu max. 0.2 percent;
- .2 Fe max. 0.5 percent;
- .3 Mg max. 2.0 percent.

The following materials fulfil these requirements:

- .1 ASTM: 5052, 5083, 5086, 5154, 5454;
- .2 DIN 1725: AlMg2.5, AlMg4.5Mn, AlMg4Mn, AlMg3, AlMg2.7Mn.

**4.2.7** Stiffeners and profiles should normally have the following material composition:

- .1 Cu max. 0.4 percent;
- .2 Fe max. 0.5 percent.

The following examples fulfil these requirements:

- .1 ASTM: 6005, 6063, 6351;
- .2 DIN 1725: AlMgSi0.7, AlMgSi0.5, AlMgSi.



### 4.3 Shaping of materials

**4.3.1** Hardened aluminium materials should normally not be shaped with heat added, and cold shaping should only be used when there is a low tension in the material. Aluminium materials should normally be straight or shaped by rolling.

**4.3.2** Shaping of plates should normally be made by rolling. Bending to 90° should not be made unless the inner bending radius (R) is at least:

$$R = f * t$$

where: f is the bending factor according to the table below; and

t is the thickness of the material.

Alloy	Condition	Bending factor for material thickness (t) in mm					
		1.0	1.5	3.0	4.5	6.0	9.0
AlMg2.5	02	0	0	0	1	1	1.5
	14	0	1	1.5	2	3	3
	08	2	3	4	5	6	7
AlMg4.5Mn	02	–	0.5	1	1	1.5	2
	32	–	1.5	3	3	3.5	

**4.3.3** The cutting of materials should be done so that the edges become straight and without burns or other damages.

### 4.4 Welding

**4.4.1** Welding should not be carried out when the temperature is lower than + 5 °C.

**4.4.2** Welding of the hull and deck should be carried out only by persons suitably qualified for handling the materials and equipment used.

**4.4.3** Normally welding electrodes of AlMg4.5Mn or AlMg6 should be used unless it is documented that another electrode will give a better result.

**4.4.4** All welding should have full burning through and a smooth surface without burrs or edge burns.

**4.4.5** All plates and fastening of watertight bulkheads should be welded with continuous welding.

**4.4.6** If intermittent welding is used, the length of weld should be at least as long as the spacing and always end with a continuous weld.

**4.4.7** The welding should comply with the dimensions approved beforehand.

**4.4.8** The weld at representative places should be tested with penetrating liquids. Surface cracks should not be accepted.

## 4.5 Manufacturing premises

4.5.1 Work up and welding of aluminium should be carried out in a dry place under roof and screened off from weather and wind.

4.5.2 The workplace should be kept clean and free of work on other metallic materials.

4.5.3 If temperatures lower than 0 °C can occur, the manufacturing premise should be so arranged that it can be heated.

## 4.6 Inspection and testing

4.6.1 The scantlings table, where applicable, and the material documentation for and workmanship of each vessel should be subject to inspections at key stages of the vessel's construction.

4.6.2 The testing of welded joints by x-ray or similar method may be carried out where considered necessary.

## Part 2

### *Recommended construction standards for aluminium vessels of design categories A and B*

## 1 Introduction

The construction standards described here should be applied to all decked vessels in design categories A and B.

## 2 Construction

2.1 In general, the requirements of Part 1 should be complied with in addition to the requirements below.

2.2 The strength and construction of the hull, deck and other structures should be sufficient to withstand all foreseeable conditions of the intended service.

2.3 All vessels should meet requirements that are compatible with a recognized aluminium vessel construction standard\* or an equivalent standard and be built to the satisfaction of the competent authority.

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\* The standards include:

1. the Nordic Boat Standard;
2. the construction rules of the United Kingdom Sea Fish Industry Authority (Seafish); and
3. the construction rules of recognized organizations.

## Part 3

### Recommended construction standards for aluminium vessels of design category C

#### 1 Introduction

1.1 The construction standards described here should be applied to all decked and undecked vessels in design category C.

1.2 The construction standards described here should always be read in conjunction with Part 1.

#### 2 Scantlings\*, \*\*

Minimum scantlings should be in accordance with the table below. Figures may be based on interpolation for vessels with a length overall between 8 m and 15 m.

LOA (m)	8	9	10	11	12	15	Remarks
<b>Frame spacing (mm)</b>	Max. 300	300	300	300	300	300	
<b>Bar keel</b>							
Sectional area (cm <sup>2</sup> )	18	19	20	21	22	24	Where bar keel is omitted, keelplate = 2.5 x t bottom. Total breadth 30 x LOA mm.
Min. thickness (mm)	17	18	18	19	20	21	
<b>Centre keel</b>							
Sectional area (cm <sup>2</sup> )	18	19	20	21	22	24	Required only where the bar keel is omitted.
Min. thickness (mm)	6.5	6.5	7.5	7.5	8.5	8.5	
<b>Floor</b>							
Height (mm)	200	210	215	225	230	250	Required only at every third frame on the other frames skeleton floors.  May be omitted where cement is inserted up to the top of the floors.
Thickness (mm)	5.5	5.5	5.5	6.5	6.5	6.5	
Flange (mm)	50 x 5.5	50 x 5.5	50 x 5.5	50 x 5.5	50 x 6.5	50 x 6.5	
<b>Keelson</b>	UPN 100	UPN 100	UPN 100	UPN 100	UPN 120	UPN 120	(Channel) Required only where centre keel is omitted.

\* The scantlings are based on the Simplified Strength Requirements for Aluminium Boats from the Nordic Boat Standard.

\*\* The scantlings are corrected by the factors applicable to fishing vessels set out in the Nordic Boat Standard.

LOA (m)	8	9	10	11	12	15	Remarks
<b>Frames</b>							
Web (mm)	90 x 8.5	90 x 8.5	90 x 8.5	95 x 8.5	95 x 8.5	100 x 8.5	
Section mod. (cm <sup>3</sup> )	23 cm <sup>3</sup>	24 cm <sup>3</sup>	25 cm <sup>3</sup>	25.2 cm <sup>3</sup>	26.3 cm <sup>3</sup>	28.4 cm <sup>3</sup>	
<b>Bottom plates (mm)</b>	5	5.5	6	6.5	6.5	7.5	Keel plates and stem plates to be increased by 1 mm.
<b>Shell plates (mm)</b>	4.5	5	5.5	5.5	6	6.5	
<b>Bulkheads</b>							
Plates (mm)	5	5.5	5.5	6	6	6.5	
Stiffener web (mm)	50 x 6.5	50 x 6.5	50 x 7.5	50 x 7.5	50 x 8.5	50 x 8.5	Max. spacing 500 mm.
Stiffener sec. mod. (cm <sup>3</sup> )	6.3	6.3	7.4	7.4	8.4	8.4	
<b>Deck</b>							
Plates (mm)	4.5	5	6	6	7	7	
Beam web (mm)	90 x 9	90 x 9	90 x 9	90 x 9	90 x 9	90 x 9	Max. spacing 300 mm. Max. span 3.5 m.
Beam sec. mod. (cm <sup>3</sup> )	31	31	31	31	31	31	
<b>Bulwark (mm)</b>	4.5	4.5	4.5	5	6	6	Stiffener 50 x 6 mm. Max. spacing 600 mm.
<b>Superstructure/ deckhouse (mm)</b>	3.5	3.5	4.5	4.5	5	6	Stiffener 50 x 6 mm. Max. spacing 300 mm.

## Annex VI

# Recommended standards for anchoring and mooring equipment

## 1 Anchoring equipment for vessels in design categories A and B

1.1 Vessels should be provided with appropriate anchoring equipment arranged in such a way that it is possible to anchor efficiently and reliably.

1.2 Vessels should be equipped with anchoring equipment in accordance with the following table:

Anchoring equipment for vessels in design categories A and B

CuNo	Total anchor weight (kg)	Length of anchor rope (m)	Minimum diameter of anchor rope (nylon rope) (mm)	Length of anchor chain (m)	Diameter of anchor chain (mm)
5	8	20	10	5	8
10	12	25	12	5	8
15	15	30	15	6	8
25	21	32	15	6	8
35	25	35	18	8	9.5
45	31	40	18	8	9.5
60	37	45	20	10	9.5
80	43	50	20	10	9.5
100	52	55	25	15	12
155	62	60	25	15	12

1.3 The anchor weight required as indicated in the table above may be distributed between two anchors, one of which should be at least 66 percent of the weight shown.

1.4 Vessels should be equipped with at least one anchor chain of a length and dimension according to the table above. The chain should be provided between the anchor and the anchor rope.

1.5 Vessels should be equipped with anchor rope(s) of length and dimension according to the table above.

1.6 Vessels should be provided with sufficient means to fix the anchor rope to the vessel and protect it against chafing.

1.7 Where operational experience justifies departure from the sizes of anchoring equipment, the competent authority may require an increase or permit a reduction in anchoring equipment.

## 2 Anchoring equipment for vessels in design category C

2.1 Vessels should be provided with anchoring equipment arranged in such a way that it is possible to anchor efficiently and reliably.

2.2 Vessels should be equipped with anchoring equipment in accordance with the following table:

Anchoring equipment for vessels in design category C

CuNo	Total anchor weight (kg)	Length of anchor rope (m)	Minimum diameter of anchor rope (nylon rope) (mm)	Length of anchor chain (m)	Diameter of anchor chain (mm)
5	6	20	10	5	8
10	9	25	12	5	8
15	11	30	15	6	8
25	16	32	15	6	8
35	19	35	18	8	9.5
45	23	40	18	8	9.5
60	28	45	20	10	9.5
80	32	50	20	10	9.5
100	39	55	25	15	12
155	47	60	25	15	12

2.3 The anchor weight required as indicated in the table above may be distributed between two anchors, one of which should be at least 66 percent of the weight shown.

2.4 Vessels should be equipped with at least one anchor chain of a length and dimension according to the table above. The chain should be provided between the anchor and the anchor rope.

2.5 Vessels should be equipped with anchor rope(s) of length and dimension according to the table above.

2.6 Vessels should be provided with sufficient means to fix the anchor rope to the vessel and protect it against chafing.

2.7 The competent authority may require increased anchor equipment for vessels fishing in very rough waters and/or may permit reduction in the equipment for vessels operating in sheltered waters.

## 3 Anchoring equipment for vessels in design category D

In general, vessels should be provided with anchoring equipment arranged in such a way that it is possible to anchor efficiently and reliably. However, where operating conditions allow, this requirement may be omitted to the satisfaction of the competent authority.

## **4 Mooring equipment**

**4.1** All vessels should be provided with appropriate mooring equipment, including mooring ropes, bollards and fairleads, arranged in such a way that the vessel can be moored, tow and be towed efficiently to the satisfaction of the competent authority.

**4.2** Mooring equipment, its mountings, and decks and bulwarks where the equipment (including anchoring equipment) is to be located should be strongly constructed. Appropriate reinforcements to structure should be provided where equipment is fastened and, where through bolts are used, washers or backing plates should be fitted below the nuts.





## Annex VII

# Guidance on the structural strength of hatch covers

### 1 General

Hatch covers should have strength equal to or greater than the surrounding deck of the vessel.

### 2 Plating

Plating and planking for hatch covers should have a thickness of, at least, the following:

CuNo	Steel (mm)	Aluminium (mm)	Wood (mm)	GRP (mm)	(Est. g/m <sup>2</sup> )
10	4.0	5.0	20	5.0	3 000
25	4.5	6.0	25	7.0	4 200
45	5.0	6.5	30	7.5	4 500
80	6.0	8.0	35	8.0	4 800
125	6.0	8.0	40	9.0	5 400
155	6.0	8.0	40	9.0	5 400

### 3 Stiffeners

3.1 The following stiffeners may be used for the hatch providing none is longer than 2.0 m and that the maximum spacing of stiffeners is 500 mm.

Material	Flat bar stiffeners	Angle stiffeners
Steel	50 x 4.5 mm	35 x 35 x 4 mm
Aluminium	64 x 6.5 mm	–
Wood	Beams 45 x 75 mm	–
GRP	As deck beams	–

3.2 Where heavy loads are to be placed on hatch covers, the stiffeners should be increased in depth to be double the tabulated depth.

3.3 Structure around the perimeter of the hatch should be sized to be equivalent to or greater than the stiffeners listed above.



## Annex VIII

# Guidance on the dimensions of freeing ports

1 On decked vessels, where the fixed bulwarks, ends or sides of the superstructure, etc. form enclosed wells, means to clear entrapped water are to be provided. Where bulwarks on weather parts of the working deck form wells, the minimum freeing port area (A) in m<sup>2</sup> on each side of the vessel for each well on the working deck should be determined in relation to the length (l) and height (h) of the bulwark in this well, in accordance with the following table:

**Freeing port area (A) in m<sup>2</sup> for vessels of design categories A and B** (for intermediate lengths (l) and heights (h), the value of A should be obtained by linear interpolation)

Height of bulwark (h) in m	Length of well (l) in metres (l need not be taken as greater than 70% of the length of the vessel)								
	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
0.2	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.09
0.3	0.07	0.08	0.08	0.09	0.10	0.11	0.11	0.12	0.13
0.4	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17
0.5	0.11	0.13	0.14	0.15	0.16	0.18	0.19	0.20	0.21
0.6	0.14	0.15	0.17	0.18	0.20	0.21	0.23	0.24	0.26
0.7	0.16	0.18	0.19	0.21	0.23	0.25	0.26	0.28	0.30
0.8	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34
0.9	0.20	0.23	0.25	0.27	0.29	0.32	0.34	0.36	0.38
1.0	0.23	0.25	0.28	0.30	0.33	0.35	0.38	0.40	0.43
1.1	0.25	0.28	0.30	0.33	0.36	0.39	0.41	0.44	0.47
1.2	0.27	0.30	0.33	0.36	0.39	0.42	0.45	0.48	0.51

Freeing port area (A) in m<sup>2</sup> for vessels of design categories C and D (for intermediate lengths (l) and heights (h), the value of A should be obtained by linear interpolation)

Height of bulwark (h) in m	Length of well (l) in metres (l need not be taken as greater than 70% of the length of the vessel)								
	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5
0.2	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05
0.3	0.04	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.08
0.4	0.05	0.06	0.07	0.07	0.08	0.08	0.09	0.10	0.10
0.5	0.07	0.08	0.08	0.09	0.10	0.11	0.11	0.12	0.13
0.6	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.14	0.15
0.7	0.09	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18
0.8	0.11	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.20
0.9	0.12	0.14	0.15	0.16	0.18	0.19	0.20	0.22	0.23
1.0	0.14	0.15	0.17	0.18	0.20	0.21	0.23	0.24	0.26
1.1	0.15	0.17	0.18	0.20	0.21	0.23	0.25	0.26	0.28
1.2	0.16	0.18	0.20	0.22	0.23	0.25	0.27	0.29	0.31

2 The freeing port area according to the table should be increased when the competent authority considers that the vessel's sheer is not sufficient to ensure rapid and effective freeing of the deck from water.

3 Freeing ports should be so arranged along the length of bulwarks as to provide the most rapid and effective freeing of the deck from water. Lower edges of freeing ports should be as near as practicable to the deck, the lowest point of the sheer curve and the ends of the well.

4 Large freeing ports should be fitted with bars or other suitable protective arrangements to prevent fish, gear, etc., on deck from sliding overboard.

5 The competent authority may permit the use of other methods in determining the dimensions of freeing ports.\*

\* As an alternative, ISO 11812 Small craft – Watertight cockpits and quick-draining cockpits may be used.

## Annex IX

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# An approximate determination of small vessels' stability by means of a rolling period test\*

- 1 As a supplement to the approved stability information, the initial stability can be approximately determined by means of a rolling period test.
- 2 Vessels with a high initial stability are “stiff” and have a short rolling period. In contrast, vessels with a low initial stability are “tender” and have a long rolling period.
- 3 The following guidance describes a rolling period test which can be performed at any time by the crew of a small vessel.

### Test procedure

- 4.1 The test should be conducted in smooth water with the mooring lines slack and the vessel “breasted off” to avoid making any contact during the rolling test. Care should be taken to ensure that there is a reasonable clearance of water under the keel and the sides of the vessel.
- 4.2 The vessel is made to roll. This can, for example, be done by the crew running together from one side of the vessel to the other. As soon as this forced rolling has commenced, the crew should stop and place themselves amidships and the vessel should be allowed to roll freely and naturally.
- 4.3 The timing and counting of the oscillations should only begin when it is judged that the vessel is rolling freely and naturally and only as much as it is necessary to accurately time and count these oscillations (approximately 2°–6° to each side).
- 4.4 With the vessel at the extreme end of the roll to one side (say port) and the vessel about to move toward the upright, one complete oscillation will have been made when the vessel has moved right across to the other extreme side (i.e. starboard) and returned to the original starting point and is about to commence the next roll.
- 4.5 By means of a chronometer, the time should be taken for not less than four of the complete oscillations. The counting of these oscillations should begin when the vessel is at the extreme end of a roll.
- 4.6 After allowing the roll to completely fade away, this operation should be repeated at least twice more. When the total time for the total number of oscillations is known, the time for one complete oscillation, say T seconds, can be calculated.

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\* Drawn from Appendix 6 to the Annex to Part A of the *Code of Safety for Fishermen and Fishing Vessels*.

## **Determination of whether the initial stability is sufficient**

5 If the calculated value of  $T$ , in seconds, is less than the breadth of the vessel, in m, it is likely that the initial stability will be sufficient, provided that the vessel carries full fuel, stores, ice, fishing gear, etc., when the test is made.

6 The rolling period  $T$  usually increases and the vessel becomes tenderer as the weight of fuel, stores, ice, fishing gear, etc., decreases. As a consequence, the initial stability will also decrease. If the rolling period test is conducted under such circumstances, it is recommended that, for the estimate of the initial stability to be considered satisfactory, the calculated value of  $T$ , in seconds, should not be more than 1.2 times the breadth of the vessel, in metres.

## **Limitations to the use of this method**

7 This method may not be applicable to vessels with a hull shape that dampens the rolling; for example, vessels with large bilge keels or vessels of an unconventional design, such as high-speed vessels.

## Annex X

# Recommended practice on portable fish-hold divisions\*

1 Recognizing the desirability of ensuring the adequate strength of scantlings of portable fish-hold divisions, studies on national practices have been carried out, resulting in the establishment of certain formulae for scantlings, which are recommended to competent authorities for their guidance.

2 These formulae represent the average of a wide range of experience covering all types of vessels operating in all sea areas, and in conditions likely to impose the maximum loading on a division. Alternative scantlings might, however, be accepted where experience has shown that they are more appropriate.

3 According to the basic type of construction, the following formulae are recommended for vertical fish-hold divisions:

*.1 Vertical steel uprights and horizontal wooden boards*

Minimum section modulus of vertical steel uprights

$$Z = 4 \rho s b h^2 \quad (1)$$

Minimum thickness of horizontal wooden boards

$$t = \sqrt{8 \rho s b^2} \quad (2)$$

*.2 Horizontal steel beams and vertical wooden boards*

Minimum section modulus of horizontal steel beams

$$Z = 4 \rho s H S^2 \quad (3)$$

Minimum thickness of vertical wooden boards

$$t = \sqrt{3.6 \rho s h^2} \quad (4)$$

where:

$Z$  = section modulus, in  $\text{cm}^3$ .

$t$  = thickness of wooden board, in cm.

$\rho$  = density of cargo, in tonne per  $\text{m}^3$ .

$s$  = maximum transverse distance between any two adjacent longitudinal divisions or line of supports, in m.

\* Drawn from Appendix V of the annex to IMO Assembly resolution A.168(ES.IV), incorporating subparagraphs 4(g) and 4(h) adopted by the Eighth Assembly.

- h = maximum vertical span of a column taken to be the hold depth, in m.
- b = maximum longitudinal distance between any two adjacent transverse divisions or line of supports, in m.
- H = vertical span of a division that is supported by a horizontal beam, in m.
- S = horizontal distance between adjacent points of support of a horizontal beam, in m.

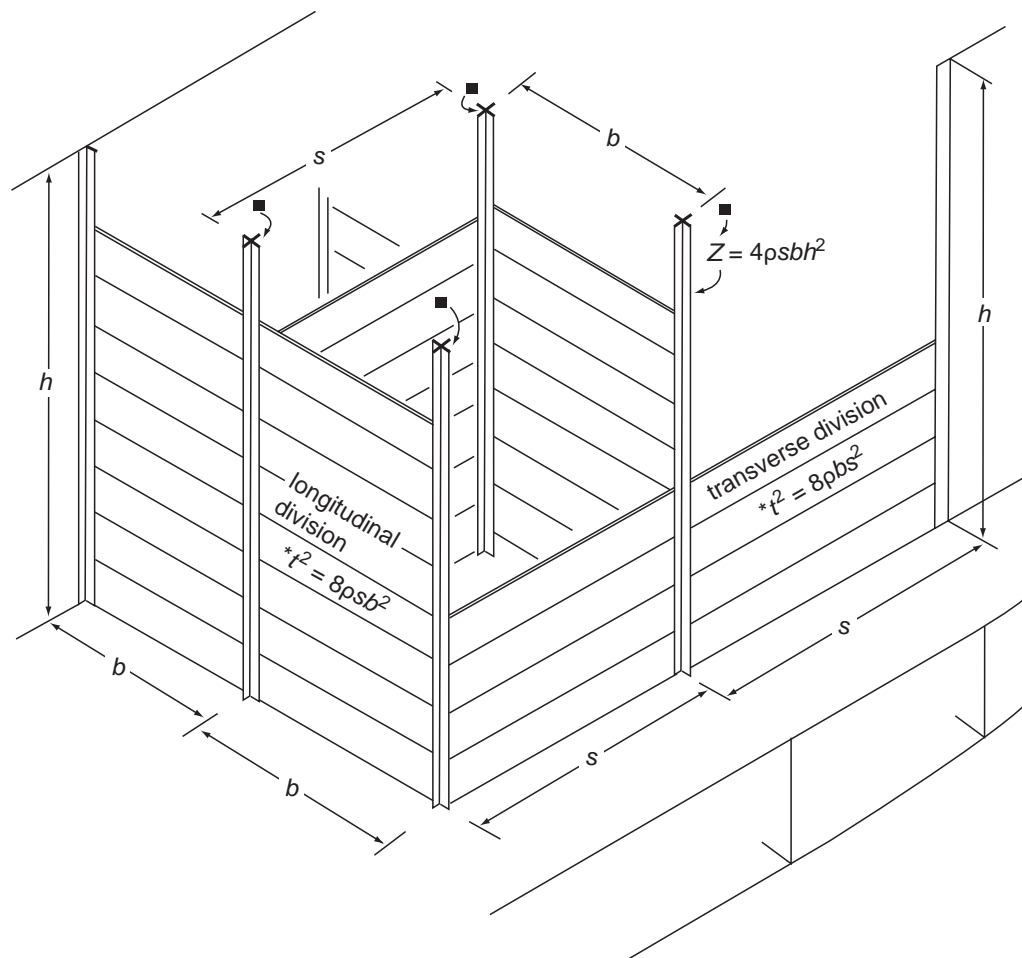
- 4 In applying the above formulae, the following notes should be observed:
- .1 The formulae are applicable to longitudinal divisions. Where the divisions are athwartships, the formulae should be modified by interchanging s and b.
  - .2 The formulae were derived on the assumption that the loads were on one side only of the divisions. When it is known that the divisions will always be loaded on both sides, reduced scantlings may be accepted.
  - .3 If vertical steel uprights are permanent and well-connected at both ends with the structure of the ship, reduced scantlings may be accepted depending upon the degree of security provided by the end connections.
  - .4 In the formula for vertical wooden boards, the full depth of the hold is assumed as the unsupported span. Where the span is less, the thickness may be calculated using the reduced span.
  - .5 The timber used should be of sound durable quality, of a type and grade which has proved satisfactory for fish-hold divisions and the actual finished thicknesses of the boards should be those derived from the formulae. The thickness of boards made from good quality hardwood may be reduced by 12.5 percent.
  - .6 Divisions made of other materials should have the strength and stiffness equivalent to those associated with the scantlings recommended for wood and steel, having regard to the comparative mechanical properties of the materials.
  - .7 Channelways in stanchions to take pound boards should have a depth of not less than 4 cm and the width should be equal to the pound board thickness plus 0.5 cm.
  - .8 Each pound board should have a length not less than the distance between the bottom of the respective channelways into which it will engage minus 1 cm.

If pound boards have shaped ends to allow a rotational manoeuvre for easy housing, the extent of end shaping should not be more than allowed by a radius equal to one-half the length of the board with its centre at the mid-length and depth of the board.

