Rules for Classification and Construction

I Ship Technology

3 Special Craft

4 Guidelines for Lifeboats and Rescue Boats

Edition 2008

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Section 1

General Requirements

A. General

1. Application

Lifeboats and rescue boats are not part of the Classification of the ship carrying these boats by Germanischer Lloyd (GL). These boats will be treated completely independent from the ship and therefore a separate application for the Certification or Classification of lifeboats or rescue boats has to be presented to GL, compare Section 2.

Thus these requirements for lifeboats and rescue boats are a Guideline of Germanischer Lloyd.

2. Certification

2.1 Lifeboats

These Guidelines cover the Certification of lifeboats by GL as a notified body according to the Marine Equipment Directive 96/98/EC (MED) of the European Communities for following types of lifeboats:

- partially enclosed lifeboats
- totally enclosed lifeboats
- lifeboats with self-contained air support system
- fire-protected lifeboats
- tenders used as lifeboats
- free-fall lifeboats

2.2 Rescue boats

In addition the Certification of rescue boats according to MED is covered by these Guidelines for the following types of rescue boats:

- rescue boats with rigid hull
- rescue boats with inflated hull
- rescue boats with rigid/inflated hull
- fast rescue boats with the hull configurations as defined for rescue boats

2.3 Procedure

The Certification procedure is described in detail in Section 2. The marking of certified boats is defined in Section 2, B.6.1.

3. Classification

For flag states outside the European Communities GL can provide the Classification of the types of lifeboats and rescue boats defined in 2. as a Classification Society and not as a notified body.

The rules for Classification are technically identical to the requirements for Certification described in the following Sections. The marking of classified boats by the prescribed data plate is defined in Section 2, B.6.2.

4. Materials

As materials for the construction of these boats fibre reinforced plastics and sandwich compositions are fully considered. For other materials see Section 2, B.1.2 and references in Section 4, A.

5. Basic requirements

The basic requirements defined in these Guidelines have to be met for the Certification and Classification by GL of lifeboats for an unrestricted range of service.

6. Equivalence

Lifeboats and rescue boats deviating from these GL Guidelines in their type, equipment or in some of their parts may be certified or classed, provided that their structure or equipment is found to be equivalent to the GL requirements for the respective type.

7. Regulations and standards

7.1 International regulations

The following international regulations are relevant at the time of issue of these Guidelines:

- International Convention for the Safety of Life at Sea (SOLAS), Chapter III, Reg. 4: Evaluation, testing and approval of life-saving appliances and arrangements
- International Life-Saving Appliances Code (LSA), IMO Resolution MSC.218(82) adopted 2006
- International Life-Saving Appliances Code (LSA), IMO Resolution MSC.207(81) adopted 2006 entering into force on the 1st July 2010 – new requirements according to this resolution are specially indicated!

- Revised Recommendations on Testing of Life-Saving Appliances, IMO Resolution MSC.81(70)
- Guidelines for Fast Rescue Boats, IMO Resolution A.656(16)
- Addendum to the Recommendations for Canopied Reversible Liferafts, Automatically Self-righting Liferafts and Fast Rescue Boats including Testing on Ro-Ro Passenger Ships, IMO Resolution MSC/Circ.809 + Add.1
- Guidelines for Ships operating in Arctic Ice-covered Waters, IMO Resolution MSC/Circ.1056
- Standardized Life-Saving Appliance Evaluation and Test Report Forms, IMO Resolutuion MSC/Circ.980/Add.1 and 2
- Guidelines on Fire Test Procedures for Acceptance of Fire retardant Materials for the Construction of Lifeboats MSC/Circ. 1006

7.2 European regulations

The following regulations of the European Communities are relevant at the time of issue of these Guidelines:

- Maritime Equipment Directive 96/98/EC (MED)
- Amended by 2002/84/EC of 05. Nov. 2002

7.3 Standards

International standards defining detailed solutions at the state of the art are mentioned in the different Sections as far as relevant.

7.4 Reference

Requirements requested directly in the defined editions of the regulations according to 7.1 and 7.2 are written in *italics*.

B. Definition of Principal Boat Parameters

1. General

For the definition of parameters only SI-units in the metric system are used. Unless otherwise mentioned, the dimensions according to 3. and 4. are to be inserted in [m] into the formulae stated in the following Sections.

2. Co-ordinate system

For the use of these Rules the fixed, right-handed co-ordinate system 0, x, y, z as defined in Fig. 1.1 is introduced. The origin of the system is situated at the aft end of the length **L**, at centreline and on the moulded baseline at the boat's keel. The x-axis points in longitudinal direction of the ship positive forward, the y-axis positive to port and the z-axis positive upwards. Angular motions are considered positive in a clockwise direction about the three axes.

3. Principal dimensions

3.1 Length L

The length **L** is the distance between the most forward and most aft element of the boat, permanent fender guards excluded, measured parallel to the design waterline.

3.2 Length L_{wl}

The length at the waterline $\mathbf{L_{wl}}$ is the length measured at the design waterline parallel to the base line.

3.3 Length L_{SC}

The scantling length $\mathbf{L_{SC}}$ is $(\mathbf{L} + \mathbf{L_{wl}}) / 2$.

3.4 Forward perpendicular FP

The forward perpendicular coincides with the moulded side of the plate stem on the waterline on which the length $\mathbf{L_{wl}}$ is measured.

3.5 Breadth B

The breadth **B** is the maximum moulded breadth of the hull, without permanent fender guard.

3.6 Depth H

The depth **H** is the vertical distance, at the middle of the length **L**, from the base line to the top of the gunwale, compare Fig. 1.1.

3.7 Draught T

The draught **T** is the vertical distance, at the middle of the length **L,** from base line to design waterline according to the displacement with complete equipment and all persons the lifeboat is permitted to accommodate on board.

3.8 Draught T_{MAX}

The draught $\mathbf{T_{MAX}}$ is the vertical distance between the lowest point of the immersed hull including appendages, e.g. rudders, etc. and the design waterline.

4. Frame spacing a

The frame spacing **a** will be measured from moulding edge to moulding edge of frame.

5. Displacement Δ

The displacement Δ represents the mass of the boat in metric tons at the draught **T**.

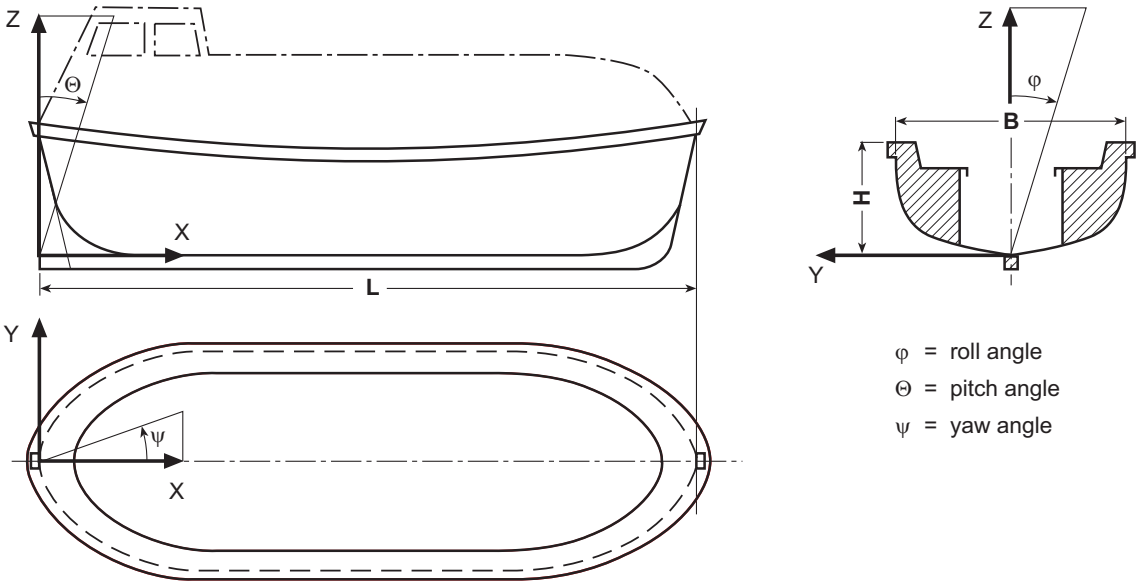

Fig. 1.1 Co-ordinate system and angles of motion

6. Block coefficient C_B

Moulded block coefficient at design draught **T**, based on the length **L**.

$$C_B = \frac{\text{moulded displacement volume } [m^3] \text{ at } \mathbf{T}}{\mathbf{L} \cdot \mathbf{B} \cdot \mathbf{T}}$$

7. Boat speeds

7.1 Speed v_0

Expected maximum, continuous ahead speed [kn] of the fully loaded boat in calm water, at the draught **T**, when the total available driving power is acting on the propulsion devices.

