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Date: 10th December 2014

Directive (18/2014)

National Guidance for the Provision of Surveyors' Note Book for Non-convention Ships

Applicable to: Ship owners, Recognized Organizations, Shipping Companies, Flag State Surveyors

1. The Department of Marine Administration circulated this directive in the exercise of the power of Section 294(B), paragraph (b) of Myanmar Merchant Shipping Act.

2. Pursuant to the provision of section 213 (A) of Myanmar Merchant Shipping Act, the Department of Marine Administration circulated this directive to apply the IMO – Surveyors' Note Book for Non-convention Ships as national guidance to provide National Standards for the survey and certification of non-convention ships subjected to Myanmar ships engaged on Myanmar waters.

3. The purpose of this guidance is to provide Myanmar National Standards of the survey and certification of non-convention ships complied with the requirements provided in chapter II-1 of the International Convention for the Safety of Life at Sea, 1974, as amended.

Maung Maung Oo
Director General
Department of Marine Administration

INTERNATIONAL MARITIME ORGANIZATION

Surveyors' Note Book

for non-Convention ships

Edition January 2010

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* Drawn from appendix IV of the Annex to Assembly resolution A.168(ES.IV).

Preamble

This Note Book for Surveyors gathers together documents that can be of assistance for surveyors when dealing with non convention ships. They supplement the national Model regulations proposed by IMO when the recommendations for SOLAS ships are not necessarily appropriate, in particular due to the size of the ship.

Many of the documents have been specially established for fishing vessels, but in some cases, they also may be used for cargo ships and small passenger vessels. Such application shall be envisaged with cautiousness and judgment.

ANNEX I

RECOMMENDED CONSTRUCTION STANDARDS FOR WOODEN FISHING VESSELS

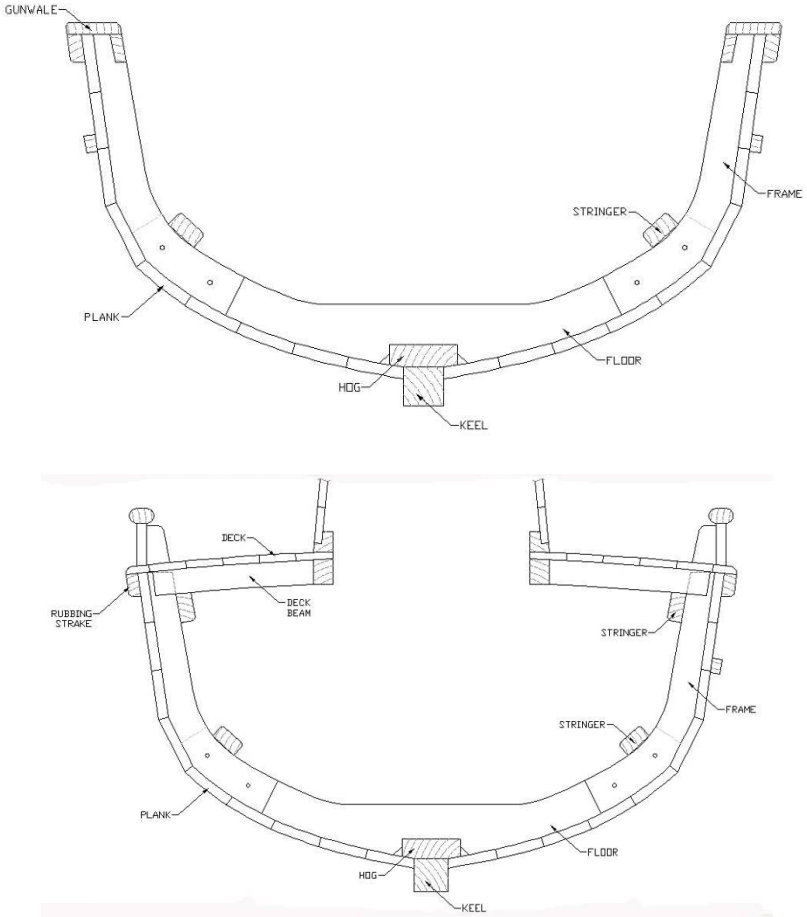
PART 1 – GENERAL

1 Scope

1.1 These construction standards apply to decked fishing vessels of less than 12 m in length and undecked vessels of any size.[1]

1.2 In general the construction standards apply to fishing vessels of conventional form and wooden construction[2]; that is single hull vessels of plank on frame construction with metal fastenings which in general should consist of:

- substantial backbone structure;
- close spaced transverse frames;
- fore and aft carvel planking fastened to frames with metal fasteners;
- deck, partial deck or full deck;
- longitudinal structure including gunwale, bilge stringer and engine beds.



[1] These construction standards are under development and require further refinement.

[2] An illustration of conventional wooden construction will be included.

1.3 In general the standards apply to vessels operating at speeds up to 10 knots as shown in the table below. Vessels operating at higher speeds will require special consideration by the Competent Authority.

Vessel Length overall	**Maximum operating speed**
up to 6 metres	7 knots
8 metres	8 knots
10 metres	9 knots
12 metres	10 knots

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

- Vessels constructed of plywood or glued wood;
- Vessels of simple construction including vessels such as rafts and dug-out canoes;
- Vessels judged by the Competent Authority to be outside the scope of this standard.

2 Design categories

2.1 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 be determined as set out in the table below:

Design category	**Part 1**	**Part 2**	**Part 3**
A	✔	✔	
B	✔	✔	
C1	✔		✔
C2	✔		✔
D	✔		

3.2 Vessels fitted with sails should be considered to operate in design categories C1, C2 and D only unless given special consideration by the Competent Authority.

4 Construction standards for wooden vessels of all design categories

4.1 Introduction

4.1.1 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 to 20%, of good quality and free from splits, sap wood and significant knots.

4.2.2 Timber should be selected according to location in the vessel as follows:

Part of vessel	**Preferred density**	**Minimum density**
Hull and deck planking	480 kg/m^3	370 kg/m^3
Keel, deadwood and stem	600 kg/m^3	480 kg/m^3
Frames and engine beds	700 kg/m^3	

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 preferably have some resistance to marine borers.

4.3 Planking

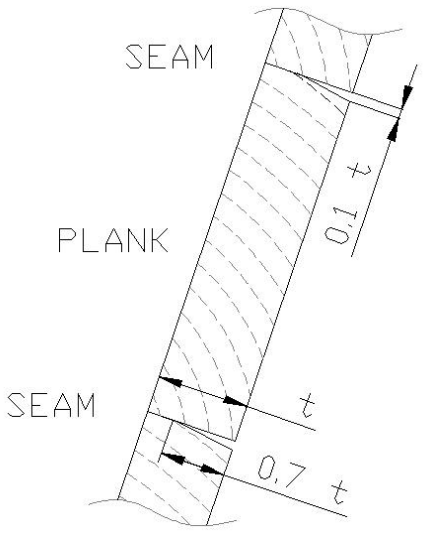
4.3.1 Hull planking should be from long or continuous lengths where possible.

4.3.2 The width of planks should be kept as small as practical, preferably less than 4 times plank thickness but not more than 8 times plank thickness.

4.3.3 Planks up to 150 mm wide should have 2 fastenings at each frame, planks over 150 mm wide should have 3 fastenings at each frame.

4.3.4 Hull planking should be of a thickness which is suitable for the size of boat and the frame spacing. In general planking of 16 mm or less should not be used unless special arrangements are made for framing.

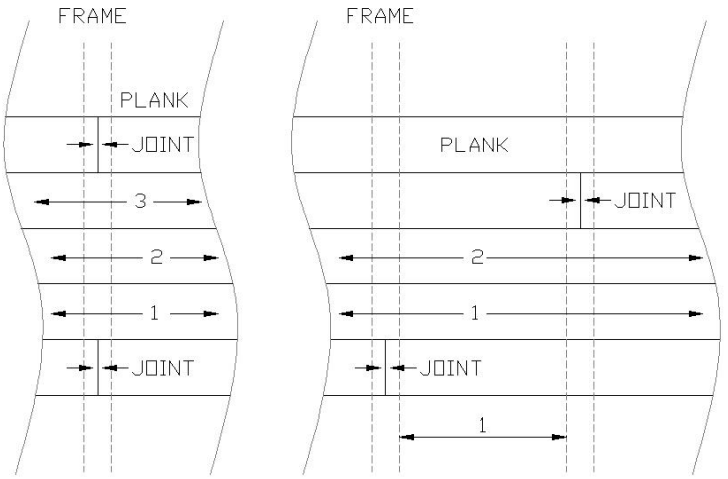
4.3.5 Planks should be fitted tight together; the gap between planks should be less than 3 mm. There should be a caulking seam of width approximately 1/10 of the planking thickness tapering to zero at a depth of about 2/3 of the planking thickness.

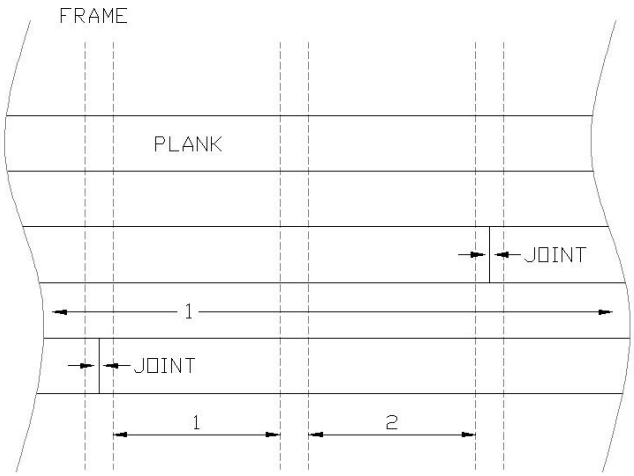


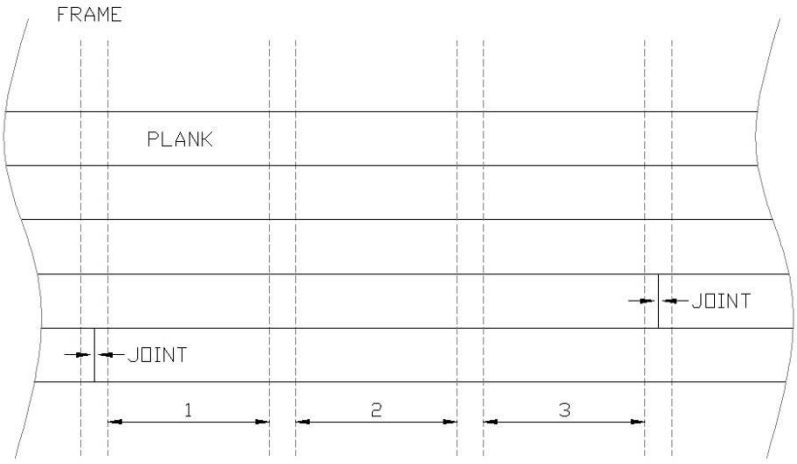
4.3.6 Seams between planks should be caulked with an organic material such as oakum and then filled with flexible waterproof filler. Synthetic fibres should not be used for caulking.

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





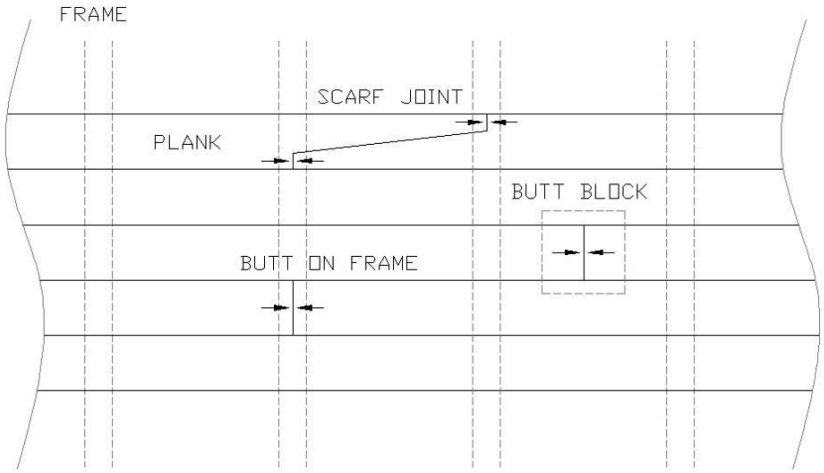


4.3.8 Joints in planks may be made by one of the following methods:

a) on a frame, this may be done where planks and frames are sufficiently large, generally a frame width of 125 mm or more;

b) 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 20-30 mm and 10 mm for thicker planks;

c) by scarf joint spanning two frames.



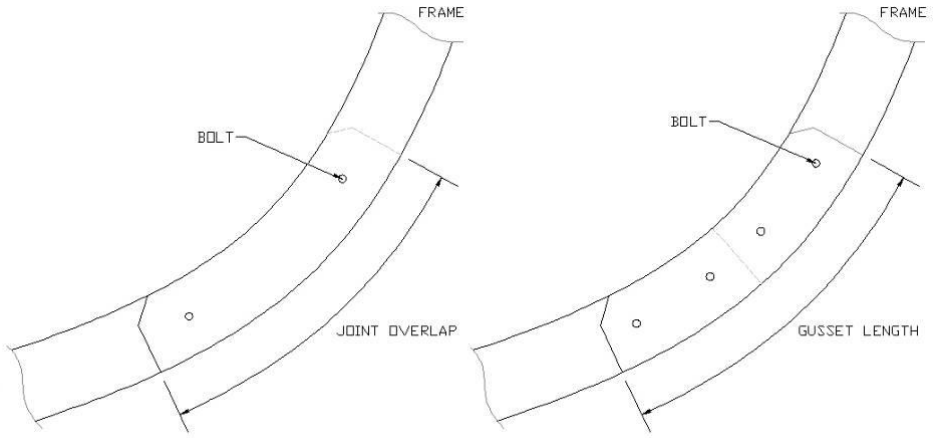
4.4 Frames

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:

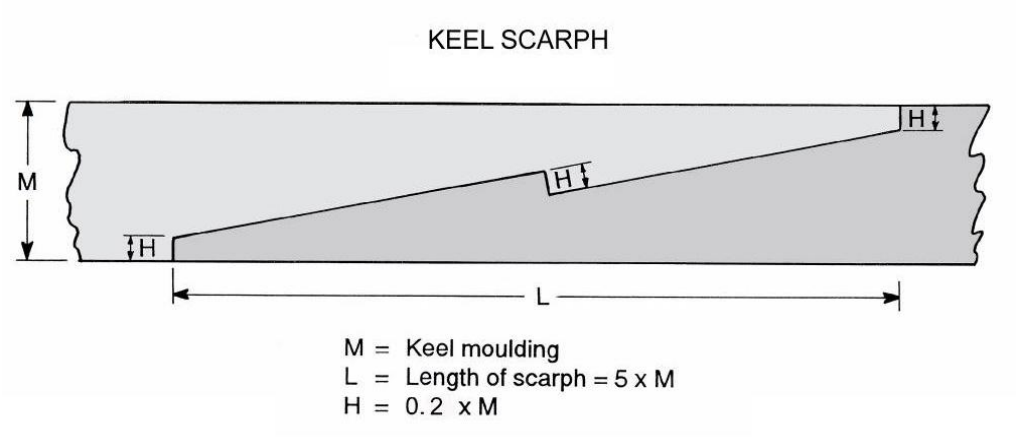
Bolt diameter	**Overlap joint Minimum length of overlap**	**Butt joint Minimum length of gussets**
8 mm	180 mm	360 mm
10 mm	210 mm	420 mm
12 mm	260 mm	510 mm



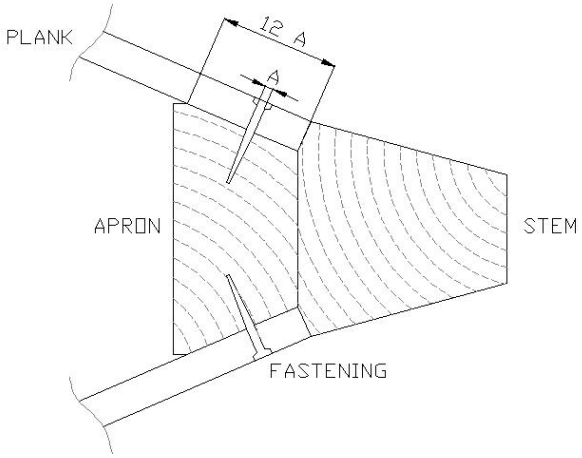
4.4.4 All frame components should be painted with primer before assembly.

4.5 Keel and other components

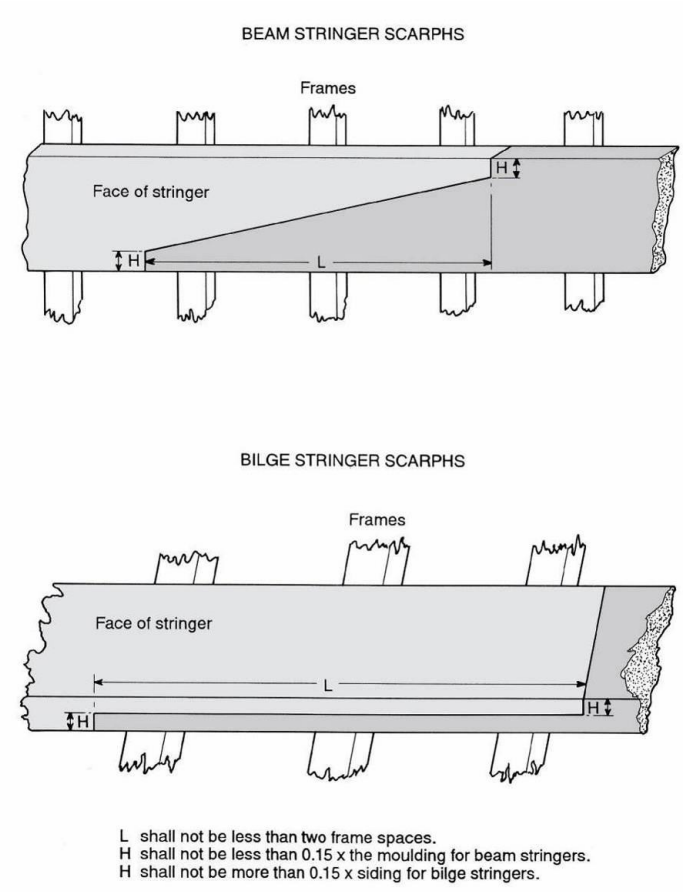
4.5.1 For vessels up to 7 m LOA the keel should preferably be in one length. For larger vessels the keel can be joined with a scarf of length 5 x keel height with end notches of depth 0.2 x keel height. The scarf should be bolted together.



4.5.2 The width of the stem should be the same 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 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 illustration below shows the requirements. It is good practice for the bilge stringer to be bolted in place.



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 3 frame spaces and should be bolted in place.

4.5.6 A gunwale and rubbing strake should be fitted and should be 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 boats 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 boats of 6 metres and above the knee length should be increase 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 small 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 16 mm or less should not be used unless special arrangements are made.

4.6.4 Planks should be fitted tight together; the maximum gap between planks should be 3 mm. There should be a caulking seam of width approximately 1/10 of the planking thickness tapering to zero at a depth of about 2/3 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 2.2.7 for the minimum spacing between joints.

4.6.7 The deck should be supported by beams; these should be curved (cambered) by at least 20 mm per metre of length. The beams may be spaced at the same centres as the hull framing and their ends are 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 each side of these. Main beams should have width increased by at least 50% 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 will increase the rigidity and strength of the structure and will 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 as follows:

Length of vessel	Keel bolt diameter
5 to 6 metres	8 mm
6 to 8 metres	10 mm
> 8 metres	12 mm

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

Bolt diameter	Minimum end distance	Minimum edge distance
up to 8 mm	60 mm	35 mm
10 mm	70 mm	40 mm
12 mm	85 mm	50 mm

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

Planking thickness (mm)	18	20	25	30	35
Minimum nail diameter (mm)	4	5	5	6	8
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 2–3 mm and the head covered with waterproof, flexible compound.

4.7.8 Planks up to 150 mm wide should have 2 fastenings at each frame, planks over 150 mm wide should have 3 fastenings at each frame.

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

PART 2 – RECOMMENDED CONSTRUCTION STANDARDS FOR WOODEN VESSELS OF DESIGN CATEGORIES A AND B

1 Introduction

1.1 The construction standard described here should be applied to all decked vessels in 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 built 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.

* The standards include:

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

PART 3 – RECOMMENDED CONSTRUCTION STANDARDS FOR WOODEN VESSELS OF DESIGN CATEGORIES C1 AND C2

1 Introduction

1.1 The construction standard described here should be applied to all decked and undecked vessels in design categories C1 and C2.

1.2 The construction standard described here should always be read in conjunction with **Part 1**.

2 Construction

2.1 Planking

2.1.1 Hull planking should be of a thickness which is suitable for the size of vessel and the spacing of frames; table 2.9.1 shows the relationship between plank thickness and frame spacing.

2.2 Frames

2.2.1 The frame dimensions should be suitable for the size of vessel and the spacing of the frames; table 2.9.3 shows typical frame dimensions.

2.2.2 The frame dimensions may be checked against table 2.9.3 or alternatively the required section modulus may be derived from table 2.9.4.

2.3 Keel

2.3.1 The size of keel and hog should be suitable for the size of vessel; table 2.9.5 shows 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 minimum requirements for bolt size for fastening keel and hog to frames.

2.4 Stem

2.4.1 The stem and apron should have the same width as the keel. Refer to 2.4.2 in Part 1 for details of plank landing dimensions.

2.5 Transom

2.5.1 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 vessel. Generally stringers should be fitted at the bilge and the top of frames or deck. Table 2.9.7 shows recommended dimensions.

2.7 Deck

2.7.1 Deck planking should be the same thickness as the hull planking.

2.7.2 The size and spacing of deck beams should be suitable for the size of vessel; table 2.9.8 shows recommended deck beam dimensions. The spacing of deck beams may be equal to or less than the hull frame spacing.

2.8 Fastenings

2.8.1 Table 2.9.2 shows the requirements for the fastening of planking to frames.

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

2.9 Tables[3] of dimensions and scantlings

Table 2.9.1 – Plank thickness and frame spacing for design categories C1 and C2[4]

CuNo	Design category C1 Planking thickness (mm)					CuNo	Design category C2 Planking thickness (mm)				
	18	20	25	30	35		18	20	25	30	35
3	395					3	400				
5	360	395				5	365	400			
10	330	360				10	335	365			
15	305	330	400			15	310	335	410		
20		320	385			20		325	390		
25		310	375	435		25		315	380		
30		300	360	435		30		305	365	430	
35			355	415		35			360	420	
40			350	410		40			355	415	
45			340	400		45			350	410	
50			335	395	450	50			345	400	
55	Frame Spacing			385	440	55	Frame Spacing			390	450
60	(mm)			375	430	60	(mm)			380	435
65				370	435	65				375	430
70				365	420	70				370	425
75				360	415	75				370	420
80				355	410	80				365	415

Note: The plank thickness shown is the minimum; and the frame spacing the maximum.

Table 2.9.2 – Minimum nail size for fastening planks to frames – all design categories

Planking thickness (mm)	18	20	25	30	35
Minimum nail diameter (mm)	4	5	5	6	8
Minimum nail length (mm)	50	60	75	75	100

[3] These tables are under development and may require further refinement.

[4] The difference in frame spacing between categories C1 and C2 is so small that the use of C2 may have to be reviewed.

Table 2.9.3 – Frame dimensions for design categories C1 and C2

CuNo	Design category C1 Frame dimensions (mm)				Design category C2 Frame dimensions (mm)			
	Width	Depth bottom	Depth bilge	Depth top	Width	Depth bottom	Depth bilge	Depth top
3	40	65	55	35	40	60	50	35
5	40	70	55	45	40	65	50	45
10	50	80	65	50	50	80	60	50
15	50	85	70	55	50	85	65	50
20	50	90	75	60	50	85	70	55
25	50	95	75	65	50	90	75	60
30	60	100	75	65	60	95	75	60
35	60	105	80	70	60	100	80	65
40	60	105	80	70	60	100	80	65
45	65	110	80	75	65	105	80	70
50	65	110	85	75	65	105	85	70
55	65	115	85	75	65	110	85	70
60	65	115	85	75	65	110	85	70
65	65	120	90	75	65	115	85	75
70	65	120	90	75	65	115	85	75
75	70	125	90	75	70	115	85	75
80	70	125	90	80	70	115	85	80

Note: Where frame width is not as listed above a check of frame section modulus may be made using the table below. The section modulus is calculated as follows: SM = width x depth^2 / 6 (cm^3), where frame dimensions are in cm.

Table 2.9.4 – Frame section modulus for design categories C1 and C2

CuNo	Design category C1 Frame section modulus (cm^3)			Design category C2 Frame section modulus (cm^3)		
	bottom	bilge	top	bottom	bilge	top
3	27	20	9	25	18	8
5	31	20	14	28	18	13
10	56	34	21	51	31	19
15	62	39	25	57	35	23
20	69	44	29	63	40	27
25	76	50	34	70	46	31
30	100	60	41	92	55	37
35	110	67	47	100	61	43
40	110	67	47	100	61	43
45	129	73	57	118	66	52
50	129	81	57	118	74	52
55	140	81	57	128	74	52
60	140	81	57	128	74	52
65	152	90	65	139	82	59
70	152	90	65	139	82	59
75	176	97	70	161	88	64
80	176	97	78	161	88	72

Note: Where frame width is not as listed above a check of frame section modulus may be made using the table below. The section modulus is calculated as follows: SM = width x depth^2 / 6 (cm^3), where frame dimensions are in cm.

Table 2.9.5 – Keel and hog dimensions – all design categories

	Keel dimensions (mm)		Hog dimensions (mm)	
CuNo	Width	Depth	Width	Depth
5	65	53	123	47
10	70	72	128	47
15	75	78	129	47
20	92	110	164	60
25	95	121	166	60
30	98	133	168	62
35	100	142	170	62
40	104	148	173	62
45	107	155	192	66
50	110	163	195	75
55	113	168	197	75
60	116	172	200	75
65	120	177	203	75
70	122	182	205	75
75	125	185	206	78
80	125	190	206	78

Note: Vessels up to CuNo = 20 are assumed to be open boats and above this are assumed to be decked boats.

Table 2.9.6 – Minimum bolt size for fastening keel and hog to frames – all design categories

CuNo	Keel bolts (mm)
5	6
10	8
15	8
20	8
25	10
30	10
35	12
40	12
45	12
50	12
55	12
60	12
65	16
70	16
75	16
80	16

Table 2.9.7 – Stringer dimensions

CuNo	Sectional area of stringer (cm^2) Bilge	Beam
3	15	15 *
5	18	18 *
10	20	20 *
15	20	20 *
20	25	25
25	30	30
30	30	30
35	30	30
40	35	35
45	35	35
50	35	40
55	40	50
60	40	50
65	40	60
70	50	65
75	50	65
80	50	75

Note: * indicates where consideration may be given to omitting the beam stringer should fishing or construction methods require this.

Table 2.9.8 – Deck beam dimensions

CuNo	Deck beam dimensions (mm) Mid beam	End of beam
3	30 x 60	50
5	30 x 60	50
10	40 x 60	50
15	40 x 60	50
20	45 x 65	55
25	45 x 75	55
30	45 x 85	55
35	45 x 90	55
40	45 x 95	55
45	50 x 100	55
50	55 x 100	60
55	55 x 100	60
60	55 x 105	60
65	55 x 105	60
70	55 x 110	70
75	55 x 110	70
80	60 x 115	70

ANNEX II

RECOMMENDED CONSTRUCTION STANDARDS FOR GRP FISHING VESSELS

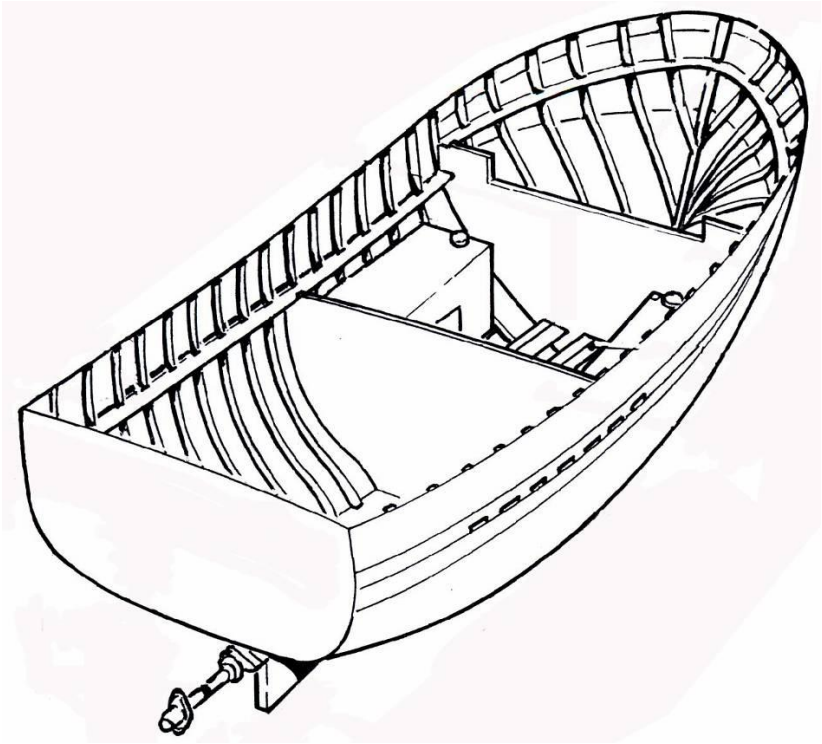
PART 1 – GENERAL

1 Scope

1.1 These construction standards apply to decked vessels of less than 12 m in length and undecked vessels of any size.[1]

1.2 In general the standards apply to vessels of conventional form and of glass reinforced plastic construction[2] (GRP); that is single hull vessels of glass rovings and mat and polyester resin construction which in general should consist of:

- moulded hull of single-skin or sandwich construction;
- deck of GRP sheathed plywood, GRP or traditional timber construction;
- transverse framing; and
- longitudinal structure including gunwale, stringers, engine beds.