- 5 Figures 1 and 2 illustrate the application of the formulae:

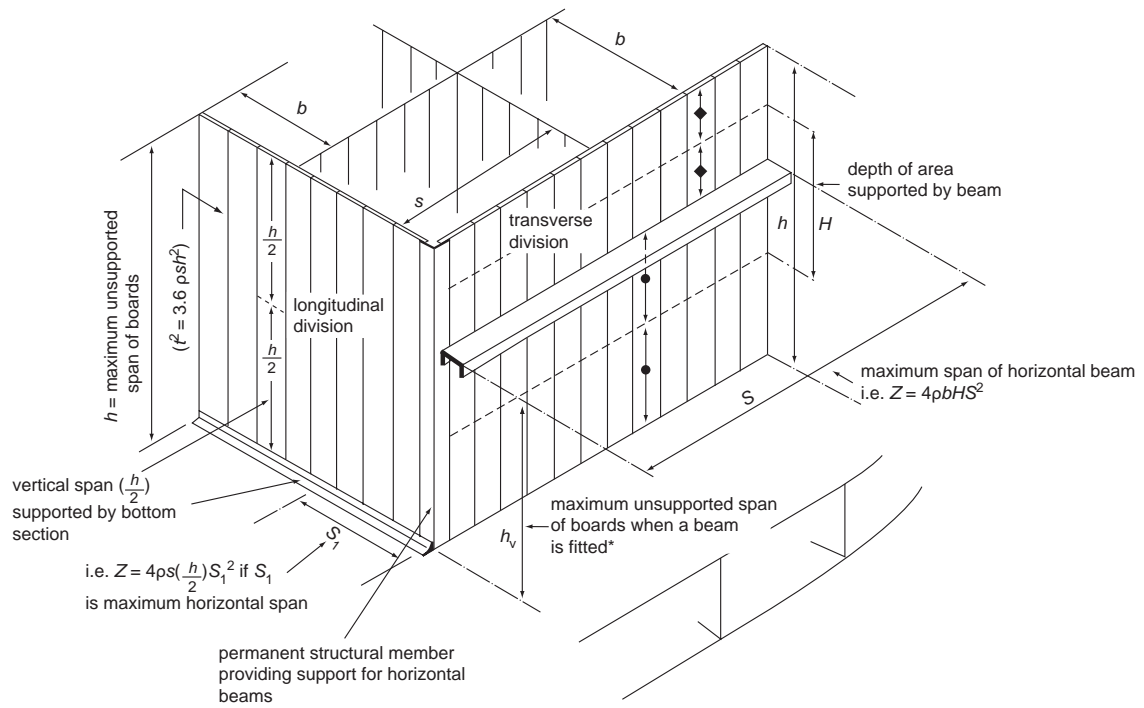


Figure 1  
Horizontal wood boards and steel uprights



\* Note: When the longitudinal and transverse divisional boards are interchangeable,  $b$  will equal  $s$  and the thickness by either formula will be the same. If the boards are required to be of equal thickness but varying span, the greater thickness should be used for all the boards when the section modulus is kept constant for all the uprights.



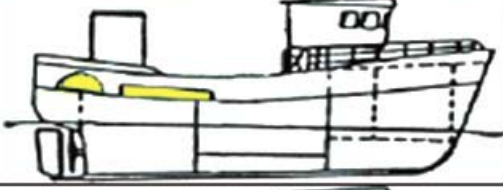
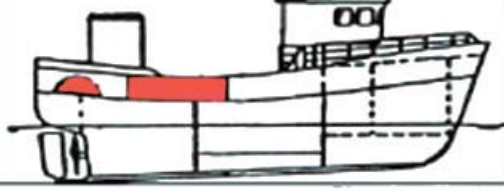
Figure 2  
Vertical wood boards and steel beams



\* Note: If no beam was fitted, the thickness of the vertical wood planks would be given by  $t^2 = 3.6\rho bh^2$ . The beam reduces the maximum span to  $h_v$  and the thickness is now given by  $t_1^2 = 3.6\rho bh_v^2$  or  $t_1 = t\left(\frac{h_v}{h}\right)$

## Annex XI

### An example of a stability notice\*

	PLACEMENT OF GEAR AND CATCH	STABILITY		
		Acceptable	On the Limit	Danger of Capsize
	<ul style="list-style-type: none"> <li>• Catch in cargo hold</li> </ul>			
	<ul style="list-style-type: none"> <li>• Part load in hold</li> <li>• Gear on deck</li> </ul>			
	<ul style="list-style-type: none"> <li>• Some catch on deck</li> <li>• Gear on deck</li> <li>• Empty cargo hold</li> </ul>			
	<ul style="list-style-type: none"> <li>• Considerable catch on deck</li> <li>• Gear on deck</li> <li>• Empty cargo hold</li> </ul>			

#### Simple efforts for maintaining stability

- # Close doors and hatches
- # Ensure scuppers are open to allow water to drain
- # Secure catch and gear against shifting
- # Move gear and catch from deck into cargo hold
- # Freeboard amidships should be at least 20 cm
- # Avoid excessive aft trim
- # Minimum freeboard at stern should be at least 20 cm
- # Avoid following seas
- # Large heeling moments when hauling gear are to be avoided
- # Change of trim and heel when trying to free snagged gear can impair stability of vessel
- # Do not go to areas with danger of icing
- # Remove snow and ice from vessel

\* In case there is insufficient stability information available to prepare operating conditions, the stability notice should contain relevant general precautions.



## Annex XII

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# Guidance on additional stability criteria for beam trawlers\*

- 1 Beam trawlers should meet the stability criteria of 3.2.1 increased, if necessary, to the satisfaction of the competent authority.
- 2 Beam trawlers with a maximum bollard pull of 0.015 L tonnes or more where the bollard pull is measured directly by physical testing at full main engine power should comply with the following additional requirements:
  - .1 The requirements of regulation 3.2.1.1 for the area under the righting lever curve GZ should be increased by 20 percent.
  - .2 The requirement of regulation 3.2.1.2 for the righting lever GZ should be increased by 20 percent.
  - .3 The requirement of regulation 3.2.1.4 for the initial metacentric height GM should be increased to 500 mm.
- 3 Beam trawlers should have a righting lever GZ that is at least 100 mm at angles of heel between 40° and 65° and that is positive up to a heel of 70° when all means of closing are assumed closed.

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\* The references in this annex refer to paragraphs in the Safety Recommendations.



## Annex XIII\*

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# Guidance on a practical buoyancy test

### 1.1 General

The methods described in 1.2, 1.3 and 1.4 below should be used, either by actual test or equivalent calculation.

### 1.2 Test condition

During the tests, the vessel should be in calm water in the light craft condition and then equipped as follows:

- .1 A mass equal to 25 percent of the dry mass of stores and equipment included in the maximum total load is to be added on the interior deck, on the centre line at LOA/2.
- .2 Vulnerable items, such as engines, may be replaced with an appropriate mass at the correct location.
- .3 For outboard engines, the builder's maximum recommended power is to be used. Tables 1 and 2, columns 2 and 4, give the appropriate replacement mass to be used with respect to engine power for petrol engines. A heavier mass may be used if it is recorded in the owner's manual. A mass of 86 percent of the engine dry mass is to be used for diesel, jet-propulsor or electric outboards, if these are supplied as the standard outfit. Vessels equipped for use both with and without an outboard engine are to be tested in both conditions.
- .4 For inboard engines, the replacement mass is to be of lead, steel or iron of a mass equal to 75 percent of the installed mass of the engine and stern-drive.
- .5 As far as practicable, replacement masses are to have the same position of centre of gravity as the actual engine.
- .6 Portable tanks should be removed. Fixed tanks are either to be removed or should be full with either fuel or water.
- .7 All cockpit and similar drains normally open during operation of the vessel are to be left open. The plugs of drains for emptying the vessel of residual water when ashore should be in place.
- .8 Care should be taken throughout the testing to eliminate entrapped air other than that in air tanks or air containers.

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\* Refer to ISO 12217-3 Small craft – Stability and buoyancy assessment and categorization – Part 3: Boats of hull length less than 6 m, Annex E.

- .9 Void compartments integral with the vessel structure and not watertight, built and pressure tested as such, are to be opened so that they become flooded with water.
- .10 Vessels intended to be fitted with engines of more than 3 kW and that are fitted with integral air tanks that have laminated, glued, welded or bolted seams in their construction, which do not comply with the air pressure test of 2 m head, must have a number of air chambers opened to atmosphere during testing, according to Table 3.

Table 1  
Mass of single-engine installations

Engine power (kW)	Engine + controls (kg)		Battery (kg)	
	1	2	3	4
	Dry	Submerged	Dry	Submerged
0–1.9	13.0	11.2	–	–
2.0–3.6	23.0	19.8	–	–
3.7–5.8	32.0	27.5	–	–
5.9–6.9	42.0	36.1	–	–
7.0–13.9	54.0	46.4	20.4	11.3
14.0–17.9	63.0	54.2	20.4	11.3
18.0–28.9	82.0	70.5	20.4	11.3
29.0–43.9	121.0	104.1	20.4	11.3
44.0–54.9	157.0	135.0	20.4	11.3
55.0–83.9	187.0	160.8	20.4	11.3
84.0–186.0	235.0	202.1	20.4	11.3
> 186	257.0	221.0	20.4	11.3

Note: Power (kW) = (Imperial horsepower) x 0.7457  
 Imperial horsepower = (power in kW) x 1.341  
 Power (kW) = (metric horsepower) x 0.7355  
 Metric horsepower = (power in kW) x 1.36

Table 2  
Mass of twin engine installations (kg)

Total engine power (kW)	Engines + controls (kg)		Battery (kg)	
	1	2	3	4
	Dry	Submerged	Dry	Submerged
28.8–359	126.0	108.4	40.8	22.7
36.0–57.9	164.0	141.0	40.8	22.7
58.0–87.9	242.0	208.1	40.8	22.7
88.0–109.9	314.0	270.0	40.8	22.7
110.0–167.9	374.0	321.6	40.8	22.7
168.0–372.0	470.0	404.2	40.8	22.7
> 372	514.0	442.0	40.8	22.7



Table 3  
Numbers of air chambers to be opened during the test

Total number of air chambers	Number to be opened
≤ 4	Single largest
> 4 but ≤ 8	Two largest
> 8	Three largest

### 1.3 Flooded stability test

**1.3.1** A metallic test weight with a dry mass of (6dCL) kg (CL = crew limit = the highest allowed number of crew members allowed on board simultaneously, see Table 6) but not less than (15d) kg is to be suspended over the side of the vessel at each of four positions in turn. These positions should be at LOA/3 from the ends of the vessel (as shown in Figure 1) or at the ends of the cockpit, if this is nearer amidships. No other test weights are to be in the vessel during this test, apart from those weights indicated in Table 2.

**1.3.2** d is a coefficient to account for the buoyancy of the test weight, as given in Table 4. Where test weights are not all of the same material, the calculation should be similar to:

$$\frac{m_L}{1.099} + \frac{m_{CL}}{1.163} + \frac{m_A}{1.612} = 6CL$$

where:

$m_L$  is the mass of lead weights, expressed in kg;

$m_{CL}$  is the mass of cast-iron weights, expressed in kg;

$m_A$  is the mass of aluminium weights, expressed in kg.

**1.3.3** As an alternative to suspending a test weight over the side, an equivalent heeling moment (calculated when the vessel is upright) may be applied using weights or persons positioned inside the vessel at sea level. Persons may only be used if they are not immersed when the vessel is heeled.

**1.3.4** With the test weight in each position in turn, flood the vessel by applying a downwards force at a position on the gunwale at approximately mid-LOA until the deepest point of the gunwale or coaming is between 0.1 m and 0.3 m below the water surface. Hold the vessel in this position until the water level has equalized between inside and outside, or for 5 minutes, whichever is less, and then release the vessel.

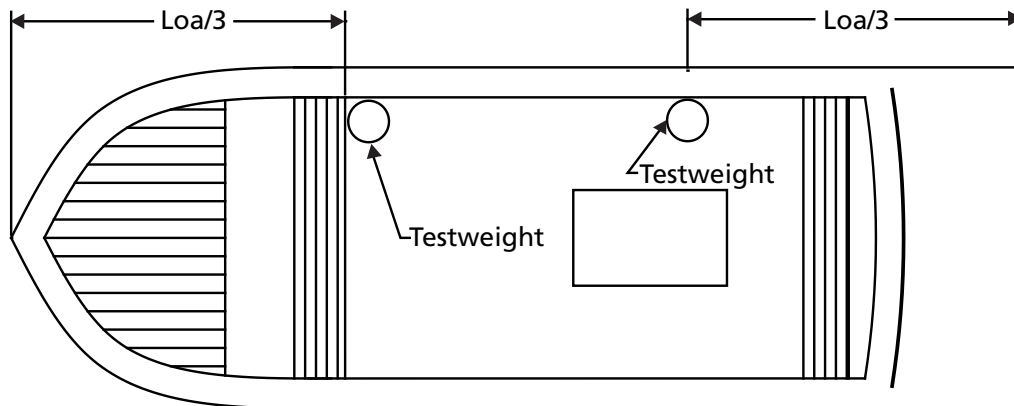
**Note:** It is often helpful to partially fill the vessel with water before flooding it in this manner.

**1.3.5** For each position of the test weights, after a further 5 minutes have elapsed, the vessel must not heel more than 45°.

Table 4  
Material coefficient

Material	Lead	65/35 brass	Steel	Cast iron	Aluminium
Value of d	1.099	1.138	1.151	1.163	1.612

Figure 1  
Test weight positioning



## 1.4 Flooded buoyancy test

1.4.1 Load metallic test weights on the inner bottom of the vessel, evenly about the centre of the area available to the crew, according to the crew limit (CL) as given in Table 5. This area is to have a minimum headroom clearance of 0.6 m above the flooded waterline. Alternatively, people may be used instead of test weights provided they are not immersed above the knee and have a total dry mass not less than the required mass of test weights if d is taken as 1.1.

Table 5  
Dry mass of test weight (kg)

Property	Design category B	Design category C	Design category D
Dry mass not less than	$4dm_{MTL}/3$	$d(60 + 15CL)$	$d(50 + 10CL)$

where:

$m_{MTL}$  (kg) = maximum load the vessel is designed to carry in addition to the light craft condition, comprising the manufacturer's maximum recommended load, including all liquids (e.g. fuel, oils, freshwater, water in ballast or bait tanks and live wells) to the maximum capacity of fixed or portable tanks.

CL = crew limit according to Table 6 below.

**1.4.2** Flood the vessel by applying a downwards force at a position on the gunwale at approximately mid-LOA until the deepest point of the gunwale or coaming is between 0.1 m and 0.3 m below the water surface. Hold the vessel in this position until the water level has equalized between inside and outside, or for 5 minutes, whichever is less, and then release the vessel.

**Note:** It is often helpful to partially fill the vessel with water before flooding in this manner.

**1.4.3** After a further 5 minutes have elapsed, the vessel should float approximately level with the entire top of the gunwale or coamings (including those across bow or stern) above water. If these criteria are met, the vessel is acceptable.

**Note:** The values of the formulae given in 1.3.2 and 1.4.1 are given in Table 6.

Table 6  
Test weights mass (kg)

Crew limit (CL)	1	2	3	4	5	6	7	8	9	10
6dCL, min, 15d	15d	15d	18d	24d	30d	36d	42d	48d	54d	60d
d(60+15CL) =	75d	90d	105d	120d	135d	150d	165d	180d	195d	210d
d(50+10CL) =	60d	70d	80d	90d	100d	110d	120d	130d	140d	150d



## Annex XIV

# Guidance on tools and spares to be carried on board

Spare parts	Outboard motor	Inboard motor
Manual for engine and other major equipment	X	X
Parts for water pump (impeller, gasket, replacement pack, etc.)	X	X
Spark plug	X	
Shearpin for propeller	X	
Split pins for propeller nuts	X	
Starting rope	X	
Propeller	X	
Stern gland packing		X
Belts for alternators and pumps		X
Lub oil filter		X
Fuel oil filter (or cartridge) and filter spanner		X
Water repellent oil/spray	X	X
Engine oil, gear oil and grease		X
Bolts, nuts, washers, screws, hoses and hose clamps of varying diameters to suit items on vessel	X	X
Glues, electrical tape, electrical wire and electrical connectors	X	X
Ropes and twine of varying types and diameters	X	X
Bulbs and fuses for lights, including navigation lights and torches	X	X
Spare batteries for torches, radio communication equipment, etc.	X	X
Parts for bilge pump(s), including impeller pack	X	X

<b>Tools</b>	<b>Outboard motor</b>	<b>Inboard motor</b>
Spanners	X	X
Socket set		X
Adjustable spanners		X
Spark plug spanner	X	
Pliers	X	X
Screwdrivers	X	X
Knife	X	X
Multitester		X
Hydrometer		X
Hammer		X
Wire cutters		X
Hacksaw and spare blades		X
Cold chisel		X
Pipe wrench		X
Torch	X	X
Bailer	X	X

Note: The competent authority should decide what spares and tools are required, having given consideration to the size of the vessel, the size and type of engine, the distance from assistance, and the communications available with other vessels and the shore. The competent authority could consider providing illustrations of tools and spares.

## Annex XV

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# Guidance on steering gear

## 1 Installation

- 1.1 The steering gear should be designed and installed to ensure safe manoeuvring of the vessel at maximum speed and engine power.
- 1.2 The steering gear should be designed and installed so that it may not come into contact with fishing gear, equipment or other obstacles that may hinder the steering.
- 1.3 Where steering is by remote control, rudder stops should be fitted.
- 1.4 Where fitted, a steering console or similar arrangement should be built and secured to withstand the forces from the gear and the vessel's operator.
- 1.5 Penetrations in an outboard motor well, such as holes for steering cables, should be effectively sealed by means of a sleeve or similar device.
- 1.6 A means of emergency steering should be possible on all vessels, unless fitted with twin screws.

## 2 Rudder stocks

- 2.1 If the rudder has a lower bearing point (heel pintle) with the same stiffness as the rudder stock, the diameter of the rudder stock should not be less than that shown in the table below.
- 2.2 The diameter of the bolts in a rudder coupling should not be less than that shown in the table below.
- 2.3 The stuffing box of the rudder stock housing should have a height of at least 350 mm above the load waterline and be provided with packing material.

## 3 Rudders

- 3.1 Rudders of steel, aluminium and GRP should have a stock from the rudder coupling down to the pintle (where fitted). In the case of rudders not fitted with a pintle, the diameter may be reduced linearly down from the rudder coupling.
- 3.2 Steel or aluminium rudders should have at least two stiffeners across the rudder stock spaced a maximum 600 mm. The thickness of the stiffeners should not be less than the thickness of the plate in the rudder.
- 3.3 Plate rudders should have a thickness not less than that shown in the table below.

**3.4** GRP rudders should enclose steel stiffeners welded to the rudder stock with maximum spacing of 200 mm. The thickness of the steel reinforcements should not be less than the thickness of the plate in a steel rudder.

**3.5** Wooden rudders should be made of hardwood and be attached to the rudder stock with steel forks welded to the rudder stock; these should not be less than the thickness of the plate in a steel rudder.

**3.6** Rudders of hardwood should have a thickness not less than that shown in the table below.\*

CuNo	Stock diameter (mm)	Steel plate thickness (mm)	Aluminium plate thickness (mm)	Timber thickness (mm)	Bolt diameter (mm)
10	30	6	8	25	10
15	30	8	10	40	10
20	30	8	10	45	10
25	40	8	10	50	12
30	40	8	10	60	12
60	45	10	12	65	15
80	45	10	12	70	15
100	45	10	12	75	15

\* The figures are based on information from the United Kingdom Sea Fish Industry Authority (Seafish) rules.



## Annex XVI

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# Recommended practice for exhaust systems

## 1 General

1.1 All materials used in exhaust systems should be corrosion-resistant and metal parts should not be used in combination in such a way that corrosion will occur.

1.2 Exhaust pipes should be securely mounted so that mechanical wear and vibration are avoided, and such that there is no weight on the engine manifold.

1.3 Exhaust pipes may require flexible connections (bellows) where engines are prone to vibration or where engines are flexibly mounted.

1.4 Exhaust outlets that discharge through the hull below the deck should be provided with means of preventing back flooding into the hull or engine. Back flooding may be prevented by the system design described below or by a flap, a valve or a non-return device.

1.5 Exhaust pipes and silencers of every engine should be adequately cooled or lagged to protect the persons on board the vessel.

1.6 Oil and fuel pipes should be kept as clear as practicable from exhaust pipes and turbochargers.

1.7 Where multiple engines are installed, each engine should have a separate exhaust system.

## 2 Dry exhaust systems

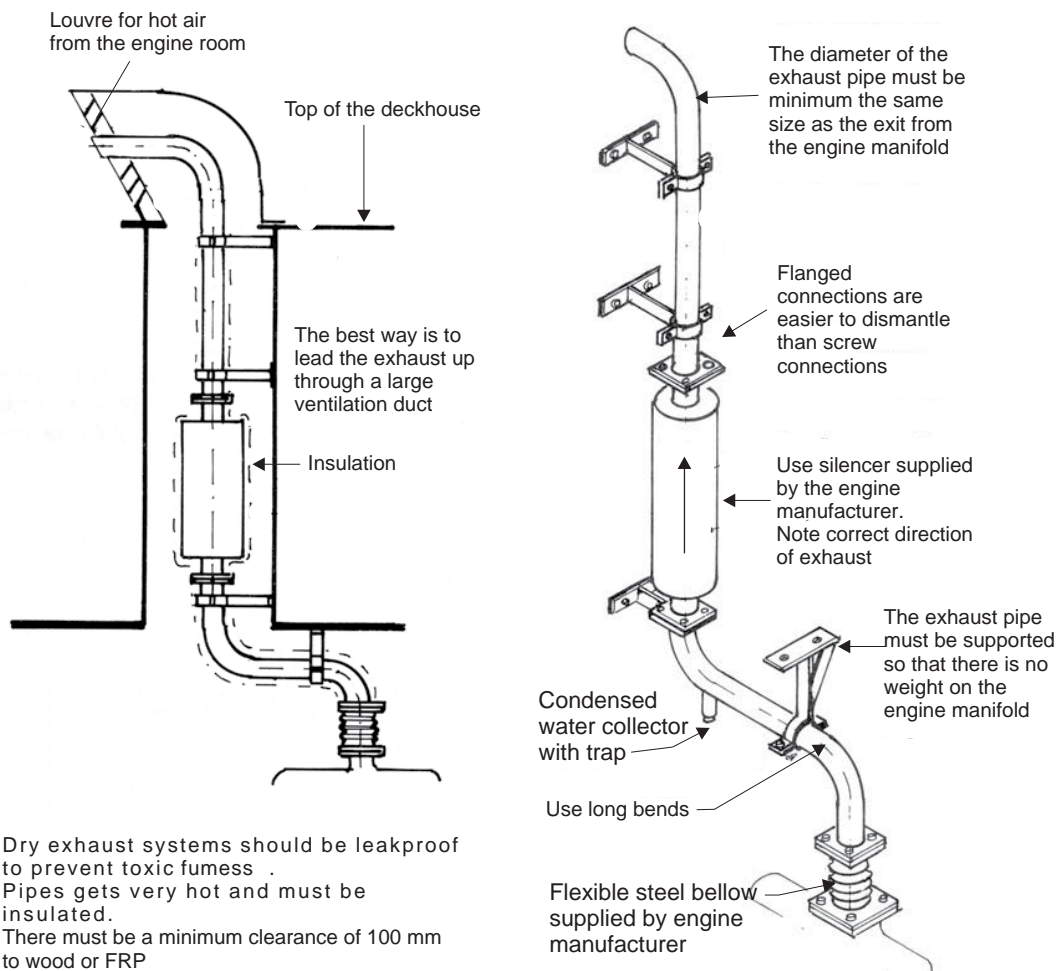
2.1 The exhaust system and piping should be leak-proof to prevent the passage of toxic fumes into accommodation spaces.

2.2 There should be at least a 100 mm clearance between piping and any wood or GRP materials.

2.3 The diameter of exhaust pipes should be sized in accordance with the engine manufacturer's recommendations or should be at least the same size as the engine manifold.

2.4 Typical installation sketches and notes are given in the figures below.

Figure 2.1  
Dry exhaust system – Sketches and notes

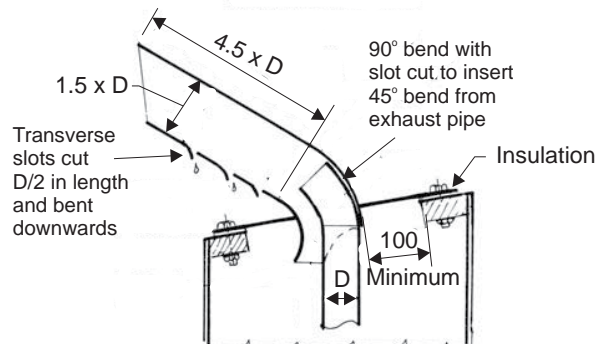


INSULATION



The exhaust pipe and silencer must be covered with glasswool or rockwool insulation and protected by a suitable cover such as thin aluminium sheet.

EXHAUST AIR EJECTOR



The ejector will suck warm air from the engine room and improve ventilation

### **3 Water-injected (wet) exhaust systems**

**3.1** The most important factor in the design and installation of wet exhaust systems is the prevention of entry of water into the engine. Prevention may be achieved by the installation of a waterlock chamber in the exhaust line and by the correct positioning of components in relation to the load waterline.

**3.2** The diameter of exhaust pipes should be sized in accordance with the engine manufacturer's recommendations.

**3.3** There are two main types of wet exhaust systems: those with the engine manifold above the load waterline and those with the engine manifold below the load waterline. Typical installation sketches and notes for these types are given in the figures below.

**3.4** Exhaust pipes should always be drawn up so that a part is at least 350 mm above the load waterline with a slope downwards to the outlet.

**3.5** Exhaust outlets should be at least 100 mm above the load waterline or connected to a fixed pipeline which is drawn up to at least 100 mm above the load waterline.

**3.6** The volume of the waterlock chamber should be sufficient to hold all the water in the pipes on either side of it; this will ensure that water does not fill up the waterlock and re-enter the engine.

Figure 3.1  
Wet exhaust system 1 – sketches and notes

WET EXHAUST SYSTEM – ENGINE MANIFOLD ABOVE LOADED WATERLINE

If the wet exhaust system is not correctly installed, water can enter into the cylinders through the exhaust. This will happen in rough seas and when the engine stops.