7.2 Speed v_{Tow}

Expected maximum ahead speed [kn] of the boat in calm water, at the draught **T,** when the total available driving power is acting on the propulsion devices and the boat is towing a liferaft for 25 persons respectively the largest liferaft carried on the ship for which the lifeboat is assigned.

8. Rated driving power

The rated driving power [kW] is defined as continuous power to be delivered by the propulsion machinery for running at rated speed v_0 and with the total available power acting on the propulsion devices.

9. Definition of decks

9.1 Freeboard deck

Freeboard deck is the deck upon which a freeboard calculation is based.

9.2 Weather deck

All free decks and parts of decks exposed to the sea are defined as weather deck.

10. Special definitions for partial and totally enclosed lifeboats

10.1 Enclosure

Enclosure is a rigid cover of the upper part of the lifeboat which encloses at least 2 x 20 % (partially enclosed fore and aft) or about 100 % (totally enclosed) of the length of the lifeboat.

10.2 Canopy

Canopy is a non-rigid or only partly rigid, mountable and dismountable cover of partially enclosed lifeboats between the rigid enclosures at the ends of the lifeboat.

11. Closure conditions

11.1 Watertight

Watertight in relation to a structural element means capable of preventing the passage of water through the structure in either direction with a proper margin of resistance under the pressure due to the maximum head of water which it might have to sustain.

11.2 Weathertight

Weathertight means that in any sea condition water will not penetrate in the lifeboat.

11.3 Weatherproof

Weatherproof means protection from wind, rain and splash water.

12. Angle of heel φ

The angle of heel φ [°] is measured relative to the x-axis, see Fig. 1.1

13. Special definitions for free-fall lifeboats

13.1 Free-fall certification height H_C

The *free-fall certification height* $\mathbf{H_C}$ [m] *is the greatest launching height for which the lifeboat is to be approved, measured from the still water surface to the lowest point of the lifeboat when the lifeboat is in the launch configuration. (LSA 1.1.4)* This height is to be defined in the Certificate of the lifeboat.

13.2 Design free-fall height H_D

The design free-fall height $\mathbf{H_D}$ [m] is the height on which the design has to be based.

13.3 Launching ramp angle Θ

The *launching ramp angle* Θ [°] *is the angle between the horizontal and the launch rail of the lifeboat in its launching position with the ship on even keel. (LSA 1.1.5)*

13.4 Launching ramp length

The *launching ramp length is the distance between the stern of the lifeboat and the lower end of the launching ramp. (LSA 1.1.6)*

C. Ambient Conditions

1. General operating conditions

1.1 The selection, layout and arrangement of the boat's structure and all machinery on board shall be such as to ensure faultless continuous operation under defined standard requirements for ambient conditions.

1.2 Inclinations and movements of the boat

The assumed limit conditions for inclinations and movement of a lifeboat under the standard requirements are defined in Table 1.1.

The effects of distortions of the boat's hull on the machinery installation have to be considered.

1.3 Environment of the boat

The assumed limit conditions for the environment of a lifeboat are contained in Table 1.2.

1.4 Flooded boat

The buoyancy requirements for a damaged boat are defined in Section 3, B.2. The engine shall be capable of operating when the lifeboat is flooded up to the centreline of the crankshaft, see Section 7, B.

1.5 Sunlight

Where exposed to sunlight, the lifeboat shall *be resistant to deterioration. (LSA 1.2.2.5)*

1.6 Corrosion and rotting

Where applicable, the lifeboat shall *be rot-proof, corrosion-resistant, and not be unduly affected by seawater, oil or fungal attack. (LSA 1.2.2.4)*

Table 1.1 Design limit conditions for boat inclinations and movements

Type of movement	Type of inclination	All types of lifeboats
Permanent static condition	**Athwartships:** [1]	
	Machinery and electrical systems [2]	22,5 ° [3]
	No uncontrolled switches or functional changes	45 °
	Boat's structure	acc. to stability requirements
	Fore and aft: [1]	
	Machinery and electrical systems [2]	
	to the bow	10 ° [4]
	to the stern	10 ° [4]
	Boat's structure	acc. to stability requirements

[1] athwartships and fore or aft inclinations may occur simultaneously

[2] including electronic equipment

[3] *for oil tankers, chemical tankers and gas carriers angle may be greater than 20 ° for free-fall lifeboats in accordance with the international Convention for the Pollution from Ships 1973 as modified 1978; compare LSA Chapter IV, 4.7.3.2*

[4] for free-fall lifeboats: inclination angle of ramp +/- 10 °

Table 1.2 Design limit conditions for the environment

Environmental area	Parameters	Standard requirements
Outside the boat/air	Temperature	*-30 °C to +65 °C* [1]
	at atmospheric pressure	1000 mbar
	at relative humidity of	60 % [2]
	for engine start	-15 °C
Outside the boat/seawater	Temperature	*-1 °C to +30 °C* [3]
Inside the boat/in electrical devices with higher degree of heat dissipation	Air temperature	0 °C to +55 °C
	Max. relative humidity	100 %

[1] *not to be damaged in stowage (LSA 1.2.2.2)*

[2] 100 % at a reference temperature of 45 °C for layout of electrical installations

[3] *if immersed in seawater during their use, operate throughout this seawater temperature range (LSA 1.2.2.3)*

2. Vibrations

Machinery, equipment and hull structures are normally also subjected to vibration stresses. Design, construction and installation shall in every case take account of these stresses and the long-term service of individual components shall not be endangered. For details, like frequency range, limits to be defined, assessment, etc., see GL Rules I – Ship Technology, Part 1 – Seagoing Ships, Chapter 2, Section 1, C.2.

D. Principle Design Requirements

The design of lifeboats and rescue boats has to meet the following principal design requirements.

1. Lifeboats

1.1 General requirements

1.1.1 Construction

All lifeboats shall be properly constructed and shall be of such form and proportions that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment and are capable of being safely launched under all conditions of trim of up to 10 ° and list of up to 20 ° either way. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in upright position in calm water and loaded with their full complement of persons and equipment and holed in any one location below the waterline, assuming no loss of buoyancy material and no other damage. (LSA 4.4.1.1)

For details of buoyancy and stability see Section 3.

1.1.2 Carrying capacity

1.1.2.1 *No lifeboat shall be approved to accommodate more than 150 persons. (LSA 4.4.2.1)*

1.1.2.2 *The number of persons which a lifeboat to be launched by falls shall be permitted to accommodate shall be equal to the lesser of: (LSA 4.4.2.2)*

- *the number of persons having an average mass of 75 kg, all wearing lifejackets, that can be seated in a normal position without interfering with the means of propulsion or the operation of any of the lifeboat's equipment*
- *the number of spaces that can be provided on the seating arrangements* as defined in Section 5, I.

1.1.3 Access into lifeboats

1.1.3.1 *Every passenger ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 10 minutes from the time the instruction to board is given. Rapid disembarkation shall also be possible. (LSA 4.4.3.1)*

1.1.3.2 *Every cargo ship lifeboat shall be so arranged that it can be rapidly boarded by its full complement of persons in not more than 3 minutes from the time the instruction to board is given. Rapid disembarkation shall also be possible. (LSA 4.4.3.2)*

1.1.3.3 *The lifeboat shall be so arranged that helpless people can be brought on board either from the sea or on stretchers. (LSA 4.4.3.4)*

1.1.4 Driving power

1.1.4.1 *Every lifeboat shall be powered by a propulsion system driven by a compression-ignition engine. For details see Section 7, B. (LSA 4.4.6.1)*

1.1.4.2 *Except for free-fall lifeboats* it shall be possible to row the lifeboat *to make headway in calm seas.* The relevant equipment has to be provided. For details see Section 5, K. *(LSA 4.4.8.1)*

1.1.5 Speed

The speed of a lifeboat when proceeding ahead in calm water, when loaded with its full complement of persons and equipment and with all engine-powered auxiliary equipment in operation, shall be: (LSA 4.4.6.8)

1.1.5.1 *The speed v_0 shall be at least 6 kn.*

Sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates, shall be provided to run the lifeboat at speed v_0 for a period of not less than 24 hours.