1.3 Standards are given for vessels operating at speeds up to 20 knots as shown in the tables given in part 3. Vessels operating at higher speeds will require special consideration by the Competent Authority.

[1] These construction standards are under development and require further refinement.

[2] An illustration of conventional GRP construction will be included.

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

- vessels constructed of other materials such as Kevlar reinforcements and epoxy resins;
- vessels propelled by paddles or oars only; and
- vessels judged by the Competent Authority to be outside the scope of this standard.

2 Design categories

2.1 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 1.1.12.

3 Construction standards

3.1 The appropriate standards of construction for GRP vessels should be determined as set out in the table below:

Design category	Part 1	Part 2	Part 3
A	✔	✔	
B	✔	✔	
C1	✔		✔
C2	✔		✔
D	✔		

3.2 Vessels fitted with sails should be considered to operate in categories C1, C2 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:

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

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 manufacturers' 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 manufacturers' 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%.

4.1.5 Careful attention should be paid to the manufacturers' recommendations concerning the storage and use 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 which could contaminate the mould surfaces.

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

4.2.6 The workshop should be as free as practical 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 within 7 days of 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 catalyst to polyester products should be strictly controlled within the limits set by the manufacturers. Tables giving 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 will 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 to 48 hours and is still chemically active, allowing a chemical bond.

4.2.11 Where a secondary bond will 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 h 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 to 0.6 mm thick.

4.3.2 The gel coat should only be left exposed in accordance with the manufacturers' recommendations; generally this will be a maximum of 24 h.

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^2, 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 a layers of chopped strand mat.

4.3.5 A suitable top coat should be applied in bilge and keel areas where water will 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 increased 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 a 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 elapsed between the completion of hull or deck laminate and the bonding of structural members should be kept within the limits of the manufacturers' recommendations.

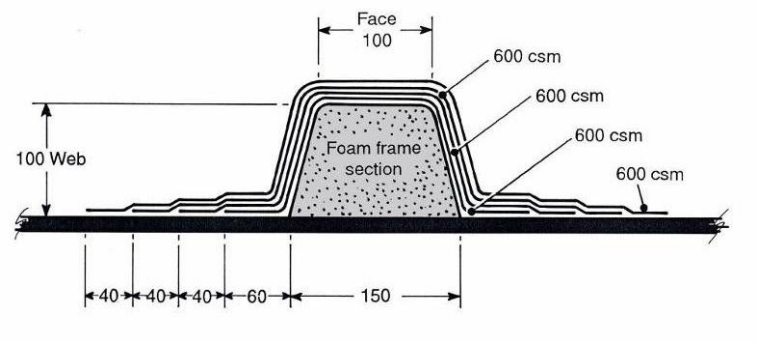
4.4 Hull construction[3]

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.

4.4.2 Hulls should be adequately stiffened; this may be in the form of longitudinal or transverse stiffeners or a combination of both.

[3] Further illustrations may be added to this section in the future.

4.4.3 Stiffeners may be constructed by moulding over foam or hollow formers which should be bonded to the inside hull laminate, see 4.3.10 and 4.3.11 for a description of primary and secondary bonding. Frame formers may be of top hat or rectangular section. Where frames have gunwales or stringers through bolted, the core of the frames is to be of timber.



Typical frame construction

4.4.4 Floors moulded over formers are to be fitted to the tops of the frames at the centreline 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 4.3.10 and 4.3.11 for a description of primary and secondary bonding. Alternatively these may be formed a combination of other longitudinal structural members such as soles, decks and lockers.

4.4.6 In vessels below 7 m 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 boats 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 dip galvanized or 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 by 100%. The additional reinforcement should be stepped down by 40 mm per 600 g/m^2 of reinforcement weight.

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.

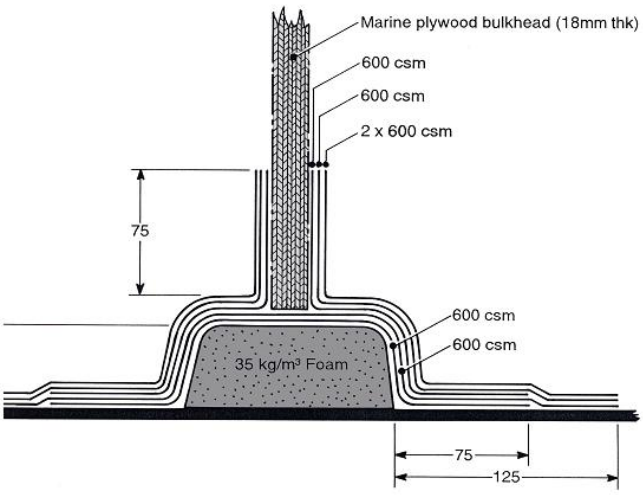
4.4.15 The centre of the hull aft of the keel to the transom is to be stiffened by lay-ups as required for the keel.

4.4.16 Where fitted, rubbing strakes may be of hardwood, rubber or plastic; securing bolts should be hot dip 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 to be well sealed and glassed over to prevent leakage.

4.4.21 Consideration should be given to including easily replaceable sacrificial structures in locations where impact or abrasion could occur. These may include structures in way of trawl doors, chains, cables, lines and other fishing equipment.

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% 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

1.1 The construction standard 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 built 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.

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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 construction rules of recognized organizations.

PART 3 – RECOMMENDED CONSTRUCTION STANDARDS FOR GRP VESSELS OF DESIGN CATEGORIES C1 AND C2

1 Introduction

1.1 The construction standard described here should be applied to all decked and undecked vessels in design categories C1 and C2.

1.2 The construction standard described here should always be read in conjunction with Part 1.

2 Construction[4,5]

2.1 Hull and deck

2.1.1 Hull bottom laminate should be of a thickness which is suitable for the size of vessel, the spacing of frames (or panel size) and the speed of operation of the vessel; tables 2.1.1 and 2.1.2 show the required laminate thickness and equivalent fibre weight.

2.1.2 Hull side laminate should be of a thickness which is suitable for the size of vessel, the spacing of frames (or panel size) and the speed of operation of the vessel; tables 2.1.3 and 2.1.4 show the required laminate thickness and equivalent fibre weight.

2.1.3 Deck laminate should be of a thickness which is suitable for the size of vessel, the spacing of frames (or panel size) and the speed of operation of the vessel; table 2.1.5 shows the required laminate thickness and equivalent fibre weight.

2.2 Stiffeners

2.2.1 Hull bottom stiffeners should be of a size which is suitable for the size of vessel, the spacing of stiffeners (or panel size) and the speed of operation of the vessel; tables 2.1.6, 2.1.7, 2.1.10 and 2.1.11 show the required section modulus.

2.2.1 Hull side stiffeners should be of a size which is suitable for the size of vessel, the spacing of stiffeners (or panel size) and the speed of operation of the vessel; tables 2.1.8, 2.1.9, 2.1.12 and 2.1.13 show the required section modulus.

2.2.3 The properties of typical square section “top hat” stiffeners are given in table 2.1.14.

[4] Tabulated information is based on *Simplified Method for Scantling Determination* from ISO standard 12215.

[5] These tables are under development and may require further development and refinement.

Table 2.1.1 – Table of hull BOTTOM LAMINATE thickness/weight for Reference Laminate Slow speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	6	3.6	1540	4.5	1920	6.7	2880	8.9	3840
10	7	4.4	1900	5.5	2380	8.3	3560	11.0	4750
24	8	5.1	2210	6.4	2760	9.6	4140	12.8	5510
46	9	5.6	2410	7.0	3010	10.5	4510	14.0	6010
79	10	6.1	2620	7.6	3280	11.4	4920	15.2	6550

Table of hull BOTTOM LAMINATE thickness/weight for Modified Laminate Slow speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	6	3.2	1821	4.0	2276	6.0	3414	8.0	4552
10	7	4.0	2249	5.0	2811	7.4	4217	9.9	5623
24	8	4.6	2613	5.8	3267	8.6	4900	11.5	6533
46	9	5.0	2849	6.3	3561	9.4	5342	12.6	7122
79	10	5.5	3106	6.9	3882	10.3	5824	13.7	7765

Table 2.1.2 – Table of hull BOTTOM LAMINATE thickness/weight for Reference Laminate Medium speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	12	4.4	1900	5.5	2380	8.3	3560	11.0	4750
10	14	5.4	2320	6.7	2890	10.1	4340	13.4	5780
24	16	6.1	2640	7.7	3300	11.5	4950	15.3	6600
46	18	6.9	2980	8.7	3730	13.0	5590	17.3	7450
79	20	8.0	3440	10.0	4290	15.0	6440	20.0	8580

Table of hull BOTTOM LAMINATE thickness/weight for Modified Laminate
Medium speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	12	4.0	2249	5.0	2811	7.4	4217	9.9	5623
10	14	4.8	2742	6.0	3427	9.1	5141	12.1	6854
24	16	5.5	3127	6.9	3909	10.3	5864	13.8	7818
46	18	6.2	3534	7.8	4418	11.7	6627	15.6	8836
79	20	7.2	4070	9.0	5087	13.5	7631	18.0	10175

Table 2.1.3 – Table of hull SIDE LAMINATE thickness/weight for Reference Laminate
Slow speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	6	2.6	1140	3.3	1430	5.0	2140	6.6	2850
10	7	2.8	1200	3.5	1490	5.2	2240	6.9	2980
24	8	3.1	1320	3.8	1650	5.7	2480	7.7	3300
46	9	3.3	1410	4.1	1770	6.1	2650	8.2	3530
79	10	3.5	1520	4.4	1900	6.6	2850	8.8	3800

Table of hull SIDE LAMINATE thickness/weight for Modified Laminate
Slow speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	6	2.4	1349	3.0	1687	4.5	2530	6.0	3374
10	7	2.5	1414	3.1	1767	4.7	2651	6.2	3534
24	8	2.8	1564	3.4	1955	5.2	2932	6.9	3909
46	9	2.9	1671	3.7	2088	5.5	3133	7.4	4177
79	10	3.2	1799	4.0	2249	6.0	3374	7.9	4498

Table 2.1.4 – Table of hull SIDE LAMINATE thickness/weight for Reference Laminate Medium speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	12	2.6	1120	3.3	1400	4.9	2100	6.5	2800
10	14	2.9	1270	3.7	1590	5.5	2380	7.4	3170
24	16	3.3	1410	4.1	1770	6.1	2650	8.2	3530
46	18	3.6	1560	4.5	1950	6.8	2920	9.0	3890
79	20	3.9	1680	4.9	2100	7.3	3150	9.8	4200

Table of hull SIDE LAMINATE thickness/weight for Modified Laminate Medium speed vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	12	2.3	1328	2.9	1660	4.4	2490	5.9	3320
10	14	2.6	1499	3.3	1874	5.0	2811	6.6	3749
24	16	2.9	1671	3.7	2088	5.5	3133	7.4	4177
46	18	3.3	1842	4.1	2303	6.1	3454	8.1	4605
79	20	3.5	1992	4.4	2490	6.6	3735	8.8	4980

Table 2.1.5 – Table of DECK LAMINATE thickness/weight for Reference Laminate All vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
3	12	4.4	1900	5.5	2370	8.3	3550	11.0	4740

Table of DECK LAMINATE thickness/weight for Modified Laminate All vessels

CuNo	Max Speed (kts)	Panel width b (mm) 400		500		750		1000	
		Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)	Laminate thickness (mm)	Fibre weight (g/m^2)
79	20	4.0	2244	5.0	2805	7.4	4208	9.9	5610

Table 2.1.6 – Table of BOTTOM STIFFENER modulus for Reference Laminate
Slow speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	0.7	1.6	2.8	4.4	0.9	2.0	3.5	5.5
10	7	1.3	2.9	5.2	8.1	1.6	3.7	6.5	10.2
24	8	2.7	6.1	10.8	16.9	3.4	7.6	13.5	21.1
46	9	3.2	7.2	12.8	20.0	4.0	9.0	16.0	25.0
79	10	3.8	8.6	15.2	23.8	4.8	10.7	19.0	29.7
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	1.3	3.0	5.3	8.2	1.8	3.94	7.0	10.9
10	7	2.4	5.5	9.8	15.2	3.3	7.3	13.0	20.3
24	8	5.1	11.4	20.3	31.6	6.8	15.2	27.0	42.2
46	9	6.0	13.5	24.0	37.5	8.0	18.0	32.0	50.0
79	10	7.1	16.0	28.5	44.5	9.5	21.4	38.0	59.4

Table 2.1.7 – Table of BOTTOM STIFFENER modulus for Modified Laminate
Slow speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	0.6	1.3	2.4	3.7	0.7	1.7	3.0	4.6
10	7	1.1	2.5	4.4	6.9	1.4	3.1	5.5	8.6
24	8	2.3	5.2	9.2	14.3	2.9	6.5	11.5	17.9
46	9	2.7	6.1	10.9	17.0	3.4	7.7	13.6	21.3
79	10	3.2	7.3	12.9	20.2	4.0	9.1	16.2	25.2
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	1.1	2.5	4.5	7.0	1.5	3.3	6.0	9.3
10	7	2.1	4.7	8.3	12.9	2.8	6.2	11.1	17.3
24	8	4.3	9.7	17.2	26.9	5.7	12.9	23.0	35.9
46	9	5.1	11.5	20.4	31.9	6.8	15.3	27.2	42.5
79	10	6.1	13.6	24.2	37.9	8.1	18.2	32.3	50.5

Table 2.1.8 – Table of SIDE STIFFENER modulus for Reference Laminate
Slow speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	0.4	0.8	1.4	2.2	0.4	1.0	1.8	2.7
10	7	0.4	0.9	1.5	2.4	0.5	1.1	1.9	3.0
24	8	0.5	1.2	2.2	3.4	0.7	1.5	2.7	4.2
46	9	0.7	1.5	2.6	4.1	0.8	1.8	3.3	5.1
79	10	0.8	1.8	3.3	5.1	1.0	2.3	4.1	6.4
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	0.7	1.5	2.6	4.1	0.9	2.0	3.5	5.5
10	7	0.7	1.6	2.9	4.5	1.0	2.1	3.8	5.9
24	8	1.0	2.3	4.1	6.3	1.4	3.0	5.4	8.4
46	9	1.2	2.7	4.9	7.6	1.6	3.7	6.5	10.2
79	10	1.5	3.5	6.2	9.6	2.1	4.6	8.2	12.8

Table 2.1.9 – Table of SIDE STIFFENER modulus for Modified Laminate
Slow speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	0.3	0.7	1.2	1.9	0.4	0.8	1.5	2.3
10	7	0.3	0.7	1.3	2.0	0.4	0.9	1.6	2.5
24	8	0.5	1.0	1.8	2.9	0.6	1.3	2.3	3.6
46	9	0.6	1.2	2.2	3.5	0.7	1.6	2.8	4.3
79	10	0.7	1.6	2.8	4.4	0.9	2.0	3.5	5.4
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	6	0.6	1.3	2.2	3.5	0.7	1.7	3.0	4.6
10	7	0.6	1.4	2.4	3.8	0.8	1.8	3.2	5.0
24	8	0.9	1.9	3.4	5.4	1.1	2.6	4.6	7.2
46	9	1.0	2.3	4.1	6.5	1.4	3.1	5.5	8.6
79	10	1.3	2.9	5.2	8.2	1.7	3.9	7.0	10.9

Table 2.1.10 – Table of BOTTOM STIFFENER modulus for Reference Laminate
Medium speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	1.2	2.7	4.8	7.5	1.5	3.4	6.0	9.4
10	14	2.3	5.2	9.2	14.4	2.9	6.5	11.5	18.0
24	16	3.6	8.1	14.4	22.5	4.5	10.1	18.0	28.1
46	18	5.2	11.7	20.8	32.5	6.5	14.6	26.0	40.6
79	20	6.8	15.3	27.2	42.5	8.5	19.1	34.0	53.1
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	2.3	5.1	9.0	14.1	3.0	6.8	12.0	18.8
10	14	4.3	9.7	17.3	27.0	5.8	12.9	23.0	35.9
24	16	6.8	15.2	27.0	42.2	9.0	20.3	36.0	56.3
46	18	9.8	21.9	39.0	60.9	13.0	29.3	52.0	81.3
79	20	12.8	28.7	51.0	79.7	17.0	38.3	68.0	106.3

Table 2.1.11 – Table of BOTTOM STIFFENER modulus for Modified Laminate Medium speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	1.0	2.3	4.1	6.4	1.3	2.9	5.1	8.0
10	14	2.0	4.4	7.8	12.2	2.4	5.5	9.8	15.3
24	16	3.1	6.9	12.2	19.1	3.8	8.6	15.3	23.9
46	18	4.4	9.9	17.7	27.6	5.5	12.4	22.1	34.5
79	20	5.8	13.0	23.1	36.1	7.2	16.3	28.9	45.2
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	1.9	4.3	7.7	12.0	2.6	5.7	10.2	15.9
10	14	3.7	8.2	14.7	22.9	4.9	11.0	19.6	30.5
24	16	5.7	12.9	23.0	35.9	7.7	17.2	30.6	47.8
46	18	8.3	18.6	33.2	51.8	11.1	24.9	44.2	69.1
79	20	10.8	24.4	43.4	67.7	14.5	32.5	57.8	90.3

Table 2.1.12 – Table of SIDE STIFFENER modulus for Reference Laminate
Medium speed vessels

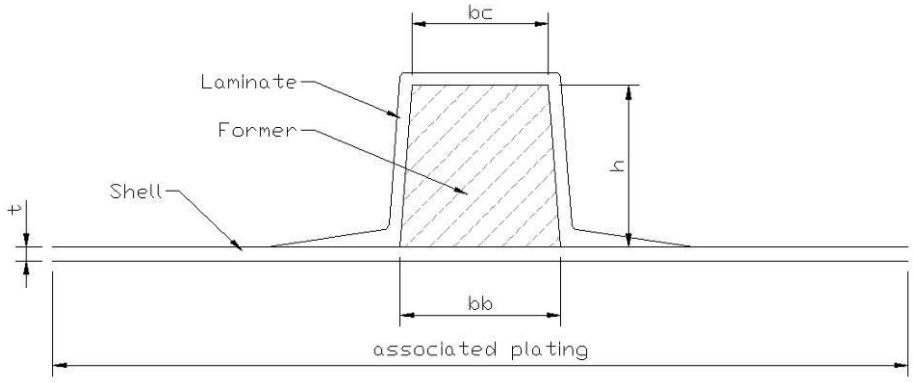
		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	0.4	0.8	1.4	2.3	0.5	1.0	1.8	2.8
10	14	0.5	1.0	1.8	2.8	0.6	1.3	2.3	3.5
24	16	0.7	1.5	2.6	4.1	0.8	1.8	3.3	5.1
46	18	0.9	1.9	3.4	5.4	1.1	2.4	4.3	6.7
79	20	1.1	2.4	4.3	6.8	1.4	3.0	5.4	8.4
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	0.7	1.5	2.7	4.2	0.9	2.0	3.6	5.6
10	14	0.8	1.9	3.4	5.3	1.1	2.5	4.5	7.0
24	16	1.2	2.7	4.9	7.6	1.6	3.7	6.5	10.2
46	18	1.6	3.6	6.5	10.1	2.2	4.8	8.6	13.4
79	20	2.0	4.6	8.1	12.7	2.7	6.1	10.8	16.9

Table 2.1.13 – Table of SIDE STIFFENER modulus for Modified Laminate
Medium speed vessels

		Stiffener spacing s (mm)							
		400	400	400	400	500	500	500	500
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	0.3	0.7	1.2	1.9	0.4	0.9	1.5	2.4
10	14	0.4	0.9	1.5	2.4	0.5	1.1	1.9	3.0
24	16	0.6	1.2	2.2	3.5	0.7	1.6	2.8	4.3
46	18	0.7	1.6	2.9	4.6	0.9	2.1	3.7	5.7
79	20	0.9	2.1	3.7	5.7	1.1	2.6	4.6	7.2
		Stiffener spacing s (mm)							
		750	750	750	750	1000	1000	1000	1000
CuNo	Max Speed	Stiffener length l (mm) 500	750	1000	1250	500	750	1000	1250
	(kts)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)	Section Modulus (cm^3)
3	12	0.6	1.3	2.3	3.6	0.8	1.7	3.1	4.8
10	14	0.7	1.6	2.9	4.5	1.0	2.2	3.8	6.0
24	16	1.0	2.3	4.1	6.5	1.4	3.1	5.5	8.6
46	18	1.4	3.1	5.5	8.6	1.8	4.1	7.3	11.4
79	20	1.7	3.9	6.9	10.8	2.3	5.2	9.2	14.3

Table 2.1.14 – Table of SECTION MODULUS for square stiffeners formed from Reference Laminate

Dimensions of former			Plating		Stiffener	
height h mm	width (base) b_b mm	width (top) b_c mm	thickness t mm	associated width mm	laminate weight g/m^2	Sect. Modulus SM cm^3
25	25	20	5	125	600	1.5
			10	225	600	2.2
			15	325	600	4.6
40	40	35	5	140	600	3.6
			10	240	600	4.4
			15	340	600	6.3
50	50	45	5	150	900	8.2
			10	250	900	9.5
			15	350	900	11.5
60	60	50	5	160	1200	14.5
			10	260	1200	16.6
			15	360	1200	18.9
75	75	65	5	175	1200	22.8
			10	275	1200	25.6
			15	375	1200	28.2
100	100	85	5	200	1800	56.2
			10	300	1800	63.7
			15	400	1800	68.6
125	125	105	5	225	2100	98.3
			10	325	2100	111.7
			15	425	2100	119.6
150	150	125	5	250	2700	172.5
			10	350	2700	198.0
			15	450	2700	212.6



Notes: **Reference Laminate** is E-glass and polyester resin with a glass content of about 30%, this may be sprayed or conventional hand lay-up of chopped strand mat.

Modified Laminate is E-glass and polyester resin with (approximately) alternating layers of chopped strand mat and woven rovings, giving a glass content of about 35% to 40%.

ANNEX III

RECOMMENDED CONSTRUCTION STANDARDS FOR STEEL FISHING VESSELS

PART 1 – GENERAL

1 Scope

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

2.1 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 1.1.12.

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	✔	✔	
C1	✔		✔
C2	✔		✔
D	✔		

3.2 Vessels fitted with sails should be considered to operate in design categories C1, C2 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 and have certificates issued by recognized organizations or a Competent Authority and with at least the following properties:

- minimum yield stress 240 N/mm^2;
- tensile strength 410 N/ mm^2; and
- ultimate strain 22%.

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 at least 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 at low temperatures or damp weather, preheating of the steel should be arranged.

4.3.4 When welding plates thicker than 4 mm either a 30 degrees joint should be used or also welding on the back side.

4.3.5 Double continuous welding should always be used in case of:

- foundations;
- end connections and brackets for stiffeners.

4.3.6 Continuous welding should always be used for plates in:

- the hull plating;
- deck and superstructures;
- tanks;
- 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 which are not subjected to a load, e.g., buckling stiffeners.

4.3.9 Fillet welds should normally have an a-measure 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), material documentation and workmanship for 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 in cases where considered necessary.

PART 2 – RECOMMENDED CONSTRUCTION STANDARDS FOR STEEL VESSELS OF DESIGN CATEGORIES A AND B

1 Introduction

1.1 The construction standard described here should be applied to all decked vessels in 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 built 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.

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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 construction rules of recognized organizations.

PART 3 – RECOMMENDED CONSTRUCTION STANDARDS FOR STEEL VESSELS OF DESIGN CATEGORIES C1 AND C2

1 Introduction

1.1 The construction standard described here should be applied to all decked and undecked vessels in design categories C1 and C2.

1.2 The construction standard described here should always be read in conjunction with **Part 1**.

2 Scantlings[1,2]

2.1 Minimum scantlings should be in accordance with the table below. Figures may be based on interpolation for boats with a length overall between 8 and 15 metres.

LOA (m)	**8**	**9**	**10**	**11**	**12**	**15**	**Remarks**
Frame Spacing (mm)	Max 500	500	500	500	500	500	
Bar keel							
Sectional Area (cm^2)	15	15	15	15	15	15	Where bar keel is omitted keelplate = 1.5 x t bottom. Total breadth 30 x LOA mm
Centre keel							
Sectional Area (cm^2)	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	
Floor							
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
Keelson	UPN 100	UPN 100	UPN 100	UPN 100	UPN 120	UPN 120	(Channel) Required only where centre keel is omitted
Frames							
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^3)	10	11.6	12.6	14.7	15.8	19	
Bottom plates (mm)	5	5.5	6	6.5	6.5	7.5	Keel plates and stem plates to be increased by 1 mm
Shell plates (mm)	4.5	5	5.5	5.5	6	6.5	
Bulkheads							
Plates (mm)	5	5.5	5.5	6	6	6.5	
Stiffener web (mm)	50 x 6.5	50 x 6.5	50 x 6.5	50 x 7	50 x 7	50 x 7	Max. spacing 750 mm
Stiffener sec mod (cm^3)	6.5	6.5	6.5	7.5	7.5	7.5	

[1] The scantlings are based on the Simplified Strength Requirements for Steel Boats from the Nordic Boat Standard.

[2] 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**
Deck Plates (mm) Beam web (mm) Beam sec mod (cm^3)	 4.5 90 x 9 25	 5 90 x 9 25	 6 90 x 9 25	 6 90 x 9 25	 7 90 x 9 25	 7 90 x 9 25	Max. spacing 300 mm. Max. span 3.5 m
Bulwark (mm)	4.5	4.5	4.5	5	5.5	5.5	Stiffener 50 x 6 mm. Max. spacing 500 mm
Superstructure/ deckhouse (mm)	4.5	4.5	4.5	5	5.5	5.5	Stiffener 50 x 6 mm. Max. spacing 500 mm

ANNEX IV

RECOMMENDED CONSTRUCTION STANDARDS FOR ALUMINIUM FISHING VESSELS

PART 1 – GENERAL

1 Scope

1.1 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

2.1 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 aluminium vessels should be determined as set out in the table below:

Design category	Part 1	Part 2	Part 3
A	✔	✔	
B	✔	✔	
C1	✔		✔
C2	✔		✔
D	✔		

3.2 Vessels fitted with sails should be considered to operate in design categories C1, C2 and D only unless given special consideration by the Competent Authority.

4 Construction standards for aluminium vessels of all design categories

4.1 General

4.1.1 Vessels may be built in accordance with this section providing that:

- the speed of the vessel is not greater than 15 knots; and
- 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 and have certificates issued by a recognized organization or a Competent Authority and have at least the following properties:

σ_2 = 170 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 which should be used for the hull should be sea water resistant and should normally have the following material composition:

- Cu max 0.2%
- Fe max 0.5%
- Mg max 2.0%

The following materials fulfil these requirements:

- ASTM: 5052, 5083, 5086, 5154, 5454
- DIN 1725: AlMg2.5, AlMg4.5Mn, AlMg4Mn, AlMg3, AlMg2.7Mn

4.2.7 Stiffeners and profiles should normally have the following material composition:

- Cu max 0.4%
- Fe max 0.5%

The following examples fulfil these requirements:

- ASTM: 6005, 6063, 6351
- DIN 1725: AlMgSi0.7, AlMgSiO,5, AlMgSil

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 degrees 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

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 at a lower temperature than + 5 degrees Celsius.

4.4.2 Welding of hull and deck should be carried out only by persons suitably qualified for 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 in 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 at a dry place under roof and screened off from weather and wind.

4.5.2 The work place should be kept clean and free of work on other metallic materials.

4.5.3 If temperatures lower than 0 degrees Celsius can occur, the manufacturing premises should be so arranged that it can be heated.

4.6 Inspection and testing

4.6.1 The scantlings table (where applicable), material documentation and workmanship for each vessel should be subject to inspections at key stages of its construction.

4.6.2 The testing of welded joints by x-ray or similar method may be carried out in cases where considered necessary.

PART 2 – RECOMMENDED CONSTRUCTION STANDARDS FOR ALUMINIUM VESSELS OF DESIGN CATEGORIES A AND B

1 Introduction

1.1 The construction standard 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 built 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.

PART 3 – RECOMMENDED CONSTRUCTION STANDARDS FOR ALUMINIUM VESSELS OF DESIGN CATEGORIES C1 AND C2

1 Introduction

1.1 The construction standard described here should be applied to all decked and undecked vessels in design categories C1 and C2.

1.2 The construction standard described here should always be read in conjunction with Part 1.

---

* The standards include:

.1 the Nordic Boat Standard;

.2 the construction rules of the United Kingdom Sea Fish Industry Authority (Seafish); and

.3 construction rules of recognized organizations.

2 Scantlings[1, 2]

2.1 Minimum scantlings should be in accordance with the table below. Figures may be based on interpolation for boats with a length overall between 8 and 15 metres.

LOA (m)	**8**	**9**	**10**	**11**	**12**	**15**	**Remarks**
Frame Spacing (mm)	Max 300	300	300	300	300	300	
Bar keel							
Sectional Area (cm^2)	18	19	20	21	22	24	Where bar keel is omitted keelplate = 2.5 x t bottom.
Min. Thickness (mm)	17	18	18	19	20	21	Total breadth 30 x LOA mm
Centre keel							
Sectional Area (cm^2)	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	
Floor							
Height (mm)	200	210	215	225	230	250	Required only at every third frame on the other frames skeleton 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	May be emitted where cement is inserted up to the top of the floors
Keelson	UPN 100	UPN 100	UPN 100	UPN 100	UPN 120	UPN 120	(Channel) Required only where centre keel is omitted
Frames							
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^3)	23 cm^3	24 cm^3	25 cm^3	25.2 cm^3	26.3 cm^3	28.4 cm^3	
Bottom plates (mm)	5	5.5	6	6.5	6.5	7.5	Keel plates and stem plates to be increased by 1 mm
Shell plates (mm)	4.5	5	5.5	5.5	6	6.5	
Bulkheads							
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
Stiffener sec mod (cm^3)	6.3	6.3	7.4	7.4	8.4	8.4	
Deck							
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	31	31	31	31	31	31	

[1] The scantlings are based on the Simplified Strength Requirements for Aluminium Boats from the Nordic Boat Standard.