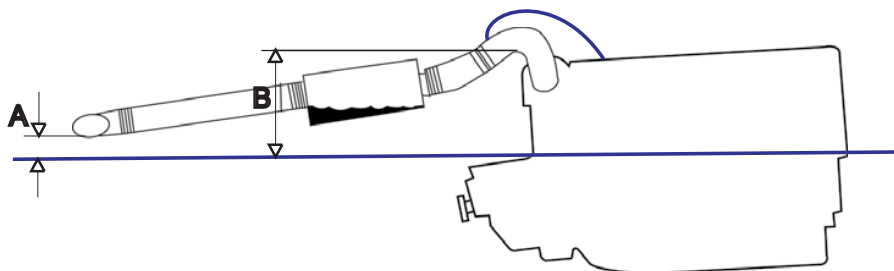
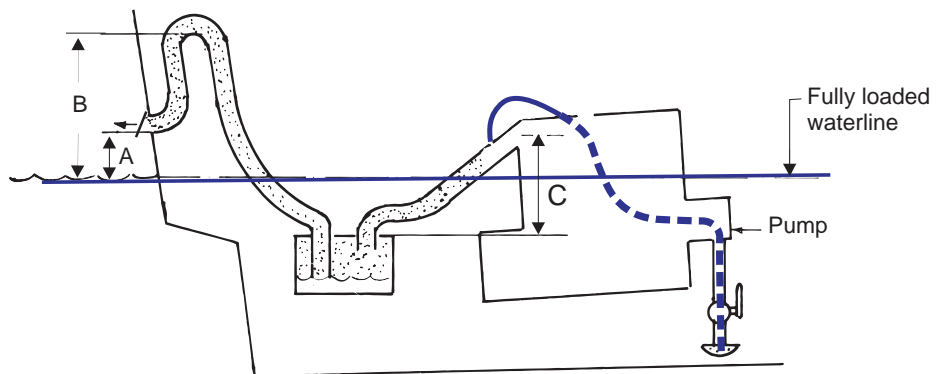
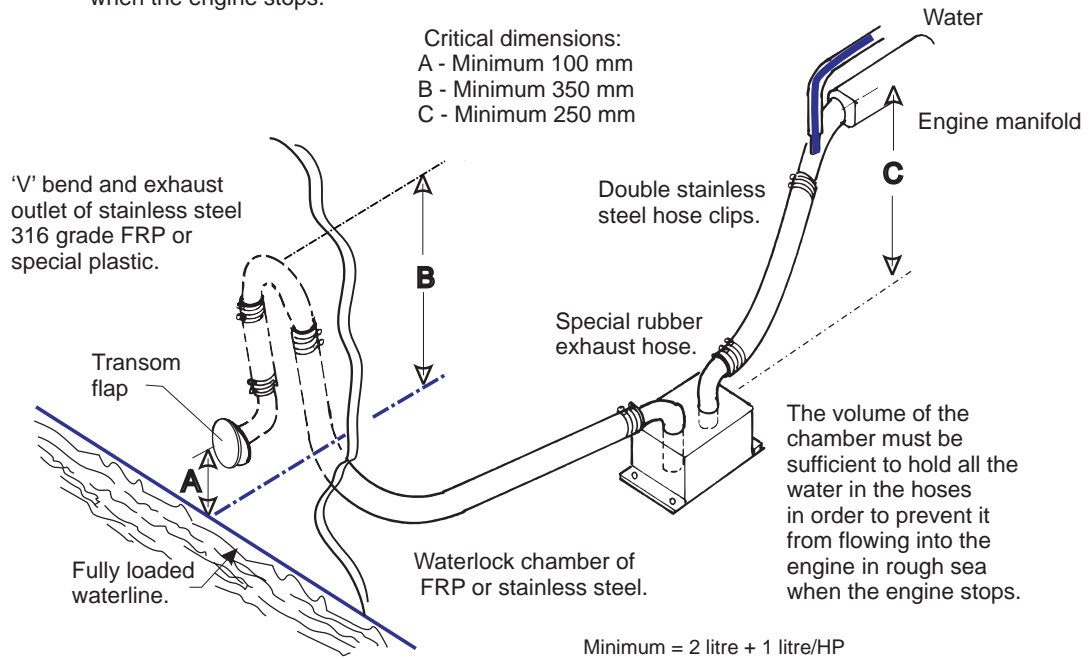


Figure 3.2  
Wet exhaust system 2 – sketches and notes

WET EXHAUST SYSTEM - ENGINE MANIFOLD BELOW LOAD WATERLINE

When the engine is stopped, water will siphon in through the waterpump, fill the exhaust system and enter the cylinders. An anti-siphoning bleed pipe of inner diameter = 5 mm must be connected to the highest point of the cooling water pipe and discharge overboard. It can be made of clear plastic tube and led through the wheelhouse to indicate whether cooling water is circulating.

Critical dimensions:

- A - Minimum 100 mm
- B - Minimum 350 mm
- C - Minimum 250 mm
- D - Minimum 300 mm
- E - Maximum 1500 mm

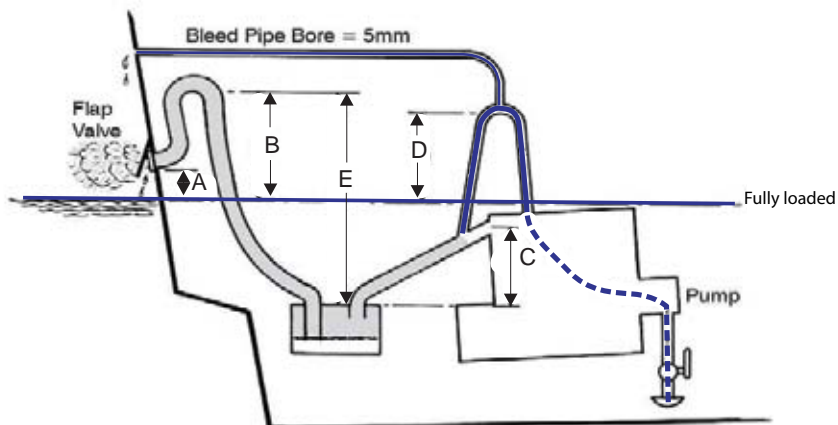
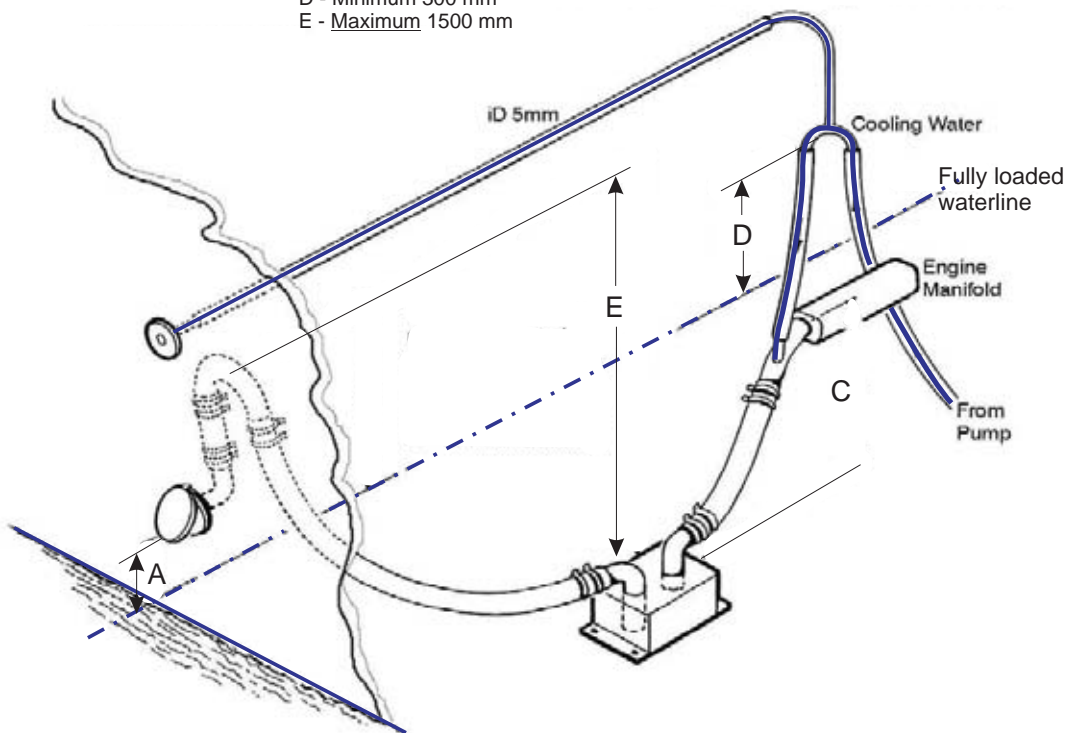
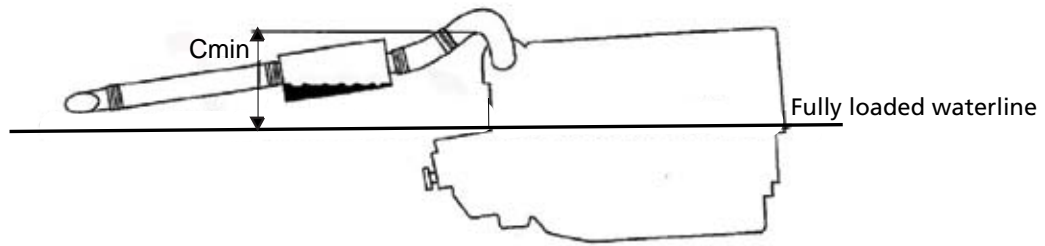


Figure 3.3  
Wet exhaust system 3



An in-line system is not recommended when height (Cmin) exhaust-elbow waterline is less than 350 mm.

## Annex XVII

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# Guidance on the installation of electrical equipment

## A Purpose

1 The purpose of this annex is to provide additional information that may be useful to those persons charged by the competent authority with the interpretation and implementation of regulations and technical schedules for the construction, outfitting and survey of decked fishing vessels of less than 12 m in length and undecked fishing vessels. In this regard, due consideration has been given to the fact that there could be substantial differences between the requirements for vessels in design categories A and B and those in design categories C and D concerning main and emergency electrical systems.

2 Furthermore, although it is recognized that only low-voltage DC systems of less than 55 V are installed in the majority of vessels covered by the Safety Recommendations, the use of higher voltages and multiphase alternating current systems has also been discussed in Chapter 4. Consequently, recommendations are also given in this annex concerning such systems.

3 It should also be noted that it may be necessary to refer to other chapters of the Safety Recommendations such as Chapter 4 and Chapter 9 section 9.4 on sources of energy for radio communication, as well as the relevant chapters of the *Voluntary Guidelines for the Design, Construction and Equipments of Small Fishing Vessels*.

## B General recommendations

1 Irrespective of the size and type of vessel, particular attention should be given to protection against water ingress and the effects of vibration.

2 Care should be taken to ensure that where systems or circuits of different voltages are to be installed, they are kept separate from each other and are clearly marked. In addition, it should not be possible to accidentally plug in or otherwise attach electrical equipment to a circuit for which it has not been designed; the same is valid for light fittings.

## C Sources of electrical supply

### 1 *General*

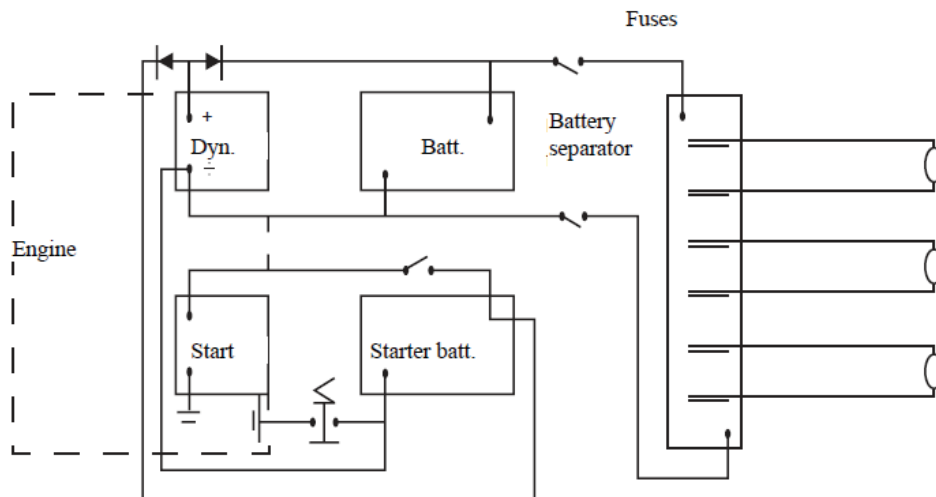
1.1 Where electrical power constitutes the only means of maintaining auxiliary services essential for the propulsion and safety of the vessel, there has to be a means of generating and storing such power. In the case of the majority of decked vessels, the main source of power is usually low voltage, requiring means to charge sets of batteries. In the case of design category A and B vessels, the competent authority may require two generating sets, one of which may be driven by the main engine. However, in extreme cases, such as powered undecked vessels, it may not be practicable to call for

a generator due to the type of the prime mover. Thus, in such cases, many vessels may rely on portable electric lamps or oil lamps for navigation and emergency purposes and this should be taken into consideration when determining the minimum candle power requirement in regulations.

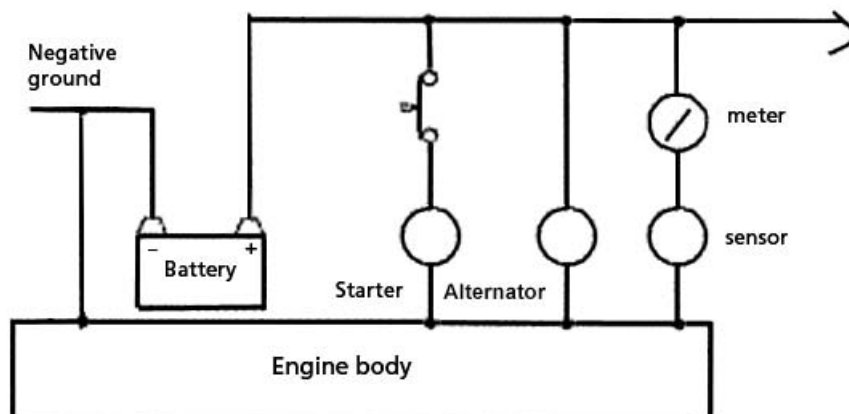
1.2 It may also be noted that on many small vessels fishing techniques are used that rely on light attraction and on many vessels a portable, powered generating set is carried, whereas on other vessels reliance is purely on battery power with no means on board to recharge the battery.

## 2 Low-voltage electrical systems

2.1 It is recommended that direct current installations should be wired as insulated return systems and that the hull should not be used to carry current. However, for propulsion engines with a power of less than 100 kW, the engine may be used as a conductor during starting only, in accordance with the following simplified diagram.



2.2 The engine block may also be used as a common ground return for electrical accessories mounted on the engine, except on metallic vessels where the engine block is not electrically isolated from the hull.



2.3 In certain cases, as provided for in 4.12.15 of Chapter 4 and particularly in the case of small vessels, decked and undecked, the single-wire system may, exceptionally, be approved by the competent authority provided that the arrangement is safe and



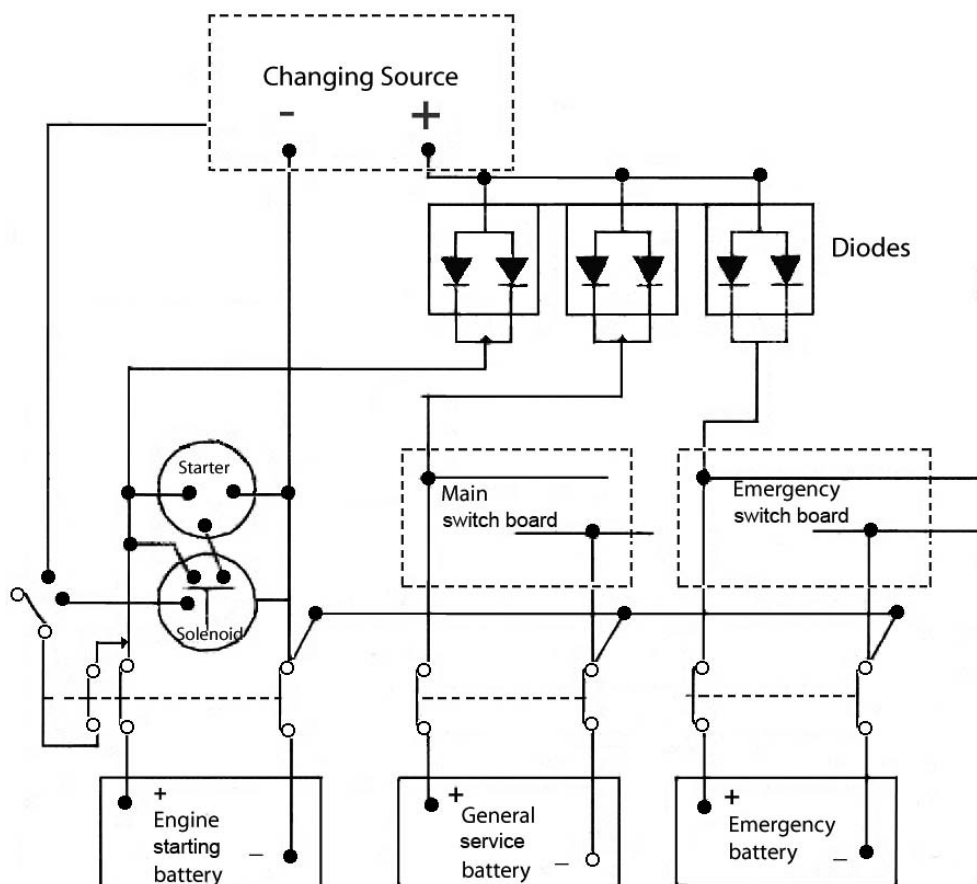
that circuits are adequately protected. The earthing of the engine block through the intermediate shaft and propeller shaft should be taken into consideration.

2.4 Except as mentioned in paragraph C.1.1, when the main source of supply is only an accumulator battery system, means should be provided for recharging it except in cases where the competent authority is satisfied that it is not practicable to do so, taking into consideration the type of vessel and its operation range. The power source for charging may be an alternator or dynamo driven by the main engine through transformers/rectifiers or marine quality chargers.

2.5 The simplest system might be one set of batteries that would cater for general use and would be arranged for continuous charging when, for example, the main engine is hand started.

2.6 However, when the main and/or auxiliary engines are fitted with electric motor starters, the batteries connected to the system for starting should be separate from the batteries used for lighting and general services. All battery banks should be arranged for continuous charging.

2.7 In the event that a further set of batteries is required for emergency purposes only, which would also have to be arranged for continuous charging, there would be a need to introduce blocking diodes (see sketch below) in order to prevent accidental paralleling of the general service battery set and the emergency battery set.



2.8 Should a separate set of batteries be required for radio use only, another set of diodes would have to be incorporated in the charging system.

**2.9** Battery sets should be fitted with double-pole spark-proof isolating switches placed close to the battery set. However, change-over switches may also be used if they are of a type that would automatically ensure that when one bank of batteries in a system is selected for discharging, the other bank in the same system would be automatically placed on charge; such switches may be incorporated in the main switchboard.

**2.10** Where alarm systems such as a bilge alarm or warning light and automatic bilge pumps are required to cover “in port” conditions, the electrical connections should be made between the battery set and its isolating switch. In the case where two sets of general service batteries are fitted (and not intended for parallel operation), there may be a need to introduce blocking diodes to ensure that the power would be drawn initially from the battery with the highest charge, that is, until such time as the batteries are at the same energy level.

**2.11** The competent authority, taking into consideration the design of the vessel and the type of electrical equipment fitted, as well as the area of operation, may require that the battery-powered main source of supply should consist of two individual sets of radio batteries, two sets of lighting and general service batteries, and two sets of starting batteries for the main engine. In such cases, one set of general service batteries and one set of radio batteries could be considered to cover emergency situations.

### **3** *High-voltage electrical systems*

Chapter 4 provides for a competent authority to address electrical systems of higher voltage than normally supplied by accumulator battery systems. In this regard, certain classes of design category A and B vessels may, in fact, require high-voltage systems to power pumps, refrigeration systems and/or deck machinery, together with a provision to charge storage batteries for starting the main engine and running radio and equivalent equipment, and to meet emergency services. Thus, in addition to low-voltage DC systems, there could be provisions for regulations to cover:

1. DC systems in excess of 110 V; and
2. AC systems in excess of 220 V.

#### **3.1** *110 V DC systems*

**3.1.1** Direct current installations should be wired as insulated return systems and double-pole switching should be used throughout. The hull should not be used to carry current.

**3.1.2** Main and emergency switchboards should be of the dead front type to prevent accidental access to live parts. The sides and backs and, where necessary, the fronts of switchboards, should be suitably guarded. Switchboards should also be suitably divided to ensure safe separation between the 110 V system and low-voltage circuits.

**3.1.3** Earth indicator lamps should be incorporated in the switchboard as a means to detect current leakage. In addition, the switchboard should be fitted with a voltmeter and an ammeter.

**3.1.4** Where only one generator is installed, a fast-action double-pole circuit-breaker should be fitted. In the case of two generators being installed that are not intended for parallel operation, a fast-action double-pole change-over switch should be fitted.

## **3.2 AC systems**

**3.2.1** If the main source of supply is an alternating current system, non self-regulating alternators should be provided with automatic voltage regulation.

**3.2.2** Where more than one alternator is installed, the competent authority may approve the parallel operation of alternators, if synchronizing and power-sharing devices are to be fitted. The system should also be fitted with reverse power protection.

**3.2.3** Where fitted, the primary windings of transformers should be protected against short circuits by circuit-breakers or fuses capable of withstanding power surges. If transformers are arranged for parallel operation, they should be provided with secondary isolation.

**3.2.4** Although provision should be made for a shore connection to the main switchboard, the arrangement should be such that individual circuits aboard the vessel cannot be energized by more than one source of electrical power at any one time.

**3.2.5** Cables for AC systems should be kept separate from cables for DC systems and run in separate trays, or trays that are suitably subdivided and have the approval of the competent authority.

**3.2.6** Switchgear for AC systems should be fitted in switchboards and panels that are separate from those containing DC systems.

**3.2.7** Switchgear and sockets should be so designed as to prevent the fitting of low-voltage equipment and lamps into high-voltage systems.

**3.2.8** In unpolarized systems, double-pole circuit-breakers that open both live and neutral conductors are required and fuses should not be installed in unpolarized systems.

## **3.3 Battery charging**

The use of transformers and marine-quality battery chargers may be considered by the competent authority.

## **4 Emergency source of electrical power**

**4.1** In the event that a self-contained emergency source of electrical power is required, it should be located outside the machinery spaces above the working 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.

**4.2** 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 at least 3 hours:

- .1** a VHF radio installation or an MF radio installation or a ship-earth station or an MF/HF radio installation, depending on the sea area for which the vessel is to be equipped;
- .2** internal communication equipment, fire detecting systems and signals, which may be required in an emergency; and

- .3 the navigational lights if solely electrical and the emergency lights, where applicable, such as:
  - .1 at launching stations and over the side of the vessel;
  - .2 in all alleyways, stairways and exits;
  - .3 in spaces containing machinery or the emergency source of power;
  - .4 at or in control stations; and
  - .5 in fish-handling and fish-processing spaces.
- 4.3 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 while maintaining the voltage of the battery throughout the discharge period within plus or minus 12 percent 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 4.2. The emergency switchboard should be provided with an auxiliary switch allowing the battery to be connected manually in case of failure of the automatic connection system.
- 4.4 The emergency switchboard should be installed as near as is practicable to the emergency source of power. Where the emergency source of power is a generator, the emergency switchboard may be located in the same place as the generator unless the operation of the emergency switchboard could be impaired.
- 4.5 An accumulator battery should be installed in a well-ventilated space, but not in the space containing the emergency switchboard. An indicator should be mounted in a suitable space on the main switchboard or where suitable 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. When the system is arranged for feedback operation, the inter-connector feeder should also be protected at the emergency switchboard against short circuit.
- 4.6 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.
- 4.7 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.

**4.8** 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.

## **D Switchboards**

**1** Switchboards should be arranged so as to give ease of access to apparatus and equipment, without danger to crew or maintenance staff. The sides and backs and, where necessary, the front of the switchboard, 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 on the floor at the front.

**2** All outgoing circuits from the switchboards should be double-pole and open-circuit protected. Lighting circuits should be separate from power circuits.

**3** The main switchboard should be fitted with a voltmeter and an ammeter for each generator and with earth lamps. The emergency switchboard should also be fitted with a voltmeter, an ammeter and earth lamps.

**4** In the case of AC installations, each section of the switchboard, supplied by an individual alternator, should be fitted with a voltmeter, a frequency meter and an ammeter, switched to allow the current to be measured in each phase. Where applicable, a subdistribution board fitted in the wheelhouse should be fitted with a voltmeter and a switch to isolate it from the mains.

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

**6** For safety purposes, it is important for electric circuits and the current-carrying capacity of each circuit to be permanently indicated, together with the rating or setting of the appropriate overload protective device to be identified on switchboards and, where appropriate, on distribution boxes. It is also important to plan the preferential tripping of circuit-breakers to safeguard essential circuits in the event of an overload situation of a generator or alternator.

**7** Each separate circuit should be protected against short circuit as well as against overload to the satisfaction of the competent authority.

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

## **E Electric cables and conductors**

- 1 In general, electrical wiring should be of marine-grade materials only and should conform to the best marine practices of installation and workmanship. When selecting cables, however, particular attention should be given to environmental factors such as temperature and contact with substances, e.g. polystyrene, that degrade PVC insulation.
- 2 Cables that are not provided with electrical protection should be kept as short as possible and be “short circuit proofed”, e.g. single core with an additional insulating sleeve over the insulation of each core. Normal marine-quality cable that is single core will meet this recommendation without an additional sleeve because it has both conductor insulation and a sheath.
- 3 Where clips are used to secure cables, it is preferable to use cable trays in order to provide better protection to a cable and prevent the effect of sag. In the event that cable trays cannot be fitted, the distance between clips should be close enough to prevent excessive sagging of the cable (between the clips).
- 4 From a safety point of view, power cables of different voltages should be kept separate from each other and should be colour-coded or otherwise marked for ease of identification.