1.1.5.2 *The towing speed v_{Tow} shall be at least 2 kn.*

1.1.6 Strength

All lifeboats shall be of sufficient strength to:

1.1.6.1 *enable them to be safely launched into the water when loaded with their full complement of persons and equipment; and (LSA 4.4.1.3.1)*

1.1.6.2 *be capable of being launched and towed when the ship is making headway at a speed of 5 kn in calm water. (LSA 4.4.1.3.2)*

1.1.6.3 *Each lifeboat to be launched by falls shall be of sufficient strength to withstand the following load, without residual deflection on removal of that load: (LSA 4.4.1.6)*

- *in case of boats with metal hulls, 1,25 times the total mass of the lifeboat when loaded with its full complement of persons and equipment, or*
- *in case of other boats 2,00 times the total mass of the lifeboat when loaded with its full complement of persons and equipment.*

1.1.6.4 *Withstand, when loaded with its full complement of persons and equipment and with, where applicable, skates or fenders in position, a lateral impact against the ship's side at an impact velocity of at least 3,5 m/s and also a drop into the water from a height of at least 3,0 m. (LSA 4.4.1.7)*

1.2 Additional requirements for partially enclosed lifeboats *(LSA 4.5.2)*

1.2.1 *Partially enclosed lifeboats shall be provided with permanently attached rigid covers extending over not less than 20 % of **L** from the stem and not less than 20 % of **L** from the aftermost part of the lifeboat. The lifeboat shall be fitted with a permanently attached foldable canopy which, together with the rigid covers, enclose the occupants in a weatherproof shelter and protects them from exposure and can be easily erected by not more than two persons.*

1.2.2 For the arrangement of a radiotelephone apparatus see Section 8, D.

1.3 Additional requirements for totally enclosed lifeboats

1.3.1 *Every totally enclosed lifeboat shall be provided with a rigid watertight enclosure which completely encloses the lifeboat. (LSA 4.6.2)*

1.3.2 *The capacity of lifeboats for ships navigating under Arctic conditions shall be evaluated with regard to operability, accessibility, seating capacity and overall space considering the needs of personnel wearing suitable polar clothing. (MSC/Circ. 1056, 11.5.2)*

1.3.3 *The stability of the lifeboat shall be such that it is inherently or automatically self-righting when loaded with its full or partial complement of persons and equipment and all entrances and openings are closed watertight and the persons are secured with safety belts*. For details see Section 3. *(LSA 4.6.3.2)*

1.3.4 *The lifeboat shall be capable of supporting its full complement of persons and equipment when the lifeboat is in damaged condition prescribed in 1.1.1 and its stability shall be such that in the event of capsizing, it will be automatically attain a position that will provide an above-water escape for its occupants. (LSA 4.6.3.3)*

1.3.5 *The engine and engine installation shall be capable of running in any position during capsize and continue to run after the lifeboat returns to the upright or shall automatically stop on capsizing and be easily restarted after the lifeboat returns to the upright.* For details see Section 7, B., C. and D. *(LSA 4.6.4.2)*

1.4 Additional requirements for free-fall lifeboats

1.4.1 Free-fall lifeboats are totally enclosed lifeboats, see 1.3.

1.4.2 Construction

1.4.2.1 *Each free-fall lifeboat shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment, a free-fall launch from a height of at least 1,3 times the free-fall certification height. (LSA 4.7.4)*

1.4.2.2 *The required free-fall height shall never exceed the free-fall certification height. (LSA 4.7.3.3)*

1.4.2.3 *Each free-fall lifeboat shall be so constructed as to ensure that the lifeboat is capable of rendering protection against harmful accelerations resulting from being launched from the height for which it is to be certified in calm water under unfavourable conditions of trim of up to 10° and list of up to 20° either way when it is fully equipped and loaded with: (LSA 4.7.5)*

- *its full complement of persons*
- *occupants so as to cause the centre of gravity to be in the most forward position*
- *occupants so as to cause the centre of gravity to be in the most aft position*
- *its operating crew only*

1.4.2.4 *For oil tankers, chemical tankers and gas carriers with a final angle of heel greater than 20 ° calculated in accordance with the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating*

hereto, and the recommendations of the International Maritime Organization (IMO) [1], as applicable, a lifeboat shall be capable of being free-fall launched at the final angle of heel and on the base of the final waterline of that calculation. (LSA 4.7.3.2)

1.4.2.5 The equipment of the boat , like engine, tanks, air bottles and spraying system as well as their foundations have also to withstand the decelerations/shock loads during the immersion phase, compare the relevant Sections where the equipment is defined.

1.4.3 Carrying capacity

The carrying capacity of a free-fall lifeboat is the number of persons that can be provided with a seat without interfering with the means of propulsion or the operation of any of the lifeboat's equipment. (LSA 4.7.2) The details of the required seats are defined in Section 5, I.2.

1.4.4 Performance

Each free-fall lifeboat shall make positive headway immediately after water entry and shall not come into contact with the ship after a free-fall launching against a trim of up to 10° and a list of up to 20° either way from the certification height when fully equipped and loaded with: (LSA 4.7.3.1)

- *its full complement of persons*
- *occupants so as to cause the centre of gravity to be in the most forward position*
- *occupants so as to cause the centre of gravity to be in the most aft position*
- *its operating crew only*

1.4.5 For further details see the following Sections.

1.5 Additional requirements for lifeboats with self-contained air support system

Lifeboats with self-contained air support system are totally enclosed lifeboats according to 1.3 and, as applicable, may be also free-fall lifeboats according to 1.4.

A lifeboat with a self-contained air support system shall be so arranged that, when proceeding with all entrances and openings closed, the air in the lifeboat remains safe and breathable and the engine runs normally for a period of not less than 10 minutes. During this period the atmospheric pressure inside the lifeboat shall never fall below the outside atmospheric pressure nor shall exceed it more than 20 mbar. *The system shall have visual indicators to indicate the pressure of the air supply at all times. (LSA 4.8)*

1.6 Additional requirements for fire-protected lifeboats

1.6.1 A fire-protected lifeboat will normally be a totally enclosed lifeboat with self-contained air support system, see 1.3. and 1.5.

1.6.2 *When waterborne,* the lifeboat *shall be capable of protecting the number of persons it is permitted to accommodate when subjected to a continuous oil fire that envelops the lifeboat for a period of not less than 8 minutes. (LSA 4.9.1)*

1.6.3 For details of water spray fire protection systems see Section 7, D.10.

2. Rescue boats

2.1 Construction

Rescue boats may be either of rigid or inflated construction or a combination of both and shall not be less than 3,8 m and not more than 8,5 m in length (**L**)*. (LSA 5.1.1.3.1)*

2.2 Carrying capacity

Rescue boats *shall be capable of carrying at least five seated persons and a person lying on a stretcher. (LSA 5.1.1.3.2)*

2.3 Manoeuvrability

Rescue boats shall have sufficient mobility and manoeuvrability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship. (LSA 5.1.1.7)

2.4 Driving Power

A rescue boat shall be fitted with an inboard engine or outboard motor. Petrol driven outboard engines with an approved fuel system may be fitted in rescue boats provided the fuel tanks are specially protected against fire and explosion. (LSA 5.1.1.8) For details see Section 7, B.

2.5 Speed

Using its driving power the rescue boat has to reach the following speeds:

2.5.1 *Manoeuvring speed v_0 of at least 6 kn and maintaining that speed for a period of at least 4 hours. (LSA 5.1.1.6)*

2.5.2 *The towing speed v_{Tow} shall be at least 2 kn. (LSA 5.1.1.7)*

2.6 For further details see Section 11.

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1 *Reference is made to the damage stability requirements of the International Code for the Construction and Equipment of Ships Carrying Chemicals in Bulk (IBC Code) adopted by the Maritime Safety Committee by resolution MSC.4(48) and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) adopted by the Maritime Safety Committee by resolution MSC.5(48).*

3. Additional requirements for fast rescue boats

3.1 Length

Fast rescue boats shall have a hull length of not less than 6,0 m and not more than 8,5 m, including inflated structures or fixed fenders. (LSA 5.1.4.3)

3.2 Speed

Fully equipped rescue boats have to reach the following speeds: *(LSA 5.1.4.4)*

3.2.1 *Manoeuvring at a speed of at least 20 kn in calm water with a crew of 3 persons* and maintaining that speed *for at least 4 hours.*

3.2.2 A speed of *at least 8 kn with a full complement of persons and equipment.*

3.3 For further details see Section 10.

Section 2

Certification Procedure

A. General

1. Definition

Certification has to verify compliance with the requirements of the GL Rules applicable to a type or a stand-alone unit of lifeboats or rescue boats as well as to their material and components.

The Certification procedure defined in the following may be applied by GL as a notified body according to the Marine Equipment Directive 96/98/EC (MED), as amended of the European Communities or by GL as Classification Society. In the first case a data plate with the mark of conformity according to B.6.1 shall be affixed to the boat. In the second case a mark according to B.6.2 shall be provided.

2. Request for Certification

A request for Certification shall be lodged by the manufacturer of the boat or his authorized representative to GL.

If GL is requested to act as notified body of the European Community the Application Form for Conformity Assessment according to the Marine Equipment Directive (MED) 96/98/EC of the European Communities shall be used.

The request shall include:

- *the name and address of the manufacturer and, if the application is lodged by the authorized representative, his name and address as well*
- address of the manufacturer's production premises
- Quality System Certification by GL or others (if applicable, copy to be attached)
- *technical documentation which makes it possible to assess the lifeboat's/rescue boat's compliance with the requirements of these Rules; it must cover the design, the building standard, manufacture, installation and functioning of the boat in accordance with the technical documentation set down in B.2.*
- intended conformity assessment procedure
- copy of other relevant Certifications
- available laboratory/type tests already granted by other authorities
- *a written declaration that the same application of the boat or components has not been lodged simultaneously with any other notified body*

The applicant shall place at the disposal of GL a specimen of the lifeboat/rescue boat (if not only one unit to be manufactured a boat *representative for* a series *production envisaged and hereinafter called "type")*

3. Certification modules

For application in the European Communities the GL steps of procedure will in their relevant combination satisfy the Module Certification System of the European Communities. The correlation of this system to the GL procedures is defined in Table 2.1. If the wording is identical with international or European regulations it is written in *italics*.