[2] 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**
(cm^3)							
Bulwark (mm)	4.5	4.5	4.5	5	6	6	Stiffener 50 x 6 mm. Max. spacing 600 mm
Superstructure / deckhouse (mm)	3.5	3.5	4.5	4.5	5	6	Stiffener 50 x 6 mm. Max. spacing 300 mm

ANNEX V

STRUCTURAL STRENGTH OF HATCH COVERS

1 General

1.1 Hatch covers should have strength equal or greater than the surrounding deck of the vessel.

2 Plating

2.1 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^2)**
10	4.0	5.0	20	5.0	3000
25	4.5	6.0	25	7.0	4200
45	5.0	6.5	30	7.5	4500
80	6.0	8.0	35	8.0	4800
125	6.0	8.0	40	9.0	5400
155	6.0	8.0	40	9.0	5400

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.

	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 or greater than the stiffeners listed above.

ANNEX VI

GUIDANCE IN 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^2, on each side of the vessel for each well on the working deck should be determined in relation to the length (l) and height (h) of bulwark in this well, in accordance with the following table:

Freeing port area (A) in m^2 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 metres	**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^2 for vessels of design categories C1, C2 and D
(for intermediate lengths (l) and heights (h) the value of A should be obtained by linear interpolation)

Height of bulwark (h)	**Length of well (l) in metres (l need not be taken as greater than 70% of the length of the vessel)**								
in metres	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 where the Competent Authority considers that the vessel's sheer is not sufficient to ensure rapid and effective freeing of the deck of 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 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 VII

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 Administrations 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 these 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

$$Z = 4\,\rho\,sbh^2 \qquad (1)$$

Minimum thickness of horizontal wooden boards

$$t = \sqrt{8\,\rho\,sb^2} \qquad (2)$$

.2 ***Horizontal steel beams and vertical wooden boards***

Minimum section modulus of horizontal steel beams

$$Z = 4\,\rho\,sHS^2 \qquad (3)$$

Minimum thickness of vertical wooden boards

$$t = \sqrt{3.6\,\rho\,sh^2} \qquad (4)$$

where:

- Z = section modulus, in cm^3
- t = thickness of wooden board, in cm
- ρ = density of cargo, in t/m^3
- s = maximum transverse distance between any two adjacent longitudinal divisions or line of supports, in m
- 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 which is supported by a horizontal beam, in m
- S = horizontal distance between adjacent points of support of a horizontal beam, in m

* Drawn from Appendix V of the annex to Assembly resolution A.168(ES.IV) incorporating subparagraphs 4(g) and 4(h) adopted by the eighth Assembly.

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 boards should be those derived from the formulae. The thickness of boards made from good quality hardwood may be reduced by 12.5%.

.6 Divisions made of other materials should have 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:

HORIZONTAL WOOD BOARDS – STEEL UPRIGHTS

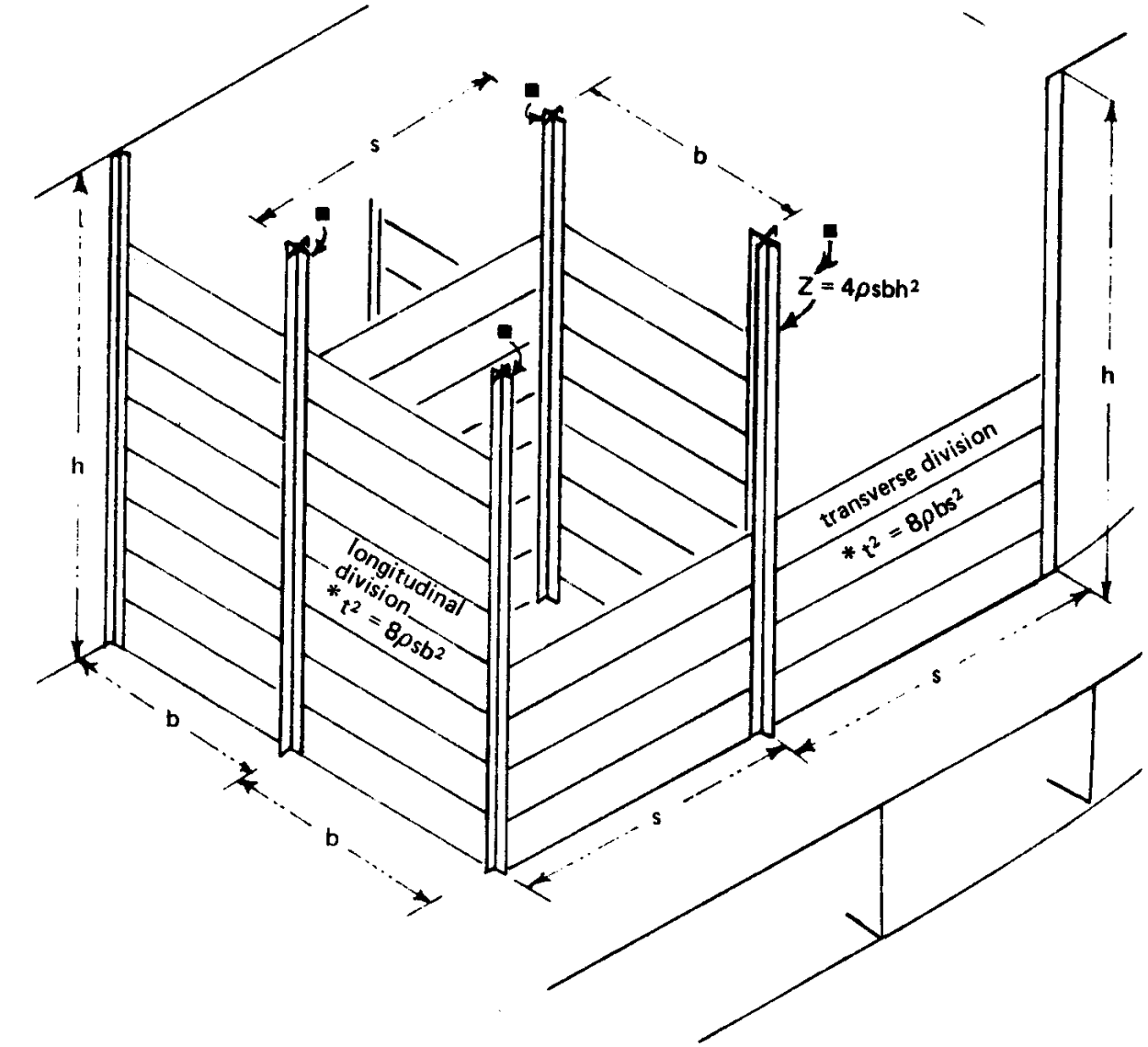


Figure 1

*** *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.

VERTICAL WOOD BOARDS – STEEL BEAMS

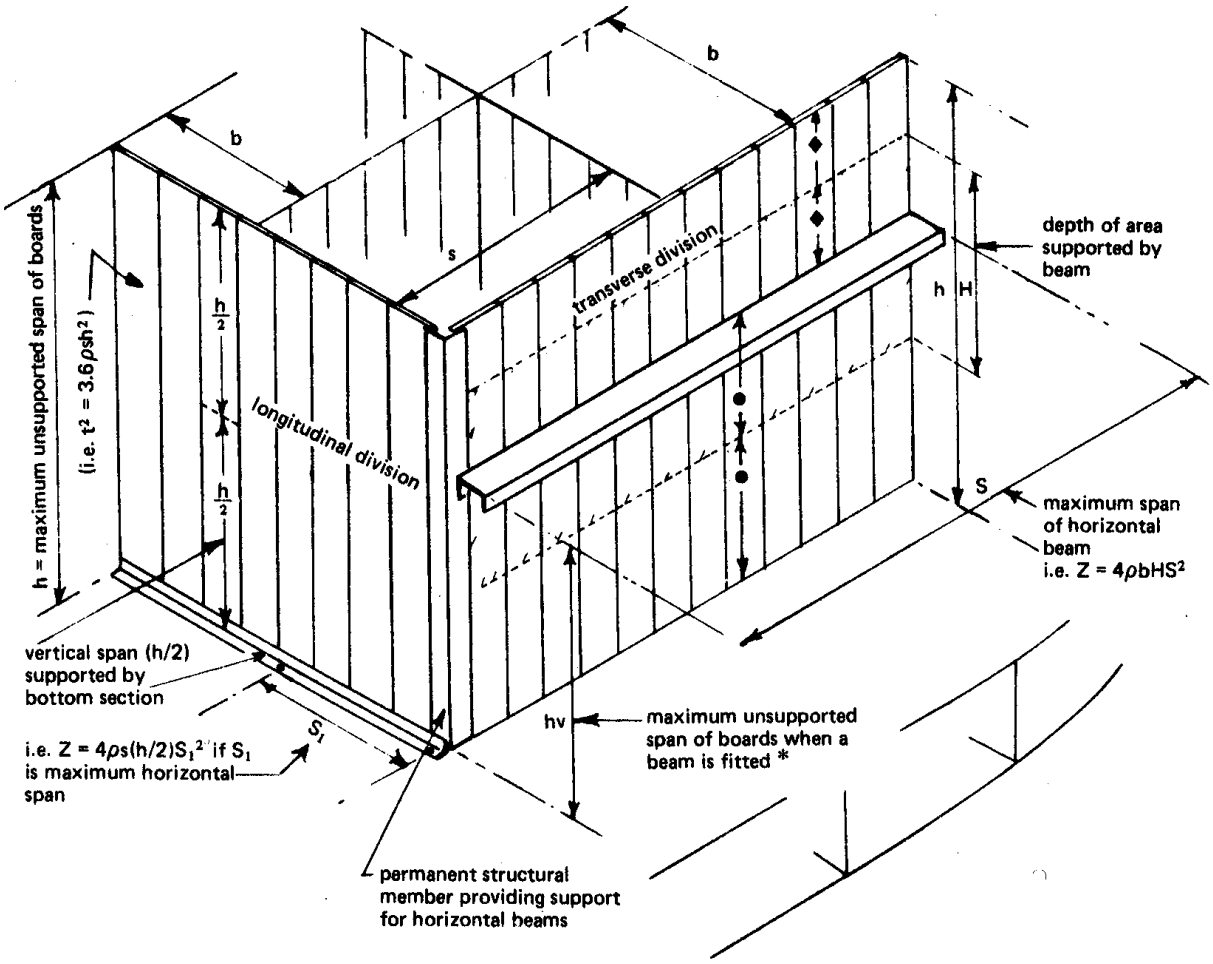


Figure 2

*** *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 hv and the thickness is now given by $t_1^2 = 3.6\,\rho\,bhv^2$ or $t_1 = t\left(\frac{hv}{h}\right)$.

ANNEX VIII

AN APPROXIMATE DETERMINATION OF SMALL VESSELS STABILITY BY MEANS OF THE ROLLING PERIOD TESTS*

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. On the other hand, 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 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 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 4 of the complete oscillations. The counting of these oscillations should begin when the vessel is at extreme end of a roll.

4.6 After allowing the roll to completely fade away, this operation should be repeated at least twice more. Knowing the total time for the total number of oscillations made, the time for one complete oscillation, say T seconds, can be calculated.

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 metres, 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.

* Drawn from appendix 6 to the annex to the FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Vessels, 2005.

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 breath 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 IX

AN APPROXIMATE DETERMINATION OF VESSEL'S STABILITY BY MEANS OF THE ROLLING PERIOD TESTS (for vessels up to 70 m in length)*

1 Recognizing the desirability of supplying to skippers of vessels instructions for a simplified determination of initial stability, attention was given to the rolling period tests. Studies on this matter showed that the rolling period test may be recommended as a useful means of approximately determining the initial stability of vessels when it is not practicable to give approved loading conditions or other stability information, or as a supplement to such information.

2 Investigations comprising the evaluation of a number of inclining and rolling tests according to various formulae showed that the following formula gave the best results and it has the advantage of being the simplest:

$$GM_o = \left(\frac{fB}{T_r}\right)^2$$

where:

f = factor for the rolling period (rolling coefficient) as given in 4;

B = breadth of the vessel, in metres;

T_r = time for a full rolling period in seconds (i.e. for one oscillation "to and fro" port - starboard - port, or vice versa).

3 The factor f is of the greatest importance and the data from the above tests were used for assessing the influence of the distribution of the various masses in the whole body of the loaded vessel.

* Drawn from appendix IV of the Annex to Assembly resolution A.168(ES.IV).

4 For unloaded fishing vessels (but with fuel, stores and equipment), the following average values were observed:

	f values
Double-boom shrimp fishing vessel	$f \approx 0.95$
Deep sea fishing vessel	$f \approx 0.80$
Vessels with a live fish well	$f \approx 0.60$

The stated values are mean values. Generally, observed f values were within + 0.05 of those given above.

5 The above f values were based upon a series of limited tests and, therefore, Competent authority should re-examine these in the light of any different circumstances applying to their own vessels.

6 It should be noted that the greater the distance of masses from the rolling axis, the greater the rolling coefficient will be. Therefore, it can be expected that:

.1 the rolling coefficient for an unloaded vessel (i.e. for a hollow body) will be higher than that for a loaded vessel; and

.2 the rolling coefficient for a vessel carrying a great amount of bunkers and ballast - both groups are usually located in the double bottom (i.e. far away from the rolling axis) will be higher than that of the same vessel having an empty double bottom.

7 The above recommended rolling coefficients were determined by tests with vessels in port and with their consumable liquids at normal working levels; thus, the influences exerted by the vicinity of the quay, the limited depth of water and the free surfaces of liquids in service tanks are covered.

8 Experiments have shown that the results of the rolling test method get increasingly less reliable the nearer they approach GM values of 0.2 m and below.

9 For the following reasons, it is not generally recommended that results be obtained from rolling oscillations taken in a seaway:

.1 exact coefficients for tests in open waters are not available;

.2 the rolling periods observed may not be free oscillations but forced oscillations due to seaway;

.3 frequently, oscillations are either irregular or only regular for too short an interval of time to allow accurate measurements to be observed; and

.4 specialized recording equipment is necessary.

10 However, sometimes it may be desirable to use the vessel's period of roll as a means of approximately judging the stability at sea. If this is done, care should be taken to discard readings which depart appreciably from the majority of other observations. Forced oscillations corresponding to the sea period and differing from the natural period at which the vessel seems to move should be disregarded. In order to obtain satisfactory results, it may be necessary to select intervals when the sea action is least violent and it may be necessary to discard a considerable number of observations.

11 In view of the foregoing circumstances, it needs to be recognized that the determination of the stability by means of the rolling test in disturbed waters should only be regarded as a very approximate estimation.

12 The formula given in 2 above can be reduced to:

$$GM_o = \left(\frac{F}{T_r^{\,2}} \right)$$

and the Competent authority should determine the F value(s) for each vessel.

13 The determination of the stability can be simplified by giving the skipper permissible rolling periods, in relation to the draughts, for the appropriate value(s) of F considered necessary.

14 The initial stability may also be more easily determined graphically by using the attached sample nomogram (figure 1) as described below:

.1 The values for B and f are marked in the relevant scales and connected by a straight line (1). This straight line intersects the vertical line (mm) at the point M.

.2 A second straight line (2) which connects this point M and the point on the T_r scale corresponding with the determined rolling period intersects the GM scale at the requested value.

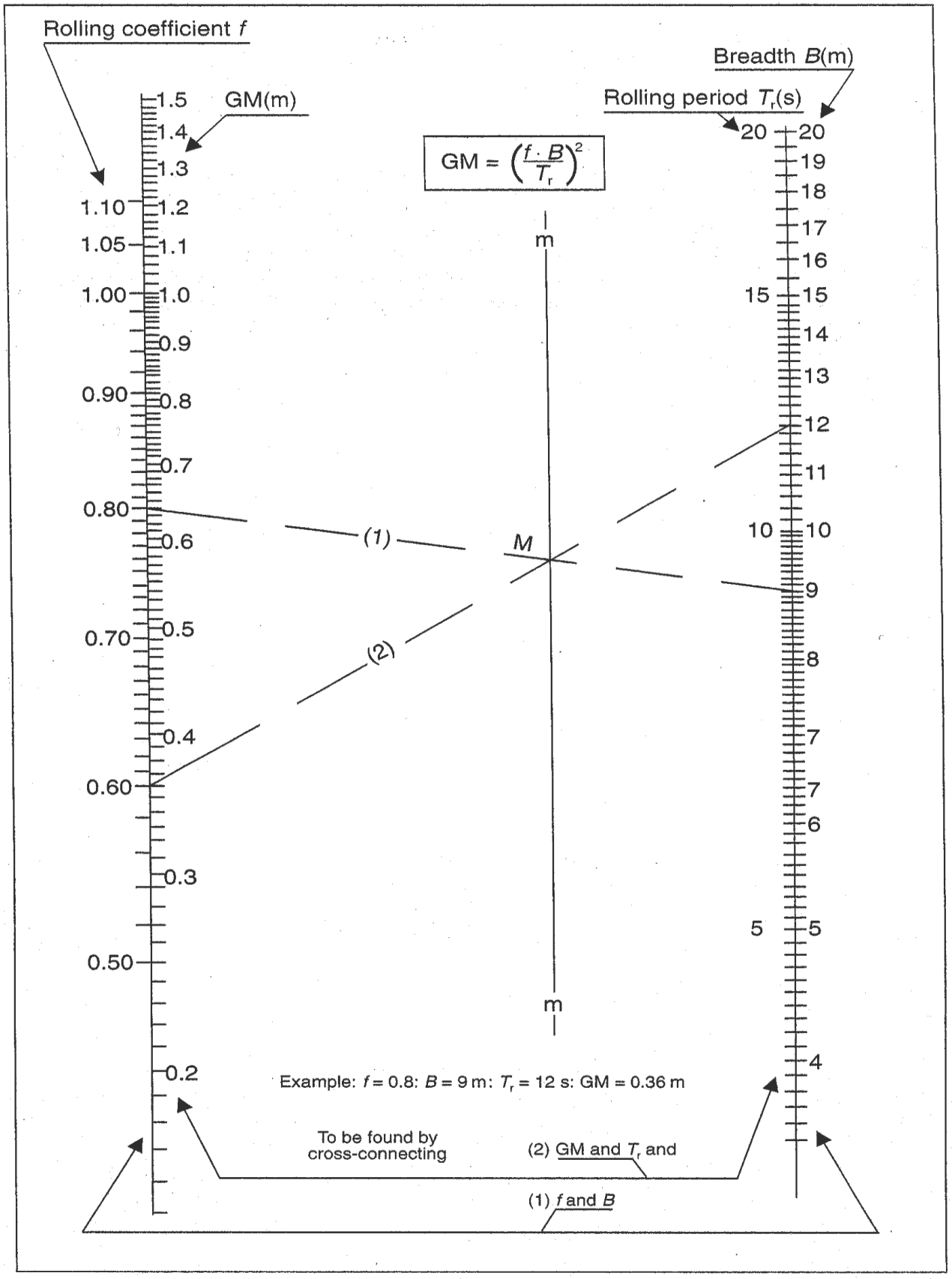

Rolling coefficient f
Breadth B(m)
Rolling period T_r(s)
GM(m)
$GM = \left(\frac{f \cdot B}{T_r}\right)^2$
m
M
(1)
(2)
Example: f = 0.8: B = 9 m: T_r = 12 s: GM = 0.36 m
To be found by cross-connecting
(2) GM and T_r and
(1) f and B

Figure 1

15 The appendix shows an example of a recommended form in which these instructions might be presented by each Competent authority to the skippers. It is considered that each Competent authority should recommend the F value or values to be used.

Appendix to Annex IX

SUGGESTED FORM OF GUIDANCE TO THE SKIPPER ON AN APPROXIMATE DETERMINATION OF VESSEL'S STABILITY BY MEANS OF THE ROLLING PERIOD TEST

Introduction

1 If the following instructions are properly carried out, this method allows a reasonably quick and accurate estimation of the metacentric height, which is a measure of the vessel's stability.

2 The method depends upon the relationship between the metacentric height and the rolling in terms of the extreme breadth of the vessel.

Test procedure

3 The rolling period required is the time for one complete oscillation of the vessel and to ensure the most accurate results in obtaining this value the following precautions should be observed:

.1 The test should be conducted with the vessel in harbour, in smooth water with the minimum interference from the wind and tide.

.2 Starting with the vessel at the extreme end of a roll to one side (say port) and the vessel about to move towards 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.

.3 By means of a stop-watch, the time should be taken for not less than about five of these complete oscillations; the counting of these oscillations should begin when the vessel is at the extreme end of a roll. After allowing the roll to completely fade away, this operation should be repeated at least twice more. If possible, in every case the same number of complete oscillations should be timed to establish that the readings are consistent, i.e. repeating themselves within reasonable limits. Knowing the total time for the total number of oscillations made, the mean time for one complete oscillation can be calculated.

.4 The vessel can be made to roll by rhythmically lifting up and putting down a weight as far off middle-line as possible; by pulling on the mast with a rope; by people running athwartships in unison; or by any other means. However, and this is most important, as soon as this forced rolling has commenced, the means by which it has been induced should be stopped and the vessel allowed to roll freely and naturally. If rolling has been induced by lowering or raising a weight it is

preferable that the weight is moved by a dockside crane. If the vessel's own derrick is used, the weight should be placed on the deck, at the middle-line, as soon as the rolling is established.

.5 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 is necessary to accurately count these oscillations.

.6 The mooring should be slack and the vessel "breasted off" to avoid making any contact during its rolling. To check this, and also to get some idea of the number of oscillations that can be reasonably counted and timed, a preliminary rolling test should be made before starting to record actual times.

.7 Care should be taken to ensure that there is a reasonable clearance of water under the keel and at the sides of the vessel.

.8 Weights of reasonable size which are liable to swing (e.g. a lifeboat), or liable to move (e.g. a drum), should be secured against such movement. The free surface effects of slack tanks should be kept as small as is practicable during the test and the voyage.

Determination of the initial stability

4 Having calculated the period for one complete oscillation, say *T* seconds, the metacentric height GM_0 can be calculated from the following formula:

$$GM_0 = \left(\frac{F}{T_r^{\,2}} \right)$$

Where *F* should be determined for each particular vessel by the Competent authority.

5 The calculated value of GM_0 should be equal to or greater than the critical value, which should be determined for each particular vessel by the Competent authority.

Limitations to the use of this method

6 A long period of roll, corresponding to a GM_0 of 0.2 m or below, indicates a condition of low stability. However, under such circumstances, accuracy in determination of the actual value of GM_0 is reduced.

7 If, for some reason, these rolling tests are carried out in open, deep but smooth waters, inducing the roll, for example, by putting over the helm, then the GM_0 calculated by using the method and coefficient of 6 above should be reduced by the figure to be estimated by the Competent authority to obtain the final answer.

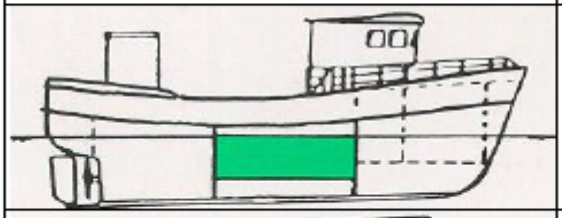
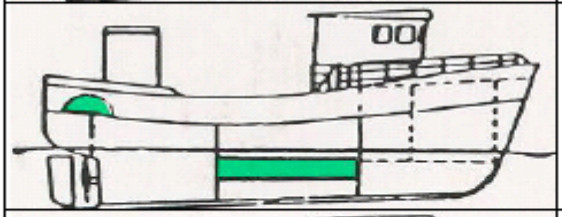
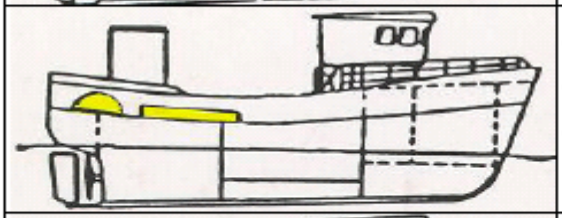
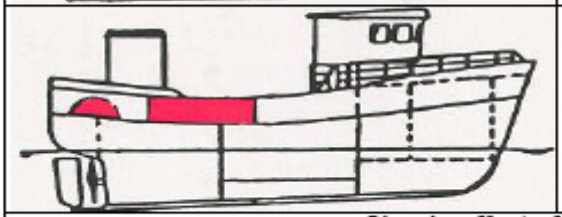
8 The determination of stability by means of the rolling test in disturbed waters should only be regarded as a very approximate estimation. If such a test is performed, care should be taken to discard readings which depart appreciably from the majority of other observations. Forced oscillations corresponding to the sea period and differing from the natural period at which the vessel seems to move should be disregarded. In order to obtain satisfactory results, it may be

necessary to select intervals when the sea action is least violent and it may be necessary to discard a considerable number of observations.

ANNEX X

AN EXAMPLE OF A STABILITY NOTICE[*1]

STABILITY NOTICE

	PLACEMENT OF GEAR AND CATCH	STABILITY		
		Acceptable	On the Limit	Danger of Capsize
	• Catch in cargo hold			
	• Part load in hold • Gear on deck			
	• Some catch on deck • Gear on deck • Empty cargo hold			
	• Considerable catch on deck • Gear on deck • Empty cargo hold			

Simple efforts for maintaining stability:

Close doors of 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 20cm
Avoid excessive aft trim
Minimum Freeboard at stern should be 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.

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[*] In case there is insufficient stability information available to prepare operating conditions, the stability notice should at least contain relevant general precautions.

1 Additional examples may be included at a later stage, for example from the Wolfson Unit-Research Project 559 May 2006.

ANNEX XI

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 3.2.1.1 for the area under the righting lever curve GZ should be increased by 20%;

.2 the requirement of regulation 3.2.1.2 for the righting lever GZ should be increased by 20%;

.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.

* The references in this annex refer to paragraphs in the Safety recommendations.

ANNEX XII

PRACTICAL BUOYANCY TEST

1.1 General

The methods described in 1.2, 1.3 and 1.4 should be used, either by actual test or equivalent calculation.

1.2 Test condition

During the tests, the boat should be in calm water in the light craft condition and then equipped as follows:

.1 A mass equal to 25 % of the dry mass of stores and equipment included in the maximum total load is to be added on the interior deck, on the centreline 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% of the engine dry mass is to be used for diesel, jet-propulsor or electric outboards, if these are supplied as the standard outfit. Boats equipped for use both with and without an outboard engine are to be tested in both conditions.

.4 For inboard engines, the replacement mass to be lead, steel or iron of a mass equal to 75 % 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 Remove portable tanks. 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 boat are to be left open. The plugs of drains for emptying the boat of residual water when ashore should be in place.

.8 Care should be taken throughout the testing to eliminate entrapped air other than in air tanks or air containers.

.9 Void compartments integral with the boat structure and not watertight, built and pressure tested as such, are to be opened so that they become flooded with water.

.10 Boats intended to be fitted with engines of more than 3 kW and which are fitted with integral air tanks which 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)	
		2	3	4
		1	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 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 onboard simultaneously, see Table 6) but not less than (15d) kg is to be suspended over the side of the boat at each of four positions in turn. These positions should be at LOA/3 from the ends of the boat (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 boat during this test, apart from those required by 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 kilograms;

m_{CL} is the mass of cast-iron weights, expressed in kilograms;

m_A is the mass of aluminium weights, expressed in kilograms.

1.3.3 As an alternative to suspending a test weight over the side, an equivalent heeling moment (calculated when the boat is upright) may be applied using weights or persons positioned inside the boat at seat level. Persons may only be used if they are not immersed when the boat is heeled.

1.3.4 With the test weight in each position in turn, flood the boat 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 boat in this position until the water level has equalized between inside and outside, or for 5 min, whichever is less, and then release the boat.

Note: It is often helpful to partially fill the boat with water before flooding in this manner.

1.3.5 For each position of the test weights, after a further 5 min have elapsed, the boat 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

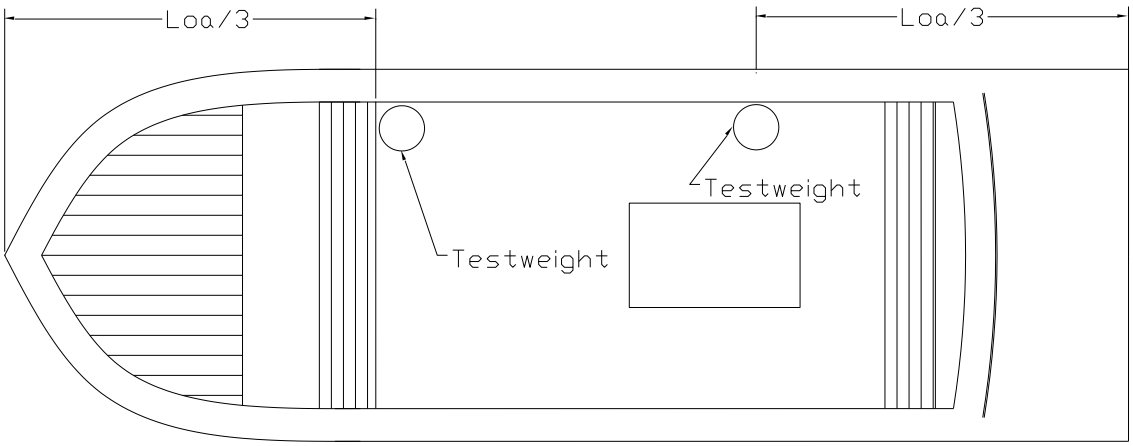


Figure 1 – Test weight positioning

1.4 Flooded buoyancy test

1.4.1 Load metallic test weights on the inner bottom of the boat, 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, provided they are not immersed above the knee, people may be used instead of test weights, provided they 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 boat 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, fresh water, 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 boat 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 boat in this position until the water level has equalized between inside and outside, or for 5 min, whichever is less, and then release the boat.