## **F Earthing arrangements**

- 1 All electrical installations should be bonded to earth and each bonding point should be accessible for maintenance.
- 2 The competent authority may approve grounded distribution systems provided that the common ground part of the vessel is only used as a means of maintaining the return side of the system at earth potential, and the grounded side of the system should be of negative polarity.
- 3 On wooden and composite-hulled vessels, a continuous ground conductor should be installed to facilitate the grounding of non-conducting exposed metal parts. The ground conductor should terminate at a copper plate or sintered bronze fitting, the area of which is not less than 0.2 m<sup>2</sup>, fixed to the keel below the light waterline so as to be fully immersed under all conditions of heel. The minimum size of the ground conductor should be not less than 16 mm.
- 4 Earth plates should not be placed within, or close to, the propeller aperture.
- 5 Every ground connection to the vessel’s structure or, on wooden and composite-hulled vessels, to the continuous ground conductor, should be made in an accessible position and should be secured by a screw or connector of brass or other corrosion-resistant material used solely for that purpose.
- 6 Exposed permanently-fixed metal parts of electrical machines or equipment that are not intended to be “live”, but that 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 (DC) or 55 V, root mean square, between conductors; auto-transformers should not be used for the purpose of achieving this alternative current 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.
- 7 Radar, radio and other navigational equipment that need to be earthed should have a separate grounding point and the connection should be of adequate dimensions and of the least resistance.
- 8 Where a flexible, non-conducting coupling is fitted between the engine and gearbox or between the gearbox output shaft and the propeller shafting, the coupling should be bridged by a piece of braided copper conductor.

## **G Precautions against shock, fire and other hazards of electrical origin**

- 1 Cable systems and electrical equipment should be so installed as to avoid or reduce interference with radio operation.
- 2 Cables should be capable of carrying the maximum-rated current for the circuit. The cross-sectional area should be sufficient to ensure that the voltage drop will not exceed 6 percent of the nominal rating under the maximum-rated load for the circuit. Electrical wiring should be of marine-grade multistrand tinned copper wire cores with an approved insulated cover.
- 3 All electrical cables should be at least of a flame-retardant type and should be installed so 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, that do not comply with the foregoing.
- 4 Electrical cables should be supported in such a manner as to avoid chafing or other damage and should not be located close to hot surfaces such as those of engine exhaust pipes. 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.
- 5 Where cables are not metal sheathed or armoured and there might be a risk of fire in case of an electrical fault, special precautions should be taken to the satisfaction of the competent authority.
- 6 Electrical wiring and electrical equipment installed in vessels should be of marine-grade materials only and should conform to the best marine practices of installation and workmanship. Electrical equipment exposed to the weather should be protected from dampness and corrosion as well as mechanical damage.
- 7 Lighting fittings should be arranged to prevent temperature rises which could damage the wiring and to prevent surrounding material from becoming excessively hot.

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

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

9 Where a potential explosion risk exists in or near any space, all electrical equipment, as well as fittings installed in those spaces, should be either explosion-proof or intrinsically safe to the satisfaction of the competent authority.

## **H Lighting systems**

1 Lighting for machinery spaces and work spaces should be supplied from at least two separate final subcircuits and arranged in such a manner that failure of one final subcircuit should not leave the space in darkness.

2 Lighting of normally unattended spaces such as the fish-hold and net stores should be controlled from outside the space.

3 An emergency source of power should be made available for a signalling lamp, if carried.

## **I Electric motors**

1 In general, every electric motor should be provided with a means of starting and stopping, located so that the person controlling the motor can easily operate it.

2 With the exception of an engine starter motor, the circuits supplying electric motors should be fitted with short-circuit and overload protection.

3 In the case of steering-gear motors, overload protection is not mandatory; therefore, in the event of failure of any of the steering-gear circuits, an alarm should sound in the wheelhouse. In addition, indicators should also be installed in the wheelhouse to give an indication when steering-gear motors and units are in operation. If protection against excess current is provided, it should be a circuit-breaker, should be set at not less than twice the full load current of the motor or circuit and should be arranged to allow the passage of the appropriate starting current.

4 Where electric motors are fitted to deck machinery, the operating device should automatically return to the stop position when released. Emergency stops should also be provided at positions as set out in the recommendations given in 6.7 of Chapter 6. The mechanical component of the deck machinery should be fitted with an appropriate fail-safe braking system. It should be noted, however, that it is common practice to incorporate electro-magnetic braking systems in machinery driven by an electric motor,



and this should be taken into consideration at the approval stage of the individual units of machinery.

**5** Fans and pumps driven by electric motors should be fitted with a remote control. The remote control should be positioned outside the machinery space concerned, for stopping the motors in the event of a fire in the space in which they are located.

## **J Lightning conductors**

**1** Lightning conductors should be fitted on wooden masts. They should be of continuous copper tape or copper rope having a cross-section of not less than 75 mm<sup>2</sup> and secured to a copper spike of 12 mm diameter projecting at least 150 mm beyond the top of the mast.

**2** In the case of metal hulls, the lower end of the conductor should be earthed to the hull.

**3** In the case of wooden or other non-metallic hulls, the lower end of the conductor should be attached to an earth plate. All sharp bends should be avoided and only bolted or riveted joints should be used.



## Annex XVIII

# Guidance on a basic first aid kit\*

Basic first aid kit	Essential	Recommended
Bandages	X	
Band aids	X	
Sterile dressings	X	
Sterile gauze	X	
Adhesive tape	X	
Scissors	X	
Safety pins	X	
Antiseptic cream	X	
Tweezers	X	
Liquid antiseptic		X
Pain-killing tablets		X
Sunscreen		X
Eyewash		X
First aid book		X

\* Note: The competent authority could consider providing illustrations of these items.



## Annex XIX

# Guidance on personnel protective equipment

Activity	Location	Working gear					Protective gear						Specialist protection	
		Oilskins (and partial)	Boiler suit	Work boots	Gloves	Hard hat	Ear protection	Safety line/ harness	Lifejacket/ buoyancy equipment	Safety goggles	Rubber gloves/ apron	Insulated jacket and trousers	Breathing apparatus	Oxygen meter
Fishing watch	Working deck	●	●	■	●	■			■					
Any	Engine room		■	■	●	●	■							
Any	Aloft	●	●	■	■	■		●						
Any	Outboard	●		■	■	●		●	■					
Grinding and cutting	Engine room		■	■	■	●	●			■				
Grinding and cutting	Working deck		■	■	■	●				■				
Exposed work including shooting and hauling	Working deck	■		■	■	■			■					
Mooring	Working deck			■	■	■			■					
Stowage/ handling	Fish room			■	■									
Stowage	Refrigerated fish room			■	■	●					■			
Battery maintenance	Engine room		■	■			●			■	■			
Battery maintenance	Wheelhouse		■	■		●				■	■			
Loading/ unloading fish boxes and lifting gear	Working deck			■	■	■								
Any	Enclosed space			■								■	■	
Vessel maintenance	Inside			■	■					●				
Vessel maintenance	Outside			■	■	■			■	■				

The competent authority could use this table, having considered the risks and local circumstances, to decide on what personal protective equipment to require.

- Means a high-priority item.
- Means a priority dependent upon local circumstances and the location.

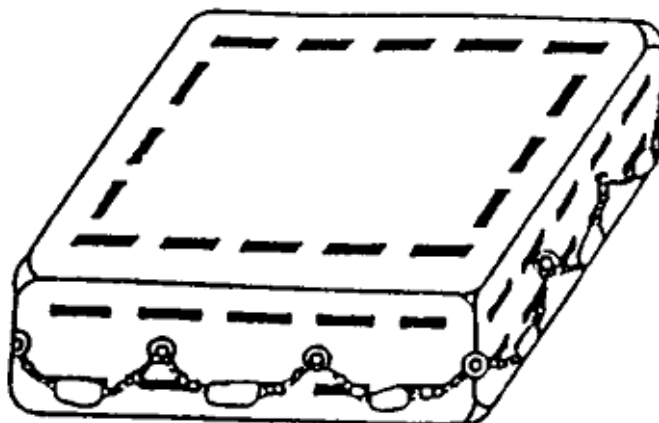


## Annex XX

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# Guidance on the requirements for buoyant apparatus

Buoyant apparatus



1 No type of buoyant apparatus should be accepted unless it satisfies the following conditions:

- .1 It is of such size and strength that it can be thrown from the place where it is stowed into the water without being damaged;
- .2 it is clearly marked as to the number of persons which it is to support;
- .3 it can be stowed where it is readily accessible, can be quickly and easily detached from the vessel and easily launched by hand. Wherever practical, buoyant apparatus should be float-free. Such arrangements are to be to the satisfaction of the competent authority;
- .4 it is made of buoyant material and of robust construction;
- .5 it would be effective and stable when floating either way up;
- .6 the air cases or equivalent buoyancy are placed as near as possible to the sides of the apparatus, and such buoyancy should not be dependent upon inflation;
- .7 it is fitted with a painter and has a line securely becketed round the outside;
- .8 it is painted in a highly visible colour and fitted with reflective tape;
- .9 it is recommended that there be a watertight container available for crew abandoning the vessel; it should contain the relevant safety equipment, such as the distress signals required to be carried on board, and drinking water; and

.10 where a container is used as the buoyant apparatus, consideration should be given to reducing the permeability.

2 Testing should be carried out to indicate the number of people the buoyant apparatus is capable of supporting with a freeboard of not less than half its depth, for a period of time acceptable to the competent authority.



## Annex XXI

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# Guidance on the requirements for life-saving equipment\*

## 1 Liferafts

### 1.1 *General requirements for liferafts*

#### 1.1.1 Construction of liferafts should comply with the following requirements:

- .1 Every liferaft should be so constructed as to be capable of withstanding exposure for 30 days afloat in all sea conditions.
- .2 The liferaft should be so constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipment will operate satisfactorily.
- .3 The floating liferaft should be capable of withstanding repeated jumps onto it from a height of at least 4.5 m above its floor with and without the canopy erected.
- .4 The liferaft and its fittings should be so constructed as to enable it to be towed at a speed of 3 knots in calm water when loaded with its full complement of persons and equipment and with one of its sea anchors streamed.
- .5 The liferaft should have a canopy to protect the occupants from exposure. The canopy should be automatically set in place when the liferaft is launched and waterborne. It should comply with the following conditions:
  - .1 It should provide insulation against heat and cold by means of either two layers of material separated by an air gap or other equally efficient means. Means should be provided to prevent accumulation of water in the air gap;
  - .2 its interior should be of a colour that does not cause discomfort to the occupants;
  - .3 each entrance should be clearly indicated and be provided with efficient adjustable-closing arrangements which can be easily and quickly opened from inside and outside the liferaft so as to permit ventilation but exclude seawater, wind and cold. Liferafts accommodating more than eight persons should have at least two diametrically opposite entrances;
  - .4 it should admit sufficient air for the occupants at all times, even with the entrances closed;
  - .5 it should be provided with at least one viewing port;
  - .6 it should be provided with means for collecting rainwater;
  - .7 it should be provided with means to mount a survival craft radar transponder at a height of at least 1 m above the sea; and
  - .8 it should have sufficient headroom for seating occupants under all parts of the canopy.

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\* Refer to the *International Life-Saving Appliance (LSA) Code* for the full text.

### 1.1.2 Equipment

- .1 The normal equipment of every liferaft should consist of:
  - .1 one buoyant rescue quoit, attached to not less than 30 m of buoyant line;
  - .2 one knife of the non-folding type, having a buoyant handle and lanyard attached and stowed in a pocket on the exterior of the canopy near the point at which the painter is attached to the liferaft. In addition, a liferaft that is permitted to accommodate 13 persons or more should be provided with a second knife, which need not be of the non-folding type;
  - .3 one buoyant bailer for a liferaft that is permitted to accommodate not more than 12 persons. For a liferaft that is permitted to accommodate 13 persons or more, two buoyant bailers;
  - .4 two sponges;
  - .5 two sea anchors each with a shock-resistant hawser and tripping line, one being spare and the other permanently attached to the liferaft in such a way that when the liferaft inflates or is waterborne it will cause the liferaft to lie oriented to the wind in the most stable manner. The strength of each sea anchor and its hawser and tripping line should be adequate for all sea conditions. The sea anchors should be fitted with a swivel at each end of the line and should be of a type which is unlikely to turn inside-out between its shroud lines;
  - .6 two buoyant paddles;
  - .7 three tin-openers; safety knives containing special tin-opener blades are satisfactory for this requirement;
  - .8 one first aid kit in a waterproof case capable of being closed tightly after use;
  - .9 one whistle or equivalent sound signal;
  - .10 four rocket parachute flares;
  - .11 six handheld flares;
  - .12 two buoyant smoke signals;
  - .13 one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container;
  - .14 an efficient radar reflector, unless a survival craft radar transponder is stowed in the liferaft;
  - .15 one daylight signalling mirror with instructions on its use for signalling to ships and aircraft;
  - .16 one copy of the life-saving signals referred to in regulation V/16 of the International Convention for the Safety of Life at Sea, 1974, on a waterproof card or in a waterproof container;
  - .17 one set of fishing tackle;
  - .18 a food ration consisting of not less than 10 000 kJ (2 400 kcal) for each person the liferaft is permitted to accommodate. These rations should be palatable, edible throughout the market life and packed in a manner which allows them to be readily divided and easily opened, taking into account immersion suits' gloved hands. The rations should be packaged in permanently sealed metal containers or vacuum packed in a flexible

- packaging material and clearly marked with the date of packaging and expiry;
  - .19 watertight receptacles containing a total of 1.5 litres of freshwater for each person the liferaft is permitted to accommodate, of which either 0.5 litre per person may be replaced by a desalting apparatus capable of producing an equal amount of freshwater in two days or 1 litre per person may be replaced by a manually-powered reverse osmosis desalinators capable of producing an equal amount of freshwater in two days;
  - .20 one rustproof graduated drinking vessel;
  - .21 anti-seasickness medicine sufficient for at least 48 hours and one seasickness bag for each person the liferaft is permitted to accommodate;
  - .22 instructions on how to survive;\*
  - .23 instructions for immediate action; and
  - .24 thermal protective aids sufficient for 10 percent of the number of persons the liferaft is permitted to accommodate or two persons, whichever is the greater.
- .2 The marking should be in block capitals of the Roman alphabet.
  - .3 Where appropriate, the equipment should be stowed in a container which, if it is not an integral part of, or permanently attached to, the liferaft, should be stowed and secured inside the liferaft and be capable of floating in water for at least 30 minutes without damage to its contents.

## 1.2 *Inflatable liferafts*

1.2.1 Inflatable liferafts should comply with the requirements of 1.1 and, in addition, should comply with the requirements of this section.

1.2.2 Construction of inflatable liferafts should comply with the following requirements:

- .1 The main buoyancy chamber should be divided into not less than two separate compartments, each inflated through a non-return inflation valve on each compartment. The buoyancy chambers should be so arranged that, in the event of any one of the compartments being damaged or failing to inflate, the intact compartments should be able to support, with positive freeboard over the liferaft's entire periphery, the number of persons which the liferaft is permitted to accommodate, each having a mass of 75 kg and seated in their normal positions.
- .2 The floor of the liferaft should be waterproof and should be capable of being sufficiently insulated against cold either:
  - .1 by means of one or more compartments that the occupants can inflate, or which inflate automatically and can be deflated and re-inflated by the occupants; or
  - .2 by other equally efficient means not dependent on inflation.
- .3 The liferaft should be inflated with a non-toxic gas. Inflation should be completed within 1 minute at an ambient temperature of between 18 °C and

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\* Refer to Instructions for action in survival craft, adopted by IMO (resolution A.657(16)).

20 °C and within 3 minutes at an ambient temperature of -30 °C. After inflation, the liferaft should maintain its form when loaded with its full complement of persons and equipment.

- .4 Each inflatable compartment should be capable of withstanding a pressure equal to at least three times the working pressure and should be prevented from reaching a pressure exceeding twice the working pressure either by means of relief valves or by a limited gas supply. Means should be provided for fitting the topping-up pump or bellows required by 1.2.8.1.2 so that the working pressure can be maintained.

### 1.2.3 Carrying capacity of inflatable liferafts

The number of persons which a liferaft should be permitted to accommodate should be equal to the lesser of the following:

- .1 the greatest whole number obtained by dividing by 0.096 the volume, measured in cubic m, of the main buoyancy tubes (which for this purpose should include neither the arches nor the thwarts, if fitted) when inflated; or
- .2 the greatest whole number obtained by dividing by 0.372 the inner horizontal cross-sectional area of the liferaft measured in square m (which for this purpose may include the thwart or thwarts, if fitted) measured to the innermost edge of the buoyancy tubes; or
- .3 the number of persons having an average mass of 75 kg all wearing lifejackets, that can be seated with sufficient comfort and headroom without interfering with the operation of any of the liferaft's equipment.

### 1.2.4 Access into inflatable liferafts

- .1 Entrances not provided with a boarding ramp should have a boarding ladder, the lowest step of which should be situated not less than 0.4 m below the liferaft's light waterline.
- .2 There should be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

### 1.2.5 Stability of inflatable liferafts

- .1 Every inflatable liferaft should be so constructed that, when fully inflated and floating with the canopy uppermost, it is stable in a seaway.
- .2 The stability of the liferaft when in the inverted position should be such that it can be righted in a seaway and in calm water by one person.
- .3 The stability of the liferaft when loaded with its full complement of persons and equipment should be such that it can be towed at speeds of up to 3 knots in calm water.
- .4 The liferafts should be fitted with water pockets complying with the following requirements:

- .1 the water pockets should be of a highly visible colour;
- .2 the design should be such that the pockets fill to at least 60 percent of their capacity within 25 seconds of deployment;
- .3 the pockets should have an aggregate capacity of at least 220 litres for liferafts certified to carry up to ten persons;
- .4 the pockets for liferafts certified to carry more than ten persons should have an aggregate capacity of not less than  $20 Nl$ , where  $N$  = number of persons carried; and
- .5 the pockets should be positioned symmetrically round the circumference of the liferaft. Means should be provided to enable air to readily escape from underneath the liferaft.

#### 1.2.6 Containers for inflatable liferafts

- .1 The liferaft should be packed in a container that is:
  - .1 so constructed as to withstand hard wear under conditions encountered at sea;
  - .2 of sufficient inherent buoyancy, when packed with the liferaft and its equipment, to pull the painter from within and to operate the inflation mechanism should the vessel sink; and
  - .3 as far as practicable, watertight except for drain holes in the container bottom.
- .2 The liferaft should be packed in its container in such a way as to ensure, as far as possible, that the waterborne liferaft inflates in an upright position on breaking free from its container.
- .3 The container should be marked with:
  - .1 the maker's name or trademark;
  - .2 the serial number;
  - .3 the name of the approving authority and the number of persons it is permitted to carry;
  - .4 the type of emergency pack enclosed;
  - .5 the date when last serviced;
  - .6 the length of painter;
  - .7 the maximum permitted height of stowage above the waterline (depending on drop-test height and length of painter); and
  - .8 launching instructions.

#### 1.2.7 Markings on inflatable liferafts\*

- .1 The liferaft should be marked with:
  - .1 the maker's name or trademark;
  - .2 the serial number;
  - .3 the date of manufacture (month and year);
  - .4 the name of the approving authority;

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\* See also 7.5.5 of the Safety Recommendations.

- .5 the name and the place of the servicing station where it was last serviced; and
- .6 the number of persons it is permitted to accommodate indicated over each entrance, in characters not less than 100 mm in height and of a colour contrasting with that of the liferaft.

**1.2.8 Additional equipment for inflatable liferafts**

- .1 In addition to the equipment, every inflatable liferaft should be provided with:
  - .1 one repair outfit for repairing punctures in buoyancy compartments; and
  - .2 one topping-up pump or bellows.
- .2 The knives required should be safety knives.

## **2 Lifejackets**

### **2.1 General requirements for lifejackets**

**2.1.1** A lifejacket should not sustain burning or continue melting after being totally enveloped in a fire for 2 seconds.

**2.1.2** Lifejackets should be provided in three sizes in accordance with Table 2.1. If a lifejacket fully complies with the requirements of two adjacent size ranges, it may be marked with both size ranges, but the specified ranges should not be divided. Lifejackets should be marked by either weight or height, or by both weight and height, according to Table 2.1.

TABLE 2.1  
**Lifejacket sizing criteria**

<b>Lifejacket marking</b>	<b>Child</b>	<b>Adult</b>
User's size:		
Weight (kg)	15 or more but less than 43	43 or more
Height (cm)	100 or more but less than 155	155 or more

**2.1.3** The in-water performance of a lifejacket should be evaluated by comparison with the performance of a suitable size, standard reference lifejacket, i.e. reference test device (RTD) complying with the recommendations of IMO.\*

**2.1.4** A lifejacket should be so constructed that:

- .1 at least 75 percent of persons who are completely unfamiliar with the lifejacket can correctly don it within 1 minute without assistance, guidance or prior demonstration;
- .2 after demonstration, all persons can correctly don it within 1 minute without assistance;

\* Refer to the Revised recommendations on testing of life-saving appliances, adopted by IMO (resolution MSC.81(70), as amended).

- .3 it is clearly capable of being worn in only one way or inside-out and, if donned incorrectly, it is not injurious to the wearer;
- .4 the method of securing the lifejacket to the wearer has quick and positive means of closure that do not require tying of knots;
- .5 it is comfortable to wear; and
- .6 it allows the wearer to jump into the water from a height of at least 4.5 m while holding on to the lifejacket, and from a height of at least 1 m with arms held overhead, without injury and without dislodging or damaging the lifejacket or its attachments.

**2.1.5** When tested according to the recommendations of IMO on at least 12 persons, adult lifejackets should have sufficient buoyancy and stability in calm freshwater to:

- .1 lift the mouth of an exhausted or unconscious person by an average height of not less than the average height provided by the adult RTD;
- .2 turn the body of an unconscious, face-down person in the water to a position whereby the mouth is clear of the water in an average time not exceeding the average turn time provided by the RTD. The number of persons not turned by the lifejacket should be no greater than the number of persons not turned by the RTD;
- .3 incline the body backwards from the vertical position for an average torso angle of not less than the torso angle provided by the RTD minus 5°;
- .4 lift the head above horizontal for an average faceplane angle of not less than the faceplane angle provided by the RTD minus 5°; and
- .5 return the wearer to a stable face-up position after being destabilized while floating in the flexed foetal position.\*

**2.1.6** An adult lifejacket should allow the person wearing it to swim a short distance and to board a survival craft.

**2.1.7** A lifejacket should have buoyancy which is not reduced by more than 5 percent after 24-hour submersion in freshwater.

- .1 The buoyancy of a lifejacket should not depend on the use of loose granulated materials.
- .2 Each lifejacket should be provided with means of securing a lifejacket light as specified in 2.2.
- .3 Each lifejacket should be fitted with a whistle firmly secured by a lanyard.
- .4 Lifejacket lights and whistles should be selected and secured to the lifejacket in such a way that their performance in combination is not degraded.

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\* Refer to the IMO publication *A Pocket Guide to Cold Water Survival* and to the Revised recommendations on testing of life-saving appliances, adopted by IMO (resolution MSC.81(70), as amended).

- .5 A lifejacket should be provided with a releasable buoyant line or other means to secure it to a lifejacket worn by another person in the water.
- .6 A lifejacket should be provided with a suitable means to allow a rescuer to lift the wearer from the water into a survival craft or rescue boat.

## 2.2 *Lifejacket lights*

### 2.2.1 Every lifejacket light should:

- .1 have a luminous intensity of not less than 0.75 cd in all directions of the upper hemisphere;
- .2 have a source of energy capable of providing a luminous intensity of 0.75 cd for at least 8 hours;
- .3 be visible over as great a segment of the upper hemisphere as is practicable when attached to a lifejacket; and
- .4 be of a white colour.

### 2.2.2 If the light referred to in 2.2.1 above is a flashing light, it should, in addition:

- .1 be provided with a manually operated switch; and
- .2 flash at a rate of not less than 50 flashes and not more than 70 flashes per minute with an effective luminous intensity of at least 0.75 cd.

## 3 **Immersion suits**

### 3.1 *General requirements for immersion suits*

#### 3.1.1 An immersion suit should be constructed with waterproof materials such that:

- .1 it can be unpacked and donned without assistance within 2 minutes, taking into account donning of any associated clothing, donning of a lifejacket if the immersion suit is to be worn in conjunction with a lifejacket, and inflation of orally inflatable chambers, if fitted;\*
- .2 it will not sustain burning or continue melting after being totally enveloped in a fire for 2 seconds;
- .3 it will cover the whole body with the exception of the face. Covering for the hands may be provided by separate gloves which should be permanently attached to the suit;
- .4 it is provided with arrangements to minimize or reduce free air in the legs of the suit; and

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\* Refer to paragraph 3.1.3 of the Revised recommendations on testing of life-saving appliances, adopted by IMO (resolution MSC.81(70), as amended).



- .5 following a jump from a height of not less than 4.5 m into the water, there is no undue ingress of water into the suit.

**3.1.2** An immersion suit on its own, or worn in conjunction with a lifejacket if necessary, should have sufficient buoyancy and stability in calm freshwater to:

- .1 lift the mouth of an exhausted or unconscious person clear of the water by not less than 120 mm; and
- .2 allow the wearer to turn from a face-down to a face-up position in not more than 5 seconds.

**3.1.3** An immersion suit should permit the person wearing it, and also wearing a lifejacket if the immersion suit is to be worn in conjunction with a lifejacket, to:

- .1 climb up and down a vertical ladder at least 5 m in length;
- .2 perform normal duties during abandonment;
- .3 jump from a height of not less than 4.5 m into the water without damaging or dislodging the immersion suit or its attachments, or without being injured; and
- .4 swim a short distance through the water and board a survival craft.