B. Steps of GL Conformity Procedure

1. Workshop approval

Workshops involved in the manufacturing of lifeboats and rescue boats need GL approval. The requirements to obtain such an approval are defined in the following.

1.1 General

1.1.1 Requirements to be complied with by the boatyard and the manufacturers

1.1.1.1 Every manufacturing plant participating in a lifeboat project is to be provided with suitable equipment and facilities to enable proper handling of the materials, manufacturing processes, structural components, etc. GL reserve the right to inspect the plant accordingly or to restrict the scope of manufacture to the potential available at the plant.

The manufacturing plant has to have at its disposal sufficiently qualified personnel. GL is to be advised of the names and areas of responsibility of all supervisory and control personnel. GL reserve the right to require proof of relevant qualification.

Table 2.1 Correlation of EC modules to GL conformity assessment procedures

EU module	Module task	Steps of GL Certification as defined in the following
B: Type examination	GL ascertains and attests that a specimen, representative of the lifeboat production envisaged, meets the provisions of these Rules	B.1., B.2., B.3. + B.5.1
D: Production Quality Assurance	The manufacturer operates an approved quality assurance system for the production of a series, subject to monitoring	B.3. [1] + B.4.1 + B.5.2 + B.6.1
G: Unit Verification	An individual boat is examined by its documentation, construction and completion survey and appropriate tests according to the Rules	B.1., B.2., B.3. + B.4.2 + B.5.3 + B.6.1
[1] only tests to verify that the quality system is functioning correctly		

1.1.1.2 The boatyard or manufacturing plant and its subcontractors have to get approval from GL for the type of work provided for the manufacture and installation of lifeboats. Approval can only be awarded if the conditions defined in detail in the GL Rules II - Materials and Welding are fulfilled.

1.1.1.3 The fabrication sites, stores and their operational equipment shall comply also with the requirements of the relevant Safety Authorities and Professional Associations. The boatyard or manufacturing plant is alone responsible for compliance.

1.1.2 Details in manufacturing documents

1.1.2.1 All significant details concerning quality and functional ability of the components concerned shall be entered in the manufacturing documents (workshop drawings, etc.). This includes not only scantlings but, where relevant, such items as surface conditions (e.g. finishing of flame cutting edges and weld seams), and special methods of manufacture involved as well as inspection and acceptance requirements and, where relevant, permissible tolerances.

A production standard which considers the special requirements for the manufacturing of lifeboats has to be defined by the boatyard or manufacturing plant and approved by GL.

1.1.2.2 If, due to missing or insufficient details in the manufacturing documents, the quality or functional ability of the component cannot be guaranteed or is doubtful, GL may require appropriate improvements. This includes the provision of supplementary or additional parts (for example reinforcements) even if these were not required at the time of plan approval or if – as a result of insufficient detailing - such requirement was not obvious.

1.2 Requirements for metal hulls

1.2.1 Welding

For details of welded joints see GL Rules II - Materials and Welding, Part 3 – Welding, Chapter 2 – Design, Fabrication and Inspection of Welded Joints, Annex A (Steel) and B (Aluminium).

1.2.2 Cut-outs, plate edges

1.2.2.1 The free edges (cut surfaces) of cut-outs, etc. are to be properly prepared and are to be free from notches. As a general rule, cutting drag lines, etc. are not be welded out, but are to be smoothly ground. All edges shall be broken or in cases of highly stressed parts, shall be rounded off.

1.2.2.2 Free edges on flame or machine cut plates or flanges are not to be sharp cornered and are to be finished off as laid down in 1.2.2.1. This also applies to cutting drag lines, etc., in particular to the upper edge of sheer strake and analogously to weld joints, changes in sectional areas or similar discontinuities.

1.2.3 Cold forming

1.2.3.1 For cold forming (bending, flanging, beading) of plates the minimum average bending radius shall not fall short of 3 times the plate thickness t and shall be at least 2 t. Regarding the welding of cold formed areas, see GL Rules defined in 1.2.1.

1.2.3.2 In order to prevent cracking, flame cutting flashes or sheering burrs are to be removed before cold forming. After cold forming all structural components and, in particular, the ends of bends (plate edges) are to be examined for cracks. Except in cases where edge cracks are negligible, all cracked components are to be rejected. Repair welding is not permissible.

1.2.4 Assembly, alignment

1.2.4.1 The use of excessive force is to be avoided during the assembly of individual structural components or during the erection of sub-assemblies. As far as possible, major distortions of individual structural components shall be corrected before further assembly.

1.2.4.2 Girders, beams, stiffeners, frames, etc. that are interrupted by other structural elements are to be accurately aligned. In case of critical components control drillings are to be made where necessary, which are then to be welded up again on completion.

1.2.4.3 After completion of welding, straightening and aligning are to be carried out in such a manner that the material properties will not be influenced significantly. In case of doubt, GL may require a procedure test or a working test to be carried out.

1.2.5 Combination of different materials

1.2.5.1 Preventive measures are to be taken to avoid contact corrosion associated with combination of dissimilar metals with different potentials in an electrolyte environment, such as sea water.

1.2.5.2 The selection of different materials has to take account to the fact that also a combination of metals with composite materials, like fibre reinforced plastics, sandwich constructions, etc. and wood or also of these materials with each other may lead to contact corrosion.

1.2.5.3 In addition to selecting appropriate materials, measures such as suitable insulation or an effective coating can be taken to prevent contact corrosion.

1.3 Requirements for composite structures

1.3.1 Materials

1.3.1.1 All materials to be used during production of components from FRP shall first be assessed and approved by GL. Approval by other organizations can be recognized following agreement by GL, provided that the tests required for approval are in accordance with GL requirements.

1.3.1.2 The manufacturer and/or supplier of the material shall apply to GL-Head Office for approval.

1.3.1.3 Approval is granted if the material fulfils the requirements of GL. For this purpose, specific tests are necessary, and they shall either be carried out under supervision of GL or the results shall be documented in the report of a recognized testing institute.

1.3.1.4 Before production starts, the required material approvals shall be submitted to GL-Head Office and/or the responsible GL inspection office. If no approvals, or not all required approvals have been obtained, then as an exception and following agreement with GL-Head Office, proof of the properties of the basic material can be demonstrated as part of material testing of the component laminate.

1.3.1.5 The packaging or wrapping material shall bear a reference to the approval.

1.3.2 Manufacturers

1.3.2.1 General

1.3.2.1.1 All manufacturing facilities, store-rooms and their operational equipment shall fulfil the requirements of the responsible safety authorities and professional employer’s liability insurance associations. The manufacturer is exclusively responsible for compliance with these requirements.

1.3.2.1.2 The danger of contamination of laminating materials shall be minimized through separation of production facilities from store-rooms.

1.3.2.1.3 During laminating and bonding in the laminating shop, no dust-generating machinery shall be operated nor any painting or spraying operations carried out. As a matter of principle, such work shall take place in separate rooms.

1.3.2.2 Laminating workshops

1.3.2.2.1 Laminating workshops shall be closed spaces capable of being heated and having supply and exhaust ventilation. During laminating and curing, a room temperature of between 16 °C and 25 °C and a maximum relative humidity of 70 % shall be maintained, provided that the manufacturer of the laminating resin compound does not specify otherwise.

1.3.2.2.2 In order to control the climatic conditions, thermographs and hydrographs shall be provided. The equipment shall be set up following agreement with GL, their number and arrangement depending on operational conditions. The equipment shall be calibrated in accordance with statutory regulations. The recordings shall be kept for at least 10 years and submitted to GL on request.

1.3.2.2.3 Ventilation facilities shall be arranged in such a manner that no inadmissible amounts of solvents are removed from the laminate, and also that no inadmissible workplace concentrations (MAK values) occur.

1.3.2.2.4 The workplaces shall be illuminated adequately and suitably, but at the same time precautionary measures shall be taken to ensure that the controlled curing of the laminating resin compound is neither impaired through neither sunlight nor lighting equipment.

1.3.2.3 Storage-rooms

1.3.2.3.1 Laminating resins shall be stored in accordance with the manufacturer's instructions. If no such instructions are provided, then they shall be stored in dark, dry rooms at a temperature between 10 °C and

18 °C. The temperature of the storage-rooms shall be recorded continuously by means of thermographs.

1.3.2.3.2 Prepregs shall be stored in special cold-storage rooms in accordance with the manufacturer's instructions. The temperature in general shall not exceed – 22 °C.