Note: It is often helpful to partially fill the boat with water before flooding in this manner.

1.4.3 After a further 5 min have elapsed, the boat 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 1.3.1 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 XIII

GUIDANCE ON TOOLS AND SPARES TO BE CARRIED

Spare Parts	Outboard Motor	Inboard Motor
Manual for engine and other major equipment	X	X
Parts for waterpump (impeller, gasket, replacement pack, etc)	X	X
Sparkplug	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, 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

Tools	Outboard Motor	Inboard Motor
Spanners	X	X
Socket set		X
Adjustable spanners		X
Spark plug spanner	X	
Pliers	X	X
Screwdrivers	X	X
Knife	X	X
Multi tester		X
Hydrometer		X

Tools	Outboard Motor	Inboard Motor
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 XIV

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 vessels 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 rudderstock, the diameter of the rudder stock should not be less than that shown in 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 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 apart. 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.[1]

CuNo	Stock Diameter (mm)	Steel Plate Thickness (mm)	Aluminium Plate Thickness (mm)	Timber Thickness (mm)	Bolt Diameter (mm)
10	30	6	8	25	5
15	30	8	10	40	6
20	30	8	10	45	6
25	40	8	10	50	8
30	40	8	10	60	8
60	45	10	12	65	10
80	45	10	12	70	10
100	45	10	12	75	12

[1] Figures based on information from Seafish rules.

ANNEX XV

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 which discharge through the hull below the deck should be provided with means of preventing back flooding into the hull or engine. This may be by the system design described below or by flap, valve or non-return device.

1.5 Exhaust pipes and silencers of every engine should be adequately cooled or lagged to protect 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

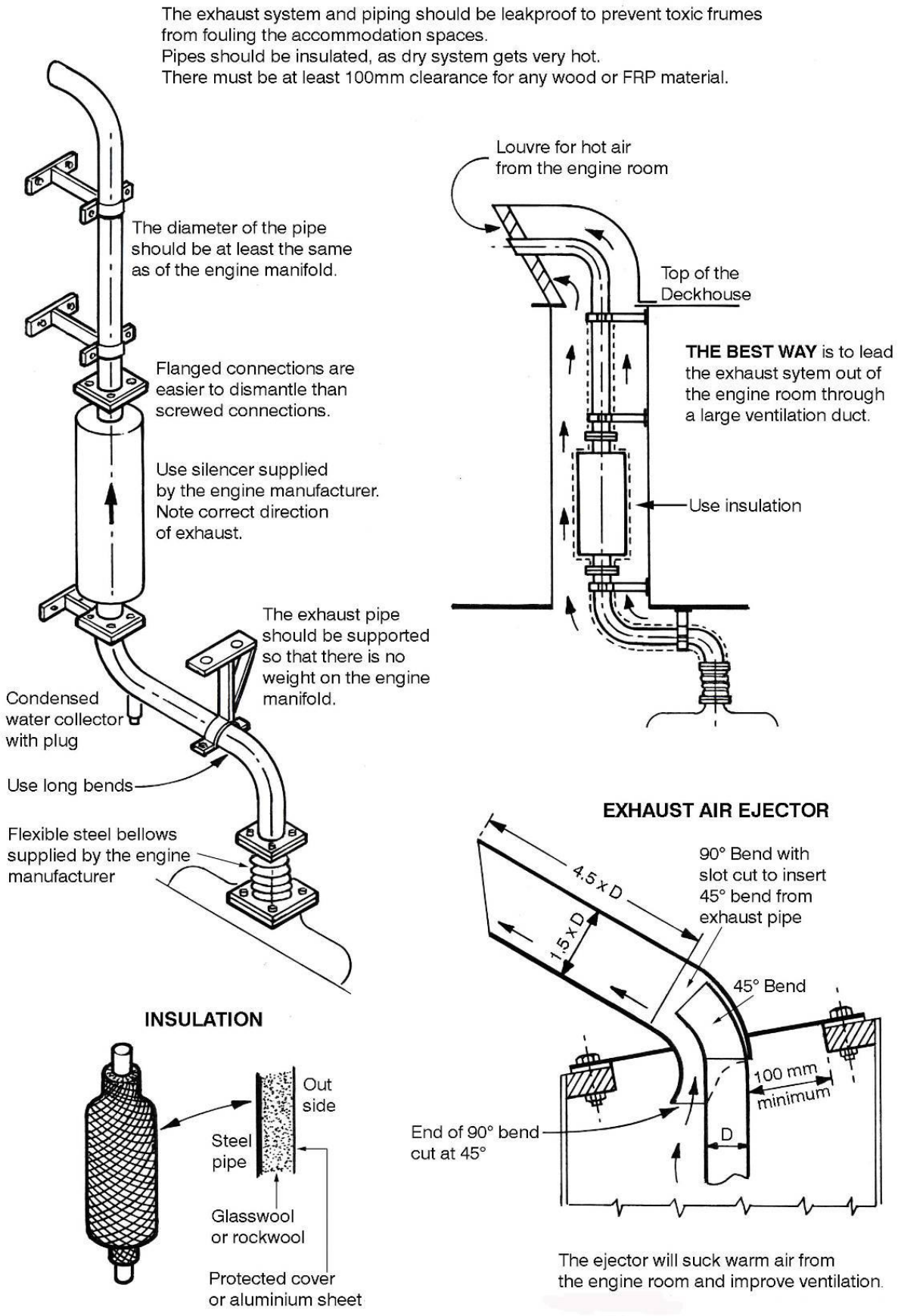
2.1 The exhaust system and piping should be leak proof to prevent the passage of toxic fumes into accommodation spaces.

2.2 There should be at least 100mm clearance between piping and any wood or GRP materials.

2.3 The diameter of exhaust pipes should be sized in accordance with engine manufacturer's recommendations or at least the same 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



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. This may be achieved by the installation of a waterlock chamber into 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 engine manufacturers' 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

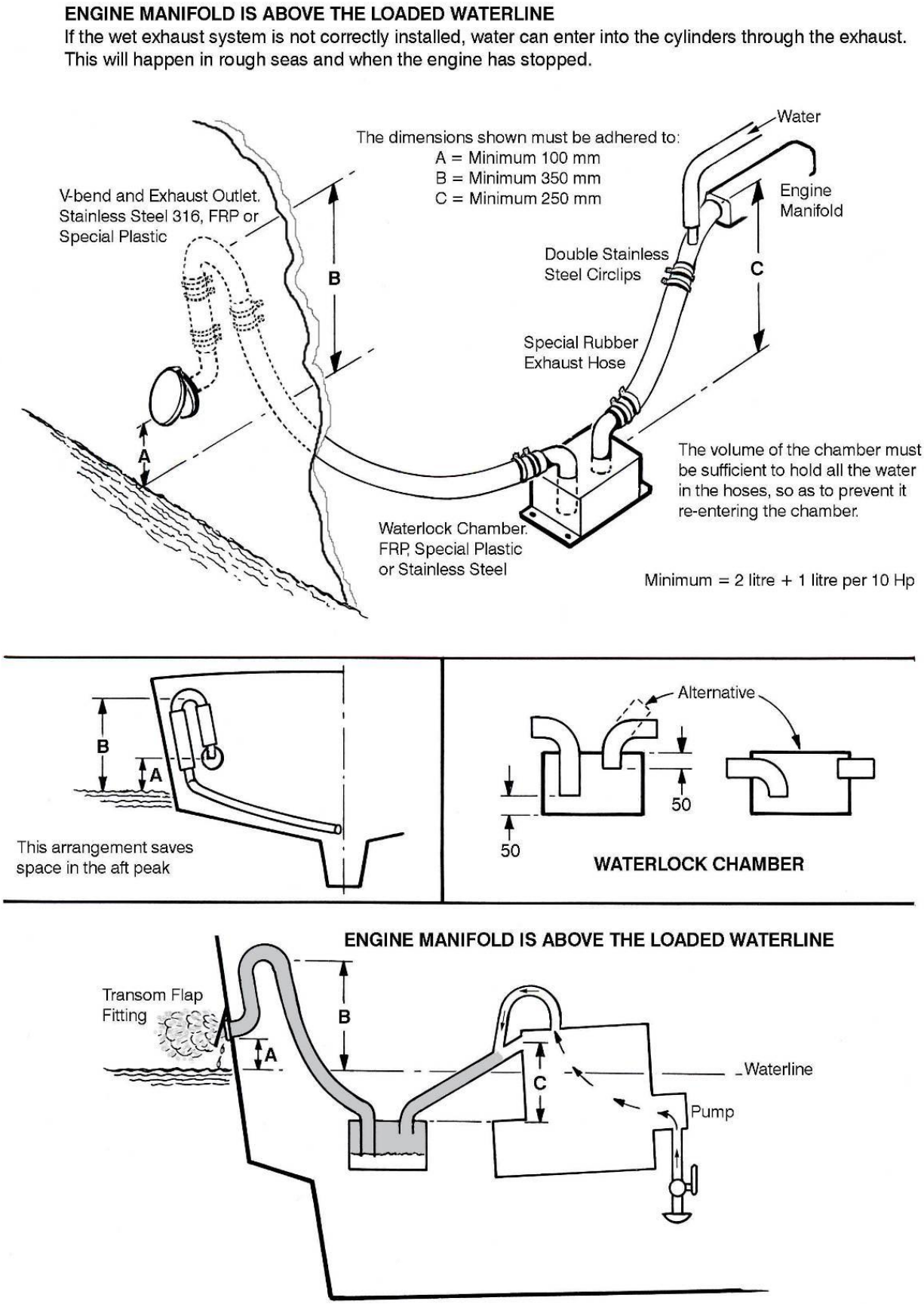
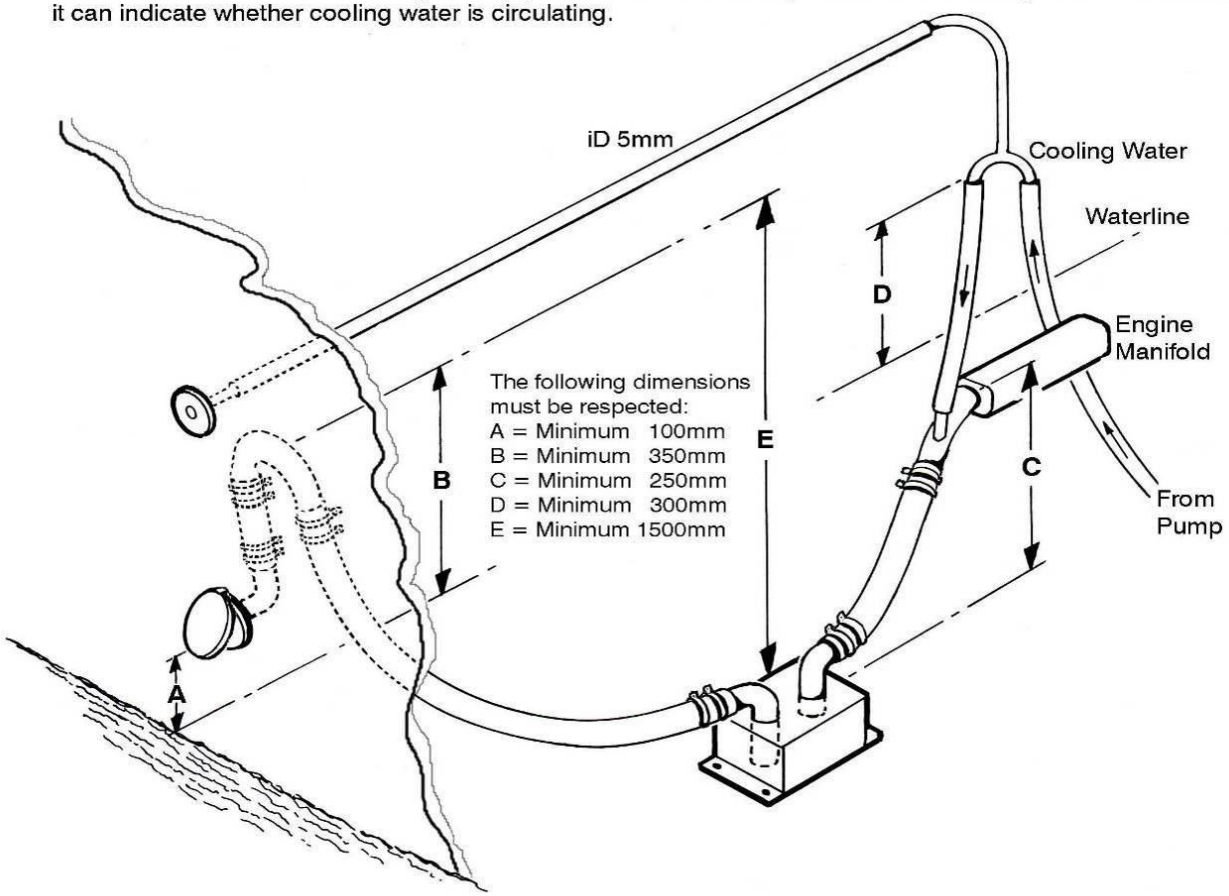


Figure 3.2 – Wet exhaust system 2 – Sketches and notes

ENGINE MANIFOLD IS BELOW LOADED WATERLINE

When the engine has stopped, water will siphon in through the water pump, fill the exhaust system and enter the cylinders. An anti-siphoning bleed pipe, of internal bore5mm and discharging overboard, must be connected to the cooling water pipe. If it is made of clear plastic and led through the deckhouse, it can indicate whether cooling water is circulating.



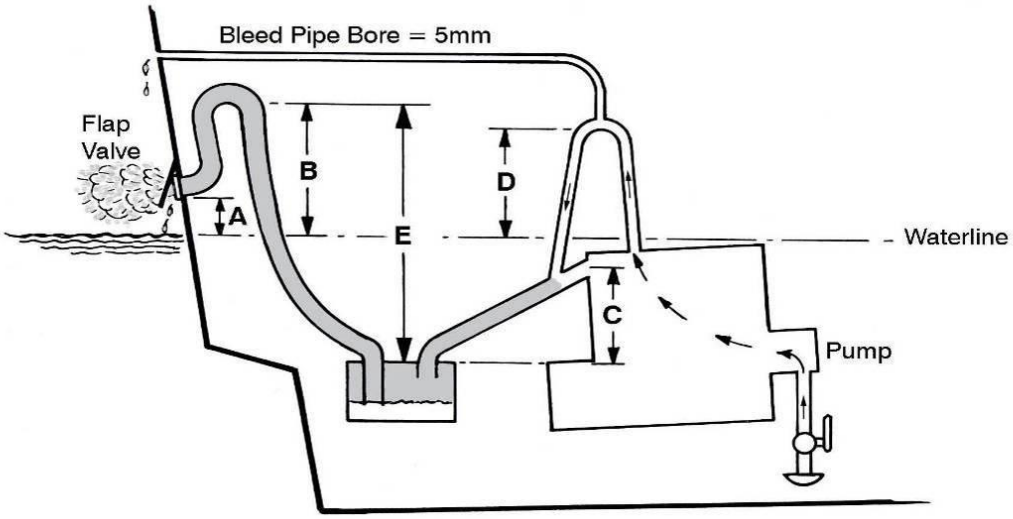
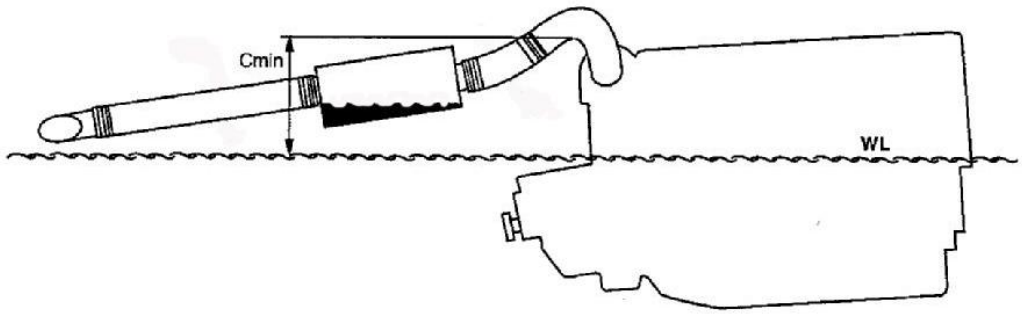


Figure 3.3 – Wet exhaust system 3



An in-line system is not recommended when height (Cmin) exhaust elbow-waterline is less than 350mm.

ANNEX XVI

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 of any length. In this regard, due consideration has been given to the fact that there could be substantial differences between the requirements for Class A and B vessels and those in Classes C (1 and 2) and D concerning requirement for 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 these recommendations, the use of higher voltages and multi-phase alternating current systems have not been excluded from chapter 4. Consequently recommendations are also given in this annex concerning such systems.

3 It should also be noted that due it may be necessary to refer to other chapters of these recommendations such as 9.8 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, that they are kept separate from each other and that they should be 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 and the same is valid for light fittings.

C Sources of electrical supply

1 *General*

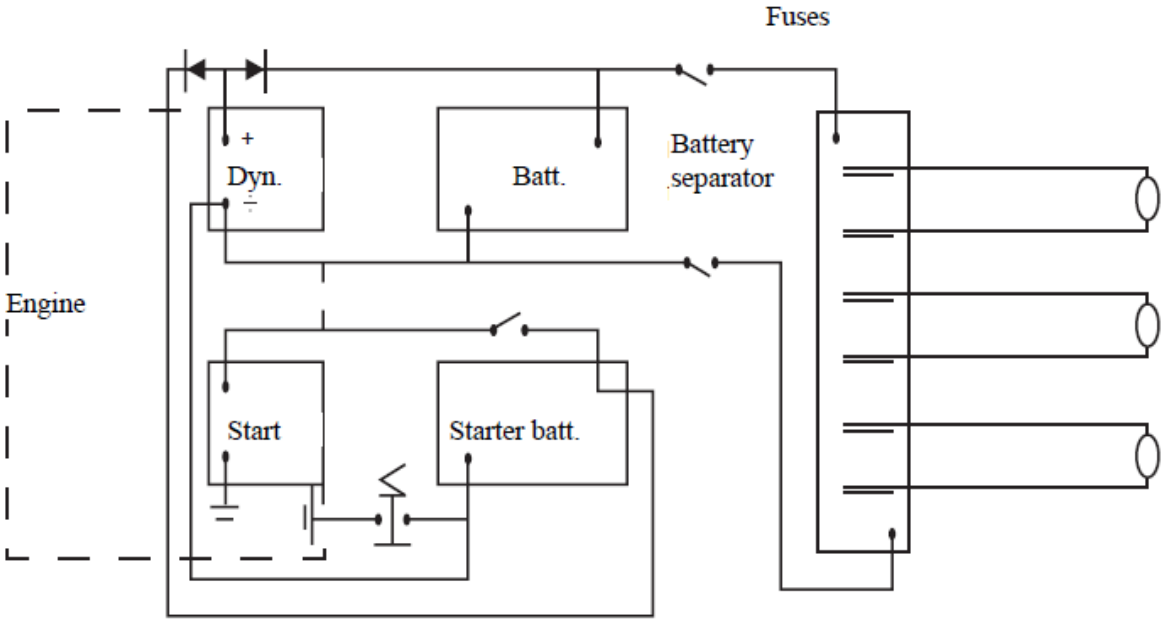
1.1 Where electrical power constitutes the only means of maintaining auxiliary services essential for the propulsion and safety of the vessel, there has to be a means of generating and storing such power. In the case of the majority of decked vessels the main source of power is usually low voltage requiring means to charge sets of batteries. In the case of 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.

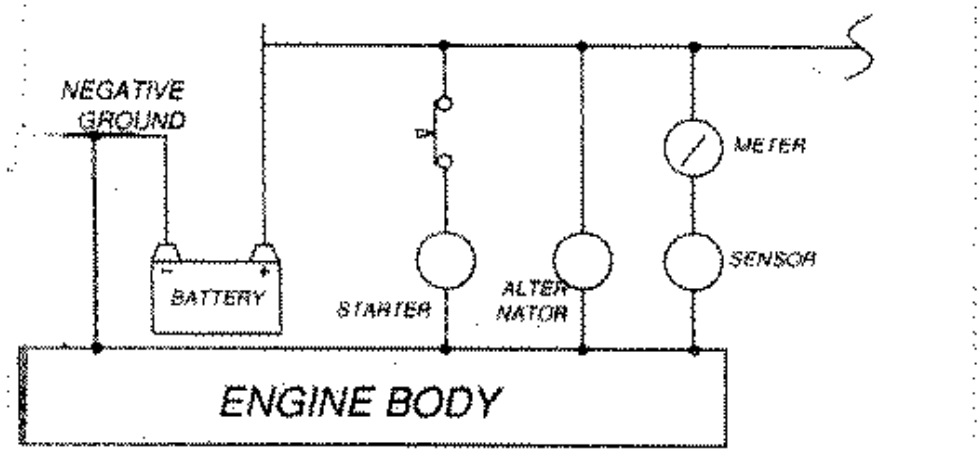
1.2 It may also be noted, that many small vessels use fishing techniques that rely on light attraction and many carry a portable, powered generating set, whereas others rely purely on battery power with no means on board to recharge the battery.

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 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 4.12.18 of chapter 4 and particularly in the case of small vessels, decked and undecked, the single wire system may be exceptionally approved by

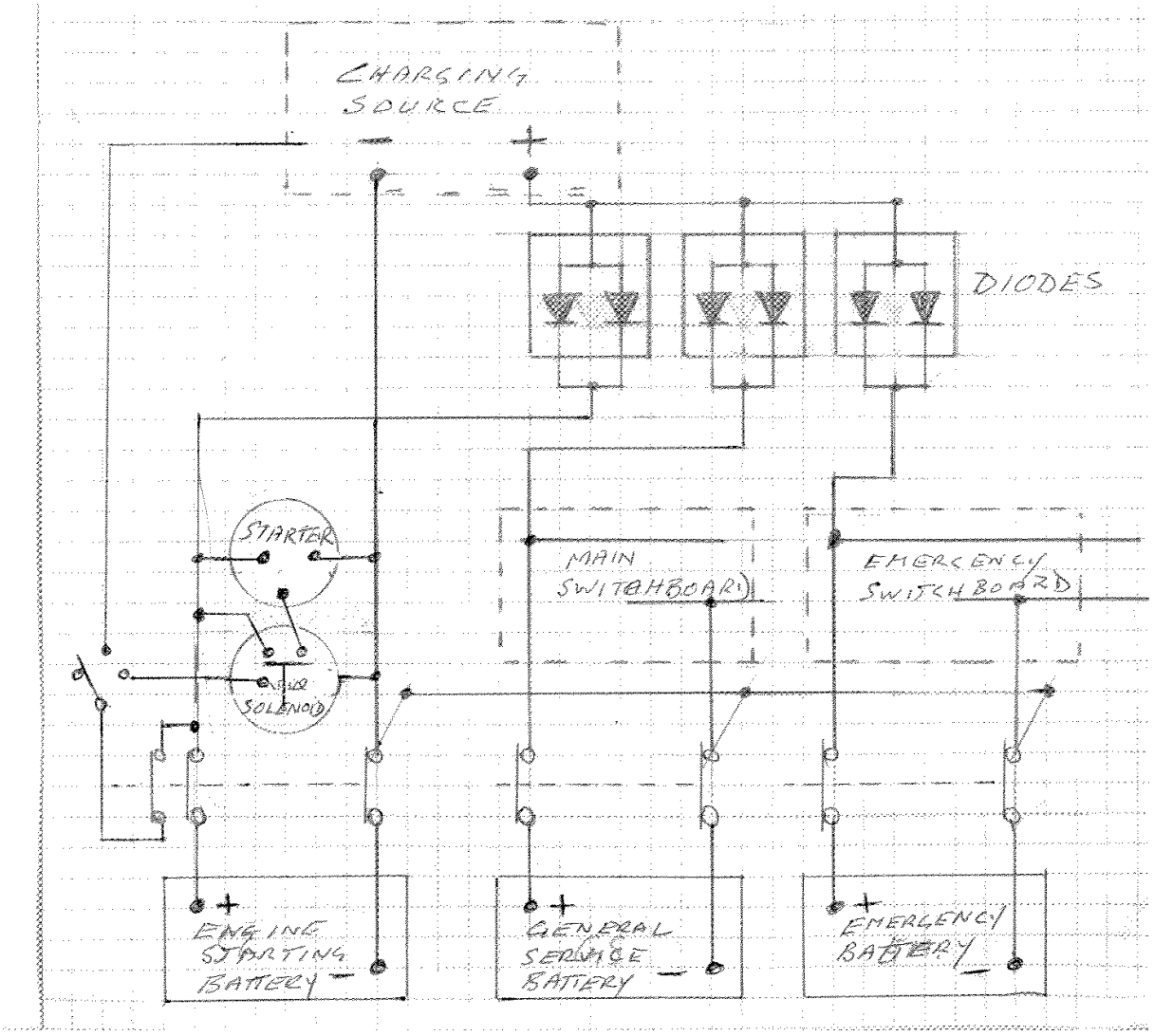
the Competent Authority provided that the arrangement is safe and that circuits are adequately protected. In the earthing of the engine block through the intermediate shaft and propeller shaft should be taken into consideration.

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 except in cases where the Competent Authority is satisfied that it is not practicable to do so taking into consideration the type of vessels 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 be also 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 an 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 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 services batteries and two sets of starting batteries for the main engine. In such cases, one set of the general service batteries and one set of radio batteries could be considered to cover emergency situations.

3 *High voltage electrical systems*

3.1 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 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, 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:

DC systems in excess of 110 V;

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 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 suitable 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 volt and ammeters.

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 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***

3.3.1 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 a period of at least three hours:

.1 a VHF radio installation or an MF radio installation or a ship-earth station or an MF/HF radio installation depending on the sea area for which the vessel is to be equipped;

.2 internal communication equipment, fire detecting systems and signals, which may be required in an emergency; and

.3 the navigational lights if solely electrical and the emergency lights where applicable such as:

.3.1 at launching stations and over the side of the vessel;
.3.2 in all alleyways, stairways and exits;
.3.3 in spaces containing machinery or the emergency source of power;
.3.4 at or in control stations; and
.3.5 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 whilst maintaining the voltage of the battery throughout the discharge period within plus or minus 12% of its nominal voltage. In the event of failure of the main power supply, this accumulator battery should be automatically connected to the emergency switchboard and should immediately supply at least those services specified in 4.2. 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 unless the operation of the emergency switchboard could be impaired.

4.5 Any accumulator battery should be installed in a well-ventilated space, but not in the space containing the emergency switchboard. An indicator should be mounted in a suitable space on the main switchboard or 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 feed back 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 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 so arranged 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 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 voltmeter and ammeter for each generator and with earth lamps. The emergency switchboard should also be fitted with a voltmeter, 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 sub-distribution 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 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, which degrades PVC insulation.

2 Cables which 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, since 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 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 provide 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 wood 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 that are area not less than 0.2 m^2 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 ship's structure or on wood and composite ships 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 which are not intended to be “live”, but which are liable under fault conditions to become “live” should be earthed (grounded) unless:

.1 they are supplied at a voltage not exceeding 55 V direct current (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 require 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% of the nominal rating under maximum rated load for the circuit. Electrical wiring should be of marine grade multi-strand tinned copper wire cores with an approved insulated cover.

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

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 the dusts, vapours or gases 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 sub-circuits and arranged in such a manner that failure of one final sub-circuit should not leave the space in darkness.

2 Lighting of normally unattended spaces such as 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 so located 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 and 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^2 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 wood 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 XVII

REFRIGERATION SYSTEMS USING TOXIC REFRIGERANTS SUCH AS AMMONIA

SAFETY IN MACHINERY SPACES AND SAFETY EQUIPMENT

1 General

The design and installation of refrigeration systems using toxic and/or flammable refrigerants should be in accordance with regulations prescribed by the Competent authority.

2 Risk assessment

Owners should ensure that a risk assessment should be carried out to identify the significant hazards associated with the system and measure to minimize and control to risk to any crewmember likely to be affected. The risk assessment should include recommendations regarding the occupational exposure limit, as well as the lower and upper flammability limits. The result of the risk assessment should be included in the record of the vessel.

3 Sources of hazards

3.1 Ammonia

3.1.1 Ammonia gas is toxic and inhalation may be lethal. It is also flammable in air at concentrations of 16% to 27% by volume. It has a characteristic odour and general can be detected by smell at low concentrations.

3.1.2 Ammonia with trace water attacks copper, zinc, tin, cadmium and most of their alloys and may also attack many rubbers and plastics.

3.1.3 Liquid ammonia has a high coefficient of thermal expansion. Care should be taken to ensure that liquid ammonia is not trapped in pipelines or fittings between shut off devices. A rise in ambient temperature may be sufficient to expand trapped liquid, generate excess pressure and rupture components, resulting in the release of ammonia.

3.1.4 Welding and all sources of flame in contact with a refrigeration system constitute a hazard.

3.1.5 Care should be taken before entering or working on vessels that have formed part of an ammonia system, even if air samples from the vessel appear clean, since oil and ammonia mixtures remaining in the vessel can release hazardous quantities of ammonia when disturbed.

3.1.6 Corrosion may occur on the external surfaces of steel piping and vessels used for ammonia refrigeration systems, reducing the strength of the pipes and/or vessels and may lead to leakage. Such corrosion on unprotected steelwork can be rapid in wet or damp conditions encountered on the low-pressure side of the system when metal temperatures are below the due point of the ambient atmosphere.

3.1.7 Goggles, gloves, head covering and other suitable protective clothing should be provided and worn whenever there is a risk of exposure to refrigerant liquid. When selecting protective clothing, it should be kept in mind, that under certain conditions many rubber compositions and plastic linings might not stand up to lengthy exposure.