**3.1.4** An immersion suit that has buoyancy and is designed to be worn without a lifejacket should be fitted with a light complying with the requirements of 2.2 and the whistle prescribed by 2.1.7.3.

**3.1.5** An immersion suit that has buoyancy and is designed to be worn without a lifejacket should be provided with a releasable buoyant line or other means to secure it to a suit worn by another person in the water.

**3.1.6** An immersion suit that has buoyancy and is designed to be worn without a lifejacket should be provided with a suitable means to allow a rescuer to lift the wearer from the water into a survival craft or rescue boat.

**3.1.7** If an immersion suit is to be worn in conjunction with a lifejacket, the lifejacket should be worn over the immersion suit. A person wearing such an immersion suit should be able to don a lifejacket without assistance. The immersion suit should be marked to indicate that it must be worn in conjunction with a compatible lifejacket.

**3.1.8** An immersion suit should have buoyancy which is not reduced by more than 5 percent after a 24-hour submersion in freshwater and does not depend on the use of loose granulated materials.

## **3.2** *Thermal performance requirements for immersion suits*

**3.2.1** An immersion suit made of material which has no inherent insulation should be:

- .1 marked with instructions that it must be worn in conjunction with warm clothing; and

- .2 so constructed that, when worn in conjunction with warm clothing and with a lifejacket, if the immersion suit is to be worn with a lifejacket, the immersion suit continues to provide sufficient thermal protection, following one jump by the wearer into the water from a height of 4.5 m, to ensure that when it is worn for 1 hour in calm circulating water at a temperature of 5 °C, the wearer's body core temperature does not fall more than 2 °C.

**3.2.2** An immersion suit made of material with inherent insulation when worn either on its own or with a lifejacket, if the immersion suit is to be worn in conjunction with a lifejacket, should provide the wearer with sufficient thermal insulation, following one jump into the water from a height of 4.5 m, to ensure that the wearer's body core temperature does not fall more than 2 °C after a 6-hour immersion in calm circulating water at a temperature of between 0 °C and 2 °C.

**3.2.3** The immersion suit should permit the person wearing it and with hands covered to pick up a pencil and write after being immersed in water at 5 °C for 1 hour.

### **3.3** *Buoyancy requirements*

A person in freshwater wearing either an immersion suit complying with the requirements of 3.1.5 or an immersion suit with a lifejacket should be able to turn from a face-down to a face-up position in not more than 5 seconds.

## **4** **Lifebuoys**

### **4.1** *Lifebuoy specifications*

Every lifebuoy should:

- .1 have an outer diameter of not more than 800 mm and an inner diameter of not less than 400 mm;
- .2 be constructed of inherently buoyant material; it should not depend upon rushes, cork shavings or granulated cork, any other loose granulated material or any air compartment that depends on inflation for buoyancy;
- .3 be capable of supporting not less than 14.5 kg of iron in freshwater for 24 hours;
- .4 have a mass of not less than 2.5 kg;
- .5 not sustain burning or continue melting after being totally enveloped in a fire for 2 seconds;
- .6 be constructed to withstand a drop into the water from the height at which it is stowed above the waterline in the lightest seagoing condition or from a height of 30 m, whichever is the greater, without impairing either its operating capability or that of its attached components;
- .7 if it is intended to operate the quick-release arrangement provided for the self-activated smoke signals and self-igniting lights, have a mass of not less than 4 kg; and

- .8 be fitted with a grabline of not less than 9.5 mm in diameter and of not less than four times the outside diameter of the body of the buoy in length. The grabline should be secured at four equidistant points around the circumference of the buoy to form four equal loops.

#### 4.2 *Buoyant lifelines*

Buoyant lifelines should:

- .1 be non-kinking;
- .2 have a diameter of not less than 8 mm; and
- .3 have a breaking strength of not less than 5 kN.

## 5 **Rocket parachute flares**

5.1 The rocket parachute flare should:

- .1 be contained in a water-resistant casing;
- .2 have brief instructions or diagrams clearly illustrating its use printed on its casing;
- .3 have integral means of ignition; and
- .4 be so designed as not to cause discomfort to the person holding the casing when used in accordance with the manufacturer's operating instructions.

5.2 The rocket should, when fired vertically, reach an altitude of not less than 300 m. At or near the top of its trajectory, the rocket should eject a parachute flare, which should:

- .1 burn with a bright red colour;
- .2 burn uniformly with an average luminous intensity of not less than 30 000 cd;
- .3 burn for not less than 40 seconds;
- .4 have a rate of descent of not more than 5 m/s; and
- .5 not damage its parachute or attachments while burning.

## 6 **Handheld flares**

6.1 The handheld flare should:

- .1 be contained in a water-resistant casing;
- .2 have brief instructions or diagrams clearly illustrating its use printed on its casing;

- .3 have a self-contained means of ignition; and
  - .4 be so designed as not to cause discomfort to the person holding the casing and not to endanger the survival craft by burning or glowing residues when used in accordance with the manufacturer's operating instructions.
- 6.2 The handheld flare should:
- .1 burn with a bright red colour;
  - .2 burn uniformly with an average luminous intensity of not less than 15 000 cd; and
  - .3 burn for not less than 1 minute; and
  - .4 continue to burn after having been immersed for 10 seconds under 100 mm of water.

## Annex XXII

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# Recommendations for testing lifebuoys and lifejackets\*

## Part 1

### *Prototype tests*

## 1 Lifebuoys

### 1.1 Lifebuoy specifications

It should be established by measurement, weighing and inspection that the lifebuoy:

- .1 has an outer diameter of not more than 800 mm and an inner diameter of not less than 400 mm;
- .2 has a mass of not less than 2.5 kg; and
- .3 is fitted with a grabline of not less than 9.5 mm in diameter and of not less than four times the outside diameter of the body of the buoy in length. The grabline should be secured in four equal loops.

### 1.2 Temperature cycling test

The following test should be carried out on two lifebuoys.

1.2.1 The lifebuoys should be alternately subjected to surrounding temperatures of -30 °C and +65 °C. These alternating cycles need not follow immediately one after the other and the following procedure, repeated for a total of ten cycles, is acceptable:

- .1 the specimens left exposed for 8 hours at a minimum temperature of +65 °C during one day; and
- .2 the specimens removed from the warm chamber that same day and left exposed under ordinary room conditions at a temperature of 20 °C ± 3 °C until the next day;
- .3 the specimens left exposed for 8-hours at a maximum temperature of -30 °C to be completed the next day; and
- .4 the specimens removed from the cold chamber that same day and left exposed under ordinary room conditions at a temperature of 20 °C ± 3 °C until the next day.

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\* For the full text, refer to the International Life-Saving Appliance (LSA) Code and the Revised recommendations on testing of life-saving appliances, adopted by IMO (resolution MSC.81(70), as amended).

**1.2.2** The lifebuoys should show no sign of loss of rigidity under high temperatures and, after the tests, should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

### **1.3 Drop test**

The two lifebuoys should be dropped into the water from the height at which they are intended to be stowed on vessels in their lightest seagoing condition, or from a height of 30 m, whichever is the greater, without suffering damage. In addition, one lifebuoy should be dropped three times from a height of 2 m on to a concrete floor.

### **1.4 Test for oil resistance**

One of the lifebuoys should be submerged horizontally for 24 hours under a 100 mm head of diesel oil at normal room temperature. After this test, the lifebuoy should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

### **1.5 Fire test**

The other lifebuoy should be subjected to a fire test. A test pan measuring 30 cm x 35 cm x 6 cm should be placed in an essentially draught-free area. Water should be put in the bottom of the test pan to a depth of 1 cm followed by enough petrol to make a minimum total depth of 4 cm. The petrol should then be ignited and allowed to burn freely for 30 seconds. The lifebuoy should then be moved through the flames in an upright, forward, free-hanging position, with the bottom of the lifebuoy 25 cm above the top edge of the test pan so that the duration of exposure to the flames is 2 seconds. The lifebuoy should not sustain burning or continue melting after being removed from the flames.

### **1.6 Flotation test**

The two lifebuoys subjected to the above tests should be floated in freshwater with not less than 14.5 kg of iron suspended from each of them and should remain floating for 24 hours.

### **1.7 Strength test**

A lifebuoy body should be suspended from a 50 mm wide strap. A similar strap should be passed around the opposite side of the body with a 90 kg mass suspended from it. After 30 minutes, the lifebuoy body should be examined. There should be no breaks, cracks or permanent deformation.

## **2 Lifejackets**

### **2.1 Temperature cycling test**

A lifejacket should be subjected to the temperature cycling test as prescribed in 1.2.1 and should then be externally examined. The lifejacket materials should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

## 2.2 Buoyancy test

The buoyancy of the lifejacket should be measured before and after a 24-hour complete submersion to just below the surface in freshwater. The difference between the initial buoyancy and the final buoyancy should not exceed 5 percent of the initial buoyancy.

## 2.3 Fire test

A lifejacket should be subjected to the fire test prescribed in 1.5. The lifejacket should not sustain burning for more than 6 seconds or continue melting after being removed from the flames.

## 2.4 Test of components other than buoyancy materials

All the materials, other than buoyancy materials, used in the construction of the lifejacket, including the cover, tapes, seams and closures, should be tested to an international standard acceptable to IMO\* to establish that they are rot-proof, colour-fast and resistant to deterioration from exposure to sunlight and that they are not unduly affected by seawater, oil or fungal attack.

## 2.5 Strength tests

### *Body or lifting loop strength tests*

2.5.1 The lifejacket should be immersed in water for 2 minutes. It should then be removed from the water and closed in the same manner as when it is worn by a person. A force of not less than 3 200 N (2 400 N in the case of a child-size lifejacket) should be applied for 30 minutes to the part of the lifejacket that secures it to the body of the wearer (see Figure 1) and applied separately to the lifting loop of the lifejacket. The lifejacket should not be damaged as a result of this test. The test should be repeated for each encircling closure.

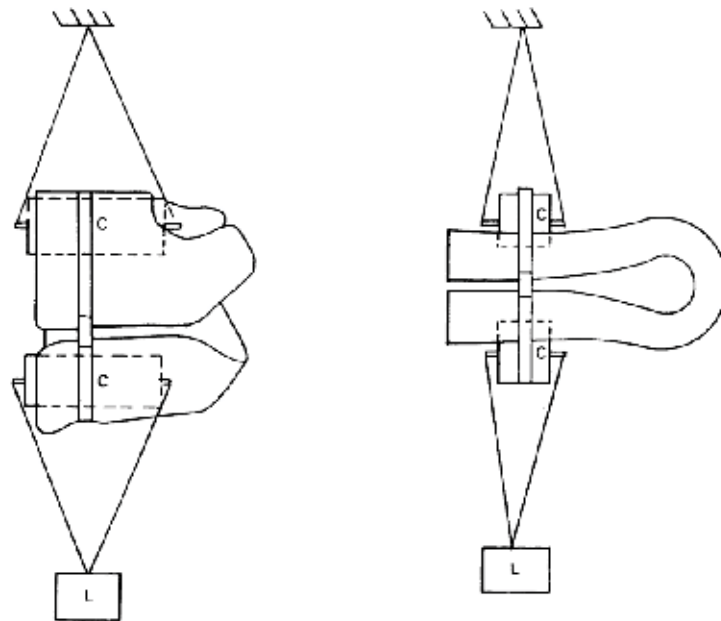
### *Shoulder lift test*

2.5.2 The lifejacket should be immersed in water for 2 minutes. It should then be removed from the water and closed on a form as shown in Figure 2, in the same manner as when it is worn by a person. A force of not less than 900 N (700 N in the case of a child-size lifejacket) should be applied for 30 minutes across the form and the shoulder section of the lifejacket (see Figure 3). The lifejacket should not be damaged as a result of this test. The lifejacket should remain secured on the form during this test.

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\* Refer to the recommendations of the International Organization for Standardization, in particular publication ISO 12402-7, *Personal flotation devices – Part 7: Materials and components – Safety requirements and test methods*.

Figure 1  
Body strength test arrangement for lifejackets

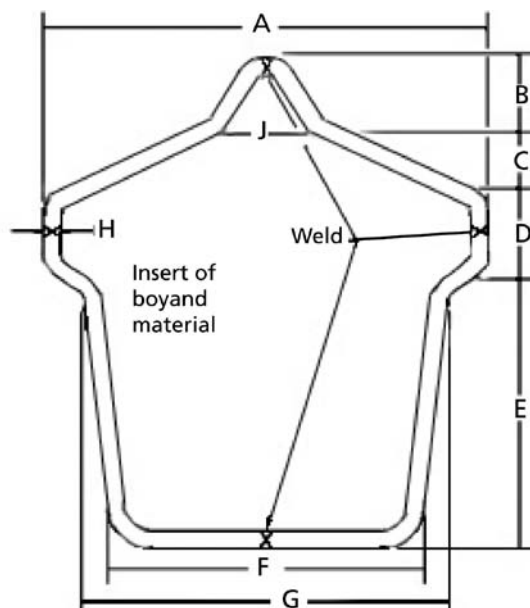


Vest-type lifejacket

Yoke or over-the-head-type lifejacket

C - Cylinder  
125 mm diameter for adult sizes  
50 mm diameter for child sizes  
L - Test load

Figure 2  
Test form for shoulder lift test for lifejackets

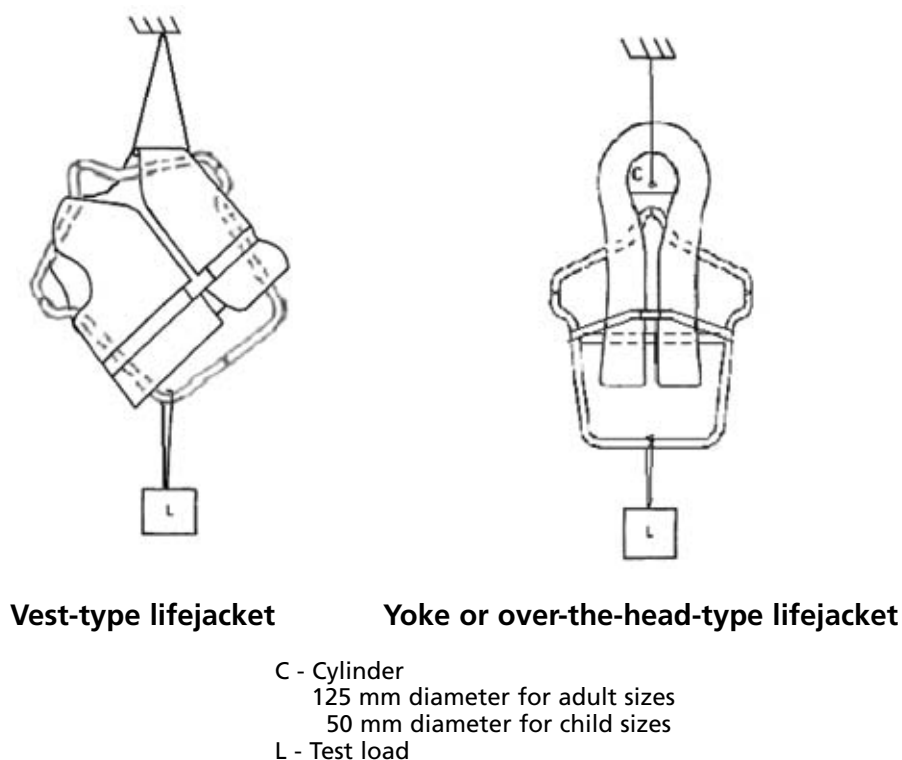


Dimensions in mm

Size	A	B	C	D	E	F	G	H	J
Adult	610	114	76.2	127	381	432	508	25.4	178
Child	508	102	76.2	102	279	330	406	22.2	152



Figure 3  
Shoulder lift test arrangement for lifejackets



## 2.6 Tests for lifejacket buoyancy material

The following tests should be carried out on eight specimens of each lifejacket buoyancy material. The specimens should be at least 300 mm square and be of the same thickness as used in the lifejacket. In the case of kapok, the entire lifejacket should be subjected to the test. The dimensions of the specimens should be recorded at the beginning and end of these tests. Where multiple layers of materials are used to achieve the total thickness desired for the lifejacket, the specimen should be of the thinnest material used.

### *Test for stability under temperature cycling*

**2.6.1** Six specimens should be subjected to the temperature cycling test as prescribed in 1.2.1.

**2.6.2** The dimensions of the specimens (except kapok) should be recorded at the end of the last cycle. The specimens should be carefully examined and should not show any sign of external change of structure or of mechanical qualities.

**2.6.3** Two of the specimens should be cut open and should not show any sign of internal change of structure.

**2.6.4** Four of the specimens should be used for compression and water absorption tests, two of which should be so tested after they have also been subjected to the diesel oil test as prescribed in 1.4.

*Tests for compression and water absorption*

**2.6.5** The tests should be carried out in freshwater and the specimens should be submerged for seven days under a 1.25 m head of water.

**2.6.6** The tests should be carried out on:

- .1 two specimens as supplied;
- .2 two specimens that have been subjected to the temperature cycling test as prescribed in 1.2.1; and
- .3 two specimens that have been subjected to the temperature cycling as prescribed in 1.2.1 followed by the diesel oil test as prescribed in 1.4.

**2.6.7** The results should state the buoyant force in N which each specimen exerts when submerged in water after one and seven days. The reduction of buoyancy should not exceed 10 percent for specimens that have been exposed to the diesel oil conditioning and must not exceed 5 percent for all other specimens. The specimens should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

*Tensile strength test*

**2.6.8** The tensile strength at break of the material should be measured before and after the combined exposure described in 2.6.6.3. When tested according to an international standard acceptable to IMO,\* the materials should have a minimum tensile strength of 140 kPa before exposure, which should not be reduced by more than 25 percent following the combined exposures. In the case of kapok, the protective cover should have a minimum breaking strength of 13 kPa before exposure, which should not be reduced by more than 25 percent following the combined exposures.

**2.7 Donning test**

**2.7.1** To minimize the risk of incorrect donning by uninitiated persons, often in adverse conditions, lifejackets should be examined for the following features and tested as follows:

- .1 fastenings necessary for proper performance should be few and simple, and provide quick and positive closure that does not require tying of knots;
- .2 adult lifejackets should readily fit various sizes of adults, both lightly and heavily clad; and
- .3 all lifejackets should be capable of being worn inside-out, or clearly in only one way.

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\* Refer to the recommendations of the International Organization for Standardization, in particular publication ISO 12402-7, *Personal flotation devices – Part 7: Materials and components – Safety requirements and test methods*.

*Test subjects*

**2.7.2** These tests should be carried out with at least 12 able-bodied persons who are completely unfamiliar with the lifejacket and are selected according to the heights and weights in Table 2.1 and as follows:

- .1 small test subjects need not be adults;
- .2 at least one-third but not more than one-half of the test subjects should be females, including at least one female per height category but excluding the tallest height;
- .3 at least one male and one female should be from the lowest and highest weight group;
- .4 at least one subject should be selected from each cell containing a “1”; and
- .5 enough additional subjects should be selected from cells containing an “X” to total the required number of test subjects, with no more than one subject per cell. A uniform distribution across weight ranges should be maintained.

TABLE 2.1  
Test subject selection for adult lifejackets

Height range (m)	Weight range (kg)							
	40–43	43–60	60–70	70–80	80–100	100–110	110–120	>120
< 1.5	1	X	X	X				
1.5–1.6	X	1	1	X	X			
1.6–1.7		X	X	1	X	X		
1.7–1.8			X	X	1	X	X	X
1.8–1.9			X	X	X	1	1	X
> 1.9					X	X	X	1

*Clothing*

**2.7.3** Each test subject should be tested wearing the clothing specified for the test and appropriate to his/her size as follows:

- .1 *Normal clothing* means normal indoor clothing, which would not normally interfere with the donning of a lifejacket; and
- .2 *Heavy, cold-weather clothing* means the attire appropriate for a hostile environment, including a hooded arctic parka and warm cotton gloves.

**2.7.4** Each test should be timed from when the order is given until the test subject declares that donning is complete. For assessment purposes, donning is considered complete when the subject has donned the lifejacket and securely adjusted all closures to the extent needed to meet the in-water performance requirements, including inflation, if needed.

*Test without instruction*

**2.7.4.1** The test subjects may be tested individually or as a group. Wearing normal clothing, the first attempt to don the lifejacket should be made with no assistance, guidance or prior demonstration. The lifejacket, with closures in the stored condition, should be placed on the floor, face up, in front of the test subject. The instruction provided should be identical for each subject and should be equivalent to the following: “Please don this lifejacket as quickly as possible and adjust it to a snug fit so you can abandon ship”. The lifejacket should be capable of being donned by at least 75 percent of the subjects, and within 1 minute. If a subject dons the lifejacket substantially correctly but fails to secure and/or adjust all closures, the jump test prescribed in 2.8.8 and the in-water performance tests prescribed in 2.8.5 and 2.8.6 should be performed with the lifejacket as donned to establish whether the performance is acceptable and the donning is successful.

*Test after instruction*

**2.7.4.2** Each test subject whose first attempt exceeds 1 minute or is incomplete, after being familiarized with the donning procedure, should then don the lifejacket without assistance while wearing normal clothing. The same instruction and timing method as prescribed in 2.7.4.1 should be used. Each subject should correctly don the lifejacket within 1 minute.

*Heavy-weather clothing test*

**2.7.4.3** Each subject should then don the lifejacket without assistance while wearing heavy-weather clothing. The same instruction and timing method as described in 2.7.4.1 should be used. Each subject should don the lifejacket correctly within 1 minute.

**2.8 Water performance tests**

**2.8.1** This portion of the test is intended to determine the ability of the lifejacket to assist a helpless person or one in an exhausted or unconscious state and to show that the lifejacket does not unduly restrict movement. The in-water performance of a lifejacket is evaluated by comparison with the performance of a suitable size, standard reference lifejacket, i.e. Reference Test Device (RTD).<sup>\*</sup> All tests should be carried out in freshwater under still conditions.

*Test subjects*

**2.8.2** These tests should be carried out with at least 12 persons as described in 2.7.2 above. Only good swimmers should be used because the ability to relax in the water is rarely otherwise obtained.

*Clothing*

**2.8.3** Subjects should wear only swimming costumes.

<sup>\*</sup> Refer to the Revised recommendation on testing of life-saving appliances, adopted by IMO (resolution MSC.81(70), as amended).

### *Preparation for water performance tests*

**2.8.4** Each test subject should be made familiar with each of the tests set out below, and particularly with the requirement regarding relaxing and exhaling in the face-down position. The test subject should don the lifejacket, unassisted, following only the instructions provided by the lifejacket manufacturer. After entering the water, the subject should take care to ensure that there is no significant amount of air unintentionally trapped in the lifejacket or swimming costume.

### *Righting tests*

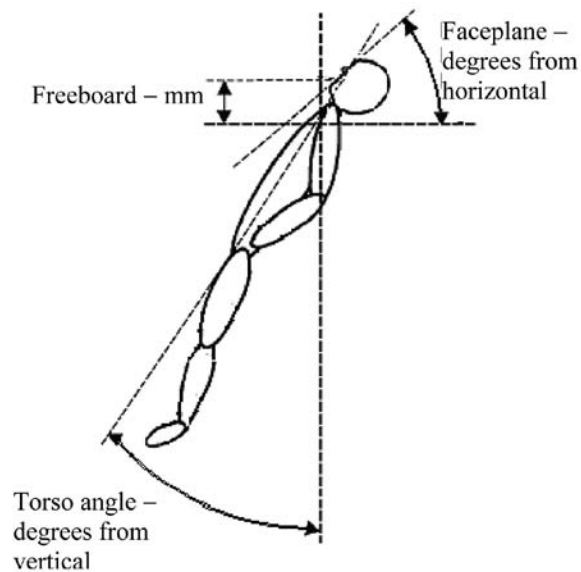
**2.8.5** Each test subject should assume a prone, face-down position in the water, but with the head lifted up so the mouth is out of the water. The subject's feet should be supported, shoulder width apart, with the heels just below the surface of the water. After assuming a starting position with the legs straight and arms along the sides, the subject should then be instructed in the following sequence to allow the body to gradually and completely relax into a natural floating posture: allow the arms and shoulders to relax; allow the legs to relax; and then allow the spine and neck to relax, letting the head fall into the water, while breathing out normally. During the relaxation phase, the subject should be maintained in a stable face-down position. Immediately after the subject has relaxed with the face in the water, simulating a state of utter exhaustion, the subject's feet should be released. The time it takes for the mouth of the test subject to come clear of the water should be recorded to the nearest one-tenth of a second, starting from when the subject's feet are released. This test should be conducted six times, and the highest and lowest times discarded. The test should then be conducted six times with test subjects wearing the RTD and the highest and lowest times discarded.

### *Static balance measurements*

**2.8.6** At the conclusion of the righting tests, without making any adjustments in body or lifejacket position, measurements should be taken with the subject floating in the relaxed face-up position of static balance resulting from the preceding tests. The following measurements should be recorded (see Figure 4):

- .1 freeboard – the distance measured perpendicularly from the surface of the water to the lowest point of the subject's mouth where respiration may be impeded if the mouth were not held shut. The lowest side of the mouth should be measured if the left and right sides are not level;
- .2 faceplane angle – the angle, relative to the surface of the water, of the plane formed between the most forward part of the forehead and the chin;
- .3 torso angle – the angle, relative to vertical, of the line formed by the forward points of the shoulder and the hipbone (ilium portion of the pelvis); and
- .4 list angle – the angle relative to the surface of the water and a line between the left and right shoulders or a line between the ears if only the head is tilted.