1.3.2.3.3 Hardeners, catalysts and accelerators shall be stored separately in well-ventilated rooms in accordance with the manufacturer's instructions. If no instructions are provided, they shall be stored in dark, dry rooms at temperatures between 10 °C and 18 °C.

1.3.2.3.4 Reinforcing materials, fillers and additives shall be stored in closed containers, in dry and dust-free conditions.

1.3.2.3.5 Storage shall be arranged in such a way that the identification of the materials, their storage conditions and maximum period of storage (expiry date) as prescribed by the manufacturer are clearly visible. Materials whose duration of storage exceeds the expiry date shall be removed immediately from the stores.

1.3.2.3.6 Quantities of materials due to be processed shall be brought to the production shops as early as possible to ensure complete adjustment to the processing temperature (ΔT = 2 °C), with the containers remaining closed.

1.3.2.3.7 Materials taken from the stores and partially used shall only be replaced in the stores in special cases (e.g. hot-curing prepregs) and with the consent of GL.

1.3.3 Further details

For regulations for processing and other details see GL Rules II – Materials and Welding, Part 2 – Non-metallic Materials, Chapter 1 – Fibre Reinforced Plastics and Adhesive Joints, Section 1.

2. Approval of documentation

2.1 The technical documentation shall in an easily understandable way cover the design, manufacture and functioning of the boat. It shall enable an assessment of the conformity of the boat with the requirements of these Rules. All data and details shall be given to show in which way the manufacturer guarantees the conformity of the boat to the requirements.

2.2 The survey of the boat‘s construction will be carried out on the basis of approved documents. All documents have to be submitted to GL in German or English language. Where deemed necessary, calculations and descriptions of the boat’s elements are to be submitted. Any non-standard symbols used are to be explained in a key list. All documents have to show the number of the project and the name of the boatyard.

2.3 The supporting calculations shall contain all necessary information concerning reference documents (parts of the specification, drawings, superior computations, computations for elements or neighbouring elements, following calculations). Literature used for the calculations has to be cited, important but not commonly known sources shall be added as copy.

The choice of computer programs according to the “State of the Art“ is free. It is recommended to use computer programs which are approved by GL in advance as appropriate to solve the actual problems. If the computer programs to be used are not known to GL, they may be checked by GL through comparative calculations with predefined test examples. Reference applications, already achieved approvals by other institutions and other relevant information shall be provided in advance. A generally valid approval for a computer program is, however, not given by GL.

The calculations have to be compiled in a way which allows to identify and check all steps of the calculations with regard to input and output in an easy way. Hand-written, easily readable documents are acceptable.

Comprehensive quantities of output data shall be presented in graphic form. A written comment to the main conclusions resulting from the calculations has to be provided.

2.4 The detailed requirements for the documentation are defined in Table 2.2.

2.5 GL reserve the right to demand additional documentation if that submitted is insufficient for an assessment of the boat or essential parts thereof. This may especially be the case for plants and equipment related to new developments and/or which are not tested on board to a sufficient extent.

2.6 The drawings are to be submitted in triplicate**,** all calculations and supporting documentation in one copy for examination at a sufficiently early date to ensure that they are approved and available to the Surveyor at the beginning of the manufacture or installation of the ship or of important components.

2.7 Once the documents submitted have been approved by GL they are binding on the execution of the work. Subsequent modifications and extensions require the approval of GL before becoming effective.

Table 2.2 List of documents for Certification

Serial number	Description
	General
1	List of submitted drawings
2	General arrangement plan including seating positions
3	Lines plan
4	General description of the boat type, as far as necessary
	Hull Structures
5	Midboat section and other typical sections
6	Bottom structure including engine foundations
7	Shell expansion plan
8	Deck, if applicable
9	Arrangement of buoyant material
10	Bouyancy and flotation calculation
11	Freeboard and stability calculation
12	Details of fixed enclosure, if applicable
13	Tanks
14	Rudder
15	Seating
16	Hook arrangement and release mechanism
17	Arrangement of hull outfit
	Machinery installations
18	Details required on GL Forms F 144 and F 144/1 when applying for approval of an internal combustion engine
19	General arrangement and technical description of the engine
20	Power transmission and propeller
21	Steering gear
22	Auxiliary systems and spray system for fire-protected lifeboats, if applicable
23	Ventilation and self-contained air support system, if applicable
24	Special equipment
	Electrical installations
25	Technical data according to GL Form F 145, as far as applicable
26	General circuit diagram showing basic systems for power generation, energy storage and distribution
	Reports
27	Design calculations
28	Reports on fire-retardant or non-combustible hull materials
29	Test reports/certificates for components already established in unprejudiced way
30	Certificates for equipment installed in the boat
31	Certificates and reports concerning the manufacturing procedures, inspections, checks, etc.
32	Further documents improving the possibility for Certification by GL
	Instructions (for information only)
33	Installation instructions
34	Operating manual
35	Maintenance manual
	Spare parts
36	Spare parts list

2.8 Documents for use on board of the boat

To allow quick action in case of emergency of the lifeboat, the following documentation is to be kept on board of the lifeboat and shall be made available to the GL Surveyor upon request:

- description of the release system
- description of the motor and propulsion system
- description of the equipment
- survival handbook

3. Tests

3.1 Purpose

Testing of the type has to be carried out for:

- prototypes in the framework of a type approval
- for verification that the quality assurance system is functioning exactly, if necessary
- individual units

GL will agree with the manufacturer the location where the examinations and necessary tests shall be carried out.

3.2 Specimen

The manufacturer or his authorized representative shall place at the disposal of GL a boat as specimen representative for the production envisaged and hereinafter called "type". A type may cover several versions of the boat provided that the differences between the versions do not affect the level of safety and other requirements concerning the performance of the boat.

GL may request further specimens if needed for carrying out the test programme.

3.3 Scope of tests

GL will verify that the type has been manufactured in conformity with the technical documentation.

GL will identify the elements which have been designed in accordance with the relevant provisions of the Rules as well as the components which have been designed without applying the relevant provisions of the Rules.

A detail listing of the testing activities is contained in MSC.81(70) of the International Maritime Organization (IMO) which is included in these Rules in Section 11. GL will in general follow this list of tests.

All tests mentioned above shall be witnessed by a GL Surveyor.

3.4 Test report

A Test Report will be issued by the GL Surveyor. The Test Report Forms according to IMO MSC/Circ.980/Add.1 shall be used.

4. Quality control

4.1 Production quality assurance

4.1.1 Task

The boatyard and the main contractors shall *operate an approved quality system for production, final product inspection and testing as specified in* 4.1.2 to 4.1.5 *and this system shall be subject to surveillance as specified in* 4.1.6. *(MED D.2)* Such a system may be according to the standard ISO 9001:2000 or equivalent.

4.1.2 Application for assessment *(MED D.3.1)*

The manufacturer shall lodge an application for assessment of his quality system with GL for the products concerned. The application shall include:

- *all relevant information for the envisaged lifeboats/rescue boats*
- *documentation concerning the quality system*
- *the technical documentation of the approved lifeboat/rescue boat type and a copy of the Type Examination Certificate*

4.1.3 Elements of the system *(MED D.3.2)*

The quality system shall ensure compliance of the product with the type as described in the Type Examination Certificate according to 5.1 and with the requirements of these Rules.

4.1.3.1 *All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic and orderly manner in form of written policies, procedures and instructions. The quality system documentation must permit a consistent interpretation of the quality programmes, plan, manuals and records.*

4.1.3.2 *The quality system shall in particular include an adequate description of:*

- *the quality objectives and the organizational structure, responsibilities and powers of the management with regard to product quality*
- *the manufacturing, quality control and quality assurance techniques, processes and systematic actions that will be used*
- *the examinations and tests that will be carried out before, during and after manufacture and the frequency with which they will be carried out*

– *the quality records, such as inspection reports and test data, calibration data, qualification reports of the personnel concerned, etc.*

– *the means of monitoring the achievement of the required product quality and the effective operation of the quality management system*

4.1.4 Approval audit *(MED D.3.3)*

4.1.4.1 *GL will assess the quality system to determine whether it satisfies the requirements referred to in 4.1.3.* For quality management systems that implement the harmonized standard ISO 9001:2000 conformity with these requirements will be presumed.

4.1.4.2 *The GL auditing team will have at least one member with experience of assessment in the lifeboat/rescue boat technology concerned. The assessment procedure will include a visit to the manufacturer's premises.*

4.1.4.3 *The decision of GL will be notified to the manufacturer. The notification shall include the conclusions of the examination and the reasoned assessment decision.*

4.1.5 Modifications *(MED D.3.4)*

4.1.5.1 *The manufacturer shall undertake to fulfil the obligations arising out of the quality system as approved and to uphold it so that it remains adequate and efficient.*

4.1.5.2 *The manufacturer or his authorized representative established within the European Community shall keep GL (or the notified body that has approved the quality system) informed of any intended updating of that quality system.*

4.1.5.3 *GL will assess the modifications proposed and decide whether the modified quality system will still satisfy the requirements referred to in 4.1.3 or whether a reassessment is required.*

The manufacturer will be notified of GL's decision. The notification shall include the conclusions of the examination and the reasoned assessment decision.