3.2 Fluorocarbon refrigerants

3.2.1 Although fluorocarbon refrigerants have a lower order of toxicity, the inhalation of high concentrations can be dangerous. If the concentration is high, oxygen deficiency could lead to unconsciousness or death due to asphyxia. It could also have a transient narcotic effect on the nervous system. High concentrations of refrigerant vapours could also lead to cardiac sensitization and if subsequently a cardiac stimulant is used or is present, cardiac arrhythmia can occur which could prove suddenly fatal.

3.2.2 Carbon dioxide has an effect on breathing reflex at concentrations in the region of 10% to 20% and can be, therefore, fatal where there would be sufficient oxygen to support life under other circumstances.

3.2.3 Thermal decomposition of fluorocarbon refrigerants external to the system is most likely in the presence of flames, hot surfaces and in electric arcs. The major by products of thermal decomposition are hydrochloric acid and hydrofluoric acids, these acids are toxic, but their irritant smell provides a warning even at concentrations too low to produce harmful effects to crewmembers.

3.2.4 The vapour of fluorocarbon refrigerants is colourless, odourless and heavier than air. Leak detection devices should also be placed at low level in the machinery space, as well as the inlets to extractors in the ventilation system.

3.2.5 Where liquid refrigerants having boiling points below ambient temperature at atmospheric pressure comes into contact with the skin or eyes, evaporation may cause freezing of the skin or eye fluids and freeze burns may occur. Clothing saturated with liquid refrigerant may freeze to the skin.

3.2.6 Fluorocarbon refrigerants do not react with steel, copper, aluminium and brass in acceptable fry refrigerating conditions. Alloys containing more than 2% magnesium should be avoided. In the presence of moisture and halocarbons, zinc and galvanized steel are particularly susceptible to attack.

3.2.7 Where liquid refrigerants having boiling points below ambient temperature at atmospheric pressure comes into contact with the skin or eyes, evaporation may cause freezing of the skin or eye fluids and freeze burns may occur. Clothing saturated with liquid refrigerant may freeze to the skin.

3.2.8 Care should be taken to exclude fluorocarbon refrigerants where any brazing or welding is to take place. Systems should not be installed in a space containing flame or spark producing equipment.

3.2.9 Goggles, rubber or PVC gloves and other suitable protective clothing should be provided and worn whenever there is a risk of exposure to refrigerant liquid.

3.3 Hydrocarbon

3.3.1 In common with fluorocarbon refrigerants, hydrocarbons have a lower order of toxicity, however the inhalation of high concentrations can be dangerous. If the concentration is high, oxygen deficiency could lead to unconsciousness or death due to asphyxia. It could also have a transient narcotic effect on the nervous system. High concentrations of refrigerant vapours could also lead to cardiac sensitization and if subsequently a cardiac stimulant is used or is present, cardiac arrhythmia can occur which could prove suddenly fatal.

3.3.2 Hydrocarbons are subject to thermal decomposition at temperatures in the order of 450°C. However, in the presence of oil and other contaminants they are subject to reaction and decomposition at lower temperatures, particularly if moisture is present in the system. Thus temperatures in refrigerating systems should be kept to about a maximum of 135°C.

3.3.3 Since hydrocarbons lack chlorine and fluorine atoms, there is no possibility of acid formation in the presence of moisture.

3.3.4 Thermal decomposition of fluorocarbon refrigerants external to the system does not cause any harmful decomposition.

3.3.5 The vapour of fluorocarbon refrigerants is colourless, odourless and denser than air. Leak detection devices, that are not a source of potential ignition, should also be placed at low level in the machinery space, as well as the inlets to extractors in the ventilation system. If temporary ventilation equipment is used, it should be of a type that would not present a source of ignition.

3.3.6 Where liquid refrigerants having boiling points below ambient temperature at atmospheric pressure comes into contact with the skin or eyes, evaporation may cause freezing of the skin or eye fluids and freeze burns may occur. Clothing saturated with liquid refrigerant may freeze to the skin.

3.3.7 Higher boiling point refrigerants have solvent actions and can cause defatting and cracking of the skin.

3.3.8 Hydrocarbon refrigerants do not react with steel, copper, aluminium and brass in acceptable fry refrigerating conditions. Alloys containing more than 2% magnesium can be used due to the absence of fluorine and chlorine elements.

3.3.9 Care should be taken to exclude fluorocarbon refrigerants where any brazing or welding is to take place. Systems should not be installed in a space containing flame or spark producing equipment.

3.3.10 Goggles, rubber or PVC gloves and other suitable protective clothing should be provided and worn whenever there is a risk of exposure to refrigerant liquid.

4 Instruction

4.1 Crewmembers with the responsibility for the operating and maintenance should be instructed in the operation of the system and possible hazards. They should be adequately

trained to react to emergencies including rescue work and procedures for the isolation of equipment.

4.2 Warning and first-aid notices should be placed in the machinery space and at access points.

4.3 Manufacturer's instruction manuals should be carried on board in an appropriate format and should include, *inter alia*:

.1 full details of the system;

.2 description of the machinery;

.3 detailed instructions for starting, stopping and running;

.4 faultfinding, repair and maintenance;

.5 refrigeration flow diagram and control circuits; and

.6 pressure-temperature relationship and chemical safety data sheets.

5 Protective clothing

5.1 Protective clothing, goggles, breathing apparatus and gloves should be available in the vicinity of the system but external to the area of risk.

5.2 Appropriate protective clothing should be worn by crewmembers working on refrigeration systems when opening the system for service or repair and when charging or purging the system. The selection of protective material should be based on the effects of exposure to the refrigerant in question.

5.3 At least two sets of breathing apparatus and full protective clothing, as well as a lifeline and, when appropriate, a means of communication between crewmembers carrying out rescue and emergency operation. The equipment should be safely stored close to, but external to, the machinery space.

5.4 Appropriate first-aid equipment should be provided and clear first-aid instructions should also be displayed in the machinery space and at access points to the machinery space.

5.5 Irrigation facilities and eye wash bottles containing and eye wash solution or distilled water should be available. The solution should be changed at least every six months.

5.6 Crewmembers should be made aware of the location of protection clothing, first aid and rescue equipment. The location or locations should be clearly indicated and the equipment should be checked at least once every month and the inspection noted in the engine-room and/or deck log together with a record of any action taken.

6 Electrical systems

6.1 Lighting should be adequate to allow free circulation of crewmembers in safety. A fixed emergency lighting system should be provided and portable lighting should be made available. Lighting intended to remain in operation following release of ammonia should be of a type suitable for use in a hazardous area and flameproof.

6.2 In the event of leakage of ammonia refrigerant, it should be possible to isolate non-flameproof electric circuits by either manual or automatic control of the circuit breakers from a safe place. Thus leak detectors should be fitted at strategic points within the system and connected to visual and audible alarms.

6.3 In the case of manually isolation of a circuit breaker, a stop switch or button, suitable protected against accidental operation, should be positioned adjacent to but outside the access to the refrigeration machinery space.

6.4 The isolation of such circuit breakers may be automatic. In such cases, the system should also activate ventilation and emergency, flame proof lighting if installed.

7 Ventilation

7.1 Mechanical ventilation should be installed. Inlets to the extraction system should be free from obstruction, should be near the machinery and be suitably guarded. The system should discharge above deck level, be free of obstruction and clear of the ventilation intakes to other spaces. Adequate provision should be made for the supply and distribution of fresh air within the machinery space.

7.2 It should be possible to stop the ventilation system from a position outside the machinery space, preferably close to the access to the machinery space.

8 Guards

Adequate guards should be fitted to prevent access to, and injury from, all rotating machinery, dangerously hot or cold surfaces and live electrical terminals.

9 Storage of refrigerant

9.1 Refrigerant should be stored in containers supplied by the manufacturer and securely supported against movement. Areas containing storage containers should be ventilated and free of flammable materials.

9.2 Refrigerant containers should not be stored where temperatures can exceed 45°C and should not be stored in machinery spaces.

10 Decommissioning

10.1 Decommissioning of an ammonia refrigerant plant should be executed in accordance with procedures established by the Competent authority. The procedures should ensure that:

.1 hazard to crewmembers or other persons carrying out the process is minimized;

.2 refrigerant and oil are correctly recovered for reclaim or correct disposal; and

.3 the system, as left does not present a hazard to crewmembers or other persons or to the environment due to residual contents.

ANNEX XVIII

PERSONNEL PROTECTIVE EQUIPMENT

		Working Gear				**Protective gear**							**Specialist Protection**	
ACTIVITY	LOCATION	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 Authorities could use this table, having considered the risks and local circumstances, to decide on what personal protective equipment is required.

■ Means a High Priority item.
● Means a priority dependent upon local circumstances and the location.

ANNEX XIX

FOOD AND HYGIENE ON BOARD FISHING VESSELS

1 This appendix provides guidance on food and hygiene that will be applicable to the majority of vessels equipped with galleys and basic sanitary accommodations.

Responsibility of fishing vessel owners

2 Fishing vessel owners should ensure that food handlers receive appropriate education and training in the principles and practice of food hygiene and associated health and safety issues and that they maintain acceptable standards to secure the health and well-being of crews.

Bacterial food contamination

3 Bacterial contamination is the most serious risk to food safety. Contaminated food looks, tastes and smells completely normal and causes the vast majority of food poisoning cases. Contamination usually occurs through ignorance and food handlers taking short cuts.

4 The 10 main reasons for food poisoning are:

.1 Preparation of food too far in advance and stored at room temperature.

.2 Cooling food too slowly prior to refrigeration.

.3 Not reheating food to high enough temperatures to destroy harmful bacteria.

.4 Using contaminated cooked food.

.5 Undercooking.

.6 Not thawing frozen meat for sufficient time.

.7 Cross contamination from raw food to cooked food.

.8 Storing hot food below 63°C.

.9 Infected food handlers.

.10 Improper use of leftovers.

Personal hygiene

5 Food handlers have a responsibility, therefore, to observe high standards of personal cleanliness to ensure that they do not contaminate food. There should be sufficient means for washing and drying hands. Prominent signs about washing hands are advisable.

Fitness to work

6 Food handlers with food poisoning symptoms, e.g. diarrhoea and vomiting or suspected of carrying food poisoning organisms because of close contact with a confirmed case should be excluded from any job which might expose food to risk of contamination.

Segregation of raw and cooked foods

7 Raw food should always be kept apart from cooked food or milk that requires no further treatment before consumption.

8 Separate work surfaces, chopping boards and utensils should be set aside for the preparation of raw meat and should not be used for the preparation of foods that will be eaten without further cooking.

Temperature control

9 Pathogenic bacteria thrive in warm conditions. To prevent their growth it is essential to keep food either very hot (above 63ºC) or very cold (below 5ºC). Food should not be left in the danger zone (5ºC to 63ºC) for longer than is absolutely necessary.

10 Meat products or rice should not be reheated more than once. If reheating is absolutely necessary, the food should be covered and cooled rapidly after cooking and stored in a refrigerator until it is ready to be reheated. It should be then reheated rapidly and thoroughly.

11 Cooling of food is likely to be a potential health hazard. The following points should be considered to minimize the risk of contamination during the cooling process.

.1 Use a safe cooling area. Pour liquids into shallow pans and stir frequently.

.2 Split food into relatively small pieces or batches.

.3 Cover food with a tight wrapping.

.4 Use an iced water bath.

12 Chill cabinets, cold rooms and refrigerators should have a temperature between 0° and 5ºC and deep freeze units should be -18ºC or below. As a guide frozen food can be safely stored at -12ºC for one month only. Regular maintenance of refrigeration equipment, including checks on door seals, defrosting and checks on the correct functioning of thermometers should be carried out as a routine by crewmembers.

13 Dry food stores should be dry, cool, around 10ºC, well lit and ventilated.

Cleaning procedures

14 All articles that come into contact with food should be thoroughly washed, rinsed and disinfected before use. Cracked or chipped food containers should be discarded.

15 Mechanical dishwashers should be regularly cleaned. Recommended temperatures should ensure that items come out clean, too hot to handle and air dry in less than half a minute. Clean items should be air-dried away from dirty items. Drying cloths should not be used.

16 Food and equipment should not be exposed to contamination during cleaning operations. For example, utensils are often stored in the bottom shelf of an open unit, leaving them exposed to contamination from hose water used to clean the deck.

17 Ventilation hoods and grease filters should be cleaned regularly. The inside surfaces of ducting should be cleaned at least once every 3 months.

Pests

18 Good housekeeping obviously minimizes the risk of infestation and it is important to ensure that areas, particularly refuse areas are kept in a clean and tidy condition. Lids should always be kept on waste bins that should be washed after emptying.

19 Flies and cockroaches present a serious hazard because of their feeding habits and the sites they visit.

20 As cockroach and other pest presence on vessels is fairly common, it is reasonable to expect a responsible member of crew to carry out routine inspections of food areas, particularly undisturbed areas. If pests are found, appropriate action should be taken to eradicate or minimize the problem.

Stock control

21 Great care should be taken to ensure the use of commodities in strict date rotation and that supplies have the best possible durability date. Perishable provisions should neither be ordered nor accepted in quantities greater than can be consumed before the expiry date, with the exception of frozen foods. Provided these have been maintained in hard frozen condition from production to delivery and during storage on board vessel, they may be accepted for use beyond the date marking.

Ventilation in galleys

22 Mechanical ventilation systems should be used and should be adequate to maintain a reasonable temperature without the need to jam open fire doors or doors to the open deck.

Sanitary facilities

23 Sanitary accommodation should be easily cleaned and impervious to damp and properly drained with sufficient light, heat, ventilation and hot and cold water. WCs should have an ample flush of water, available at all times and independently controlled. Shower heads should be cleaned in a chlorine solution (50 ppm) every 3 months.

Potable water

24 Potable water should be bright, clear, virtually colourless and it should bubble when shaken. This does not, however, guarantee that the water is safe. It is, therefore, essential that control measures are taken to minimize the risk of contamination.

25 Dedicated fresh water hoses should be super chlorinated at 100 ppm for a contact of one hour at least every 6 months.

26 All fresh water taken from shore should be chlorinated on loading to ensure a residual free chlorine content of 0.2 ppm, unless an automatic chlorination unit is used. Concentration levels should be checked.

27 Storage tanks should be opened up, emptied, ventilated and inspected at intervals not exceeding 12 months for inspection and maintenance. Tanks should be thoroughly cleaned, re-coated as necessary and flushed out.

28 It is also recommended that water be tested for bacterial and chemical contamination every 3 months.

Crew information

29 Information, including simple placards and up-to-date material, relating to national and international regulations on food preparation and storage, and hygiene and food safety should be readily available to members of the crew in an approved language understood by the crew.

30 The following is an example of the kind of information that might be posted in the galley to promote food safety.

TEN TIPS FOR FOOD SAFETY

STORE CHILLED AND FROZEN FOOD QUICKLY (Keep delays to an absolute minimum when taking on stores)

KEEP YOUR GALLEY CLEAN (Disinfect worktops, equipment and utensils between handling food that is to be cooked and food that is not to be cooked)

WASH HANDS THOROUGHLY (Particularly after visiting the toilet, before preparing food, in between handling raw and cooked food and after handling waste food)

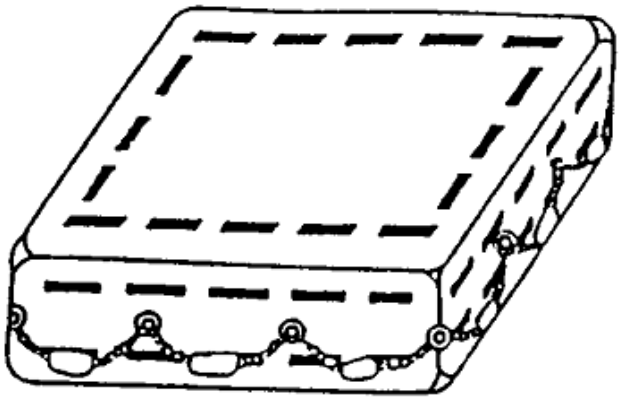
PREPARE AND STORE RAW AND COOKED FOOD SEPARATELY (If separate cabinets are not available, then raw meat and fish should be stored at the bottom of the refrigerator and always keep food covered)

KEEP YOUR REFRIGERATOR BELOW 5°C (Get a refrigerator thermometer)

ANNEX XX

REQUIREMENTS FOR BUOYANT APPARATUS

Buoyant Apparatus



(a) No type of buoyant apparatus should be accepted unless it satisfies the following conditions:

(i) 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;
(ii) it is clearly marked as to the number of persons it is to support;
(iii) 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;
(iv) it is made of buoyant material and robust construction;
(v) it would be effective and stable when floating either way up;
(vi) the air cases or equivalent buoyancy are placed as near as possible to the sides of the apparatus, and such buoyancy is not be dependent upon inflation;
(vii) it is fitted with a painter and has a line securely becketed round the outside;
(viii) it is painted in a highly visible colour and fitted with reflective tape;
(ix) it is recommended that there is a watertight container available for crew abandoning the vessel; containing the relevant safety equipment such as the distress signals required to be carried onboard and drinking water; and
(x) where a container is used as the buoyant apparatus consideration should be given to reducing the permeability.

(b) 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

GUIDANCE ON THE REQUIREMENTS FOR LIFESAVING EQUIPMENT

1 Liferaft

1.1 *General requirements for liferafts*

(1) Construction of liferafts

(a) Every liferaft should be so constructed as to be capable of withstanding exposure for 15 days afloat in all sea conditions.

(b) The liferaft should be so constructed that when it is dropped into the water from a height of 2 metres, the liferaft and its equipment will operate satisfactorily.

(c) 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.

(d) The liferaft should have a canopy to protect the occupants from exposure which is automatically set in place when the liferaft is launched and waterborne. The canopy should comply with the following:

(i) 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;
(ii) its interior should be of a colour that does not cause discomfort to the occupants;
(iii) 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;
(iv) it should admit sufficient air for the occupants at all times, even with the entrances closed;
(v) it should be provided with at least one viewing port;
(vi) it should be provided with means for collecting rainwater.

(2) Equipment

(a) The normal equipment of every liferaft should consist of:

(i) one buoyant rescue quoit, attached to not less than 30 metres of buoyant line;
(ii) 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 which is permitted to accommodate 13 persons or more should be provided with a second knife which need not be of the non-folding type;
(iii) for a liferaft which is permitted to accommodate not more than 12 persons, one buoyant bailer. For a liferaft which is permitted to accommodate 13 persons or more, two buoyant bailers;
(iv) two sponges;
(v) 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;
(vi) two buoyant paddles;
(vii) three tin-openers; safety knives containing special tin-opener blades are satisfactory for this requirement;
(viii) one first-aid outfit in a waterproof case capable of being closed tightly after use;
(ix) one whistle or equivalent sound signal;
(x) one waterproof electric torch suitable for Morse signalling together with one spare set of batteries and one spare bulb in a waterproof container;
(xi) an efficient radar reflector, unless a survival craft radar transponder is stowed in the liferaft;
(xii) one daylight signalling mirror with instructions on its use for signalling to ships and aircraft;
(xiii) 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;
(xiv) one set of fishing tackle;
(xv) a food ration totalling not less than 10,000 kilojoules for each person the liferaft is permitted to accommodate; these rations should be kept in airtight packaging and be stowed in a watertight container;
(xvi) watertight receptacles containing a total of 1.5 litres of fresh water for each person the liferaft is permitted to accommodate, of which 0.5 litres per person may be replaced by a de-salting

apparatus capable of producing an equal amount of fresh water in 2 days;
(xvii) one rustproof graduated drinking vessel;
(xviii) six doses of anti-seasickness medicine and one seasickness bag for each person the liferaft is permitted to accommodate;
(xix) instructions on how to survive;
(xx) instructions for immediate action;

(b) The marking should be block capitals of the Roman alphabet.

(c) 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) Inflatable liferafts should comply with the requirements of 1.1 and, in addition, should comply with the requirements of this paragraph.

(2) Construction of inflatable liferafts

(a) 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 kilograms and seated in their normal positions.

(b) The floor of the liferaft should be waterproof and should be capable of being sufficiently insulated against cold either:

(i) by means of one or more compartments that the occupants can inflate, or which inflate automatically and can be deflated and reinflated by the occupants; or
(ii) by other equally efficient means not dependent on inflation.

(c) The liferaft should be inflated with a non-toxic gas. Inflation should be completed within a period of 1 minute at an ambient temperature of between 18 degrees Celsius and 20 degrees Celsius and within a period of 3 minutes at an ambient temperature of –30 degrees Celsius. After inflation the liferaft should maintain its form when loaded with its full complement of persons and equipment.

(d) Each inflatable compartment should be capable of withstanding a pressure equal to at least 3 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(9)(a)(ii) so that the working pressure can be maintained.

(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:

(i) the greatest whole number obtained by dividing by 0.096 the volume, measured in cubic metres, of the main buoyancy tubes (which for this purpose should include neither the arches nor the thwarts, if fitted) when inflated; or

(ii) the greatest whole number obtained by dividing by 0.372 the inner horizontal cross-sectional area of the liferaft measured in square metres (which for this purpose may include the thwart or thwarts, if fitted) measured to the innermost edge of the buoyancy tubes; or

(iii) the number of persons having an average mass of 75 kilograms all wearing lifejackets, that can be seated with sufficient comfort and headroom without interfering with the operation of any of the liferaft's equipment.

(4) Access into inflatable liferafts

(a) Entrances should have a boarding ladder, the lowest step of which should be situated not less than 0.4 metres below the liferaft's light waterline.

(b) There should be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

(5) Stability of inflatable liferafts

(a) Every inflatable liferaft should be so constructed that, when fully inflated and floating with the canopy uppermost, it is stable in a seaway.

(b) 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.

(c) 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.

(6) Containers for inflatable liferafts

(a) The liferaft should be packed in a container that is:

(i) so constructed as to withstand hard wear under conditions encountered at sea;
(ii) 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;
(iii) as far as practicable watertight, except for drain holes in the container bottom.

(b) 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.

(c) The container should be marked with:

(i) maker's name or trade mark;
(ii) serial number;
(iii) name of approving authority and the number of persons it is permitted to carry;
(iv) type of emergency pack enclosed;
(v) date when last serviced;
(vi) length of painter;
(vii) maximum permitted height of stowage above waterline (depending on drop-test height and length of painter);
(viii) launching instructions.

(7) Markings on inflatable liferafts*

The liferaft should be marked with:

(i) maker's name or trade mark;
(ii) serial number;
(iii) date of manufacture (month and year);
(iv) name of approving authority;
(v) name and place of servicing station where it was last serviced;
(vi) number of persons it is permitted to accommodate over each entrance in characters not less than 100 millimetres in height of a colour contrasting with that of the liferaft.

(8) Additional equipment for inflatable liferafts

(a) In addition to the equipment, every inflatable liferaft should be provided with:

(i) one repair outfit for repairing punctures in buoyancy compartments;

* See also 7.5.5 of the Recommendations.

(ii) one topping-up pump or bellows.

(b) The knives required should be safety knives.

2 Lifejackets

2.1 *General requirements for lifejackets*

(a) A lifejacket should not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds.

(b) A lifejacket should be so constructed that:

(i) after demonstration, a person can correctly don it within a period of 1 minute without assistance;
(ii) it is capable of being worn inside-out or is clearly capable of being worn in only one way and, as far as possible, cannot be donned incorrectly;
(iii) it is comfortable to wear;
(iv) it allows the wearer to jump from a height of at least the deck level into the water without injury and without dislodging or damaging the lifejacket.

(c) A lifejacket should have sufficient buoyancy and stability in calm fresh water to:

(i) lift the mouth of an exhausted or unconscious person not less than 120 millimetres clear of the water with the body inclined backwards at an angle of not less than 20 degrees and not more than 50 degrees from the vertical position;
(ii) turn the body of an unconscious person in the water from any position to one where the mouth is clear of the water in not more than 5 seconds.

(d) A lifejacket should have buoyancy which is not reduced by more than 5 per cent after 24 h submersion in fresh water.

(e) A lifejacket should allow the person wearing it to swim a short distance and to board a survival craft.

(f) Each lifejacket should be fitted with a whistle firmly secured by a cord.

3 Immersion suits

3.1 *General requirements for immersion suits*

(a) The immersion suit should be constructed with waterproof materials such that:

(i) it can be unpacked and donned without assistance within 2 minutes taking into account any associated clothing, and a lifejacket if the immersion suit is to be worn in conjunction with a lifejacket;
(ii) it will not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds;
(iii) it will cover the whole body with the exception of the face. Hands should also be covered unless permanently attached gloves are provided;
(iv) it is provided with arrangements to minimize or reduce free air in the legs of the suit;
(v) following a jump from a height of not less than 4.5 metres into the water there is no undue ingress of water into the suit.

(b) An immersion suit which also complies with the requirements of 2 may be classified as a lifejacket.

(c) 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:

(i) climb up and down a vertical ladder at least 5 metres in length;
(ii) perform normal duties during abandonment;
(iii) jump from a height of not less than 4.5 metres into the water without damaging or dislodging the immersion suit, or being injured;
(iv) swim a short distance through the water and board a survival craft.

(d) An immersion suit which has buoyancy and is designed to be worn without a lifejacket should be fitted with a light complying with the requirements of 2.3 and the whistle prescribed by 2.1(f).

(e) If the 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.

3.2 *Thermal performance requirements for immersion suits*

(a) An immersion suit made of material which has no inherent insulation should be:

(i) marked with instructions that it must be worn in conjunction with warm clothing;
(ii) 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 metres to ensure that when it is worn for a period of 1 hour in calm circulating water at a temperature of 5 degrees Celsius the wearer's body core temperature does not fall more than 2 degrees Celsius.

(b) 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 metres to ensure that the wearer's body core temperature does not fall more than 2 degrees Celsius after a period of 6 h immersion in calm circulating water at a temperature of between 0 degrees Celsius and 2 degrees Celsius.

(c) The immersion suit should permit the person wearing it with hands covered to pick up a pencil and write after being immersed in water at 5 degrees Celsius for a period of 1 hour.

3.3 *Buoyancy requirements*

A person in fresh water wearing either an immersion suit complying with the requirements of 2 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 specification*

Every lifebuoy should:

(i) have an outer diameter of not more than 800 millimetres and an inner diameter of not less than 400 millimetres;
(ii) 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 which depends on inflation for buoyancy;
(iii) be capable of supporting not less than 14.5 kilograms of iron in fresh water for a period of 24 h;
(iv) have a mass of not less than 2.5 kilograms;
(v) not sustain burning or continue melting after being totally enveloped in a fire for a period of 2 seconds;
(vi) 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 30 metres, whichever is the greater, without impairing either its operating capability or that of its attached components;
(vii) if it is intended to operate the quick-release arrangement provided for the self-activated smoke signals and self-igniting lights, have a mass sufficient to operate the quick-release arrangement or 4 kilograms, whichever is the greater;
(viii) be fitted with a grabline not less than 9.5 millimetres in diameter and not less than 4 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:

(i) be non-kinking;
(ii) have a diameter of not less than 8 millimetres;
(iii) have a breaking strength of not less than 5 kilonewtons.

5 Rocket parachute flares

5.1 The rocket parachute flare should:

(i) be contained in a water-resistant casing;
(ii) have brief instructions or diagrams clearly illustrating the use of the rocket parachute flare printed on its casing;
(iii) have integral means of ignition;
(iv) 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 metres. At or near the top of its trajectory, the rocket should eject a parachute flare, which should:

(i) burn with a bright red colour;
(ii) burn uniformly with an average luminous intensity of not less than 30,000 candela;
(iii) have a burning period of not less than 40 seconds;
(iv) have a rate of descent of not more than 5 metres per second;
(v) not damage its parachute or attachments while burning.

6 Hand flares

6.1 The hand flare should:

(i) be contained in a water-resistant casing;
(ii) have brief instructions or diagrams clearly illustrating the use of the hand flare printed on its casing;
(iii) have a self-contained means of ignition;
(iv) be so designed as not to cause discomfort to the person holding the casing and not endanger the survival craft by burning or glowing residues when used in accordance with the manufacturer's operating instructions.

6.2 The hand flare should:

(i) burn with a bright red colour;
(ii) burn uniformly with an average luminous intensity of not less than 15,000 candela;
(iii) have a burning period of not less than 1 minute;
(iv) continue to burn after having been immersed for a period of 10 seconds under 100 millimetres of water.

ANNEX XXII

RECOMMENDATION FOR TESTING LIFEJACKETS*

PART 1 – PROTOTYPE TEST

1 Testing

1.1 *Temperature test*

The lifebuoys should be alternately subjected to surrounding temperatures of -30°C and +65°C. These alternating cycles need not follow immediately after each other and the following procedure, repeated for a total of 10 cycles, is acceptable:

.1 an 8 h cycle at +65°C to be completed in one day;

.2 the specimens removed from the warm chamber that same day and left exposed under ordinary room conditions until the next day;

.3 an 8 h cycle at -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 until the next day.

1.2 *Test for oil resistance*

One of the lifebuoys should be immersed horizontally for a period of 24 h 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.

1.3 *Fire test*

The other lifebuoy should be subjected to a fire test. A test pan 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 s. The lifebuoy should then be moved through 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 lifebuoys should not sustain burning or continue melting after being removed from the flames.

* Refer to the Standardized life-saving appliance evaluation and test report forms (MSC/Circ.980).

2 Lifejackets

2.1 *Temperature cycling test*

A lifejacket should be subjected to the temperature cycling as prescribed in 1.1 and should then be externally examined. If the buoyancy material has not been subjected to the tests prescribed in 2.7, the lifejacket should also be examined internally. 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 24 hour complete submersion to just below the surface in fresh water. The difference between the initial buoyancy and the final buoyancy should not exceed 5% of the initial buoyancy.

2.3 *Fire test*

A lifejacket should be subjected to the fire test prescribed in 1.3. The lifejacket should not sustain burning or continue melting after being removed from the flames.