Figure 4  
Static balance measurements



#### Assessment

2.8.7 After the water tests described in 2.8.5 and 2.8.6, the following assessment should be made:

- .1 *Turning time:* The average turn time for all subjects in the candidate lifejacket should not exceed the average turn time for subjects wearing the RTD, and the number of “no-turns”, if any, should not exceed the number of no-turns for subjects wearing the RTD;
- .2 *Freeboard:* The average freeboard of all the subjects should not be less than the average freeboard for subjects wearing the RTD;
- .3 *Torso angle:* The average of all the subjects’ torso angles should not be less than the average of the torso angles for subjects wearing the RTD minus 5°;
- .4 *Faceplane (head) angles:* The average of all the subjects’ faceplane angles should be not less than the average of the faceplane angles for subjects wearing the RTD minus 5°; and
- .5 *Lifejacket light location:* The position of the lifejacket light should permit the light to be visible over as great a segment of the upper hemisphere as is practicable.

#### Jump and drop tests

2.8.8 Without readjusting the lifejacket, the test subject should jump vertically into the water, feet first, from a height of at least 1 m while holding the arms over the head. Upon entering the water, the test subject should relax to simulate a state of utter exhaustion. The freeboard to the mouth should be recorded after the test subject comes to rest. The test should be repeated from a height of at least 4.5 m but, when jumping into the water,

the test subject should hold on to the lifejacket during water entry to avoid possible injury. Upon entering the water, the test subject should relax to simulate a state of utter exhaustion. The freeboard to the mouth should be recorded after the test subject comes to rest. The lifejacket and its attachments should be examined for any damage. If injury is believed to be a likely outcome from any jump or drop test, the lifejacket should be rejected or the test delayed until tests from a lower height or with additional precautions demonstrate that the risk from the required test is acceptable.

#### *Assessment*

**2.8.9** Following the drop test, the lifejacket should:

- .1 surface the test subject in a face-up position, with an average freeboard for all the subjects of not less than the average freeboard for the subjects wearing the RTD as determined in accordance with 2.8.6;
- .2 not be dislodged or cause harm to the test subject;
- .3 incur no damage that would affect its in-water performance or buoyancy; and
- .4 incur no damage to its attachments.

#### *Stability test*

**2.8.10** The test subject should attain a relaxed face-up position of static balance in the water. The subject should be instructed to assume a fetal position as follows: “Place your elbows against your sides, your hands on your stomach, under the lifejacket if possible, and bring your knees up as close to your chest as possible”. The subject should be rotated clockwise around the longitudinal axis of the torso by grasping the subject’s shoulders or upper areas of the lifejacket so that the subject attains a  $55^{\circ} \pm 5^{\circ}$  list. The subject should then be released. The subject should return to a stable face-up position. The test should then be conducted with the subject rotated counter-clockwise. The entire test should then be repeated with the test subject wearing the RTD. The candidate lifejacket should not roll any subject face down in the water. The number of subjects who are returned to the stable face-up fetal position in the candidate lifejacket should be at least equal to the number who are returned to the stable face-up foetal position in the RTD.

#### *Swimming and water emergence test*

**2.8.11** All test subjects, without wearing the lifejacket, should attempt to swim 25 m and board a life raft or a rigid platform with its surface 300 mm above the water surface. All test subjects who successfully complete this task should perform it again wearing the lifejacket. At least two-thirds of the test subjects who can accomplish the task without the lifejacket should also be able to perform it with the lifejacket.

### **2.9 Children’s lifejacket tests**

As far as possible, similar tests should be applied for approval of lifejackets suitable for children.

*Child test subjects*

**2.9.1** For child-size lifejackets, tests should be carried out with at least nine able-bodied persons. All test subjects should be selected according to the heights and weights in Table 2.2 and as follows:

- .1 One subject should be selected from each cell containing a “1”.
- .2 Remaining subjects should be selected from cells containing an “X”, without repeating a cell.
- .3 At least 40 percent of the subjects should be male and at least 40 percent should be female.

TABLE 2.2  
Selection of child test subjects

Height range (cm)	Weight range (kg)										
	14–17	17–20	20–22	22–25	25–28	28–30	30–33	33–36	36–38	38–41	41–43
79–105	1	X									
90–118		X	1								
102–130				1	X						
112–135					X	1					
122–150							1	1	X		
145–165									X	1	1

*Assesment*

**2.9.2** When conducting water performance tests as perscribed in 2.8, child-size lifejackets should meet the following requirements for critical flotation stability:

- .1 *Turning time:* The average turn time for all subjects in the candidate lifejacket should not exceed the average turn time for subjects wearing the appropriate size RTD;
- .2 *Freeboard:* The average results for clearance of the mouth above the water for all subjects should not be less than the average results for subjects wearing the appropriate size RTD;
- .3 *Torso angle:* The average of all subjects’ torso angles should be not less than the average torso angles for subjects wearing the appropriate size RTD minus 10°;
- .4 *Faceplane (head) angle:* The average of all subjects’ faceplane angles should be not less than the average faceplane angles of subjects wearing the appropriate size RTD minus 10°; and
- .5 *Mobility:* The mobility of the subject both in and out of the water should be given consideration in determining the acceptability of a device for approval. Mobility when wearing the candidate lifejacket should be compared with



mobility when wearing the appropriate size RTD when climbing out of the water, going up and down stairs, picking up an article from the floor, and drinking from a cup.

## **Part 2**

### ***Production and installation tests***

#### **1 General**

1.1 Representatives of the competent authority should make random inspection of manufacturers to ensure that the quality of life-saving appliances and the materials used comply with the specification of the approved prototype life-saving appliance.

1.2 Manufacturers should be required to institute a quality control procedure to ensure that life-saving appliances are produced to the same standard as the prototype life-saving appliance approved by the competent authority and to keep records of any production tests carried out in accordance with the competent authority's instructions.

1.3 Where the proper operation of life-saving appliances is dependent on their correct installation in vessels, the competent authority should require installation tests to ensure that the appliances have been correctly fitted in a vessel.

#### **2 Individual buoyancy equipment for lifejackets**

##### *Production tests*

2.1 Manufacturers should be required to carry out a buoyancy test on at least 0.5 percent of each batch of lifejackets produced, subject to a minimum of one lifejacket from every batch.

##### *Inspections by the competent authority*

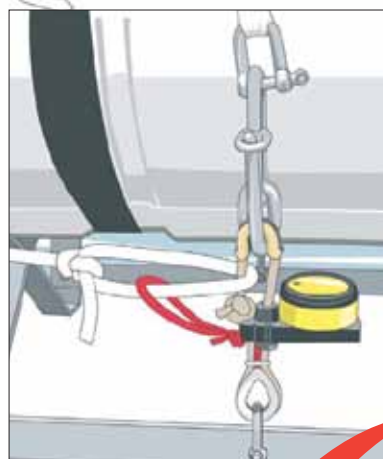
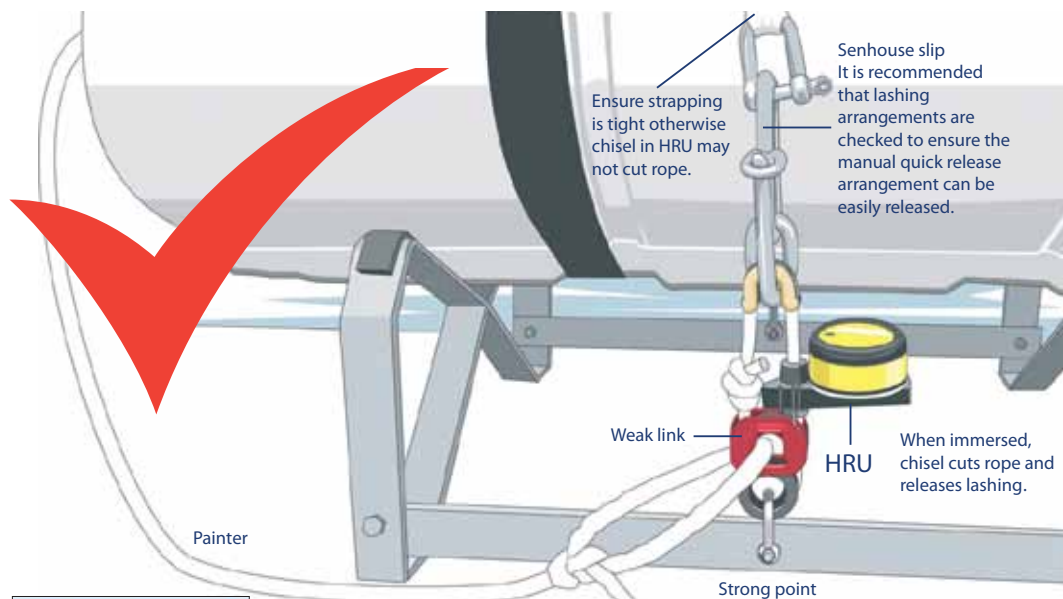
2.2 Inspections by a representative of the competent authority should be made at intervals of at least one inspection per 6 000 lifejackets produced, subject to a minimum of one inspection per calendar quarter. When the manufacturer's quality control programme results in lifejackets which are consistently free of defects, the rate of inspection may be reduced to one inspection in every 12 000 lifejackets produced. At least one lifejacket of each type in production should be selected at random by the inspector and subjected to detailed examination, including, if necessary, cutting open. He should also satisfy himself that the flotation tests are being conducted satisfactorily; if he is not satisfied, a flotation test should be undertaken.



## Annex XXIII

# Correct securing of hydrostatic release units\*

### HYDROSTATIC RELEASE UNIT (HRU) CORRECT INSTALLATION

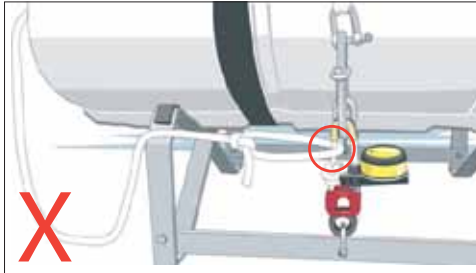


This illustration is an example of one type of HRU. The manufacturer's instructions should always be followed when fitting HRUs.

\* Source: Royal National Lifeboat Institution (United Kingdom).

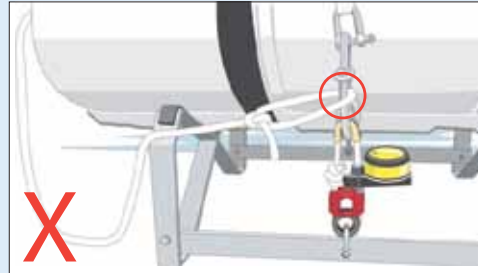
## INCORRECT INSTALLATION

Painter secured to HRU  
(not through weak link)



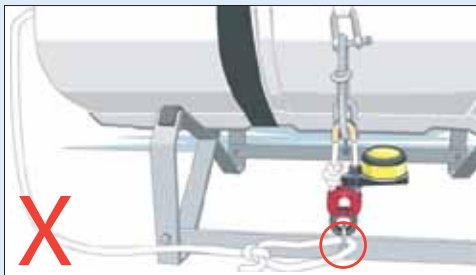
1. HRU will activate
2. Liferaft will be released but will not automatically inflate and will eventually drift away

Painter secured to senhouse slip



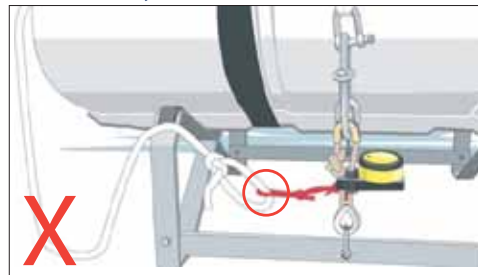
1. HRU will activate
2. Liferaft will float free and eventually inflate
3. Because the painter is secured to the slip, the liferaft will **NOT** be released to the surface

Painter secured directly to strong point



1. HRU will activate
2. Liferaft will float free and eventually inflate
3. Because the painter is secured directly to the strong point, the liferaft will **NOT** be released to the surface **EVEN IF** it is attached to the weak link as well

Painter secured only to weak link  
(older version only)



1. Will work correctly for automatic release, but:
2. If liferaft is thrown overboard in an emergency (or comes adrift at sea), it may be lost

## Annex XXIV

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# Guidance on safety training in emergency procedures

## 1 Training in emergency procedures

The competent authority should take such measures as it may deem necessary to ensure that crews are adequately trained in their duties in the event of emergencies and to avoid panic in such situations. Training should cover, as appropriate:

- .1 the types of emergencies which may occur, such as collisions, fire, grounding and foundering;
- .2 the types of life-saving appliances normally carried on vessels;
- .3 the need to adhere to the principles of survival;
- .4 the value of training and drills;
- .5 first aid training;
- .6 the need to be ready for any emergency and to be constantly aware of;
- .7 the location of each crew member's own and spare lifejackets;
- .8 the means of escape;
- .9 the actions to be taken when recovering and caring for a person who has fallen overboard;
- .10 the actions to be taken in respect to lifting persons from vessels and survival craft by helicopter;
- .11 the actions to be taken when abandoning ship, including:
  - .1 putting on suitable clothing;
  - .2 donning of lifejacket;
  - .3 collecting additional protection such as blankets, time permitting;
  - .4 anticipating how to board survival craft from the vessel and water; and
  - .5 the actions to be taken when in the water, such as:
    - .1 dealing with fire or oil on the water;
    - .2 dealing with cold conditions; and
    - .3 dealing with shark-infested waters;
- .12 how to right a capsized survival craft;

- .13 the actions to be taken when aboard a survival craft, such as:
  - .1 protecting against cold or extreme heat;
  - .2 using a drogue or sea anchor;
  - .3 keeping a lookout;
  - .4 protecting against seasickness;
  - .5 using freshwater and food properly;
  - .6 being aware of the effects of drinking seawater; and
  - .7 giving importance to maintaining morale;
- .14 recovering and caring for survivors;
- .15 facilitating detection by others;
- .16 checking equipment available for use in the survival craft and using it correctly;
- .17 acknowledging the importance of remaining, so far as possible, in the vicinity;
- .18 being aware of the main dangers to survivors and the general principles of survival; and
- .19 the actions to be taken in respect of fire-fighting appliances.

## Annex XXV

# Guidance on safe operation of winches, line haulers and lifting gear

## General

In general, all deck machinery involved in the handling of fishing gear and catch should be designed, installed and used in a way that prevents accidents and injuries.

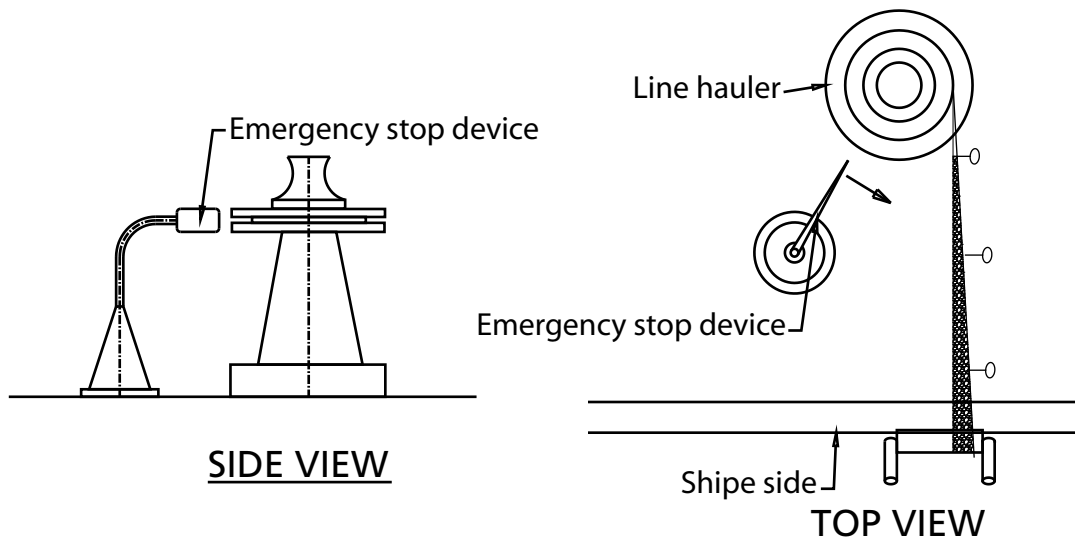
### 1 Emergency stop safety devices on winches and hauling equipment

1.1 All powered equipment used for the handling of fishing gear and catch, such as winches, line and net-hauling equipment and other deck machinery, that, upon use, represent a danger to the operator if he is dragged towards or into the equipment during working operations, should be fitted with emergency stop safety devices. Emergency stops should be provided at the winch, at appropriate places in the deck area and in the wheelhouse. Emergency stops on the equipment should be capable of being activated by any part of the body of the person being hauled towards the equipment. See examples and illustrations below.

1.2 The purpose of these devices is to automatically stop the equipment, without any action from the operator if he is dragged towards the actual equipment.

1.3 In particular, such devices are very important on single-handed vessels where only one person is on board. It will normally not be sufficient to have emergency stop buttons that must be manually activated, due to the fact that in an emergency situation on a single-handed vessel, the person to activate the stop button may have his hands, feet or clothing trapped in the fishing gear and, therefore, be unable to activate the emergency stop button himself.

#### An emergency stop device



## **2 Winches**

2.1 The design of winch systems should ensure that, when power is supplied to the winch, the control valves and levers would always be in the stop/neutral position.

2.2 Winches should be provided with means to prevent overhoisting and to prevent the accidental release of a load if the power supply fails. Where practicable, winches with wire storage drums should be fitted to avoid the need to use warping heads.

2.3 Winches should be equipped with brakes capable of effectively arresting and holding the safe working load. Brakes should be proof-tested before installation with a static load suitably in excess of the maximum safe working load to the satisfaction of the competent authority. Brakes should be provided with simple and easily accessible means of adjustment. Every winch drum that could be uncoupled from the drive should be furnished with a separate brake independent of the brake connected with the drive.

2.4 Where a manually-operated “guiding on” gear is installed, the operating wheels should be without open spokes or protrusions that could cause injury to the operator and should be capable of being disengaged when the warps are paying out. Preferably, the guiding on gear should be capable of being disengaged when the warps are paying out.

2.5 Where practicable, winches should be reversible.

2.6 Winch barrels should be provided with means for fastening wire ends, for instance clamps, shackles or other equally effective means, which should be so designed as to prevent kinking of the wires.

2.7 Where a fishing winch is provided with local and remote controls, these controls should be so arranged as to prevent simultaneous operation. The operator should have a clear view of the winch and adjacent area from either the local or remote control positions. An emergency cut-off should be provided at the winch and at the remote station, as well as in the wheelhouse.

2.8 Where a fishing winch is controlled from the wheelhouse, an emergency control switch at the winch should be provided. Where a second control at the winch is required by the competent authority, the arrangement should be such as to make simultaneous control from both control positions impossible, as well as to show which control position is in operation. Where necessary, emergency switches for winches should be provided in positions remote from the winch to protect fishermen working in places that are dangerous for operation of warps and trawl boards. Where a fishing winch is controlled from the bridge, the arrangements should be such that the operator has a direct or televised clear view of the winch and adjacent area.

## **3 Line and net hauling equipment**

3.1 Line and net hauling equipment should be fitted with devices to ensure that the designated safe working load is not exceeded. Such devices should be tested to the satisfaction of the competent authority.

3.2 Where line and net hauling equipment is intended to be blocked or braked in the stop position, the arrangements should be tested to the satisfaction of the competent authority.



**3.3** Where line and net hauling equipment is controlled from the wheelhouse or from a position remote from the equipment, means should be provided at the equipment to stop hauling and/or shooting in an emergency. In like manner, when the main controls are at the equipment, means should be provided in the wheelhouse to stop the equipment in an emergency.

**3.4** The arrangement of the safety devices should also ensure that an emergency stop would be activated if a person is pulled towards a line or net hauling equipment.

## **4 Lifting gear**

**4.1** Cranes should be well-constructed of sound material and the design should conform with national standards that may be appropriate. They should be tested to the satisfaction of the competent authority and the crane should be marked with the designated maximum safe working load. In the case of a crane fitted with an extendable jib, the safe working load at various radii should be clearly marked as close as practical to the operating controls.

**4.2** In general, cranes adapted to carry net hauling equipment should be so designed that in the fail-safe condition, the hanging point of the jib should not be too high or extend so far beyond the bulwark that retrieval of fishing gear or equipment would endanger the crew.

**4.3** The braking or blocking arrangements of a crane should be tested to at least 1.5 times the designated safe working load to the satisfaction of the competent authority.

**4.4** Lifting and hoisting appliances, as well as derricks and similar equipment, including all parts of the working gear thereof, whether fixed or movable, and all plant should be of good construction, reliable material, adequate strength and free from patent defect. They should be adequately and suitably anchored, supported or suspended, having regard to the purpose for which they are used, and should be marked with the safe working load. They should have easy access for maintenance. Guards should be provided to prevent any undesirable movement of lifted or hoisted parts, such as codend or fishing gear, which could present danger to the crew.

**4.5** Lifting and hoisting appliances, as well as derricks, should be protected from overhoisting.

**4.6** The competent authority should ensure that lifting and hoisting appliances, as well as derricks, should be tested at least every two years and the results entered in the record of the vessel.

**4.7** No such appliance of a kind referred to in 4.2 nor any part or working gear thereof should be taken into use for the first time or after it has undergone any substantial repair unless it has been tested and the result entered in the record of the vessel.

## **5 Deck machinery and tackle**

**5.1** All elements of a fishing gear system, including warping heads, winches, warps, wires, tackle, nets, etc., should be designed, arranged and installed to provide safe and convenient operation. In so far as is possible, such components should be of a suitable strength so that,

in the event of an overload strain, the failure will occur on the designated weak link in the system. All crew members should be made aware of the designated weak link in the system.

- 5.2 Warp guards should be fitted, where practicable, between warp lead rollers.
- 5.3 Sheaves and rollers should be guarded, where practicable.
- 5.4 Chains or other suitable devices should be provided for stoppering off.
- 5.5 Wires, chains and warps provided should be of adequate strength for the anticipated loads.
- 5.6 Where practicable, provision should be made to stop trawl boards from swinging inboard, such as the fitting of a portable prevention bar at the gallows aperture or other equally effective means.
- 5.7 Lifting and running parts of the fishing gear should be of adequate strength for the anticipated loads.
- 5.8 Provision should be made for the stowage of bulky netting to allow for drainage and to prevent lateral movement. The stowage area should be of adequate dimensions to keep the centre of gravity of the stowed net to a minimum and to allow for the crew to work in safety when flaking down nets.
- 5.9 Moving parts of winches, line and net hauling equipment and of warp and chain leads that may present a hazard should be, as far as practicable, adequately guarded and fenced.
- 5.10 Quick release devices should, preferably, be fitted in the case of beam trawling and in purse seining and should be capable of being activated in an emergency from the wheelhouse and at the main control station if not in the wheelhouse.
- 5.11 The design and construction of winches, line and net hauling equipment should, where practicable, be such that the maximum effort necessary for operating handwheels, handles, crank handles, levers, etc., should not exceed 160 N and in the case of pedals, maximum effort should not exceed 320 N.
- 5.12 The design parameters of the equipment should not be exceeded.

## Annex XXVI

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# Guidance on the Global Maritime Distress and Safety System (GMDSS)

## General

Vessels intended to comply completely with the GMDSS system may use as reference the information listed below related to a complete GMDSS installation. Actual minimum requirements are mentioned in the Safety Recommendations.

### 1 The GMDSS

1.1 The basic concept of the GMDSS is that search and rescue authorities ashore, as well as vessels in the immediate vicinity of the vessel in distress, would be rapidly alerted to a distress incident so that they can assist in a coordinated sea-air rescue operation with a minimum delay.

1.2 The system also provides for urgency and safety communications and the promulgation of navigational and meteorological warnings and forecasts and other urgent safety information to vessels.

1.3 In other words, every vessel is able, irrespective of the GMDSS sea area in which it operates, to perform those communication functions which are essential for the safety of the vessel itself and of other vessels operating in the same area.

1.4 The equipment to be carried depends on the sea area in which vessels operate. There are four sea areas:

- .1 **A1** means an area within the radiotelephone coverage of at least one VHF coast station in which continuous alerting by Digital Selective Calling (DSC) is available;
- .2 **A2** means an area within the radiotelephone coverage of at least one MF coast station in which continuous alerting by DSC is available;
- .3 **A3** means an area within the coverage of an Inmarsat geostationary satellite in which continuous alerting is available; and
- .4 **A4** means an area outside sea areas A1, A2 and A3.

### 2 Functional requirements

Every vessel, while at sea, complying with the GMDSS should be capable of:

- .1 transmitting ship-to-shore alerts;
- .2 receiving shore-to-ship distress alerts;
- .3 transmitting and receiving ship-to-ship distress alerts;
- .4 transmitting and receiving search and rescue coordinating communications;
- .5 transmitting and receiving on-scene communications;
- .6 transmitting and receiving maritime safety information; and
- .7 transmitting and receiving ship-to-ship communications.

### **3 Installation, location and control of radio equipment**

3.1 Every vessel should be provided with radio installations capable of complying with the functional requirements prescribed above throughout its intended voyage unless exempted by the competent authority.

3.2 Where it is feasible to comply with the functional requirements prescribed above by means of a fixed installation, every radio installation should:

- .1 be so located that no harmful interference of mechanical, electrical or other origin affects its proper use, and so located as to ensure electromagnetic compatibility and avoidance of harmful interaction with other equipment and systems;
- .2 be so located as to ensure the greatest possible degree of safety and operational availability;
- .3 be protected against harmful effects of water, extremes of temperature and other adverse environmental conditions; and
- .4 be clearly marked with the call sign, the vessel station identity and other codes as applicable for the use of the radio installation.

3.3 Control of the VHF radiotelephone channels, required for navigational safety, should be immediately available in the wheelhouse and convenient to the steering position.

3.4 Every radio transmitter and receiver fitted in accordance with the radio regulations of the competent authority should be provided with a suitable antenna or antennas. The antennas should be so constructed and sited as to enable each radio installation to perform effectively its intended communication function.