4.1.6 Surveillance under responsibility of GL *(MED D.4)*

4.1.6.1 *The purpose of surveillance carried out by GL is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.*

4.1.6.2 *The manufacturer shall allow GL access for inspection purposes to the locations of manufacture, inspection and testing and storage and shall provide GL with all necessary information, in particular:*

– *quality system documentation*

– *quality records, such as inspection reports and test data, calibration data, qualification reports of the personnel concerned, etc.*

4.1.6.3 *GL will periodically carry out audits to make sure that the manufacturer maintains and applies the quality system and will provide the manufacturer with audit reports.*

4.1.6.4 *In addition GL will make unannounced visits to the manufacturer. During such visits GL may carry out tests or cause tests to be carried out to check that the quality system is functioning correctly, if necessary. GL will provide the manufacturer with a visit report and, if a test has taken place, with a test report.*

4.1.7 Availability of documents

The manufacturer has to keep, for at least ten years after the last lifeboat/rescue boat has been manufactured, at the disposal of the national authorities and GL the following documents: *(MED D.5)*

– description of the boat

– technical documentation according to 2.

– documentation of the quality system and any updating of that quality system

– copy of the Type Examination Certificate according to 5.1

– GL reports and decisions such as approval audit report, reports about periodical audits and unannounced visits

4.2 Examination of individual units

4.2.1 Task

An individual lifeboat or rescue boat unit shall be tested for its conformity with these Rules. *(comparable to MED G).*

4.2.2 Elements of this step

This step of the procedure contains the following elements:

– the manufacturer has to ensure that the individual boat or component complies with the requirements of these Rules and has to declare this to GL

– GL shall examine the individual boat by survey under construction and/or a completion survey and shall carry out appropriate tests according to 3. to ensure that it complies with the relevant requirements.

5. Certificates

5.1 Type Examination Certificate

5.1.1 Validity

Where the type meets the provisions 1. to 3., GL will issue a Type Examination Certificate to the applicant with a validity of five years. The validity expires immediately if essential modifications are made, see 5.1.3.

If the manufacturer is denied a Type Examination Certificate, GL will provide detailed reasons for such denial, compare 5.1.4.

5.1.2 Content (LSA 4.4.1.2 + 4.7.7)

A Type Examination Certificate shall contain at least the following items:

- name of certifying organization (GL)
- type and *number of the Certificate*
- date of issue and validity
- *manufacturer's name and address*
- *lifeboat type and serial number*
- *month and year of manufacture*
- *number of persons the lifeboat is approved to carry*
- *clearly marked with approval information, including the institution which approved it* (GL) *and any operational restrictions* defined by GL *(LSA 1.2.2.9)*
- *material of hull construction, in such detail as to ensure that compatibility problems in repair should not occur*
- *total mass fully equipped and fully manned*
- *the measured towing force of the lifeboat*
- *statement of approval of the special construction and equipment for the following types of lifeboats, if applicable:*
  - partially enclosed lifeboats, or
  - totally enclosed lifeboats, or
  - free-fall lifeboats with
    - *free-fall certification height*
    - *required launching ramp length*
    - *launching ramp angle for the free-fall certification height*
  - life boats with self-contained air support system
  - fire-protected lifeboats
- statement of approval of the special construction and equipment for rescue boats, if applicable
- *annexed to the Certificate shall be a list of the relevant parts of the technical documentation*

A copy of the complete documentation will be kept by GL.

5.1.3 Modifications

The manufacturer or his authorized representative shall inform GL of all modifications to the approved boat, which must receive additional approval where such changes may affect compliance with the Rule requirements or the prescribed conditions for use of the boat. (MED B.6)

If approval for such modification is given by GL a new Type Examination Certificate will be issued.

5.1.4 Repeated application (MED B.5)

If a manufacturer is refused a Type Certification, GL will give detailed reasons for that refusal.

Where a manufacturer reapplies for type approval for a lifeboat/rescue boat for which a Type Certificate has been refused, his submission to GL shall include all relevant documentation, including the original test reports, the detailed reasons for the previous refusal and details of all modifications made to the boat.

5.1.5 Exchange of information

5.1.5.1 *GL will, on request, provide Flag States which are members of the European Communities and other notified bodies with the relevant information concerning the Type Examination Certificates and additions issued and withdrawn. (MED B.7)*

5.1.5.2 *The other notified bodies may receive copies of the Certificates and/or their additions from GL. The annexes to the Certificates will be kept by GL at the disposal of other notified bodies. (MED B.8)*

5.1.5.3 *The manufacturer or his authorized representative established within the European Communities shall keep the technical documentation together with copies of the Type Examination Certificates and their additions for at least ten years after the last boat has been manufactured. (MED B.9)*

5.2 Certificate of Conformity (Production Quality Assurance)

5.2.1 Issue

If the manufacturer got already a Type Examination Certificate for a defined boat type and if the provisions according to 4.1 are met, GL will issue a Certificate of Conformity (Production Quality Assurance) with a validity of five years. The validity expires immediately if essential changes are made, compare 5.2.3.

5.2.2 Content

A Certificate shall contain at least the following items:

- name of certifying organization (GL)
- type and number of the Certificate
- date of issue and validity
- name of certified manufacturer and address
- Type Examination Certificate forming the basis of the Certificate including data of the lifeboat type, see 5.1.2
- quality system used by the manufacturer, compare 4.1
- reports concerning successful audits
- validity of the Certificate

A copy of the quality system documentation will be kept by GL.

5.2.3 Modifications

If approval for modifications according to 4.1.5 is given by GL, a new Certificate will be issued.

5.2.4 Repeated application

If a manufacturer is refused a Certificate of Conformity, GL will give detailed reasons for that refusal.

In case the manufacturer still wants such a Certificate, the manufacturer may present to GL relevant documentation including all former reports, the justification for denial and detailed information concerning the alterations to Production Quality System.

5.2.5 Exchange of information *(MED D.6)*

GL will, on request, provide Flag States which are members of the European Communities and other notified bodies with the relevant information concerning the quality system approvals issued and withdrawn.

5.3 Certificate of Conformity (Unit Verification)

5.3.1 Issue

If the requirements of 1. to 3. and 4.2 are met, GL will issue a Certificate of Conformity (Unit Verification). In some places of these references the text has to be modified for unit verification without changing the content.

5.3.2 Content (LSA 4.4.1.2 + 4.7.7)

A Certificate of Conformity shall contain at least the following items:

- name of certifying organization (GL)
- type and *number of the Certificate*
- date of issue
- *manufacturer's name and address*
- *lifeboat serial number*
- *month and year of manufacture*
- *number of persons the boat is approved to carry*
- *clearly marked with approval information, including the institution which approved it* (GL) *and any operational restrictions* defined by GL *(LSA 1.2.2.9)*
- *material of hull construction, in such detail as to ensure that compatibility problems in repair should not occur*
- *total mass fully equipped and fully manned*
- *the measured towing force of the lifeboat*
- *statement of approval of the special construction and equipment for the following types of lifeboats, if applicable:*
  - partially enclosed lifeboats, or
  - totally enclosed lifeboats, or
  - free-fall lifeboats with
    - *free-fall certification height*
    - *required launching ramp length*
    - *launching ramp angle for the free-fall certification height*
  - lifeboats with self-contained air support system
  - fire-protected lifeboats
- statement of approval of the special construction and equipment for rescue boats, if applicable
- annexed to the Certificate shall be a list of the relevant parts of the technical documentation

A copy of the complete documentation will be kept by GL.

5.3.3 Modifications

The manufacturer or his authorized representative shall inform GL of all modifications of the approved boat where such changes may affect the conformity with the Rule requirements or the prescribed conditions for use of the boat.

If approval for such modification is given by GL a new Type Examination Certificate will be issued.

5.3.4 Repeated application

If a manufacturer is refused a Unit Verification, GL will give detailed reasons for that refusal.

In case the manufacturer still wants such a Certificate, the manufacturer may present to GL relevant documentation including all former reports, the justification for denial and detailed information concerning the alterations to the boat.

5.3.5 Information

The manufacturer has to keep, for at least ten years after the lifeboat/rescue boat has been manufactured, at the disposal of the national authorities and GL the following documents:

- description of the boat
- technical documentation according to 2.
- copy of the Certificate of Conformity
- record of all complaints and remedial actions

6. Data plate

6.1 GL as notified body according to MED

6.1.1 If GL acts as notified body according to the Marine Equipment Directive (MED) 96/98/EC, as amended and if a Type Examination Certificate according to 5.1 with a Certificate of Conformity according to 5.2 or a Certificate of Conformity according to 5.3 has been issued the manufacturer or his authorized representative established within the European Communities shall affix the mark of conformity to each boat and draw up a written declaration of conformity.