2.4 *Test for oil resistance*

2.4.1 The lifejacket should be tested for oil resistance as prescribed in 1.2.

2.4.2 If the buoyancy material has not been subjected to the tests prescribed in 2.7, the lifejacket should also be examined internally and the effect determined. The material should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

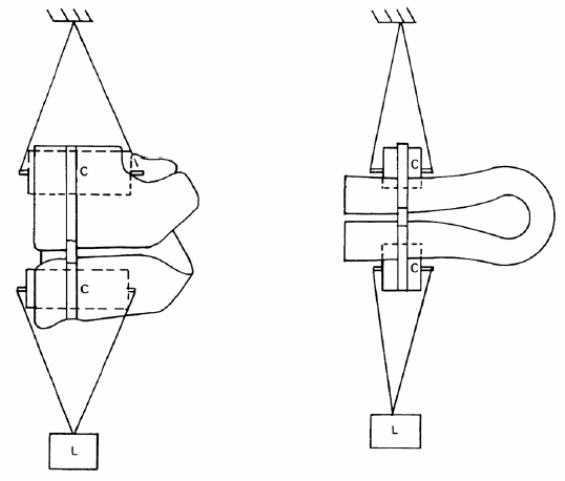
2.5 *Tests of materials for cover, tapes and seams*

The materials used for the cover, tapes, seams and additional equipment should be tested to the satisfaction of the Competent Authority 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 sea water, oil or fungal attack.

2.6 *Strength tests*

Body or lifting loop strength tests

2.6.1 The lifejacket should be immersed in water for a period of 2 min. 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 min to the part of the lifejacket that secures it to the body of the wearer (see figure 1) or to the lifting loop of the lifejacket. The lifejacket should not be damaged as a result of this test.



Vest-type lifejacket Yoke or over-the-head-type lifejacket

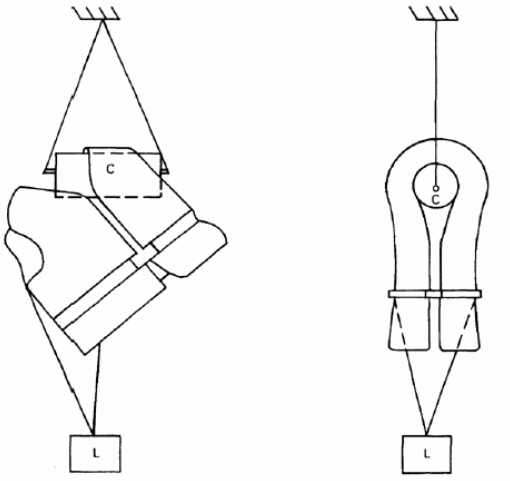
C – Cylinder: 125 mm diameter for adult sizes
50 mm diameter for child sizes

L – Test load

Figure 1 – Body strength test arrangement for lifejackets

Shoulder strength test

2.6.2 The lifejacket should be immersed in water for a period of 2 min. 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 900 N (700 N in the case of a child-size lifejacket) should be applied for 30 min to the shoulder section of the lifejacket (see figure 2). The lifejacket should not be damaged as a result of this test.



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 – Shoulder strength test arrangement for lifejackets

2.7 *Additional tests for lifejacket buoyancy material other than cork or kapok*

The following tests should be carried out on eight specimens of lifejacket buoyancy materials other than cork or kapok.

Test for stability under temperature cycling

2.7.1 Six specimens should be alternately subjected for 8 hour to surrounding temperatures of -30°C and +65°C. These alternating cycles need not follow immediately after each other and the following procedure, repeated for ten cycles, is acceptable:

.1 an 8 hour cycle at +65°C to be completed in one day;

.2 the specimens removed from the warm chamber on the same day and left exposed under the ordinary room conditions until the next day;

.3 an 8 hour cycle at -30°C to be completed the next day; and

.4 the specimens removed from the cold chamber that same day and left exposed under the ordinary room conditions until the next day.

2.7.2 The dimensions of the specimens should be recorded at the end of the 10-cycle period. The specimens should be carefully examined and should not show any sign of external change of structure or of mechanical qualities.

2.7.3 Two of the specimens should be cut open and should not show any sign of internal change of structure.

2.7.4 Four of the specimens should be used for water absorption tests, two of which should be so tested after they have also been subjected to the diesel oil test as prescribed in 1.2.

Tests for water absorption

2.7.5 The tests should be carried out in fresh water and the specimens should be immersed for a period of seven days under a 1.25 m head of water.

2.7.6 The tests should be carried out:

.1 on two specimens as supplied;

.2 on two specimens which have been subjected to the temperature cycling as prescribed in 2.7.1; and

.3 on two specimens which have been subjected to the temperature cycling as prescribed in 2.7.1 followed by the diesel oil test as prescribed in 2.4.

2.7.7 The specimens should be at least 300 mm square and be of the same thickness as used in the lifejacket. Alternatively, the entire lifejacket may be subjected to the test. The dimensions should be recorded at the beginning and end of these tests.

2.7.8 The results should state the mass in kilograms which each specimen could support out of the water after one and seven days immersion (the selection of a test method suitable for obtaining this result directly or indirectly is left to the discretion of the testing Competent Authority). The reduction of buoyancy should not exceed 16% for specimens which have been exposed to the diesel oil conditioning and should not exceed 5% for all other specimens. The specimens should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

2.8 *Donning test*

2.8.1 As lifejackets will be used by uninitiated persons, often in adverse conditions, it is essential that risk of incorrect donning be minimized. Ties and fastenings necessary for proper performance should be few and simple. Lifejackets should readily fit various sizes of adults, both lightly and heavily clad. Lifejackets should be capable of being worn inside-out, or clearly in only one way.

Test subjects

2.8.2 These tests should be carried out with at least six able-bodied persons of the following heights and weights:

Height	Weight
1.4 m – 1.6 m	1 person under 60 kg 1 person over 60 kg
1.6 m – 1.8 m	1 person under 70 kg 1 person over 70 kg
over 1.8 m	1 person under 80 kg 1 person over 80 kg

.1 at least one and not more than two of the persons should be females with no more than one female in the same height range; and

.2 for the approval of the lifejackets, the test results obtained from each of the participating subjects should be acceptable except as provided otherwise.

Clothing

2.8.3 Each test subject should be tested wearing normal clothing. The test should be repeated with the test subject wearing heavy-weather clothing.

Test

2.8.4 After demonstration, the test subjects should correctly don lifejackets within a period of 1 min, without assistance.

Assessment

2.8.5 The observer should note:

.1 ease and speed of donning; and

.2 proper fit and adjustment.

2.9 *Water performance tests*

2.9.1 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. All tests should be carried out in fresh water under still conditions.

Test subjects

2.9.2 These tests should be carried out with at least six persons as described in 2.8.2. Only good swimmers should be used, since the ability to relax in the water is rarely otherwise obtained.

Clothing

2.9.3 Subjects should wear only swimming costumes.

Preparation for water performance tests

2.9.4 The test subjects should be made familiar with each of the tests set out below, particularly the requirement regarding relaxing and exhaling in the face-down position. The test subject should don the lifejacket, unassisted, using only the instructions provided by the manufacturer. The observer should note the points prescribed in 2.8.5.

Righting tests

2.9.5 The test subject should swim at least three gentle strokes (breast stroke) and then with minimum headway relax, with the head down and the lungs partially filled, simulating a state of utter exhaustion. The period of time should be recorded starting from the completion of the last stroke until the mouth of the test subject comes clear of the water. The above test should be repeated after the test subject has exhaled. The time should again be ascertained as above. The freeboard from the water surface to the mouth should be recorded with the test subject at rest.

Drop test

2.9.6 Without readjusting the lifejacket, the test subject should jump vertically into the water, feet first, from a height of at least 4.5 m. When jumping into the water, the test subject should be allowed to hold on to the lifejacket during water entry to avoid possible injury. The freeboard to the mouth should be recorded after the test subject comes to rest.

Assessment

2.9.7 After each of the water tests described above, the test subject should come to rest with the mouth clear of the water by at least 120 mm. The average of all subjects' trunk angles should be at least 30° back of vertical, and each individual subject's angle should be at least 20° back of vertical. The average of all subjects' faceplane (head) angles should be at least 40° above horizontal, and each individual subject's angle should be at least 30° above horizontal. In the righting test, the mouth should be clear of the water in not more than 5 s. The lifejacket should not become dislodged or cause harm to the test subject.

2.9.8 When evaluating the results of a test in accordance with 2.9.5, 2.9.6 and 2.9.7, the Competent Authority may, in exceptional circumstances, disregard the results of a test on a subject if the results show a very slight deviation from the specified criteria, provided the Competent Authority is satisfied that the deviation can be attributed to the unusual size and stature characteristics of the test subject and the results of tests on other subjects, chosen in accordance with 2.9.2, show the satisfactory performance of the lifejacket.

Swimming and water emergence test

2.9.9 All test subjects, without wearing the lifejacket, should attempt to swim 25 m and board a liferaft 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.

2.10 ***Children's lifejacket tests***

As far as possible, similar tests should be applied for approval of lifejackets suitable for children.

2.10.1 When conducting water performance tests under 2.9, child-size lifejackets should meet the following requirements for their critical flotation stability characteristics. The range of sizes for child-size lifejackets, should be considered based on the test results. Devices should be sized by height or by height and weight.

2.10.2 Test subjects should be selected to fully represent the range of sizes for which the device is to be approved. Devices for smaller children should be tested on children as small as approximately 760 mm tall and 9 kg mass. At least six test subjects should be used for each 380 mm and 16 kg of size range:

.1 Turning time. Each individual subject should turn face-up in not more than 5 s.

.2 Freeboard. The combined results for clearance of the mouth above the water for all subjects should average at least 90 mm; each individual subject under 1,270 mm and 23 kg should have at least 50 mm clearance, and each individual subject over 1,270 mm and 23 kg should have at least 75 mm clearance.

.3 Trunk angle. The average of all subjects' results should be at least 40° back of vertical, and each individual subject's result should be at least 20° back of vertical.

.4 Faceplane (head) angle. The average of all subjects' results should be at least 35° above horizontal, and each individual subject's result should be at least 20° above horizontal.

.5 Mobility. Mobility of the subject both in and out of the water should be given consideration in determining the acceptability of a device for approval.

2.11 *Tests for inflatable lifejackets*

2.11.1 Two inflatable lifejackets should be subjected to the temperature cycling test prescribed in 1.1 in the uninflated condition and should then be externally examined. The inflatable lifejacket materials should show no sign of damage such as shrinking, cracking, swelling, dissolution or change of mechanical qualities. The automatic and manual inflation systems should each be tested immediately after each temperature cycling test as follows:

.1 after the high temperature cycle (test in 1.1.1), the two inflatable lifejackets taken from a stowage temperature of +65°C, one should be activated using the automatic inflation system by placing it in sea water at a temperature of +30°C and the other should be activated using the manual inflation system; and

.2 after the low temperature cycle (test in 1.1.3), the two inflatable lifejackets taken from a stowage temperature of -30°C, one should be activated using the automatic inflation system by placing it in sea water at a temperature of -1°C and the other should be activated using the manual inflation system.

2.11.2 The test in 2.8 should be conducted using lifejackets both in the inflated and uninflated conditions.

2.11.3 The tests in 2.9 should be conducted using lifejackets that have been inflated both automatically and manually, and also with one of the compartments uninflated. The tests with one of the compartments uninflated should be repeated as many times as necessary to perform the test once with each compartment in the uninflated condition.

Tests of materials for inflatable bladders, inflation systems and components

2.11.4 The material used for the inflatable bladder, inflation system and components should be tested to establish that they are rot-proof, colour fast and resistant to deterioration from exposure to sunlight and that they are not duly affected by sea water, oil or fungal attack.

Material tests

2.11.5 Resistance to rot and illumination tested according to AATCC Method 30:1981 and ISO 105-B04:1988 Illumination should take place to Class 4-5.

2.11.6 Following exposure to rot or illumination tests above the tensile strength should be measured using the grab method given in ISO 5082. Minimum tensile strength should be not less than 300 N per 25 mm in the warp and weft direction.

Coated fabrics

2.11.7 Coated fabrics used in the construction of inflatable buoyancy chambers should comply with the following requirements:

.1 coating adhesion should be tested in accordance with ISO 2411:1991 by dropping the lifejacket from a height of 18 m into the water at 100 mm/min and should be not less than 50 N per 50 mm width;

.2 coating adhesion should be tested when wet following ageing according to ISO 188 with an exposure of 336 ± 0.5 h in fresh water at (70.0 ± 1.0)°C, following which the method at ISO 2411:1991 of dropping the lifejacket from a height of 18 m into the water at 100 mm/min and should not be less then 40 N per 50 mm width;

.3 tear strength should be tested in accordance with ISO 4674:1977 using method A1 and should not be less than 35 N;

.4 resistance to flex cracking should be tested in accordance with ISO 7854:1984 method A using 9,000 flex cycles, there should be no visible cracking or deterioration;

.5 breaking strength should be tested in accordance with ISO 1421:1977 using the CRE or CRT method, following conditioning for 24 ± 0.5 h at room temperature and should not be less than 200 N per 50 mm width**;**

.6 breaking strength should be tested in accordance with ISO 1421:1977 using the CRE or CRT method, following conditioning immersed in fresh water for 24 ± 0.5 h at room temperature and should not be less than 200 N per 50 mm width;

.7 elongation to break should be tested in accordance with ISO 1421:1977using the CRE or CRT method following conditioning at room temperature for 24 ± 0.5 h and should not be more than 60%;

.8 elongation to break should be tested in accordance with ISO 1421:1977using the CRE or CRT method following conditioning immersed in fresh water at room temperature for 24 ± 0.5 h and should not be more than 60%;

.9 the resistance to exposure to light when tested in accordance with ISO 105-BO2:1988 and the contrast between the unexposed and exposed samples should not be less than class 5;

.10 the resistance to wet and dry rubbing when tested in accordance with ISO 105-X12:1995 and should not be less than class 3;

.11 the resistance to sea water should not be less than class 4 in accordance with ISO 105-EO2:1978 and the change in colour of the specimen should not be less than class 4.

Operating head load test

2.11.8 The operating head load test should be carried out using two lifejackets, one lifejacket to be conditioned at -30°C for 8 h and the other at +65°C for 8 h. After mounting on the mannequin or the test form the lifejackets should be inflated, and a steady force of 220 ± 10 N applied to the operating head as near as possible to the point where it enters the buoyancy chamber. This load should be maintained for 5 min during which the direction and angle in which it is applied should be continuously varied. On completion of the test the lifejacket should remain intact and should hold its pressure for 30 min.

Pressure test

2.11.9 The inflatable buoyancy chambers should be capable of withstanding an internal over pressure at ambient temperature. A lifejacket should be inflated using the manual method of inflation, after inflation the relief valves should be disabled and a fully charged gas cylinder according to the manufacturers recommendation should be fitted to the same inflation device and fired. The lifejacket should remain intact and should hold its pressure for 30 min. The lifejackets should show no signs of damage such as cracking, swelling or changes of mechanical qualities and that there has been no significant damage to the lifejacket inflation component. All fully charged gas cylinders used in this test should be sized according to the markings on lifejacket.

2.11.10 With one buoyancy chamber inflated, the operating head on the opposite buoyancy chamber should be fired manually, using a fully charged gas cylinder according to the manufacturers recommendations. The operation of the relief valves should be noted to ensure that the excess pressure is relieved. The lifejacket should remain intact and should hold its pressure for 30 min. The lifejackets should no signs of damage such as cracking, swelling or changes of mechanical qualities and that there has been no significant damage to the lifejacket inflation component.

2.11.11 Air retention test: One inflation chamber of a lifejacket is filled with air until air escapes from the over-pressure valve or, if the lifejacket does not have an over-pressure valve, until its design pressure, as stated in the plans and specifications, is reached. After 12 h the drop in pressure should not be greater than 10%. This test is then repeated as many times as necessary to test a different chamber until each chamber has been tested in this manner.

Compression test

2.11.12 The inflatable lifejacket packed in the normal manner should be laid on a table. A bag containing 75 kg of sand and having a base of 320 mm diameter should be lowered onto the lifejacket from a height of 150 mm in a time of 1 s. This should be repeated ten times, after which the bag should remain on the jacket for not less than 3 h. The lifejacket should be inflated by immersion into water and should inflate fully; the jacket should be inspected to ensure that no swelling or change of mechanical properties has occurred; and the jacket should be checked for leaks.

Test of metallic components

2.11.13 Metal parts and components of a lifejacket should be corrosion-resistant to sea water and should be tested in accordance with ISO 9227:1990 for a period of 96 h. The metal components should be inspected and should not be significantly affected by corrosion, or affect any other part of the lifejacket and should not impair the performance of the lifejacket.

2.11.14 Metal components should not affect a magnetic compass of a type used in small boats by more than 1°, when placed at a distance of 500 mm from it.

Inadvertent inflation test

2.11.15 The resistance of an automatic inflation device to inadvertent operation should be assessed by exposing the entire lifejacket to sprays of water for fixed period. The lifejacket should be fitted correctly to a free-standing mannequin of adult size, with a minimum shoulder height of 1,500 mm. The lifejacket should be deployed in the mode in which it is worn ready for use but not deployed as used in the water (i.e. if it is equipped with a cover which is normally worn closed, then the cover should be closed for the test. Two sprays should be installed so as to spray fresh water onto the lifejacket, as shown in the diagram. One should be positioned 500 mm above the highest point of the lifejacket, and at an angle of 15° from the vertical centre line of the mannequin and the bottom line of the lifejacket. The other nozzle should be installed horizontally at a distance of 500 mm from the bottom line of the lifejacket, and points directly at the lifejacket. These nozzles should have a spray cone of 30°, each orifice being 1.5 ± 0.1 mm in diameter, and the total area of the orifice should be 50 ± 5 mm², the orifice being evenly spread over the spray nozzle area.

2.11.16 The air temperature should be 20°C, and water should be supplied to the sprays at a pressure of 0.3 kPa to 0.4 kPa, a flow of 600 *l*/h, and a temperature of 18°C to 20°C.

2.11.17 The sprays should be turned on, and the lifejacket exposed to the following series of test to access the ability of the jacket to resist inadvertent inflation:

.1 5 min with the high spray on the front of the lifejacket;

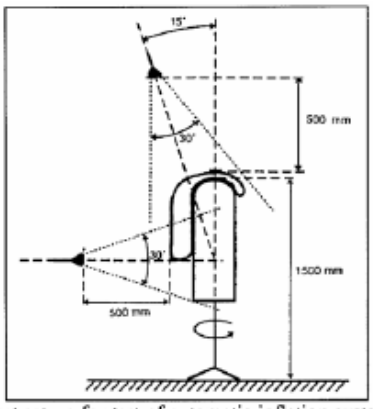
.2 5 min with the high spray on the left side of the lifejacket;

.3 5 min with the high spray on the back of the lifejacket; and

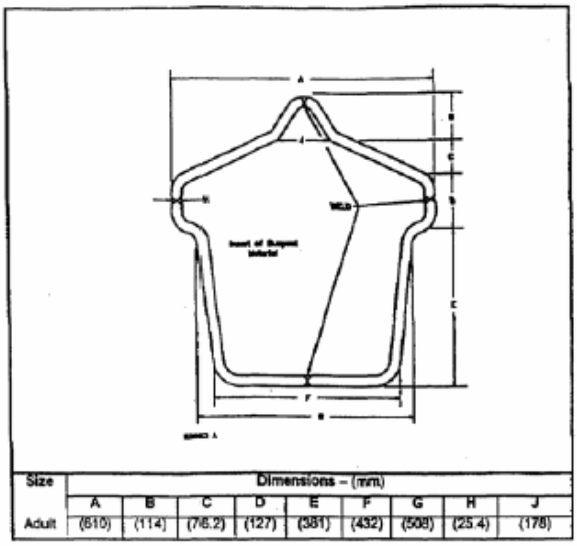
.4 5 min with the high spray on the right side of the lifejacket.

2.11.18 During exposures specified in 2.11.17.1, 2.11.17.2 and 2.11.17.4 above, the horizontal spray should be applied for 10 periods of 3 s each to the front, left or right sides (but not back) as with the high spray.

Alternative former



Test set-up for test of automatic inflation system



Size	Dimensions – (mm)								
	A	B	C	D	E	F	G	H	J
Adult	(610)	(114)	(76.2)	(127)	(381)	(432)	(508)	(25.4)	(178)

2.11.19 After completing the above test the lifejacket should be removed from the mannequin and immersed in water to verify that the auto-inflation system functions.

PART 2 – PRODUCTION AND INSTALLATION TESTS

1 General

1.1 Representatives of the Competent Authority should make random inspections 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 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 installed in a vessel.

2 Individual buoyancy equipment for lifejackets

Production tests

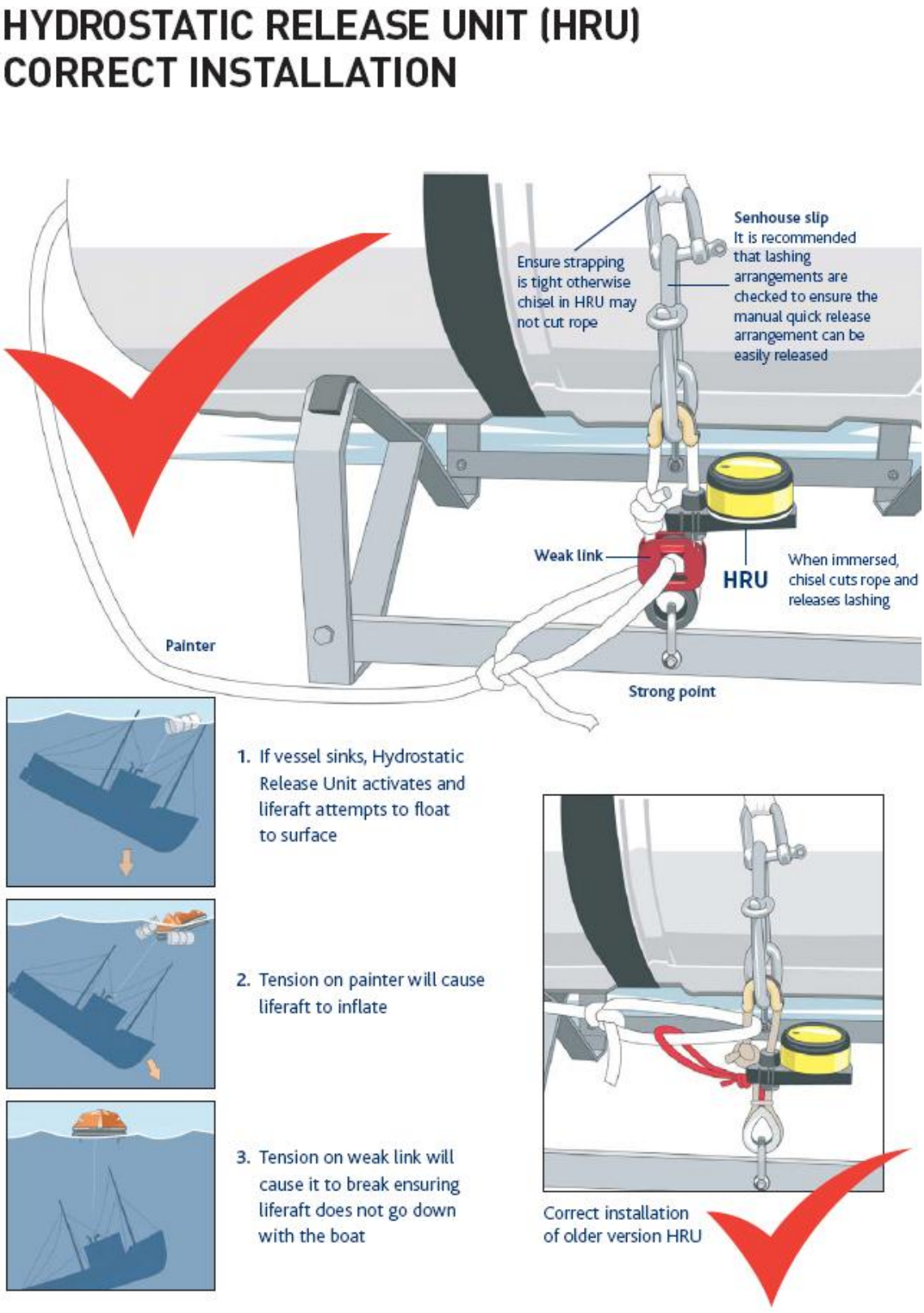
2.1 Manufacturers should be required to carry out a buoyancy test on at least 0.5% of each batch of lifejackets produced, subject to a minimum of one from every batch.

Inspections by the Competent Authority

2.2 Inspections by a representative of the Competent Authority should be made at intervals of at least one per 6,000 lifejackets produced, subject to a minimum of one inspection per calendar quarter. When the manufacturer's quality control program results in lifejackets that are consistently free of defects, the rate of inspection may be reduced to one in every 12,000. 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. Inspectors should also be satisfied that the flotation tests are being conducted satisfactorily; if this is not the case, a flotation test should be undertaken.

ANNEX XXIII

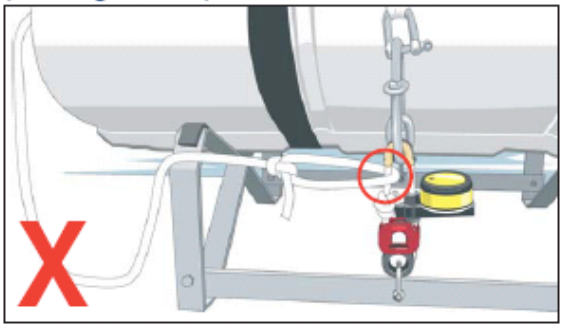
CORRECT SECURING OF HYDROSTATIC RELEASE UNITS*



* Source: Royal National Lifeboat Institution (United Kingdom).

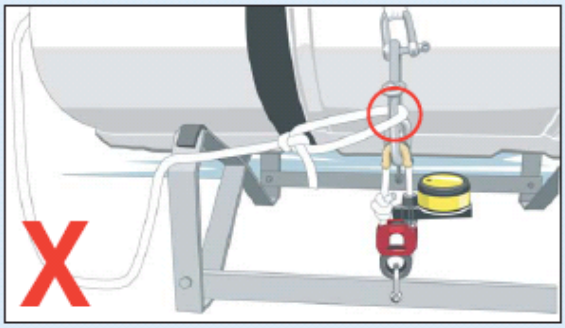
INCORRECT INSTALLATION

Painter secured to HRU
(not through weak link)



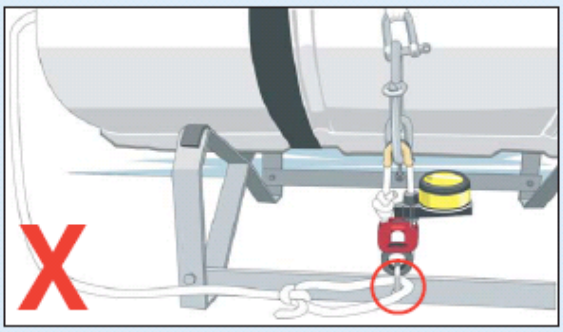
1. HRU will activate
2. Liferaft will be released but will **NOT** automatically inflate and will eventually drift away

Painter secured to senhouse slip



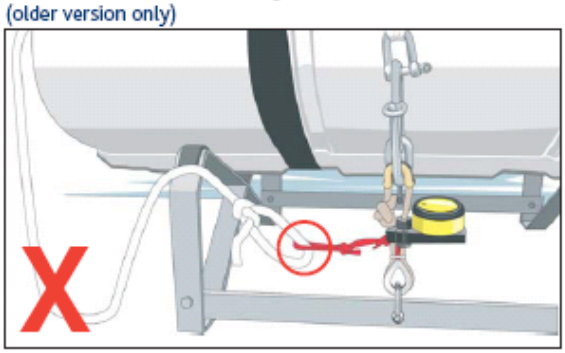
1. HRU will activate
2. Liferaft will float free and eventually inflate
3. Because the painter is secured to the slip, the liferaft will **NOT** be released to the surface

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

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. Such training should include, as appropriate:

.1 types of emergencies which may occur, such as collisions, fire, grounding and foundering;
.2 types of life-saving appliances normally carried on vessels;
.3 need to adhere to the principles of survival;
.4 value of training and drills;
.5 first aid training;
.6 need to be ready for any emergency and to be constantly aware of;
.7 location of each crew member's own and spare lifejackets;
.8 means of escape;
.9 recovering and caring for a person who has fallen overboard;
.10 actions to be taken in respect to lifting persons from vessels and survival craft by helicopter;
.11 actions to be taken when abandoning ship, including:
  .1 putting on suitable clothing;
  .2 donning of lifejacket; and
  .3 collecting additional protection such as blankets, time permitting;
  .4 how to board survival craft from vessel and water; and
  .5 actions to be taken when in the water, such as:
    .1 fire or oil on the water;
    .2 cold conditions; and
    .3 shark-infested waters;
.12 how to right a capsized survival craft;
.13 actions to be taken when aboard a survival craft, such as:
  .1 protection against cold or extreme heat;
  .2 using a drogue or sea anchor;
  .3 keeping a look-out;
  .4 protection against seasickness;
  .5 proper use of fresh water and food;
  .6 effects of drinking sea water; and
  .7 importance of 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 remaining, so far as possible, in the vicinity;
.18 main dangers to survivors and the general principles of survival; and
.19 actions to be taken in respect of fire fighting appliances.

ANNEX XXV

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.