3.5 Where it is not feasible to comply with the requirements prescribed above by means of a fixed installation, every radio installation should be:

- .1 an approved portable waterproof transmitter and receiver;
- .2 provided with a suitable antenna; and

- .3 provided with a fully-charged sealed reserve power pack at all times while the vessel is at sea.

#### **4 Radio equipment to be provided for all sea areas**

Every vessel should be provided with:

- .1 a VHF radio installation capable of transmitting and receiving radiotelephony on the frequencies 156.300 MHz (channel 6), 156.650 MHz (channel 13), and 156.800 MHz (channel 16);
- .2 a satellite emergency position-indicating radio beacon (satellite EPIRB) which should be:
  - .1 capable of transmitting a distress alert through the satellite service operating in the 406 MHz band;
  - .2 installed in a readily accessible position;
  - .3 ready to be manually released and capable of being carried by one person into a survival craft;
  - .4 capable of floating free if the vessel sinks and of being automatically activated when afloat; or
  - .5 capable of being activated manually.

#### **5 Additional radio equipment to be provided for sea areas A1 and A2**

In addition to meeting the requirements of section 4, every vessel engaged on voyages beyond sea area A1, but remaining within sea area A2, should be provided with:

- .1 A VHF radio installation capable of transmitting and receiving:
  - .1 DSC on the frequency 156.525 MHz (channel 70). It should be possible to initiate the transmission of distress alerts on channel 70 from the position from which the vessel is normally navigated; and
  - .2 radiotelephony on the frequencies 156.300 MHz (channel 6), 156.650 MHz (channel 13) and 156.800 MHz (channel 16);
- .2 a radio installation capable of maintaining a continuous DSC watch on VHF channel 70, which may be separate from, or combined with, that required by 5.1.1;
- .3 an MF radio installation capable of transmitting and receiving, for distress and safety purposes, on the frequencies:
  - .1 2 187.5 kHz (assigned frequency) using DSC; and
  - .2 2 182 kHz using radiotelephony; and
- .4 a radio installation capable of maintaining a continuous DSC watch on the frequency 2 187.5 kHz (assigned frequency), which may be separate from, or combined with, that required by 5.3.1.

## **6 Radio watches**

6.1 Every vessel, while at sea, should maintain a continuous watch on:

- .1 VHF channel 16;
- .2 VHF DSC channel 70, if the vessel is fitted with a VHF DSC installation; and
- .3 the distress and safety DSC frequency 2 187.5 kHz (assigned frequency), if the vessel is fitted with an MF DSC radio installation.

6.2 Every vessel, while at sea, should maintain a radio watch for broadcasts of maritime safety information on the appropriate frequency or frequencies on which such information is broadcasted for the area in which the vessel is navigating.

## **7 Sources of energy**

7.1 There should be available at all times, while the vessel is at sea, a supply of electrical energy sufficient to operate the radio installations and to charge any batteries used as part of a reserve source or sources of energy for the radio installations.

7.2 A reserve source or sources of energy should be provided on every vessel complying with the provisions of section 4, to supply radio installations, for the purpose of conducting distress and safety radio communications, in the event of failure of the vessel's main source of electrical power. The reserve source or sources of energy should be capable of simultaneously operating the VHF radio installation required by section 4 and any of the additional loads mentioned in section 5 for at least 6 hours.

7.3 The reserve source or sources of energy should be independent of the propelling power of the vessel and the vessel's electrical system.

7.4 The reserve source or sources of energy may be used to supply the electrical lighting required by section 3.

7.5 Where a reserve source of energy consists of a rechargeable accumulator battery or batteries:

- .1 a means of automatically charging such batteries should be provided and should be capable of recharging them to minimum capacity requirements within 10 hours; and
- .2 the capacity of the battery or batteries should be checked, using an appropriate method, at intervals not exceeding 12 months, when the vessel is not at sea.

7.6 The location and installation of accumulator batteries which provide a reserve source of energy should be such as to ensure:

- .1 the highest degree of service;
- .2 a reasonable lifetime;
- .3 reasonable safety;

- .4 that battery temperatures remain within the manufacturer's specifications whether under charge or idle;
- .5 that when fully charged, the batteries will provide at least the minimum required hours of operation under all weather conditions; and
- .6 that the batteries are situated in the upper part of the vessel.

7.7 If an uninterrupted input of information from the vessel's navigational or other equipment to a radio installation required by the radio regulations of the competent authority is needed to ensure the proper performance of the radio installation, means should be provided to ensure the continuous supply of such information in the event of failure of the vessel's main or emergency source of electrical power.

7.8 For the purpose of calculating the required capacity of the reserve source or sources of energy, the following formula is recommended for determining the electrical load to be supplied by the reserve source or sources of energy for each radio installation required for distress conditions:

half of the current consumption necessary for transmission + the current consumption necessary for reception + the current consumption of any additional loads.

## **8 Performance standards**

Equipment required to be provided under the radio regulations of the competent authority should conform to appropriate performance specifications issued by the relevant authorities.

## **9 Serviceability and maintenance requirements**

9.1 Equipment should be so designed that the main units can be replaced readily, without elaborate recalibration or readjustment.

9.2 Where applicable, equipment should be so constructed and installed that it is readily accessible for inspection and on-board maintenance purposes.

9.3 Adequate information should be provided to enable the equipment to be properly operated and maintained.

## **10 Radio personnel**

10.1 Every vessel should carry personnel qualified for distress and safety radio communication purposes to the satisfaction of the competent authority, as specified below.

10.2 The personnel should be holders of at least the Restricted Certificate of Competency in Radiotelephony (VHF) granted by the relevant authorities.

**10.3** For operation of radio equipment required for sea area A1 and VHF, a Restricted Operator's Short Range Certificate (SRC) or a Restricted Operator's Certificate (ROC) is necessary.

**10.4** For operation of radio equipment required for sea area A2 and MF, a General Operator's Long Range Certificate (LRC) or a General Operator's Certificate (GOC) is necessary.

**10.5** The Restricted Operator's SRC means an operator's certificate covering the operation of radio equipment fitted on non-GMDSS vessels operating within the range of a VHF or a VHF-DSC coast station.

**10.6** The ROC means an operator's certificate covering the operation of radio equipment fitted for GMDSS sea area A1.

**10.7** The General Operator's LRC means an operator's certificate covering the operation of radio equipment fitted on non-GMDSS vessels operating beyond the range of a VHF or a VHF-CSC coast station.

**10.8** The GOC means an operator's certificate covering the operation of radio equipment fitted for GMDSS sea areas A2, A3 and A4.



## Annex XXVII

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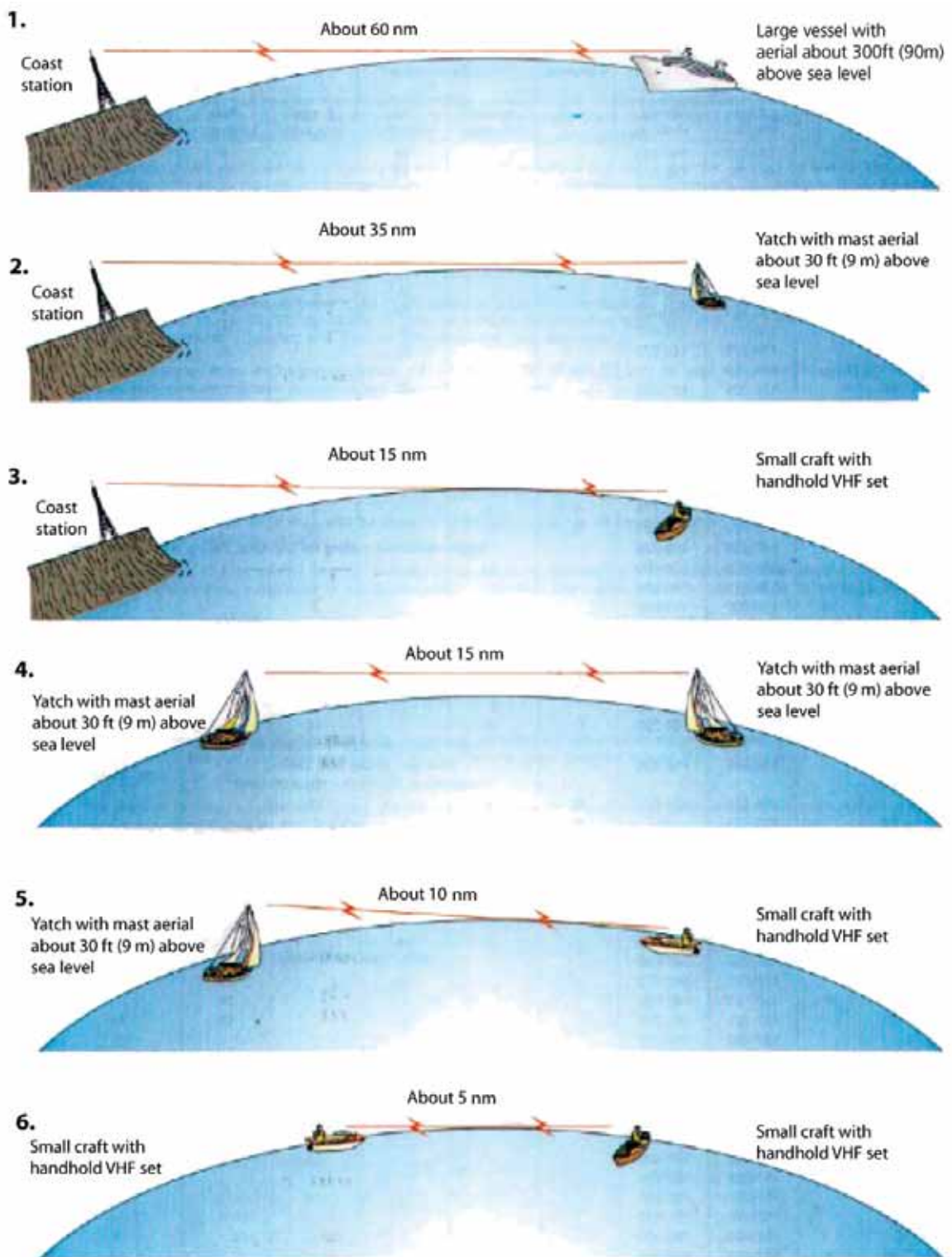
# Range of VHF for various transmitting/receiving units

1 It is most important to realize that the transmission and receiving of VHF signals is limited, in theory, to line of sight. This is because the radio waves of VHF do not normally bend around the curvature of the earth. The range may be affected to some degree by barometric pressure and/or increased humidity which often gives greater ranges than normally attained.

2 This atmospheric refraction results in the radio waves tending to follow curved rather than straight paths.

3 The bending or refraction arises from a change of wave speed as the waves propagate through the atmosphere; the waves change direction towards the region of lower wave speed. The degree of bending or refraction depends upon the rate at which the wave speed changes. This is governed by the refractive index of the air and its variation with height, which, in turn, depends upon the pressure, temperature and humidity of the air.

4 Another significant factor in determining range is, generally, the height above sea level of the transmitting and receiving aerials. It should also be noted that the fact that a transmitter and a receiver are within radio sight does not automatically guarantee that an acceptable signal will be received at that point. This will depend, among other things, on the power of transmission, the sensitivity of the receiver and the quality and position of the transmission and receiving aerials. The figure below illustrates some typical VHF ranges that can be obtained from various transmitting and receiving stations.



## Annex XXVIII

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# Use of mobile telephones in distress and safety communications

1 The use of mobile telephones in the marine environment offshore is now well-established with users in all areas of the commercial, fishing and leisure communities.

2 A growing numbers of incidents have occurred when vessels requiring assistance from rescue services have used inland emergency services or, alternatively, telephoned directly to request assistance. The use of mobile telephones for these procedures is strongly discouraged.

3 Use of mobile telephones bypasses the existing dedicated well-established international marine distress communications organization on VHF channel 16.

4 Cellular radio (mobile telephone) coverage offshore is limited and does not afford the same extensive safety coverage as VHF channel 16 (monitored 24 hours a day). Consequently, a greater risk exists of communication difficulties or even a complete breakdown if an accident should occur at the edge of a cell coverage area.

5 Subsequent on-scene casualty communications would be restricted and delayed if mobile telephone communications were maintained throughout.

6 There is always a risk that elements of vital information could be lost or misinterpreted by the introduction of further relay links in the communication chain.

7 It is not possible to communicate directly with another vessel able to render assistance unless that vessel is also fitted with a mobile telephone and the telephone number is known.

8 Requests for assistance cannot be monitored by other vessels in a position to render assistance. Valuable time would be lost while the relevant coastguard rescue coordination centre receives and then rebroadcasts the information to all vessels on the appropriate distress channel(s).

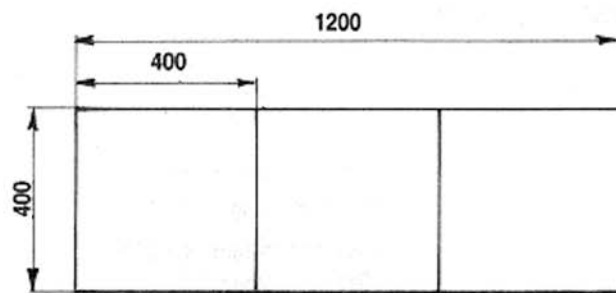
9 In the interest of safety of life at sea, owners of vessels are urged to carry MARINE communications equipment on board and to use this medium as the primary means of distress and safety communications.



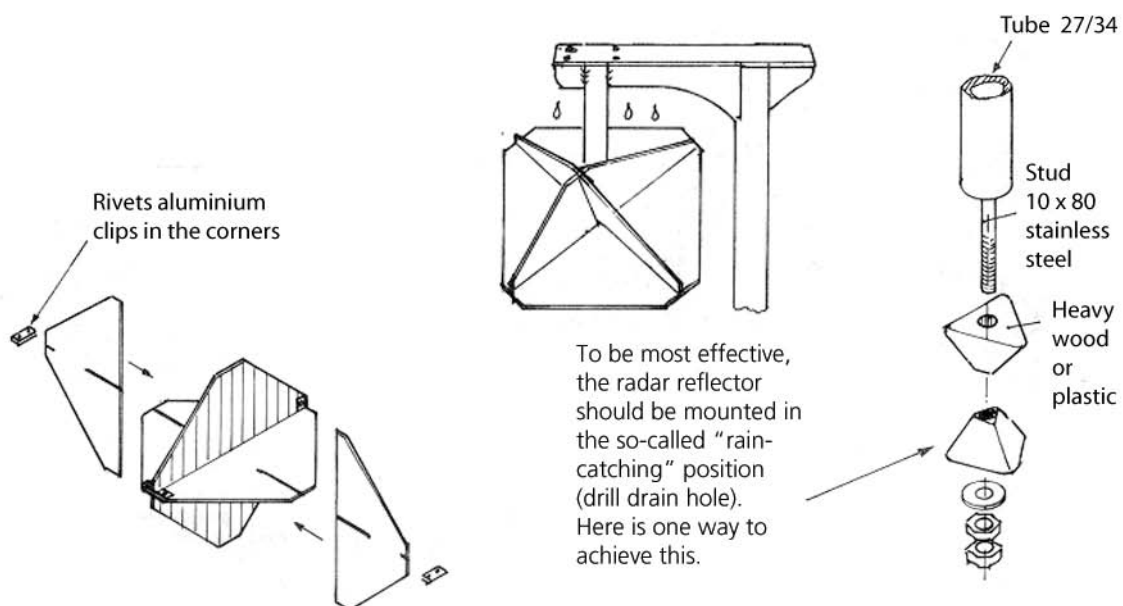
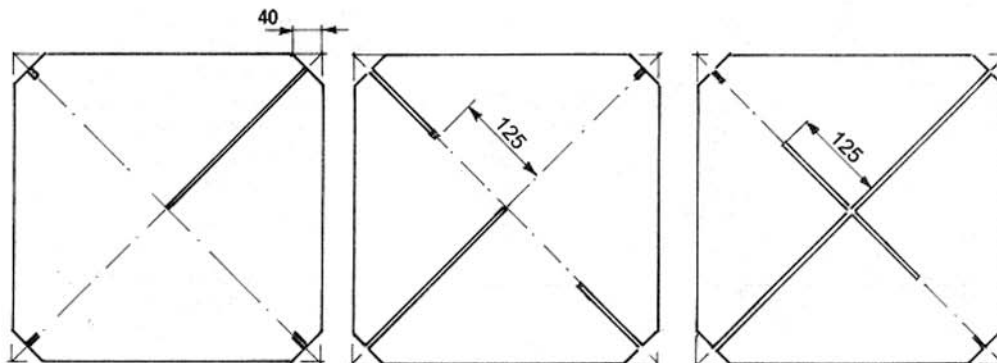
## Annex XXIX

# Recommended performance standards for radar reflectors

Small vessels should be visible on the radars of other vessels if they are not to be run down. Radar beams transmitted by other vessels must be reflected by small vessels and because a GRP or wooden vessel will reflect radar beams poorly, a small vessel needs a special radar reflector. Here is how one can be made:



**Radar reflective material minimum 1.6 mm (16SWG)**





## Annex XXX

# Equipment required to comply with the Collision Regulations (COLREGS)\*

### Rule 22

#### *Visibility of lights*

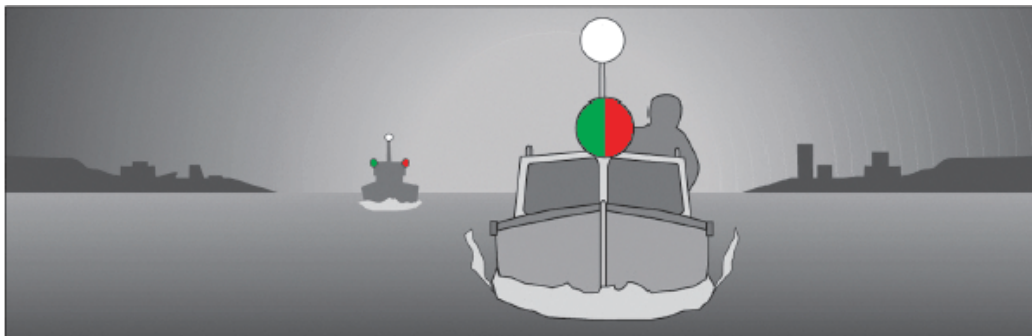
The lights prescribed in the 1972 COLREGS shall have an intensity as specified in section 8 of Annex I to the Regulations so as to be visible at the following minimum ranges:

- (c) In vessels of less than 12 m in length:
  - a masthead light, 2 miles;
  - a sidelight, 1 mile;
  - a sternlight, 2 miles;
  - a towing light, 2 miles;
  - a white, red, green or yellow all-round light, 2 miles.

### Rule 23

#### *Power-driven vessels underway*

- (a) A power-driven vessel underway shall exhibit:
  - (i) a masthead light forward;
  - (ii) a second masthead light abaft of and higher than the forward one; except that a vessel of less than 50 m in length shall not be obliged to exhibit such light but may do so;
  - (iii) sidelights;
  - (iv) a sternlight.



\* In this annex, length is defined as LOA.

- (d) (i) A power-driven vessel of less than 12 m in length may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and sidelights;



- (ii) a power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and shall, if practicable, also exhibit sidelights;
- (iii) the masthead light or all-round white light on a power-driven vessel of less than 12 m in length may be displaced from the fore-and-aft centre line of the vessel if centre line fitting is not practicable, provided that the sidelights are combined in one lantern which shall be carried on the fore-and-aft centre line of the vessel or located as nearly as practicable in the same fore-and-aft line as the masthead light or the all-round white light.

## Rule 25

### *Sailing vessels underway and vessels under oars*

- (a) A sailing vessel underway shall exhibit:
- (i) sidelights;
- (ii) a sternlight.



- (b) In a sailing vessel of less than 20 m in length, the lights prescribed in paragraph (a) of this Rule may be combined in one lantern carried at or near the top of the mast where it can best be seen.



- (c) A sailing vessel underway may, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower green, but these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (b) of this Rule.
- (d)
  - (i) A sailing vessel of less than 7 m in length shall, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.
  - (ii) A vessel under oars may exhibit the lights prescribed in this Rule for sailing vessels, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.
- (e) A vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards.

## **Rule 26**

### *Vessels*

- (a) A vessel engaged in fishing,\* whether underway or at anchor, shall exhibit only the lights and shapes prescribed in this Rule.
- (b) A vessel when engaged in trawling, by which is meant the dragging through the water of a dredge net or other apparatus used as a fishing appliance, shall exhibit:
  - (i) two all-round lights in a vertical line, the upper being green and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other;
  - (ii) a masthead light abaft of and higher than the all-round green light; a vessel of less than 50 m in length shall not be obliged to exhibit such a light but may do so;
  - (iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.
- (c) A vessel engaged in fishing, other than trawling, shall exhibit:
  - (i) two all-round lights in a vertical line, the upper being red and the lower white, or a shape consisting of two cones with apexes together in a vertical line one above the other;

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\* The term “vessel engaged in fishing” means any vessel fishing with nets, lines, trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manoeuvrability (COLREG, Rule 3, paragraph d.).

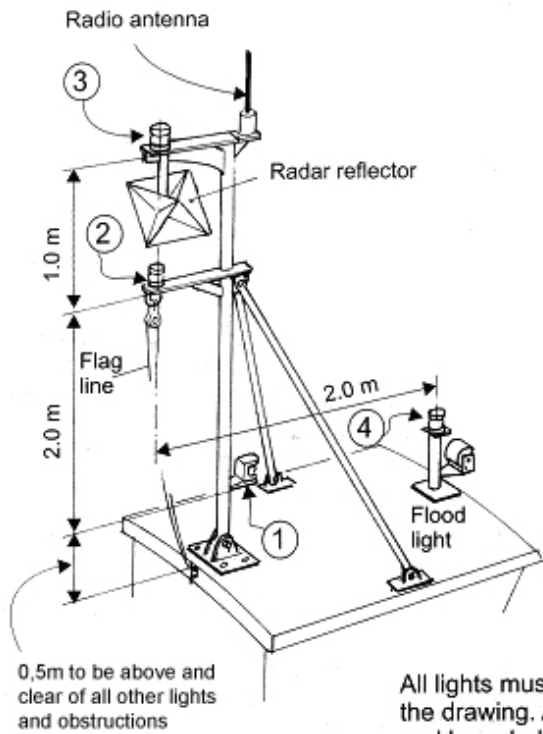
- (ii) when there is outlying gear extending more than 150 m horizontally from the vessel, an all-round white light or a cone apex upwards in the direction of the gear;
- (iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.
- (d) The additional signals described in Annex II to these Regulations apply to a vessel engaged in fishing in close proximity to other vessels engaged in fishing.
- (e) A vessel when not engaged in fishing shall not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

### **Rule 35**

#### *Sound signals in restricted visibility*

- (j) A vessel of less than 12 m in length shall not be obliged to give the signals prescribed in Rule 35 but, if she does not, shall make some other efficient sound signal at intervals of not more than 2 minutes.

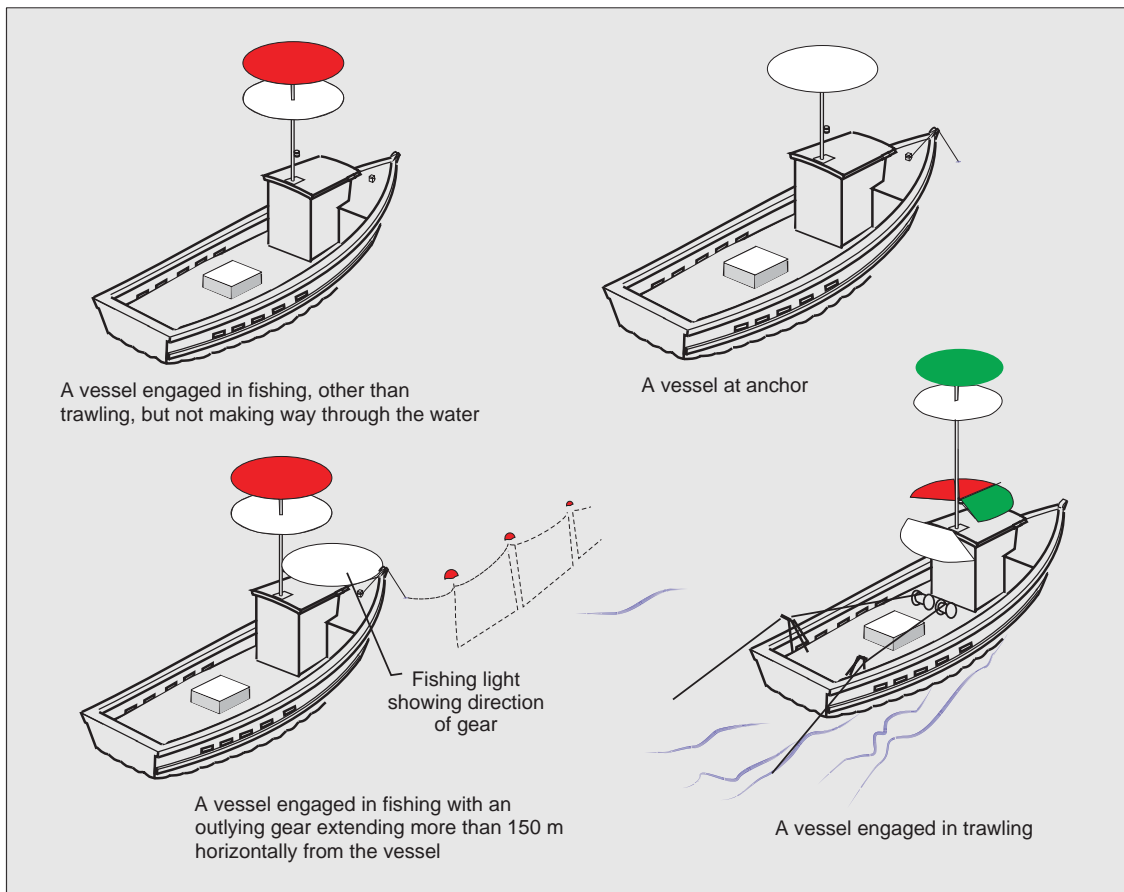
## APPENDIX



According to international rules, fishing boats less than 12 m in length must carry the following lights to prevent collision at night.