The data plate with the mark of conformity has to be affixed at the end of the manufacturing phase and shall be easily visible, legible and lasting for the presumable lifetime of the boat.

6.1.2 The data plate shall show the mark of conformity according to Fig. 2.1 accompanied by the identification number of GL (0801) and the last two digits of the number of the year in which the mark is affixed.

6.1.3 The use of equipment without the mark of conformity may be permitted, if extraordinary circumstances are evident.

6.1.4 It is not permitted to affix symbols or inscriptions on the boat which are suitable to mislead third parties in relation to meaning or face of the Certification signboard according to these Rules.

The different parts of the data plate shall be of the same height. The minimum height is 5 mm.

Fig. 2.1 Mark of conformity according to MED

6.2 GL acting as Classification Society

6.2.1 If GL acts as Classification Society without considering the Regulations of the European Community and a Type Examination Certificate according to 5.1 with a Certificate of Conformity according to 5.2 or a Certificate of Conformity according to 5.3 has been issued, the manufacturer shall affix a data plate to each boat. This data plate has to be affixed at the end of the manufacturing phase and shall be easily visible, legible and lasting for the presumable lifetime of the boat.

6.2.2 The data plate shall show the mark of conformity according to Fig. 2.2 accompanied by the Certificate Number, the number of persons the lifeboat is approved to accommodate as well as the month and last two digits of the number of the year in which the approval has been granted.

42 295 BM

53 Persons

A small anchor is shown if the conformity is based on the approval of drawing, a wide anchor is shown if the conformity is attested according to a specification.

Fig. 2.2 Example for a mark of conformity according to GL as Classification Society

C. GL Acceptance of Approvals by other Societies/Authorities

1. GL may accept the Certification of lifeboats and rescue boats, or parts thereof, issued under the Maritime Equipment Directive (MED) by other notified bodies in the European Communities and in Norway and Iceland.

2. Outside the European Communities GL may accept Certifications issued by Classification Societies which are member of the International Association of Classification Societies (IACS).

3. For Certifications issued by other institutions GL will decide about acceptance case by case.

D. Periodical Surveys

1. The Certificates according to B.5. verify the compliance with the Rules at the time of issue of the Certificate and do not involve surveying of the lifeboats and rescue boats during their operation.

2. Periodical surveys of lifeboats and rescue boats are required by **SOLAS** during periodical inspections of the safety equipment of the ship to which the boats belong. Actual regulation at the date of issue of this Guideline is MSC/Circ.1093.

These surveys will be carried out by the Authorities of the Flag State of the ship or other Organisations appointed for these duties by the Authorities.

Section 3

Buoyancy and Stability

A. General

1. Principle

All lifeboats shall be properly constructed and shall be of such form and proportions that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment and are capable of being launched under all conditions of trim of up to 10 ° and list of up to 20 ° either way. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in upright position in calm water and loaded with their full complement of persons and equipment and holed in any one location below the waterline, assuming no loss of buoyancy material and no other damage. (LSA 4.4.1.1)

2. Definitions

Definitions relevant for buoyancy and stability are given in Section 1, B.

3. Closure conditions

The closure conditions of partially and totally enclosed lifeboats are defined in Section 1, D – Principal Design Requirements. Constructional requirements are given in Section 5, F. and H.

B. Buoyancy

1. Intact buoyancy

1.1 *All lifeboats shall be properly constructed and shall be of such form and proportions that they have sufficient freeboard and ample stability when loaded with their full complement of persons and equipment. (LSA 4.4.1.1)*

1.2 Under the condition of loading defined in C.1.2:

1.2.1 *Each lifeboat with side openings near the gunwhale shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1,5 % **L** or 100 mm, whichever is the greater. (LSA 4.4.5.2.1)*

1.2.2 *Each lifeboat without side openings near the gunwhale shall not exceed an angle of heel of φ = 20° and shall have a freeboard measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1,5 % **L** or 100 mm whichever is the greater. (LSA 4.4.5.2.2)*

2. Damage buoyancy

2.1 *All lifeboats shall have inherent buoyancy or shall be fitted with inherently buoyant material which shall not be adversely affected by seawater, oil or oil products, sufficient to float the lifeboat with all its equipment on board when flooded and open to the sea.*

Additional inherent buoyant material, equal to 280 N of buoyant force per person, shall be provided for the number of persons the lifeboat is permitted to accommodate. Buoyant material, unless in addition to that required above, shall not be installed external to the hull of the lifeboat. (LSA 4.4.4)

2.2 *When the* totally enclosed *lifeboat is in the stable flooded condition, the water level inside the lifeboat, measured along the seat back, shall not be more than 500 mm above the seat pan at any occupant seating position. (LSA 4.6.3.3)*

C. Stability

1. Intact stability

1.1 General

Adequate stability of the lifeboat shall be proven by calculation and relevant tests. For the requirements for stability and freeboard tests of prototype lifeboats see Section 11.

1.2 Stability criteria

All lifeboats shall be stable and have a positive metacentric height *GM when loaded with 50 % of the number of persons the lifeboat is permitted to accommodate in their normal positions to one side of the centreline. (LSA 4.4.5.1)*

The stability of totally enclosed *lifeboats shall be such that the lifeboat is inherently or automatically self-righting* for angles of heel up to and including φ = 180° *when loaded with its full or partial complement of persons and equipment and all entrances and openings are closed watertight and the persons are secured with safety belts. (LSA 4.6.3.2)*

2. Damage stability

2.1 *All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in an upright position in calm water and loaded with their full complement of persons and equipment and holed in any location below the waterline, assuming no loss of buoyancy material and no other damage. (LSA 4.4.1.1)*

2.2 For totally enclosed lifeboats the *stability shall be such that, in the event of capsizing, it will automatically attain a position that will provide an above-water escape for its occupants. (LSA 4.6.3.3)*

Section 4

Hull Structures

A. General

1. Fibre reinforced plastics

This Section summarizes the requirements for hull structures built from fibre reinforced plastics (FRP) as this material is used for the utmost majority of modern lifeboats. In detail the material characteristics, the design loads and the determination of panel and stiffener scantlings are defined.

2. Other materials

2.1 Metal

For lifeboats with metal hulls the GL Rules Chapter 3 – Yachts and Boats up to 24 m, Section 1, F. may be applied.

2.2 Wood

For lifeboats with wooden hulls the GL Rules Chapter 3 – Yachts and Boats up to 24 m, Section 1, D. may be applied.

B. Fibre Reinforced Plastics (FRP) Materials

1. General

1.1 This Section applies to FRP structures where various fibre types and fibre arrangements may be utilised. Fibre types besides E-glass are e.g. carbon and ARAMID. Combinations of different fibres i.e. hybrid layers are also possible. Examples for fibre arrangements are unidirectional, multi-axial or woven fabrics.

1.2 Resins are to be appropriate for the chosen reinforcing layers and capable of withstanding ageing in marine environments.

1.3 Different lamination techniques besides wet hand lay-up can be applied, e.g. prepreg lamination where the laminate is built up from reinforcing material which is pre-impregnated with a thermosetting resin and can be processed without any further addition of resin and hardener.

1.4 Different fibres and the multitude of fabrics give rise to sophisticated laminate lay-ups of components specially designed to the loads expected. Strength and stiffness calculation of such lay-ups require careful analysis.

1.5 Mechanical properties of the laminate, nominal thickness and weight, type and fibre content of the individual reinforcing materials used shall be specified on the design drawings if the laminate differs from the defined reference laminate which consists of chopped strand mats and woven roving layers (see Table 4.1).

1.6 Regarding FRP and core materials GL Rules II – Materials and Welding, Part 2 - Non-Metallic Materials, Chapter 1 - Fibre Reinforced Plastic and Adhesive Joints are to be observed; excerpts are to be found there in Annex B.

1.7 In way of bolted connections and fittings, a sandwich core possibly has to be replaced by inserts of high density foam or single skin laminate.

Table 4.1 Characteristic data of reference laminate (75 % woven roving, 25 % chop strand mat) (lay-up of laminate, thickness, FVF have to be defined)

Property designation	Property symbol	Strength [N/mm^2] Chop strand mat (CSM)	Strength [N/mm^2] Woven roving (WR)
Young's modulus (tension)	E_z	10000	13500
Shear modulus	G	3900	3500
Specific thickness: 0,16 mm per 100 g/mm^2 Fibre Volume Faction (FVF): ς = 0,25			

2. Structural sandwich

2.1 The sandwich generally consists of two FRP skins and a core of lightweight material. In case of flexural loading the skins mainly absorb tension and compression stresses, whereas the core mainly absorbs shear stresses.