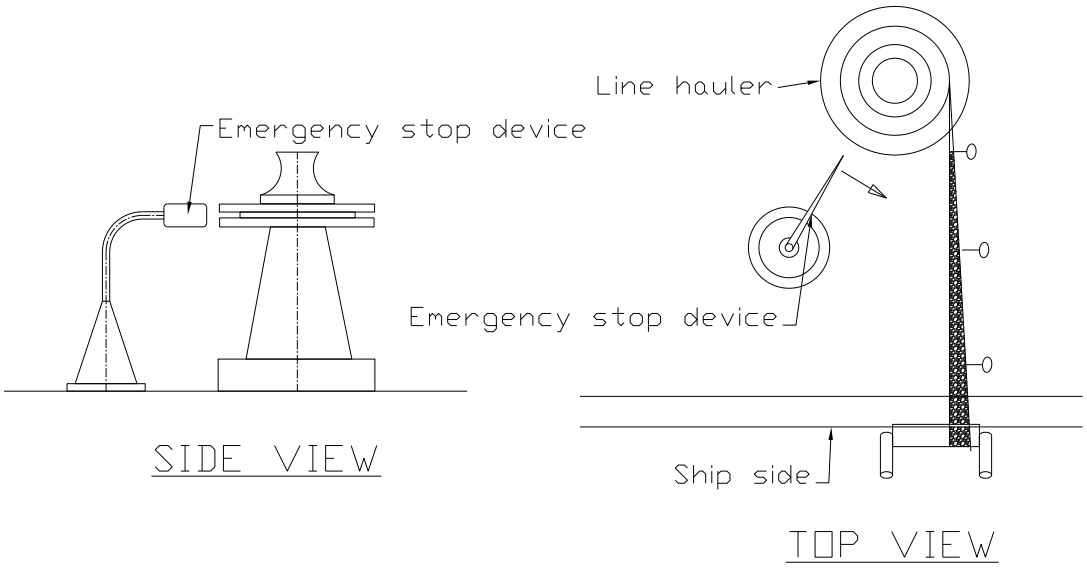
1 Emergency stop safety devices on winches and hauling equipment

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 which upon use represents a danger for the operator if dragged towards or into the equipment during working operations should be fitted with emergency stop safety devices. The emergency stop should be provided at the winch and at the remote station as well as in the wheelhouse. Emergency stops on the equipment should be 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 cause an automatic stop of 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 onboard. It will normally not be sufficient to have emergency shut of buttons that must be manually activated, due to the fact that in an emergency situation on a single-handed vessel the person to activate this may have his hands, feet, or clothing trapped in the fishing gear and therefore is unable to activate the emergency stop button himself.

Illustrations



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 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, which could be uncoupled from the drive, should be furnished with a separate brake independent of the brake connected with the drive.

2.4 Where 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 method 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 should be so arranged as to prevent simultaneous operation. The operator should have a clear view of the winch and adjacent area from either position. 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 remote from the winch to protect fishermen working in places which 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 it 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 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 which 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 that can be 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 not exceed 320 N.

5.12 The design parameters of the equipment should not be exceeded.

ANNEX XXVI

THE GMDSS SYSTEM*

General

Vessels intended to comply completely with the GMDSS system can use the information listed below related to a complete GMDSS installation as reference. Actual minimum requirements are mentioned in the recommendations.

1.1 The Global Maritime Distress and Safety System (GMDSS)

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, will be rapidly alerted to a distress incident so that they can assist in a co-ordinated Sea Air Rescue operation with the minimum delay.

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.

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.

The equipment to be carried depends on the sea area in which vessels operate. There are four sea areas:

- **A1** means an area within the radiotelephone coverage of at least one VHF coast station in which continuous alerting by Digital Selective Calling is available;
- **A2** means an area within the radiotelephone coverage of at least one MF coast station in which continuous alerting by DSC is available;
- **A3** means an area within the coverage of an Inmarsat geostationary satellite in which continuous alerting is available and;
- **A4** means an area outside of sea areas Al, A2 and A3.

1.2 Functional requirements

Every vessel, while at sea, complying with the GMDSS system should be capable:

a. of transmitting ship-to-shore alerts;
b. of receiving shore-to-ship distress alerts;
c. of transmitting and receiving ship-to-ship distress alerts;

* Drawn from Chapter 9 of the FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005

d. of transmitting and receiving search and rescue co-ordinating communications;
e. of transmitting and receiving on-scene communications;
f. of transmitting and receiving maritime safety information;
g. of transmitting and receiving ship-to-ship communications.

1.3 Installation, location and control of radio equipment

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.

Where it is feasible to comply with the functional requirements prescribed above by means of a fixed installation, every radio installation should:

a. be so located that no harmful interference of mechanical, electrical or other origin affects its proper use, and so as to ensure electromagnetic compatibility and avoidance of harmful interaction with other equipment and systems;

b. be so located as to ensure the greatest possible degree of safety and operational availability;

c. be protected against harmful effects of water, extremes of temperature and other adverse environmental conditions;

d. be clearly marked with the call sign, the ship station identity and other codes as applicable for the use of the radio installation.

Control of the VHF radiotelephone channels, required for navigational safety, should be immediately available in the wheelhouse, convenient to the steering position.

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 to enable each radio installation to perform effectively its intended communication function.

Where it is not feasible to comply with the requirements prescribed by above by means of a fixed installation, every radio installation should:

a. be an approved portable waterproof transmitter and receiver;

b. be provided with a suitable antenna; and

c. be provided with a fully charged sealed reserve power pack at all times while the vessel is at sea.

1.4 Radio equipment to be provided for all sea areas

Every vessel should be provided with:

a. 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);

b. a satellite emergency position-indicating radio beacon (satellite EPIRB) which should be:

   i capable of transmitting a distress alert either through the polar orbiting satellite service operating in the 406 MHz and 121.5 MHz bands, or the 1.6 GHz band;
   ii installed in a readily accessible position;
   iii ready to be manually released and capable of being carried by one person into a survival craft;
   iv capable of floating free if the vessel sinks and of being automatically activated when afloat; or
   v capable of being activated manually.

1.5 Additional radio equipment to be provided for sea areas A1 and A2

In addition to meeting the requirements of 1.4, 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:

   i 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
   ii 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 1.i;

3. an MF radio installation capable of transmitting and receiving, for distress and safety purposes, on the frequencies:

   i 2187.5 kHz (assigned frequency) using DSC; and
   ii 2182 kHz using radiotelephony; and

4. a radio installation capable of maintaining a continuous DSC watch on the frequency 2187.5 kHz (assigned frequency) which may be separate from, or combined with, that required by 3.i.

1.6 Radio watches

Every vessel while at sea should maintain a continuous watch:

i on VHF channel 16;
ii on VHF DSC channel 70, if the vessel is fitted with a VHF DSC installation; and
iii on the distress and safety DSC frequency 2187.5 kHz (assigned frequency), if the vessel is fitted with an MF DSC radio installation.

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.

1.7 Sources of energy

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.

A reserve source or sources of energy should be provided on every vessel complying with the provisions of 1.4, 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 1.4, and any of the additional loads mentioned in 1.5 for a period of at least six hours.

The reserve source or sources of energy should be independent of the propelling power of the vessel and the vessel's electrical system.

The reserve source or sources of energy may be used to supply the electrical lighting required by 1.3.

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

a. a means of automatically charging such batteries should be provided, which should be capable of recharging them to minimum capacity requirements within 10 h; and

b. 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.

The location and installation of accumulator batteries which provide a reserve source of energy should be such as to ensure:

a. the highest degree of service;

b. a reasonable lifetime;

c. reasonable safety;

d. that battery temperatures remain within the manufacturer's specifications whether under charge or idle;

e. that when fully charged, the batteries will provide at least the minimum required hours of operation under all weather conditions; and

f. that the batteries are situated in the upper part of the vessel.

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 its proper performance, 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.

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:

> ½ of the current consumption necessary for transmission + the current consumption necessary for reception + the current consumption of any additional loads.

1.8 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.

1.9 Serviceability and maintenance requirements

Equipment should be so designed that the main units can be replaced readily, without elaborate recalibration or readjustment.

Where applicable, equipment should be so constructed and installed that is readily accessible for inspection and on-board maintenance purposes.

Adequate information should be provided to enable the equipment to be properly operated and maintained.

1.10 Radio personnel

Every vessel should carry personnel qualified for distress and safety radio communication purposes as specified below.

The personnel should be holders of at least the Restricted Certificate of Competency in Radiotelephony (VHF) granted by the relevant authorities.

In the case of vessels complying with the additional requirements of 1.5, the personnel should be holders of at least the Radio Operator's Long Range Certificate granted by the relevant authorities, or an equivalent recognized certificate approved by the Competent Authority.

ANNEX XXVII

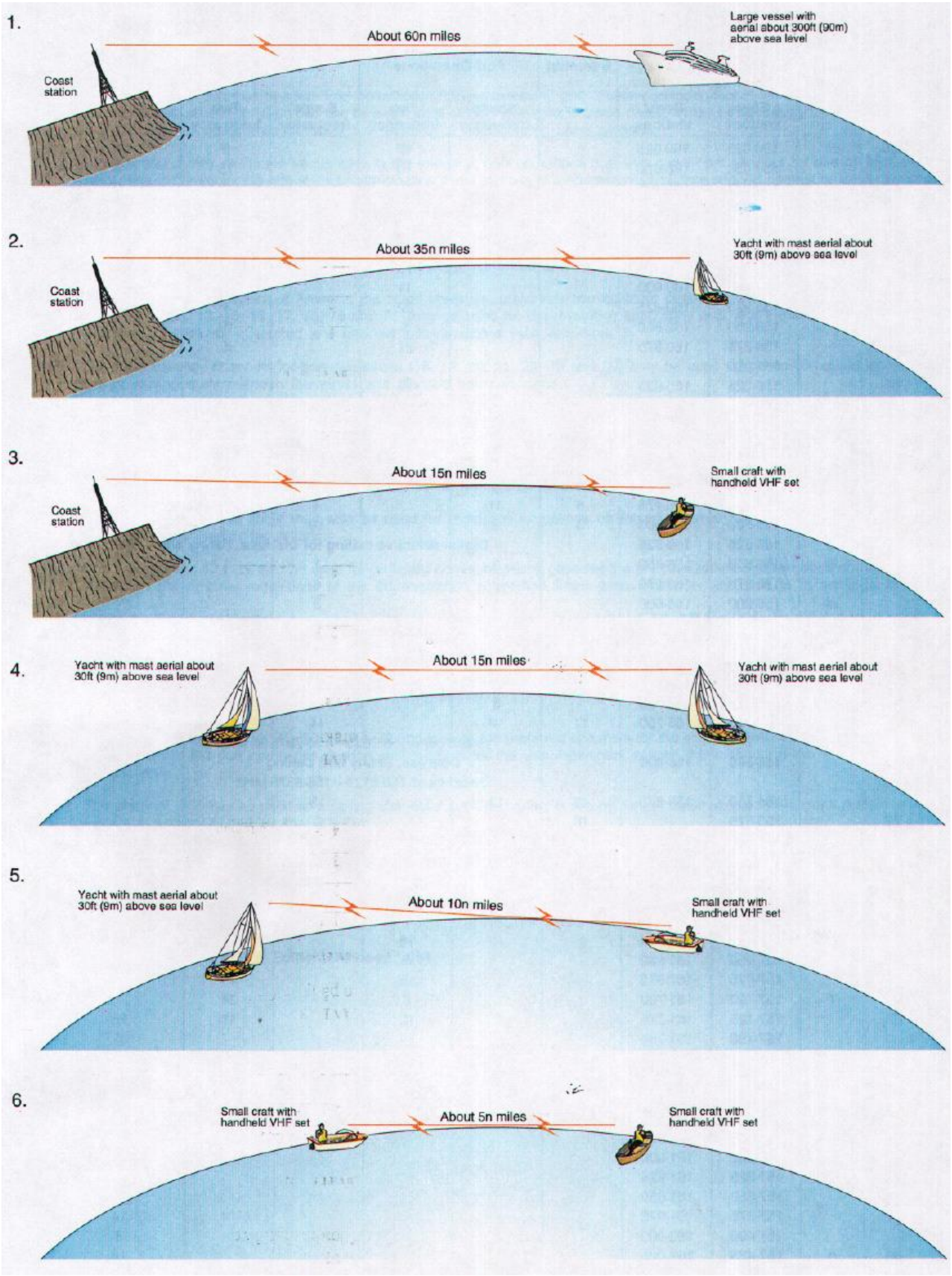
RANGE OF VHF FOR VARIOUS TRANSMITTING/RECEIVING UNITS

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 no 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 grater ranges than normally attained.

This atmospheric refraction results in the radio waves tending to follow curved rather than straight paths.

The bending or refraction arises from a change of wave speed as the waves propagate through the atmosphere, the waves changing 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.

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, amongst 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.


1.
About 60n miles
Large vessel with aerial about 300ft (90m) above sea level
Coast station
2.
About 35n miles
Yacht with mast aerial about 30ft (9m) above sea level
Coast station
3.
About 15n miles
Small craft with handheld VHF set
Coast station
4.
Yacht with mast aerial about 30ft (9m) above sea level
About 15n miles
Yacht with mast aerial about 30ft (9m) above sea level
5.
Yacht with mast aerial about 30ft (9m) above sea level
About 10n miles
Small craft with handheld VHF set
6.
Small craft with handheld VHF set
About 5n miles
Small craft with handheld VHF set

ANNEX XXVIII

USE OF MOBILE TELEPHONES IN DISTRESS AND SAFETY COMMUNICATIONS

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.

A growing numbers of incidents have occurred where vessels requiring assistance from rescue services have used inland emergency service, or alternatively telephoned direct to request assistance. This procedure through mobile telephone is strongly discouraged.

Use of mobile telephones bypasses the existing dedicated well established international marine distress communications organization on VHF Ch 16.

Cellular radio (mobile telephone) coverage offshore is limited and does not afford the same extensive safety coverage as VHF Ch 16 (monitored 24 hours a day). Consequently a greater risk exists of communications difficulties or even a complete breakdown if an accident should occur at the edge of a cell coverage area.

Subsequent on-scene casualty communications would be restricted and delayed if mobile telephone communications were maintained throughout.

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.

It is not possible to communicate direct to another vessel able to render assistance unless that vessel is also fitted with a mobile telephone and the telephone number is known.

Request for assistance cannot be monitored by other vessels in a position to render assistance. Valuable time would be lost whilst the relevant Coastguard Rescue Co-ordination Centre receives and then re-broadcasts the information to all vessels on the appropriate distress channel(s).

In the interest of Safety of Life At Sea (SOLAS), owners of vessels are urged to carry MARINE communications equipment onboard and to use this medium as the primary means of Distress and Safety communications.

ANNEX XXIX

SAFE NAVIGATION AND AVOIDANCE OF DANGEROUS SITUATIONS

The Competent authority expects all skippers of a fishing vessel to make a careful assessment of any proposed voyage taking into account all dangers to navigation, weather forecasts, tidal predictions and other relevant factors including the competence of the crew.

An appropriate voyage plan should be left with a responsible person on shore. The voyage plan will help guide search and rescue teams in the event of an emergency. An oral message, in some circumstances may be enough; however a written message is recommended.

An example of a voyage plan sheet may be:

Voyage plan sheet **Vessel ……Call sign……Mobile……**	
Departure date and time	
Vessel endurance in hours and days	
Intended fishing areas	
Proposed routes	
Estimated date and time of return	
Number of persons on board	
Times of radio calls to person holding plan	
Probable port of refuge	
If fishing with another vessel, name of other vessel	

ANNEX XXX

ELECTRONIC CHART SYSTEMS - DIFFERENCES

Differences between ECDIS and RCDS

1 The IMO Maritime Safety Committee, at its seventieth session (7 to 11 December 1998), adopted amendments to the performance standards for Electronic Chart Display and Information Systems (ECDIS) to include the use of Raster Chart Display Systems (RCDS).

2 These amendments permit ECDIS equipment to operate in two modes:

.1 the ECDIS mode, when ENC data is used; and

.2 the RCDS mode, when ENC data is not available.

However, the RCDS mode does not have the full functionality of ECDIS, and can only be used together with an appropriate portfolio of up-to-date paper charts.

3 The mariners' attention is therefore drawn to the following limitations of the RCDS mode:

.1 unlike ECDIS where there are no chart boundaries, RCDS is a chart-based system similar to a portfolio of paper charts;

.2 Raster navigational chart (RNC) data, itself, will not trigger automatic alarms (e.g. anti-grounding). However, some alarms can be generated by the RCDS from user-inserted information. These can include:

.1 clearing lines;

.2 vessel safety contour lines;

.3 isolated dangers; and

.4 danger areas;

.3 horizontal datums and chart projections may differ between RNCs. Mariners should understand how the chart horizontal datum relates to the datum of the position fixing system. In some instances, this may appear as a shift in position. This difference may be most noticeable at grid intersections and during route monitoring;

.4 chart features cannot be simplified or removed to suit a particular navigational circumstance or task at hand. This could affect the superimposition of radar/ARPA;

.5 without selecting different scale charts, the look-ahead capability may be somewhat limited. This may lead to some inconvenience when determining range and bearing or the identity of distant objects;

.6 orientation of the RCDS display to other than chart-up, may affect the readability of chart text and symbols (e.g., course-up, route-up);

.7 it may not be possible to interrogate RNC features to gain additional information about charted objects;

.8 it is not possible to display a vessel's safety contour or safety depth and highlight it on the display, unless these features are manually entered during route planning;

.9 depending on the source of the RNC, different colours may be used to show similar chart information. There may also be differences in colours used during day and night-time;

.10 an RNC should be displayed at the scale of the paper chart. Excessive zooming in or zooming out can seriously degrade RCDS capability, for example, by degrading the legibility of the chart image; and

.11 mariners should be aware that in confined waters, the accuracy of chart data (i.e., paper charts, ENC or RNC data) may be less than that of the position-fixing system in use. This may be the case when using differential GNSS. ECDIS provides an indication in the ENC which allows a determination of the quality of the data.

Other electronic chart systems

4 Other forms of electronic chart systems not conforming to the performance standards for ECDIS or RCDS are called Electronic Chart Systems (ECS). There are no official performance standards for such systems. An ECS may not be used as a substitute for official paper charts, and vessels fitted with an ECS are legally required to carry suitable up-to-date official paper charts. Examples of ECS include radar systems incorporating videomaps as well as stand-alone video plotters.

ANNEX XXXI

METAREAS/NAVAREAS

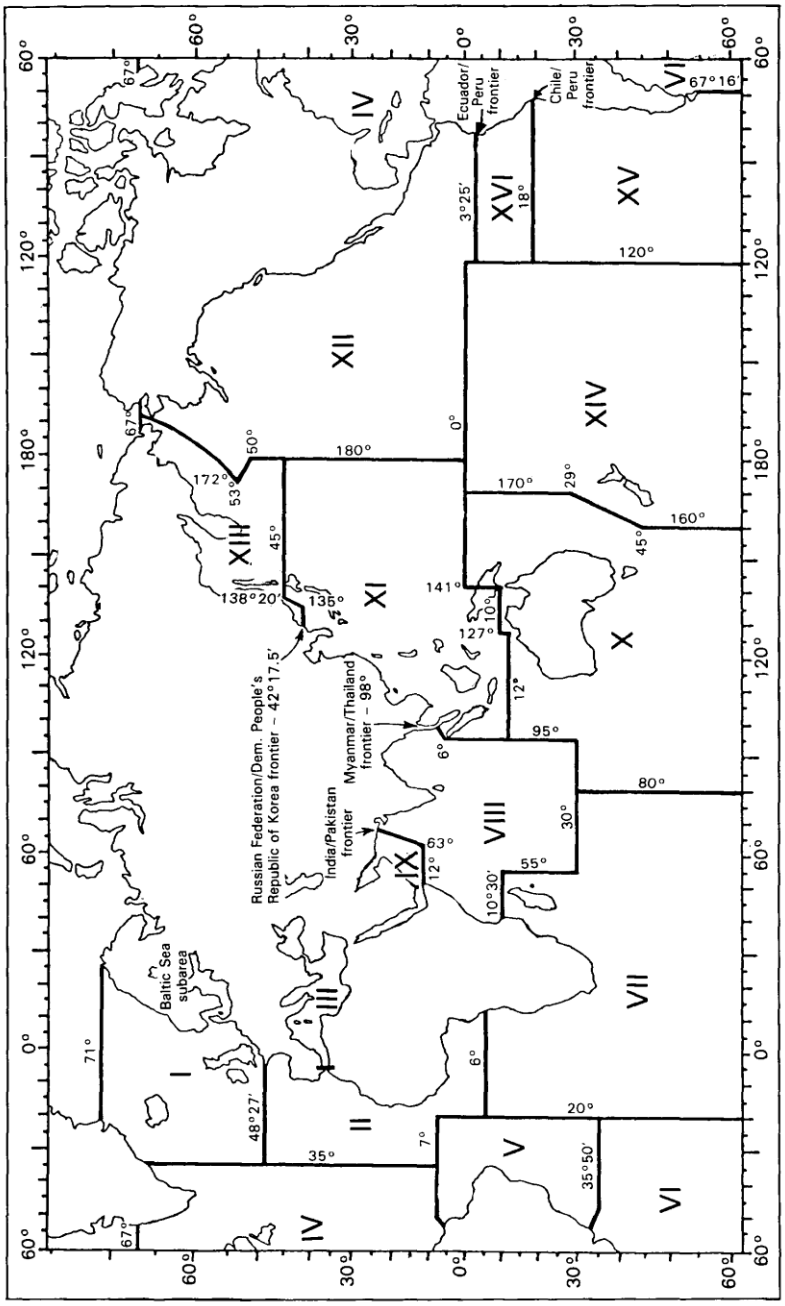
A NAVAREA is a geographical sea area, as shown in the appendix, established for the purpose of co-ordinating the transmission of radio navigational warnings. Where appropriate, the term NAVAREA followed by an identifying roman numeral may be used as a short title, e.g. NAVAREA I. The delimitation of such areas is not related to and should not prejudice the delimitation of any boundaries between States. In total there are 16 NAVAREAs.

METAREAs are the same as the NAVAREAs shown in the appendix.

For each area, a NAVAREA Co-ordinator co-ordinates the broadcasting of navigational warnings, and a Meteorological Issuing Service co-ordinates the meteorological information throughout that area.

Appendix

Geographical areas for co-ordinating and promulgating NAVAREA warnings



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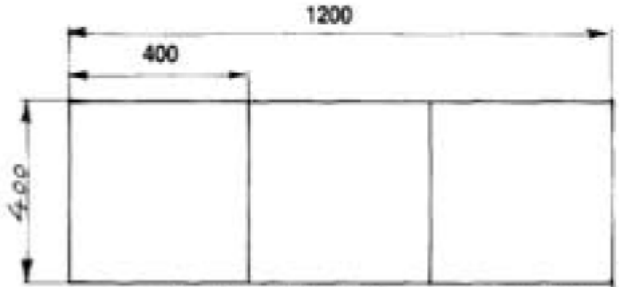
ANNEX XXXII

RADAR REFLECTOR

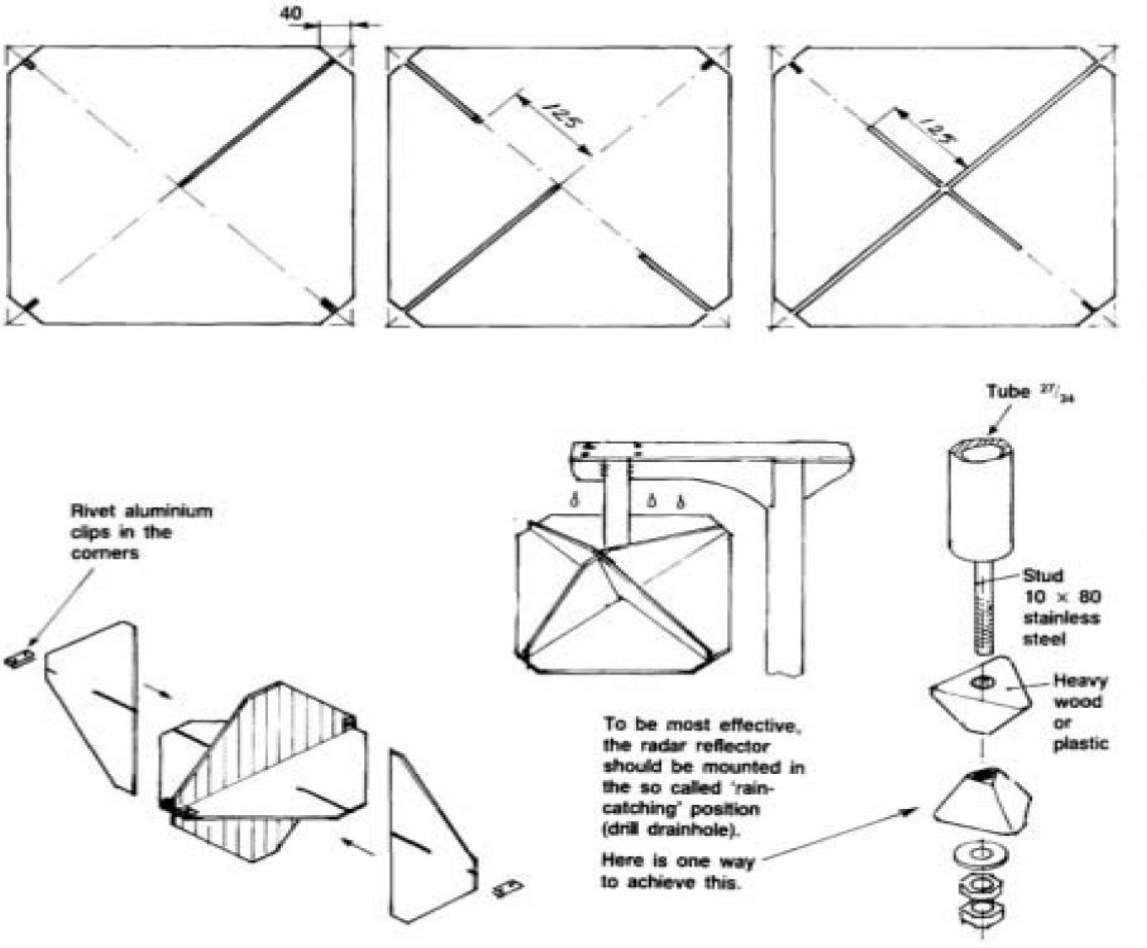
Small vessels should be visible on the radars of other vessels if they are not to be run down. Radar beams transmitted by other vessels must be reflected by small vessels and since a GRP or wooden vessel will reflect radar beams poorly, a small vessel needs a special radar reflector; here is how one can be made:

A small boat must be seen on the radar of a large ship at night if it is not to be run down. The radar beams sent by the big ship must be reflected by the small boat. Since an FRP or wooden boat reflects radar beams poorly, the small boat needs a special radar reflector.

Here is how it is made:



Radar reflective material minimum 1.6 mm (16 SWG)



ANNEX XXXIII

EQUIPMENT REQUIRED TO COMPLY WITH COLLISION REGULATIONS

Rule 22

Visibility of lights

The lights prescribed in the 1972 COLREGS should 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.

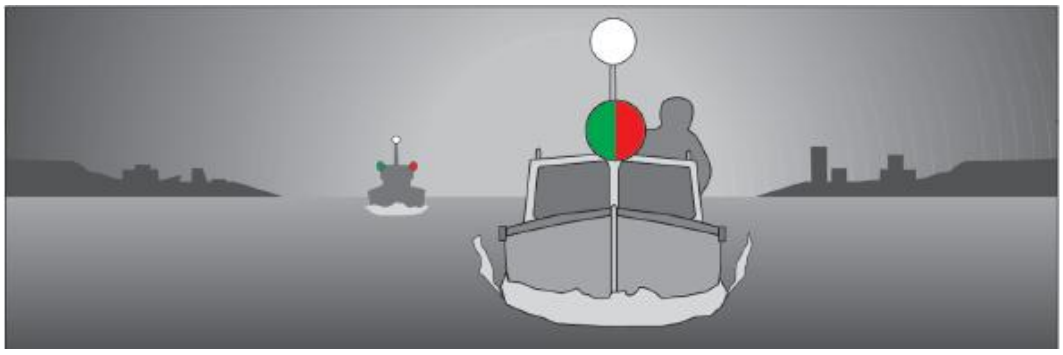
Rule 23

Power-driven vessels underway

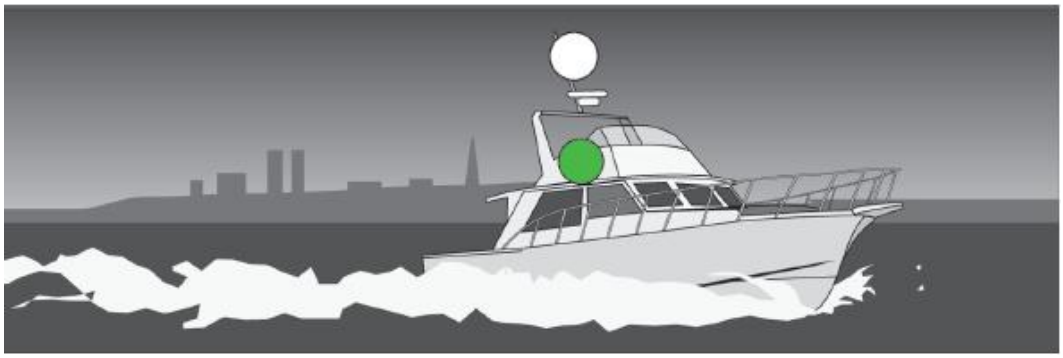
(a) A power-driven vessel underway should exhibit:

(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 should not be obliged to exhibit such light but may do so;
(iii) sidelights;
(iv) a sternlight.

...



(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 should, if practicable, also exhibit sidelights;

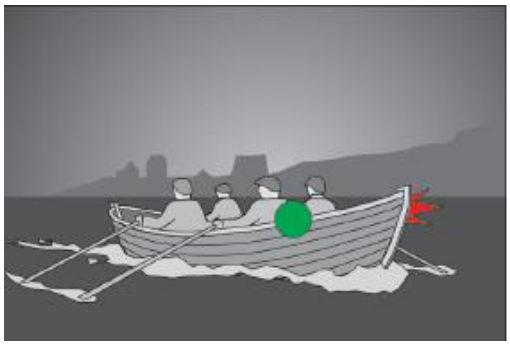
(iii) the masthead light or all-round white light on a power-driven vessel of less than 12 m in length may be displaced from the fore-and-aft centreline of the vessel if centreline fitting is not practicable, provided that the sidelights are combined in one lantern which should be carried on the fore-and-aft centreline 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.