- ① Sidelights or a combined (RED and GREEN) lantern mounted exactly parallel to the centre line of the boat.
- ② Combined all-round lantern, lower fishing light and anchor light. WHITE showing all around.
- ③ Upper fishing light showing all around – GREEN if the boat is trawling, RED for other fishing methods.
- ④ Fishing light, WHITE showing all around. When the boat is using floating fishing gear extending more than 150 m from the boat, this light indicates the direction of the floating fishing gear so that other boats can avoid the gear.









































All lights must be fixed at the minimum distances shown in the drawing. All lights must be approved for boats up to 12 m and have bulbs of 18 W.





# Annex XXXI

## The International Code of Signals

ALFA  **	I HAVE A DIVER DOWN; KEEP WELL CLEAR AT SLOW SPEED.	UNIFORM  **	YOU ARE RUNNING INTO DANGER.
BRAVO  ****	I AM TAKING IN, OR DISCHARGING, OR CARRYING DANGEROUS GOODS.	VICTOR  ****	I REQUIRE ASSISTANCE.
CHARLIE  *****	YES (AFFIRMATIVE OR THE SIGNIFICANCE OF THE PREVIOUS GROUP SHOULD BE READ IN THE AFFIRMATIVE).	WHISKEY  *****	I REQUIRE MEDICAL ASSISTANCE.
DELTA  ****	KEEP CLEAR OF ME; I AM MANOEUVRING WITH DIFFICULTY.	X-RAY  *****	STOP CARRYING OUT YOUR INTENTIONS AND WATCH FOR MY SIGNALS.
ECHO  *	I AM ALTERING MY COURSE TO STARBOARD.	YANKEE  *****	I AM DRAGGING MY ANCHOR.
FOXTROT  ****	I AM DISABLED; COMMUNICATE WITH ME.	ZULU  *****	I REQUIRE A TUG. WHEN MADE BY FISHING VESSELS OPERATING IN CLOSE PROXIMITY ON FISHING GROUNDS IT MEANS 'I AM SHOOTING NETS'.
GOLF  ****	I REQUIRE A PILOT. WHEN MADE BY FISHING VESSELS OPERATING IN CLOSE PROXIMITY ON FISHING GROUNDS IT MEANS 'I AM HAULING NETS'.	1ST SUBSTITUTE  ****	USED TO REPEAT THE FIRST FLAG OR PENNANT IN THE SAME HOIST.
HOTEL  ****	I HAVE A PILOT ON BOARD.	2ND SUBSTITUTE  ****	USED TO REPEAT THE SECOND FLAG OR PENNANT IN THE SAME HOIST.
INDIA  **	I AM ALTERING MY COURSE TO PORT.	3RD SUBSTITUTE  ****	USED TO REPEAT THE THIRD FLAG OR PENNANT IN THE SAME HOIST.
JULIETT  *****	I AM ON FIRE AND HAVE A DANGEROUS CARGO ON BOARD; KEEP WELL CLEAR OF ME.	CODE AND ANSWER  *****	USED TO ACKNOWLEDGE A SIGNAL.
KILO  **	I WISH TO COMMUNICATE WITH YOU.	 *****	ONE
LIMA  ****	YOU SHOULD STOP YOUR VESSEL INSTANTLY.	 *****	TWO
MIKE  **	MY VESSEL IS STOPPED AND MAKING NO WAY THROUGH THE WATER.	 *****	THREE
NOVEMBER  **	NO (NEGATIVE OR THE SIGNIFICANCE OF THE PREVIOUS GROUP SHOULD BE READ IN THE NEGATIVE).	 *****	FOUR
OSCAR  *****	MAN OVERBOARD.	 *****	FIVE
PAPA  *****	IN HARBOUR; ALL PERSONS SHOULD REPORT ON BOARD AS VESSEL IS ABOUT TO PROCEED TO SEA. AT SEA; IT MAY BE USED BY FISHING VESSELS TO MEAN 'MY NETS HAVE COME FAST UPON AN OBSTRUCTION'.	 *****	SIX
QUEBEC  *****	MY VESSEL IS HEALTHY, AND I REQUEST FREE PRACTICE.	 *****	SEVEN
ROMEQ  ****	(NO SINGLE LETTER MEANING)	 *****	EIGHT
SIERRA  ***	I AM OPERATING ASTERN PROPULSION.	 *****	NINE
TANGO  **	KEEP CLEAR OF ME; I AM ENGAGED IN PAIR TRAWLING.	 *****	ZERO

USED ON ALL OCCASIONS WHEN IT IS REQUIRED TO REPRESENT NUMBERS IN FLAG SIGNALING

Note: Single-letter signals may be made by any method of signalling. The letters B, C, D, E, G, H, I, M, S, T and Z and Figure 5 when made by a sound must comply with the International Regulations for Preventing Collisions at Sea, Rules 34 and 35. Signals "K" and "S" have special meanings as landing signals for small boats with persons in distress.



## Annex XXXII

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# Distress signals\*

1 The following signals, used or exhibited either together or separately, indicate distress and need of assistance:

- .1 a gun or other explosive signals fired at intervals of about a minute;
- .2 a continuous sounding with any fog-signalling apparatus;
- .3 rockets or shells, throwing red stars fired one at a time at short intervals;
- .4 a signal made by any signalling method consisting of the group ... --- ... (SOS) in the Morse Code;
- .5 a signal sent by radiotelephony consisting of the spoken word “MAYDAY”;
- .6 the International Code Signal of distress indicated by N.C. (November, Charlie);
- .7 a signal consisting of a square flag having above or below it a ball or anything resembling a ball;
- .8 flames on the vessel (as from a burning tar barrel, oil barrel, etc.);
- .9 a rocket parachute flare or a handheld flare showing a red light;
- .10 a smoke signal giving off orange-coloured smoke;
- .11 slowly and repeatedly raising and lowering arms outstretched to each side;
- .12 a distress alert by means of digital selective calling (DSC) transmitted on:
  - .1 VHF channel 70; or
  - .2 MF/HF on the frequencies 2 187.5 kHz, 8 414.5 kHz, 4 207.5 kHz, 6 312 kHz, 12 577 kHz or 16 804.5 kHz;
- .13 a ship-to-shore distress alert transmitted by the vessel’s Inmarsat or other mobile satellite service provider ship-earth station;
- .14 signals transmitted by emergency position-indicating radio beacons;
- .15 approved signals transmitted by radiocommunications systems, including survival craft radar transponders.

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\* Reference to Annex IV of the *International Regulations for Preventing Collisions at Sea*, 1972, as amended (annex to IMO resolution A.1004(25)).

2 The use or exhibition of any of the foregoing signals, except for the purpose of indicating distress and need of assistance and the use of other signals which may be confused with any of the above signals, is prohibited.

3 Attention is drawn to the relevant sections of the *International Code of Signals*, the *International Aeronautical and Maritime Search and Rescue Manual*, Volume III, and the following signals:

- .1 a piece of orange-coloured canvas with either a black square and circle or other appropriate symbol (for identification from the air); and
- .2 a dye marker.



## Annex XXXIII

# Guidance on basic pre-sea safety training

Training required by any person going to sea for the first time on decked vessels of less than 12 m in length and undecked vessels

Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Knows the types of emergencies that can occur, e.g. fire collision, grounding, capsize and injury.	Explains actions taken in each event.	Sequence of actions taken on reporting and reacting to the event is appropriate.
Knows the types of emergency equipment available on board.	Explains what various types of equipment are used for.	Can identify and state what safety equipment is used for and in what circumstances.
Knows the use of a lifejacket, immersion suit (as appropriate) and/or flotation aid.	Can demonstrate how to don a lifejacket, immersion suit (as appropriate) and/or flotation aid and how to remain afloat and move in the water with and without aids.	Practical demonstration in water that indicates proof of competence.
Knows the use of fire extinguishers and hoses.	Understands the types of fire extinguishers and what types of fire they are used on. Understands the use of jet and spray nozzles.	Practical demonstration extinguishing fires using hoses and extinguishers.
Knows the use of all types of visual distress signalling equipment.	Understands the difference between day and night equipment. When to use the various equipment. Where the equipment is to be found.	Practical demonstration on the use of different types of pyrotechnics. Can identify visual distress signals.
Understands the dangers associated with the consumption of alcohol and drugs.	Identifies the dangers of consuming alcohol or drugs when going to sea.	Shows understanding that it is dangerous and illegal to use alcohol and drugs before going to and at sea.
Understands the basic first aid steps to be taken on encountering an accident.	Explains the sequence of events and what steps to take prior to the arrival of a qualified person.	Demonstrates how to position a casualty and stop bleeding.
Knows common nautical terms.	Understands basic terminology of: direction (north south, port starboard, astern abeam, etc.), parts of a vessel, items of equipment, ropes and knots.	Demonstrates ability to point out parts of a vessel, direction and items of equipment.

Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Knows the causes and effects of hypothermia and what precautions can be taken to prevent its onset.	Understands what actions to be taken on finding himself in the water and what equipment is available to prevent the onset of hypothermia.	Explains that he should climb onto an upturned hull, dry out his clothes and use the space blanket found in the capsized bottle.
Knows the requirement that the skipper has to leave personnel and voyage particulars behind with a competent person.	Understands the necessity for leaving contact details ashore before proceeding to sea.	Conveys that he would tell the skipper his name, identity number, next of kin and contact numbers for inclusion on the crew list.
Understands basic safety awareness for work on board vessels.	Explains risks and actions to be taken as concerns social, environmental and living conditions, the working environment and safety on deck.	Can identify major risks and actions to be taken to protect safety and health.

It is recommended that when designing training programmes for basic pre-sea safety training, the following should be consulted, as appropriate: the FAO/ILO/IMO *Document for Guidance on Training and Certification of Fishing Vessel Personnel*, in particular Part A – General matters, and Part B – Small vessels. See also IMO model course 1.33, *Safety of Fishing Operations (Support Level)*, 2005 edition.

## Annex XXXIV

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# List of pertinent publications

### FAO ([www.fao.org](http://www.fao.org))

#### *Aspects of Sea Safety in the Fisheries of Pacific Island Countries*

This publication is the report of a survey of fisheries-related sea safety in the Pacific Islands region undertaken by FAO in 2003. It is intended to assist in sensitizing fishery managers that sea safety is a legitimate and important objective of fisheries management, focus more attention on small vessel safety and lead to improved systems for recording/analysing sea accident data and making use of the results. It will also serve as a discussion document at a meeting that is to be attended by motivated people from several relevant disciplines, focused on challenging issues, oriented to small vessels, having the objective of producing results with a positive effect on regional and national sea safety programmes.

#### *Guide to simple repairs of FRP boats in a tropical climate*

This booklet would be useful to fishers and small workshop participants in fishing villages when undertaking minor repairs to FRP boats. It may also serve as a guide for officials of departments of fisheries and of other concerned agencies when training in matters of simple repairs to FRP boats.

#### *Engineering applications: 1. Installation and maintenance of engines in small fishing vessels*

This publication provides a basic handbook covering all details of installation and the necessary maintenance procedures to be adopted for small boatyards, boat owners and fishermen.

#### *Engineering applications: 2. Hauling devices for small fishing craft*

This publication provides an introduction to the basic principles involved in the planning and building of a simple hauler.

#### *Engineering applications: 3. Hydraulics for small fishing vessels*

This publication provides some ideas and basic rules for general design principles, to mounting details, construction, installation and maintenance of various machines, in addition to all the other elements that compose a hydraulic circuit.

#### *FAO Code of Conduct for Responsible Fisheries*

The Code of Conduct sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity.

*FAO Safety at Sea as an Integral Part of Fisheries Management*

This paper provides a comprehensive overview of sea safety issues, and concludes that safety at sea should be integrated into fisheries management.

*FAO Standard Specifications for the Marking and Identification of Fishing Vessels*

This document contains the specifications of a standardized system for the marking and identification of vessels as endorsed by the FAO Committee on Fisheries, Rome, April 1989.

*FAO Technical Guidelines for Responsible Fisheries – Fishing Operations*

The technical guidelines are given in support of the implementation of the Code of Conduct in relation to fishing operations. They are addressed to states, international organizations, fisheries management bodies, owners, managers and charterers of vessels, and fishermen and their organizations.

*Fishing boat construction: 1. Building a sawn frame fishing boat*

The purpose of this publication is to explain how a designer draws the curved shape of a boat and shows where to look for the details of construction and the dimensions necessary to build a boat.

*Fishing boat construction: 2. Building a fibreglass fishing boat*

This publication is intended to give the reader a sound basic knowledge of GRP and its possibilities and limitations in boatbuilding.

*Fishing boat construction: 3. Building a ferrocement fishing boat*

The publication is intended to provide the reader with a sound basic knowledge of ferrocement and its potential and limitations in boatbuilding.

*Fishing boat construction: 4. Building an undecked fibreglass reinforced plastic boat*

The information provided in this manual relates specifically to the production of a 4.5 m open fishing boat which is a simple, easily-driven, seaworthy boat intended for both rowing and power propulsion.

*Fishing boat designs: 1. Flat bottom boats*

The purpose of this publication is to present some basic designs of boats that are simple to construct for use in small-scale, non-industrial fisheries.

*Fishing boat designs: 2. V-bottom boats of planked and plywood construction*

This publication includes the designs of four small vessels (from 5.2 m to 8.5 m), with comprehensive material specifications and lists, and provides detailed instructions for their construction, both planked and of plywood.

*Fishing boat designs: 3. Small trawlers*

This publication contains designs of a range of small trawlers suitable for operation in coastal waters and was prepared to provide detailed technical information and guidance on the choice of appropriate vessels to fisheries officers, vessel owners and boatbuilders.

*Report of the FAO/SPC Regional Expert Consultation on Sea Safety in Small Fishing Vessels, Suva, Fiji, 9–13 February 2004*

The consultation was held in Suva from 9 to 13 February 2004. Discussions focused in particular on the significance of good sea accident data, mandatory requirements for vessel registration, vessel inspection and crew certification, enforcement of regulations in remote locations and training requirements for improving safety on small fishing vessels. This report lists a number of recommendations together with considerations relating to their implementation.

*Safety for fishermen website ([www.safety-for-fishermen.org](http://www.safety-for-fishermen.org))*

This website is hosted by FAO and managed by a selected group of experts contributing information and material on safety at sea in the fisheries sector.

*A Safety Guide for Small Fishing Boats*

The purpose of this safety guide is to present simple measures to ensure that new boats will satisfy internationally accepted safety standards. The guide deals mainly with small boats of less than 15 m in length, which from experience are most prone to accidents.

*Sub-Regional Workshop on Artisanal Safety at Sea, Banjul, The Gambia, 26–28 September 1994*

A subregional workshop organized by the Integrated Development of Artisanal Fisheries (IDAF) Programme on safety at sea was held in Banjul, The Gambia, from 26 to 28 September 1994. The objectives of the workshop were: to review the results of the national accidents survey; to identify the fundamental problems and examine information on the status of safety at sea activities in the different countries and to prepare a draft proposal for a subregional project on safety at sea.

**IMO ([www.imo.org](http://www.imo.org))**

*Carriage of Inmarsat Enhanced Group Call SafetyNET Receivers under the Global Maritime Distress and Safety System (GMDSS) (resolution A.701(17))*

*Carriage of radar operating in the frequency band 9300–9500 MHz (resolution A.614(15))*

*Code of Practice Concerning the Accuracy of Stability Information for Fishing Vessels, 1973 (resolution A.267(VIII))*

*Code of Practice for the Evaluation, Testing and Acceptance of Prototype Novel Life-saving Appliances and Arrangements (resolution A.520(13))*

*Code of Safety for Fishermen and Fishing Vessels, 2005. Part A, Safety and Health Practice*

*Code of Safety for Fishermen and Fishing Vessels, 2005. Part B, Safety and Health Requirements for the Construction and Equipment of Fishing Vessels*

*Code on Intact Stability for All Types of Ships Covered by IMO Instruments, 1993 (resolution A.749(18), as amended)*

*Code on Noise Levels on Board Ships (resolution A.468(XII))*

*Document for Guidance on Training and Certification of Fishing Vessel Personnel, as amended*

*FAO/ILO/IMO. Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005*

*General requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids (resolution A.694(17))*

*Improved Guidelines for Marine Portable Fire Extinguishers, 2003 (resolution A.951(23))*

*Instructions for action in survival craft (resolution A.657(16))*

*Magnetic compasses: carriage and performance standards (resolution A.382(X))*

*Recommended practice on portable fish-hold divisions (resolution A.168(ES.IV), as amended by resolution A.268(VIII), appendix V)*

*Revised recommendations on testing of life-saving appliances (resolution MSC.81(70), as amended)*

*Safety of Fishing Operations (Support Level), (model course 1.33), 2005 edition*

*Standardized Life-saving Appliance Evaluation and Test Report Forms (MSC/Circ.980)*

*Torremolinos Protocol, 1993, and Torremolinos International Convention for the Safety of Fishing Vessels, consolidated edition, 1995*

*International Code on Intact Stability, 2008 (2008 IS Code) (resolution MSC.267(85))*

*International Life-Saving Appliance (LSA) Code (resolution MSC.48(66))*

*International Regulations for Preventing Collisions at Sea (COLREGs), 1972*

*Operational standards for radiotelephone alarm signal generators (resolution A.421(XI))*

*Performance standards for enhanced group call equipment (resolution A.664(16))*

*Performance standards for float-free release and activation arrangements for emergency radio equipment (resolution A.662(16))*

*Performance standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz (resolution A.810(19))*

*Performance standards for float-free satellite emergency position-indicating radio beacons operating through the geostationary Inmarsat satellite system on 1.6 GHz (resolution A.661(16))*

*Performance standards for Inmarsat Standard-C ship-earth stations capable of transmitting and receiving direct-printing communications (resolution A.663(16))*

*Performance standards for narrow-band direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (MSI) by HF (resolution A.700(17))*

*Performance standards for ship-earth stations capable of two-way communications (resolution A.698(17))*

*Performance standards for shipborne MF radio installations capable of voice communication and digital selective calling (resolution A.804(19))*

*Performance standards for shipborne MF/HF radio installations capable of voice communication, narrow band direct-printing and digital selective calling (resolution A.806(19))*

*Performance standards for shipborne VHF radio installations capable of voice communication and digital selective calling (resolution A.803(19)).*

*Performance standards for survival craft radar transponders for use in search and rescue operations (resolution A.802(19))*

*Promulgation of maritime safety information (resolution A.616(15))*

*Provision of radio services for the Global Maritime Distress And Safety System (GMDSS) (resolution A.704(17))*

*Radar beacons and transponders (resolution A.615(15))*

*Recommendation on performance standards for combined GPS/GLONASS receiver equipment (resolution MSC.74(69), annex 1, as amended by resolution MSC.115(73))*

*Recommendation on performance standards for daylight signalling lamps (resolution MSC.95(72))*

*Recommendation on performance standards for devices to indicate speed and distance (resolution A.824(19), as amended by resolution MSC.96(72))*

*Recommendation on performance standards for echo-sounding equipment (resolution A.224(VII), as amended by resolution MSC.74(69), annex 4)*

*Recommendation on performance standards for Electronic Chart Display And Information Systems (ECDIS) (resolution A.817(19), as amended by resolutions MSC.64(67), annex 5, and MSC.86(70), annex 4)*

*Recommendation on performance standards for heading control systems (resolution MSC.64(67), annex 3)*

*Recommendation on performance standards for radar equipment (resolution MSC.64(67), annex 4)*

*Recommendation on performance standards for radar reflectors (resolution A.384(X), as amended by resolution MSC.164(78))*

*Recommendation on performance standards for shipborne DGPS and DGLONASS maritime radio beacon receiver equipment (resolution MSC.64(67), annex 2, as amended by resolution MSC.114(73))*

*Recommendation on performance standards for shipborne global positioning system receiver equipment (resolution A.819(19), as amended by resolution MSC.112(73))*

*Recommendation on performance standards for shipborne GLONASS receiver equipment (resolution MSC.53(66), as amended by resolution MSC.113(73))*

*Recommendation on the carriage of electronic position-fixing equipment (resolution A.156(ES.IV))*

*Revised performance standards for Electronic Chart Display And Information Systems (ECDIS) (resolution MSC.232(82))*

*System performance standards for the promulgation and co-ordination of maritime safety information using high-frequency narrow-band direct-printing (resolution A.699(17))*

*Type approval of Satellite Emergency Position-Indicating Radio Beacons (EPIRBs) operating in the COSPAS-SARSAT System (resolution A.696(17))*

*Type approval of ship-earth stations (resolution A.570(14))*

## **ILO ([www.ilo.org](http://www.ilo.org))**

A majority of the publications mentioned below are available on the ILO website, in particular at [www.ilo.org/public/english/protection/safework/index.htm](http://www.ilo.org/public/english/protection/safework/index.htm).

### *Guidelines on occupational safety and health management systems (ILO-OSH 2001)*

The guidelines aim to contribute to the protection of workers from hazards and to the elimination of work-related injuries, ill-health, diseases, incidents and deaths. They provide guidance for the national and enterprise levels, and can be used to establish the framework for occupational safety and health management systems.

*The Work in Fishing Convention, 2007 (No. 188) and Recommendation, 2007 (No. 199)* provide a comprehensive set of standards concerning working conditions on board fishing vessels. These include, among other things, standards on accommodation, occupational safety and health, and medical care at sea.

### *Risks and dangers in small-scale fisheries: An overview. By M. Ben-Yami. Working paper.*

The working paper provides a comprehensive overview of the risks and dangers in small-scale and artisanal fisheries, including working conditions, safety approaches in developed



and developing countries, accidents associated with the marine environment, navigation and fishing operations, problems associated with boat design and construction as well as other risks and dangers.

## **Other ILO codes of practice of possible interest to the fisheries sector**

*Ambient factors in the workplace, 2001*

*HIV/AIDS and the world of work, 2001*

*Technical and ethical guidelines for workers' health surveillance, 1998*

*Protection of workers against noise and vibration in the working environment, 1977*

*Safety and health in shipbuilding and ship repairing, 1974*

*Recording and notification of occupational accidents and diseases, 1996*

*Safety in the use of chemicals at work, 1993*

*Radiation protection of workers (ionizing radiations), 1987*

*Safety in the use of asbestos, 1984*

*Safety and health in ports, 2005*

## **SafeWork training manuals**

ILO's SafeWork programme has prepared a number of documents that could be used as training manuals and/or as teachers' guides for occupational safety and health courses organized by employers, workers' organizations or educational institutions. Though not specifically aimed at the fishery sector, these documents may be very useful for addressing such issues as noise and vibration, ergonomics, hazard control and AIDS.

*Ergonomic Checkpoints*

This fully illustrated easy-to-use manual is a collection of practical, easy-to-use ergonomic solutions for improving working conditions. It is an extremely useful tool for everyone who wants to improve working conditions for better safety, health and efficiency. Each of the 128 checkpoints has been developed to help the user look at various workplaces and identify practical solutions that can be made applicable under local conditions. It has been developed jointly with the International Ergonomics Association. 1996.

*International Hazard Datasheets on Occupations – Diver, indigenous fisherman*

An International Hazard Datasheets on Occupations is a multipurpose information resource containing information on the hazards, risks and notions of prevention related to a specific occupation. These datasheets are intended for those professionally

concerned with health and safety at work, including occupational physicians and nurses, safety engineers, hygienists, education and information specialists, inspectors, employers' representatives, workers' representatives, safety officers and other competent persons.

## **WHO ([www.who.int/en/org](http://www.who.int/en/org))**

*International Medical Guide for Ships*

*Guide to ship sanitation (as amended)*

## **OTHER READINGS**

*European Union Council Directive 92/29/EEC on minimum safety and health requirements for improved medical treatment on board vessels  
Publication IEC 60079*

*Nordic Boat Standards, 1991 ([www.sigling.is/English](http://www.sigling.is/English))*

*SEAFISH Construction standards for new fishing vessels 15 m length overall to 24 m registered length*

*ISO 10133 (2000) Small craft – Electrical Systems – Extra-low-voltage DC installations*

*ISO 11812 (2001) Small craft – Watertight cockpits and quick-draining cockpits*

*ISO12215-5 (2008) Small craft – Hull construction and scantling – Part 5: Design pressures for monohulls, design stresses, scantlings determination*

*ISO12215-6 (2008) Small craft – Hull construction and scantling – Part 6: Structural arrangements and details*

*ISO 12217-3 Small craft – Stability and buoyancy assessment and categorization – Part 3: Boats of hull length less than 6 m, Annex E.*

*ISO 12402-7 (2007) Personal flotation devices – Part 7: Materials and components – Safety requirements and test methods.*

*ISO 13297 (2000) Small craft – Electrical systems – Alternating current installations.*

The purpose of the Safety Recommendations contained in this publication is to provide information on the design, construction, equipment, training and protection of the crews of small fishing vessels with a view to promoting the safety of the vessel and the safety and health of the crews. The Safety Recommendations may also serve as a guide for those concerned with the safety of vessels used in support of aquaculture activities. They are not intended as a substitute for national laws and regulations but may serve as a guide to those persons concerned with framing such national laws and regulations. Unless otherwise stated, the provisions of the Safety Recommendations are intended to apply to new decked vessels of less than 12 m in length and new undecked vessels intended to operate at sea (as well as on oceans, rivers, lakes and dams, or on any body of water). Nevertheless, even where not otherwise stated, the competent authority should as far as reasonable and practical give consideration to the application of these provisions to existing vessels.

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