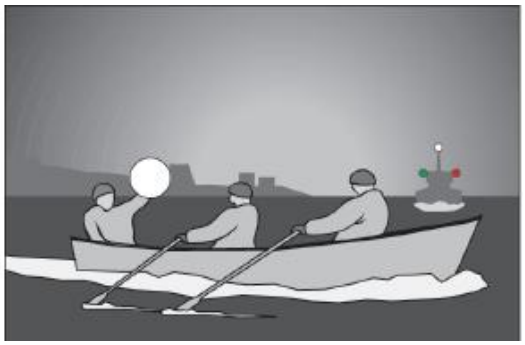
Rule 25

Sailing vessels underway and vessels under oars

(a) A sailing vessel underway should 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 should 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 should, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule, but if she does not, she should have ready at hand an electric torch or lighted lantern showing a white light which should 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 should have ready at hand an electric torch or lighted lantern showing a white light which should be exhibited in sufficient time to prevent collision.

(e) A vessel proceeding under sail when also being propelled by machinery should 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, should 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, should 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 should 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 should 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;

(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;

[*] 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.).

(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.

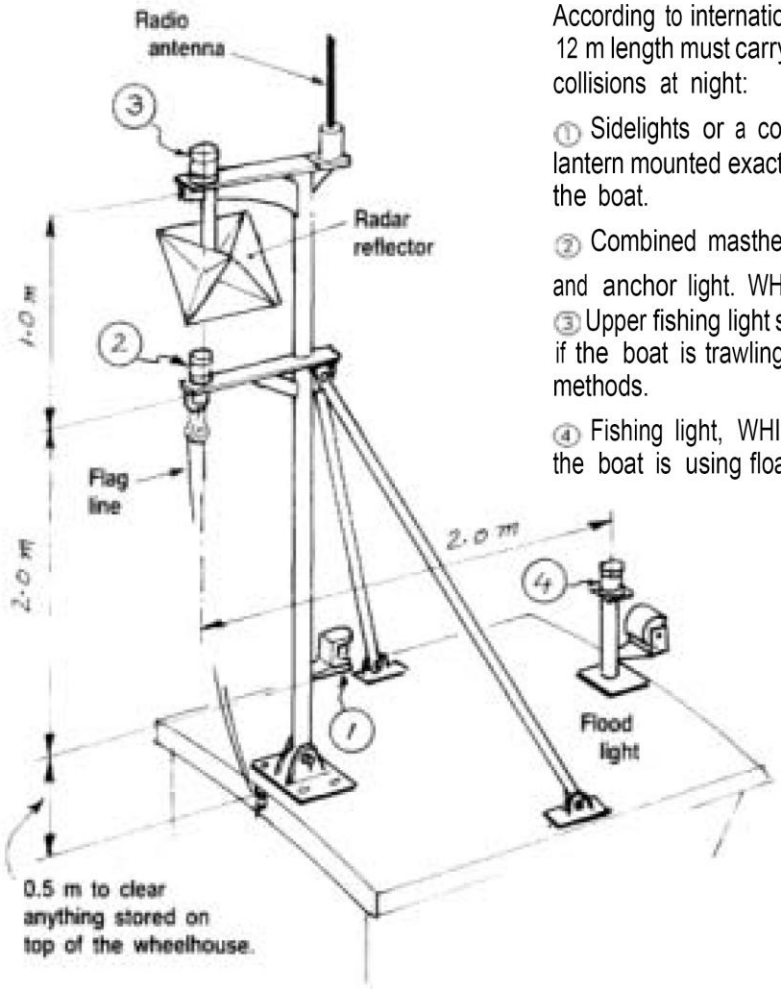
(e) A vessel when not engaged in fishing should not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

Rule 35

Sound signals in restricted visibility

…

(j) A vessel of less than 12 m in length should not be obliged to give the signals prescribed in Rule 35 but, if she does not, should make some other efficient sound signal at intervals of not more than 2 minutes.



According to international rules, fishing boats under 12 m length must carry the following lights to prevent collisions at night:

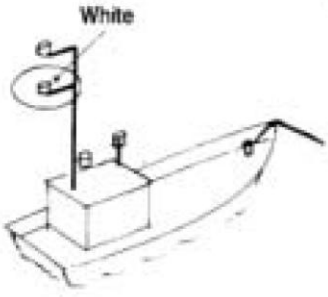
① Sidelights or a combined (RED and GREEN) lantern mounted exactly parallel to the centre line of the boat.

② Combined masthead lantern, lower fishing light and anchor light. WHITE showing all around.

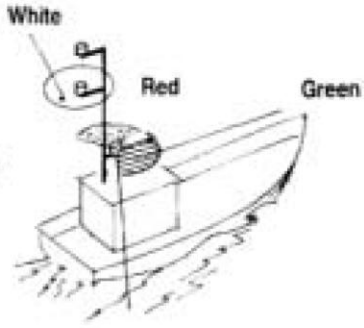
③ Upper fishing light showing all around – GREEN if the boat is trawling, RED for other fishing methods.

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.

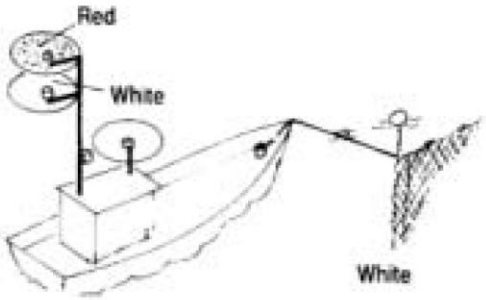
All lights must be fixed at the minimum distances shown in the drawing. All lights must be approved for boats upto 12 m and have bulbs of 18 watts.



Boat at anchor, showing WHITE anchor light



Boat under power, showing RED/GREEN sidelights and WHITE masthead light.



Boat with floating fishing gear extending more than 150 m, showing top RED and lower WHITE fishing light and WHITE directional light.

ANNEX XXXIV

INTERNATIONAL CODE OF SIGNALS

INTERNATIONAL CODE OF SIGNALS

ALFA • –	I HAVE A DIVER DOWN; KEEP WELL CLEAR AT SLOW SPEED.
BRAVO – • • •	I AM TAKING IN, OR DISCHARGING, OR CARRYING DANGEROUS GOODS.
CHARLIE – • – •	YES (AFFIRMATIVE OR 'THE SIGNIFICANCE OF THE PREVIOUS GROUP SHOULD BE READ IN THE AFFIRMATIVE').
DELTA – • •	KEEP CLEAR OF ME; I AM MANOEUVRING WITH DIFFICULTY.
ECHO •	I AM ALTERING MY COURSE TO STARBOARD.
FOXTROT • • – •	I AM DISABLED; COMMUNICATE WITH ME.
GOLF – – •	I REQUIRE A PILOT. WHEN MADE BY FISHING VESSELS OPERATING IN CLOSE PROXIMITY ON FISHING GROUNDS IT MEANS 'I AM HAULING NETS'.
HOTEL • • • •	I HAVE A PILOT ON BOARD.
INDIA • •	I AM ALTERING MY COURSE TO PORT.
JULIETT • – – –	I AM ON FIRE AND HAVE A DANGEROUS CARGO ON BOARD; KEEP WELL CLEAR OF ME.
KILO – • –	I WISH TO COMMUNICATE WITH YOU.
LIMA • – • •	YOU SHOULD STOP YOUR VESSEL INSTANTLY.
MIKE – –	MY VESSEL IS STOPPED AND MAKING NO WAY THROUGH THE WATER.
NOVEMBER – •	NO (NEGATIVE OR 'THE SIGNIFICANCE OF THE PREVIOUS GROUP SHOULD BE READ IN THE NEGATIVE').
OSCAR – – –	MAN OVERBOARD.
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'.
QUEBEC – – • –	MY VESSEL IS HEALTHY, AND I REQUEST FREE PRATIQUE.
ROMEO • – •	(NO SINGLE LETTER MEANING)
SIERRA • • •	I AM OPERATING ASTERN PROPULSION.
TANGO –	KEEP CLEAR OF ME; I AM ENGAGED IN PAIR TRAWLING.

UNIFORM • • –	YOU ARE RUNNING INTO DANGER.
VICTOR • • • –	I REQUIRE ASSISTANCE.
WHISKEY • – –	I REQUIRE MEDICAL ASSISTANCE.
X-RAY – • • –	STOP CARRYING OUT YOUR INTENTIONS AND WATCH FOR MY SIGNALS.
YANKEE – • – –	I AM DRAGGING MY ANCHOR.
ZULU – – • •	I REQUIRE A TUG. WHEN MADE BY FISHING VESSELS OPERATING IN CLOSE PROXIMITY ON FISHING GROUNDS IT MEANS 'I AM SHOOTING NETS'.
1ST SUBSTITUTE	USED TO REPEAT THE FIRST FLAG OR PENNANT IN THE SAME HOIST.
2ND SUBSTITUTE	USED TO REPEAT THE SECOND FLAG OR PENNANT IN THE SAME HOIST.
3RD SUBSTITUTE	USED TO REPEAT THE THIRD FLAG OR PENNANT IN THE SAME HOIST.
CODE AND ANSWER	USED TO ACKNOWLEDGE A SIGNAL.
• – – – –	ONE
• • – – –	TWO
• • • – –	THREE
• • • • –	FOUR
• • • • •	FIVE
– • • • •	SIX
– – • • •	SEVEN
– – – • •	EIGHT
– – – – •	NINE
– – – – –	ZERO

USED ON ALL OCCASIONS WHEN IT IS REQUIRED TO REPRESENT NUMBERS IN FLAG SIGNALLING

NOTE: SINGLE LETTER SIGNALS MAY BE MADE BY ANY METHOD OF SIGNALLING. THE LETTERS B, C, D, E, G, H, I, M, S, T, Z AND FIGURE 5 WHEN MADE BY A SOUND MUST COMPLY WITH 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 XXXV

DISTRESS SIGNALS*

* Reference to Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, Consolidated Edition 2003.

DISTRESS SIGNALS

1. The following signals, used or exhibited either together or separately, indicate distress and need of assistance.
   - a **gun** or other explosive signal fired at intervals of about a minute;
   - a continuous **sounding** with any fog - signalling apparatus;
   - **rockets** or shells, throwing red stars fired one at a time at short intervals;
   - a signal made by **radiotelegraphy** or by any other signalling method consisting of the group ...---... **(SOS)** in the morse code;
   - a signal sent by radiotelephony consisting of the spoken word **"mayday"**;
   - the International code signal of distress indicated by **N over C flags**;
   - a signal consisting of a square flag having above or below it a ball or anything resembling a ball;
   - **flames** on the vessel (including from a burning tar barrel, oil barrel, etc.);
   - a **rocket parachute flare** or a **hand flare** showing a red light;
   - a **smoke signal** giving off orange - coloured smoke;
   - slowly and repeatedly **raising and lowering arms** outstretched to each side;
   - the radiotelegraph alarm signal;
   - the radiotelephone alarm signal;
   - signals transmitted by emergency position - indicated radio beacons (EPIRB);
   - approved signals transmitted by radio - communication systems;

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 section of the International Code of Signals, the Merchant Ship Search and Rescue Manual and the following signals:
   a. a piece of **orange - coloured canvas** with either a black square and circle or other appropriate symbol (for identification from the air);
   b. a **dye marker**;

ANNEX XXXVI

BASIC PRE-SEA SAFETY TRAINING

Training required by any person going to sea for the first time on decked vessels of less than 12 metres in length and undecked vessels

Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Types of emergencies that can occur, 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 onboard.	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. 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.	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 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.

Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Knowledge of common nautical terms.	Understands basic terminology of; direction (north south, port starboard, astern abeam, etc.), parts of a boat, items of equipment, ropes and knots.	Demonstrates ability to point out parts of a boat, direction and items of equipment.
Knowledge of the causes and effects of hypothermia and what precautions can be taken to prevent the 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 capsize bottle.
Knowledge of 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, 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 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

ANNOTATED LIST OF PERTINENT PUBLICATIONS

FAO (www.fao.org)

FAO Code of Conduct for Responsible Fisheries

The Code 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 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.

FAO Standard Specifications for the Marking and Identification of 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 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.

Report of the FAO/SPC regional expert consultation on sea safety in small 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 in small fishing boats. This report lists a number of recommendations together with considerations relating to their implementation.

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 which 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.

Sub-Regional Workshop on Artisanal Safety at Sea, Banjul, The Gambia, 26-28 September 1994

A sub-regional workshop organized by the IDAF 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 sub-regional project on safety at sea.

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 to 8.5 metres), 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.

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 it's 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.

Engineering applications: 1. Installation and maintenance of engines in small 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 vessels

This publication provides some ideas and basic rules for general design principles, to mounting details, construction, installation and maintenance of various machines, besides all the other elements that compose a hydraulic circuit.

IMO (www.imo.org)

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, Equipment of Fishing Vessels.

FAO/ILO/IMO Voluntary Guidelines for the Design, Construction and Equipment of Small Fishing Vessels, 2005.

Regulations for Prevention of Collisions at Sea (COLREGs)

The 1993 Torremolinos Protocol and Torremolinos International Convention for the Safety of Vessels (Consolidated edition, 1995)

Code on Intact Stability for All Types of Ships covered by IMO Instruments (resolution A.749(18), as amended)

Code of practice concerning the Accuracy of Stability Information for Vessels (resolution A.267(VIII))

Recommended Practice on Portable Fish-Hold Divisions (resolution A.168(ES.IV), as amended by resolution A.268(VIII), appendix V)

Improved guidelines for marine portable fire extinguishers (resolution A.951(23))

Life-Saving Appliances Code (LSA Code) (resolution MSC.48(66))

Revised recommendations on the testing of life-saving appliances (resolution MSC.81(70), as revised)

Code of Practice for the evaluation, testing and acceptance of prototype novel life-saving appliances and arrangements (resolution A.520(13))

Standardized life-saving appliance evaluation and test report forms (MSC/Circ.980)

Recommendation on performance standards for magnetic compasses (resolution A.382(X))

Recommendation on performance standards for radar equipment

(resolution MSC.64(67), annex 4)

Performance standards for survival craft radar transponders for use in search and rescue operations (resolution A.802(19))

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 devices to indicate speed and distance (resolution A.824(19), as amended by resolution MSC.96(72))

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 performance standards for combined GPS/GLONASS receiver equipment(resolution MSC.74(69), annex 1, as amended by resolution MSC.115(73))

Recommendation on the carriage of electronic position-fixing equipment (resolution A.156(ES.IV)

Recommendation on performance standards for heading control systems (resolution MSC.64(67), annex 3)

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 radar reflectors (resolution A.384(X), as amended by resolution MSC.164(78))

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 daylight signalling lamps (resolution MSC.95(72))

Provision of Radio Services for the Global Maritime Distress and Safety System (GMDSS) (resolution A.704(17))

Carriage of Radar Operating in the Frequency Band 9,300-9,500 MHz (resolution A.614(15))

Carriage of Inmarsat Enhanced Group Call SafetyNET Receivers under the Global Maritime Distress and Safety System (GMDSS) (resolution A.701(17))

Promulgation of maritime safety information (resolution A.616(15))

Search and rescue homing capability (resolution A.615(15))

Operational standards for radiotelephone alarm signal generators (resolution A.421(XI))

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))

Performance standards for ship-earth stations capable of two-way communications (resolution A.698(17))

Type approval of ship-earth stations (resolution A.570(14))

Performance standards for shipborne VHF radio installations capable of voice communication and digital selective calling (resolution A.609(15))

Performance standards for shipborne MF radio installations capable of voice communication and digital selective calling (resolution A.610(15))

Performance standards for shipborne MF/HF radio installations capable of voice communication, narrow band direct-printing and digital selective calling (resolution A.613(15))

Performance standards for Float-Free Satellite Emergency Position-Indicating Radio Beacons(EPIRBs) operating on 406 MHz (resolution A.695(17))

Type approval of Satellite Emergency Position-Indicating Radio Beacons (EPIRBs) operating in the COSPAS-SARSAT System (resolution A.696(17))

Performance standards for survival craft radar transponders for use in search and rescue operations (resolution A.697(17))

Performance standards for Inmarsat Standard-C ship-earth stations capable of transmitting and receiving direct-printing communications (resolution A.663(16))

Performance standards for enhanced group call equipment (resolution A.664(16))

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 float-free release and activation arrangements for emergency radio equipment (resolution A.662(16))

System performance standards for the promulgation and co-ordination of maritime safety information using high-frequency narrow-band direct-printing (resolution A.699(17))

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))

Code on Noise Levels on board Ships (resolution A.468(XII))

ILO (www.ilo.org)

The majority of the publications mentioned below are available on the ILO website, in particular at 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 level, and can be used to establish the framework for occupational safety and health management systems.

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 fishing sector

Safety and health in ports, 2005

Ambient factors in the workplace, 2001

HIV/AIDS and the world of work, 2001

Technical and ethical guidelines for workers' health surveillance, 1998

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

Protection of workers against noise and vibration in the working environment, 1977

Safety and health in shipbuilding and ship repairing, 1974

SafeWork training manuals

ILO's SafeWork has prepared a number of documents that could be used as teaching 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 fishing sector, these documents may be very useful for addressing such issues as noise and vibration, ergonomics, controlling hazards and AIDS.

Ergonomic checkpoints

A collection of practical, easy-to-use ergonomic solutions for improving working conditions. This fully illustrated easy-to-use manual is an extremely useful tool for everyone who wants to improve their 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 which can be made applicable under local conditions. Developed jointly with the International Ergonomics Association, 1996.

International Hazard Datasheets on Occupation, 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)

International Medical Guide for Ships
Guide to ship sanitation, (as amended)

OTHERS

European Union Council Directive 92/29/EEC on minimum safety and health requirements for improved medical treatment on board vessels
Publication IEC 60079

BOBP/MAG/16 - A safety guide for small offshore fishing boats
This publication provides information to boatyards, boat owners and crew on the design and operational aspects related to the safety of decked fishing boats of less than 12 m in length.

Nordic Boat Standard, 1991 (www.sjofartsdir.no)

SEAFISH Construction Standards for under 15m Fishing Vessels
SEAFISH Construction Standards for over 15m to less than 24m registered Length

Annex XXXVIII

EXAMPLE OF AN INSPECTION CHECK LIST

INSPECTION CHECK LIST

Name of ship:

Type of ship

Gross Tonnage

Length

Year of construction

1. Documentation

N°	Documents	Next due date	Expiry date	N.A.	Yes	No
1.1	All required **certificates** valid and respectively endorsed					
	Flag registry certificate			□	□□	□
	Load Line Certificate			□	□□	□
	Class Certificate			□	□□	□
	Radio station licence			□	□□	□
	Tonnage Certificate			□	□□	□
	IOPP certificate (ships >400)			□	□□	□
	Air Pollution Prevention Certificate (>400)			□	□□	□
	Exemption certificates *(if any)*			□	□□	□
1.2	Obsolete documents removed from the document folder				□□	□

2. **Hull and load lines**

N°	Item	Yes	No	Reference
2.1	Ship's **side shell plates** without visible damage and excessive wastage	□□	□	
2.2	**Structure of cargo holds** (bulkheads, frames, brackets, tank tops, ..., without damages and excessive wastage	□□	□	
2.3	**Anchoring devices** in good condition, without damages	□□	□	
2.4	**Mooring ropes** in good working condition	□□	□	
2.5	**Bulwarks, handrails, catwalks** without signs of damage or excessive wastage	□□	□	
2.6	**Hatch cover arrangements**, including gaskets and closing appliances, in good condition to close weathertight, without signs of wastage	□□	□	
2.7	**Ventilators and air pipes** properly working, and able to be closed weathertight	□□	□	
2.8	Closing devices of all **sounding pipes** properly working	□□	□	
2.9	**Weathertight doors** and small access hatches in good condition to close weathertight	□□	□	
2.10	**Load line marks** permanently marked in accordance with load line certificate	□□	□	
2.11	**Draft marks and load line marks** painted in contrasting colour	□□	□	
2.12	**Stability information** approved on behalf of the flag Administration, written in a language understood by the ship's command	□□	□	

3. Machinery and electricity

N°	Item	Yes	No	Reference
3.1	Electric cable arrangements properly installed and **insulated**, no loose wiring	☐☐	☐	
	Light covers properly fitted on all lamps	☐☐	☐	
	Insulation mats provided around the **main switchboard**	☐☐	☐	
3.2	**Engine room** in a generally clean condition with regard to work and fire safety	☐☐	☐	
3.3	**Main propulsion system** in proper working condition	☐☐	☐	
3.4	**Auxiliary** engine and power system in proper working condition	☐☐	☐	
3.5	**Emergency generator** arrangement in proper working condition	☐☐	☐	
3.6	**Jacketed piping system** properly installed on high pressure fuel lines, alarms working	☐☐	☐	
3.7	No **leakages** from engines and piping systems	☐☐	☐	
3.8	**Steering gear**, including rudder angle indicator, in operating condition	☐☐	☐	
	Emergency steering gear in operating condition	☐☐	☐	
3.9	**Communication systems** between bridge and engine room and steering gear room in working condition	☐☐	☐	
3.10	Engineer's alarm of unmanned machinery system working properly	☐☐	☐	

4. Fire protection

N°	Item	Yes	No	Reference
4.1	**Fire main** piping and hydrants in good condition, coupling and valves free of leakages	□□	□	
4.2	**Fire pumps**, including prime mover in engine room, in proper working condition, with delivery of sufficient water pressure	□□	□	
4.3	**Emergency fire pump** in proper working condition, delivering sufficient water pressure	□□	□	
4.4	All **fire stations** with required equipment of hoses, nozzles, spanners, in good condition	□□	□	
4.5	**Portable fire extinguishers** available as per safety plan, in good condition, duly serviced	□□	□	
4.6	Fireman outfits available in required number, complete	□□	□	
	Breathing apparatuses in good condition, ready for use	□□	□	
4.7	**Fixed fire fighting systems** for engine room and cargo spaces in proper working condition	□□	□	
	Gas bottle or foam tanks **filling status** duly checked	□□	□	
	CO_2 room duly locked, key readily available	□□	□	
	Last **test records** of the system available	□□	□	
4.8	Fire **detection** arrangements properly working	□□	□	
4.9	Fire extinguishing arrangement provided in **paint locker**, in good working condition	□□	□	
4.10	All **fire dampers** and **ventilation closing** appliances in proper working condition	□□	□	
4.11	All **fire doors** properly closing by their automatic closing devices	□□	□	

4.12	All **quick closing devices** for tank shut-off and emergency stop of pumps and fans in proper working condition	□□	□	
4.13	**Emergency escape breathing devices** available in required amount, under full pressure	□□	□	
4.14	International **shore connection** available as per safety plan, with appropriate bolts and nuts	□□	□	
4.15	Paint materials stored in the designated **paint locker** only	□□	□	

5. Life saving appliances

N°	Item	Yes	No	Reference
5.1	**Lifeboats** in proper condition, **release mechanisms** properly maintained	□□	□	
	Reflexive tapes adhered as required on bottom, sides and top	□□	□	
5.2	Lifeboat **inventory** complete, in good condition	□□	□	
	Expiry dates for pyrotechnics and foodstuff rations recorded, not outdated	□□	□	
5.3	**Rescue boats** complete, in good condition	□□	□	
	Inventory stored in the rescue boat	□□	□	
5.4	Lifeboat/rescue boat **engines** starting easily	□□	□	
5.5	**Liferafts** and **launching arrangements** in good working condition	□□	□	
	Hydrostatic release properly connected, validity not outdated	□□	□	
5.6	**Annual examination** of the launching appliances carried out by shore service in time	□□	□	

5.7	**Embarkation ladders**, including their shackles and padeyes, in good working condition	□□	□	
5.8	**Wire falls** of launching/recovery arrangements in good condition, turned/renewed as required	□□	□	
5.9	**Life buoys** available in sufficient amount and in good condition, with non-outdated batteries or smoke signals	□□	□	
5.10	**Lifejackets** available in sufficient amount, as per certification and in good condition	□□	□	
	Additional lifejackets provided for persons on watch and on remote working stations	□□	□	
5.11	**Line throwing appliances** complete, with non-outdated pyrotechnic units	□□	□	
5.12	**Parachute distress signals** available in sufficient amount, with expiry dates not outdated, placed on the bridge in appropriate marked containment	□□	□	
5.13	**Immersion suits**, including lights and special attachment, available as required	□□	□	
	Additional immersion suits available at remote working stations	□□	□	
5.14	Sufficient **emergency lighting** at all survival craft stations	□□	□	
5.15	Public alarm systems as for **general alarm** working properly	□□	□	

6. Radiocommunications

N°	Item	Yes	No	Reference
6.1	GMDSS transmitting and receiving **equipment**, including sources of energy, properly working	□□	□	
6.2	**Radio operators** familiar with cancellation procedures for false distress alarms	□□	□	
6.3	Radio **log book** kept current, including records of tests	□□	□	
6.4	**Portable VHF** for survival craft, including batteries, in good working condition	□□	□	
6.5	**Antenna** systems in good condition	□□	□	
6.6	**Radar transponders** in good condition, serviced in accordance with manufacturer's requirements	□□	□	
6.7	**EPIRB** in correct and float free position, with non-outdated battery and hydrostatic release	□□	□	
	Last **EPIRB test certificate** readily available	□□	□	
6.8	Reserve **sources of energy** (batteries) properly maintained and in working condition	□□	□	
6.9	**NAVTEX receiver** in good working condition, with enough spare paper available	□□	□	

7. Safety of navigation

N°	Item	Yes	No	Reference
7.1	All **nautical publications** and **nautical charts** (or ECDIS) to be used for the next intended voyage updated at the latest amendment	□□	□	
7.2	System for **correcting** nautical publications available on board	□□	□	
7.3	**Passage plan** from berth to berth available	□□	□	

7.4	**Navigational instruments** (radar, echo sounder, speed log) in good operational condition	□□	□	
7.5	**Navigational lights** working, including duplication and failure alarm	□□	□	
7.6	Daylight **signalling lamp** and independent power supply in good operational condition	□□	□	
7.7	Automatic **position indicator** in good operating condition	□□	□	
7.8	Illustrated table of **life saving signals** posted on the bridge	□□	□	
7.9	**Magnetic compass** in good condition, properly visible from steering position	□□	□	
	Spare magnetic compass available, in good condition	□□	□	
	Updated **calibration table** available	□□	□	
7.10	**AIS** system installed, constantly switched on	□□	□	

8. Safety in general

N°	Item	Yes	No	Reference
8.1	**Working language** established, recorded in the log book	□□	□	
8.2	Up-to-date **fire control plans** posted in accommodation alleyways	□□	□	
	Copy of the fire control plans stored in a weathertight enclosure outside the deck house	□□	□	
8.3	Instruction **manuals** for on board **maintenance** of life saving appliances available and understood by all crew members	□□	□	

	Regular **maintenance recorded**	□□	□	
8.4	Regular **drills** for fire fighting, abandon ship, rescue boat operation, oil spill fighting **carried out and recorded** in the log book	□□	□	
8.5	All **escape ways** accessible, free of obstruction, properly lighted	□□	□	
8.6	**IMO symbols** properly used for marking escape ways and locations of emergency equipment	□□	□	
8.7	**Pilot ladders** and related boarding arrangements clean and in good condition	□□	□	
8.8	Crew working on the bridge familiar with the **steering gear** switch-over procedures and with the use of emergency steering device	□□	□	
8.9	Key engine crew familiar with **emergency power** arrangements	□□	□	
8.10	Key persons for fire fighting familiar with starting the **emergency fire pump**	□□	□	
8.11	Designated lifeboat/rescue boat crew familiar with **starting the engines**	□	□	
8.12	Records about **familiarisation** of new crew members are available	□□	□	
8.13	**Maintenance routine** and related records available	□□	□	
8.14	Crew members can identify the **responsible person** on board	□	□	
8.15	Procedures are available to establish **contact with shore** management	□□	□	

9. MARPOL requirements

N°	Item	Yes	No	Reference
9.1	Oily water **separator** system in proper working condition, without illegal by-pass piping	□□	□	
9.2	All **piping arrangements** in proper condition, without any signs of damage or corrosion	□□	□	
9.3	**Engine room bilges** and other machinery areas free of excessive oily substances	□□	□	
9.4	**Oil record book** kept up-to-date, with correct entries, periodically signed by the master	□□	□	
9.5	**Garbage record book** kept up-to-date, with correct entries, periodically signed by the master	□□	□	

10. Accommodation and living conditions

N°	Item	Yes	No	Reference
10.1	**Sanitary facilities** in crew accommodation, clean and in proper condition	□□	□	
10.2	**Sick bay** and **medical locker** complete and in required condition	□□	□	
10.3	**Ventilation** arrangements in proper working condition	□□	□	
10.4	**Galley** and provision rooms clean and without possible signs of vermin	□□	□	
10.5	Galley ventilation **grease traps** clean	□□	□	
10.6	**Garbage** collected, separated and disposed of in accordance with garbage management plan	□□	□	
10.7	**Accommodation ladder**, including hoisting arrangements and safety net, in good condition	□□	□	

11. STCW requirements

N°	Item	Yes	No	Reference
11.1	Actual **crew composition** in accordance with the requirements of the safe manning document	□□	□	
11.2	Master, officers and ratings in possession of a respective **certificate** of competence	□□	□	
11.3	Officers' licences **endorsed** by the flag Administration where appropriate	□□	□	
11.4	All crew members in possession of valid **medical** examination certificates	□□	□	
11.5	**New** crew members made **familiar** with their duties and the safety equipment onboard	□□	□	
11.6	Required documentation available about **rest hours** of the crew, duly signed	□□	□	
11.7	Table of **working arrangements** posted at an easily accessible place	□□	□	

Conclusion

1 - The following deficiencies need to be rectified before departure:

2 - The following deficiencies need to be rectified before:

The Commission/Surveyor is of the opinion that the Safety Certificate can be renewed for ..... after completion of the rectifications mentioned in 1.

Date:

Signature of the Commission Members / the Surveyor

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