2.2 Flexural strength requirements can be usually achieved even with skins of reduced thickness,

particularly if high-strength fibres are used. Therefore, when dimensioning sandwich structures, additional failure modes have to be considered, which can occur before ultimate stress of the skins is attained. Among these are:

- shear failure of the core material
- failure of skin/ core bending
- wrinkling
- core failure under point load

2.3 Structural sandwich core materials:

- rigid foam materials of a closed-cell type with a minimum apparent density of 60 kg/m³
- end-grained balsa wood
- honeycomb materials

3. Non-structural core

A non-structural core has to meet the following requirements:

- rigid foam materials of a closed-cell type shall have a minimum apparent density of at least 35 kg/m³
- the material shall have the ability to fill hollow spaces completely
- The material has to withstand the prescribed tests for lifeboat buoyant material, like temperature cycling test, water absorption test, different oil tests, etc. as defined in SOLAS.
- the detailed composition and its application shall conform to the manufacturer's data sheet
- this type of core material can not be fully considered for strength calculations

4. Transitions from single-skin laminate to sandwich construction

The connection between a single-skin laminate and a sandwich laminate in structural relevant areas is to be carried out as gradually as possible over a width not to be less than three times the thickness of the sandwich core.

C. General Practical Approval Tests

1. General

The strength has to be proven by the practical approval tests required by the IMO/LSA Code, compare Section 11.

2. Lifeboats launched by falls

The following loads have to be considered for lifeboats launched by falls:

- *Weights in the boat according to Section 11 , Part 1: 6.1*
- *Lifeboat material tests according to Section 11, Part 1: 6.2*
- *Lifeboat overload test according to Section 11, Part 1: 6.3*
- *Lifeboat impact and drop test according to Section 11, Part 1: 6.4*

3. Free-fall lifeboats

The following loads have to be considered for free-fall lifeboats:

- *Weights in the boat according to Section 11, Part 1: 6.1*
- *Lifeboat material tests according to Section 11, Part 1: 6.2*
- *Lifeboat overload test for free-fall lifeboats according to Section 11, Part 1: 6.3*
- *Free-fall lifeboat free-fall test according to Section 11, Part 1: 6.5*

D. Design Loads for Normal Operation

1. The design loads are defined in GL Rules Chapter 3 - Yachts and Boats up to 24 m (for FRP structures Section 1, B. has to be used).

2. For fast rescue boats the design loads are defined in 1. and in the GL Rules Chapter 1 – High Speed Craft. The higher loads have to be used.

E. Determination Procedure for FRP Structures

1. Procedure for panel scantling determination

1.1 Laminate lay-up

The following is to be specified for each FRP layer:

- fibre orientation relative to appropriately defined coordinates
- cured ply thickness

– modulus of elasticity in short and long span direction

– shear modulus

In case of sandwich construction also:

– core material thickness

– shear strength

1.2 Geometric panel data

– short and long span of panel/ stiffeners

– curvature if applicable

1.3 Applicable design pressure

Depending on:

– whether the panel is part of the hull, deck, bulkhead, tank boundary or superstructure

– other parameters as specified in D.

1.4 Results of calculation

– strain of each individual FRP layer

– shear stress of core in case of sandwich construction

– deflection of panel

1.5 Required factors of safety (FoS)

– The FoS between ultimate strain and calculated strain of each FRP layer according to the ply analysis shall be at least 4,0 (for boats which are only used as lifeboats this factor can be reduced to 3,0).

– In case of sandwich construction the FoS against core shear failure shall be at least 2,0.

– Standard values for maximum panel deflection are 1,5 % of the panel's short span in case of single-skin laminate and 1 % for a sandwich panel.

1.6 Required minimum thicknesses referring to reference laminate

The following minimum thicknesses of the reference laminate according to Table 4.1 for panels at different locations have to be considered:

– outer hull laminate of an open or partially closed lifeboat: 5,0 mm

– inner hull laminate of an open or partially closed lifeboat: 4,0 mm

– outer hull laminate of a totally closed lifeboat: 5,0 mm

– canopy laminate of a totally closed lifeboat: 4,0 mm

– inner hull laminate of a totally closed lifeboat: 4,0 mm

– outer hull laminate of a freefall lifeboat: 5,0 mm (general) to 12,0 mm (bow)

– canopy laminate of a freefall lifeboat: 4,0 mm (general) to 9,0 mm (bow)

– inner hull laminate of a freefall lifeboat: 4,0 mm

2. Procedure for stiffener scantling determination

2.1 Specification of stiffener lay-up and attached plate

The specification shall include:

– fibre orientation related to stringer orientation

– cured ply thickness

– modulus of elasticity

– shear modulus

2.2 Geometric stiffener data

The specification shall include:

– stiffener core height

– stiffener core width

– bonding width

– unsupported length of stiffener

– support conditions

– curvature, if applicable

– stiffener spacing

2.3 Applicable design pressure

The applicable design pressure depends on:

– whether the stiffener is attached to the hull, deck, wall, tank boundary or enclosure

– other parameters as specified in D.

2.4 Results of calculation

The results of calculation shall be:

– bending moment and shear force due to design pressure and support conditions

– effective width of plating

– strain of FRP layers in stiffener capping due to bending

– strain of FRP layers in attached plating according to effective width

– shear stress in stiffener webs

– deflection of stiffener

2.5 Required factors of safety (FoS)

The following FoS have to be considered:

- The FoS between ultimate strain and calculated strain of each FRP layer due to stiffener's bending shall be at least 4,0 (for boats which are only used as lifeboats this factor can be reduced to 3,0).
- The FoS against ultimate shear stress in stiffener webs shall be also at least 4,0 (for boats which are only used as lifeboats this factor can be reduced to 3,0).
- The standard value for maximum deflection of stiffeners is 0,5 % of their unsupported length; in case of engine foundations a 0,3 % limit shall be kept.

Section 5

Hull Outfit

A. General

1. Scope

This Section summarizes all necessary components for fitting out of the hull and to enable a professional operation of the lifeboat under emergency conditions. The most important components are the rudder, anchoring and manoeuvring equipment, release mechanism and partially and totally covering enclosures. Finally also the loose inventory prescribed by the regulations of the IMO Life-Saving Appliances is listed for completeness.

B. Painting and Marking

1. Marking

1.1 *The number of persons for which the lifeboat is approved shall be clearly marked on it in clear permanent characters. (LSA 4.4.9.1)*

1.2 *The name and the port of registry of the ship to which the lifeboat belongs shall be marked on each side of the lifeboat's bow in block capitals of the Roman alphabet. (LSA 4.4.9.2)*

1.3 *Means of identifying the ship to which the lifeboat belongs and the number of the lifeboat shall be marked in such a way that they are visible from above. (LSA 4.4.9.3)*

The identification of the ship shall consist of the signal letters or the IMO number of the ship. Letters and number shall be painted or pasted on the top of the cover, if available, with a height of not less than 500 mm and not less than 50 mm width, where possible.

1.4 Other markings on the lifeboat shall be so arranged to avoid visual mixing with the markings defined in 1.1 to 1.3.

2. Improved visibility

2.1 The lifeboat shall on the top of the gunwale and under the gunwale respectively on the bottom be fitted with retro-reflective bands to assist detection of the floating or capsized lifeboat.

2.2 Retro-reflective bands are to be provided on the upper part of self-righting lifeboats.

2.3 *The exterior of the canopy of partially enclosed lifeboats respectively of the enclosure of totally enclosed lifeboats is to be of a highly visible colour. (LSA 4.5.2.4+ LSA 4.6.2.8)*

According to IMO resolution MSC.207(81) adopted 2006 for entry into force on the 1st July 2010 the exterior has to be of "*international or vivid reddish orange or a comparable highly visible colour on all parts where this will assist detection at sea". (LSA 1.2.2.6)*

3. Internal painting

The interior of the canopy respectively of the enclosure of partially or totally enclosed lifeboats shall be of a light colour which does not cause discomfort to the occupants. (LSA 4.5.2.4 + 4.6.2.8)

C. Rudder

1. Arrangement

1.1 Every lifeboat shall be fitted with rudder and steering arrangements which provide adequate manoeuvrability.

1.2 *Every lifeboat shall be so arranged that an adequate view forward, aft and to both sides is provided from the control and steering position for safe launching and manoeuvring. (LSA 4.4.7.12)*

1.3 The rudder shall be permanently fitted and secured to the lifeboat. It shall however be possible on board the ship to dismount the rudder for repair without affecting the boat structures.

1.4 The requirements for tiller and steering gear are defined in Section 7, F.

2. Rudder force and torsional moment

2.1 Rudder force

The rudder force to be used for determining the component scantlings is to be calculated in accordance with the following formula:

$$C_R = \kappa_1 \cdot \kappa_2 \cdot C_H \cdot v_0^2 \cdot A_1 \qquad [N]$$

A_1 = total surface area of rudder without that of a skeg, [m^2], see Fig. 5.1

κ_1 = factor depending on the aspect ratio of the rudder surface area A_1, see Table 5.1

$\Lambda = b^2 / A_1$

b = mean height of rudder surface [m]

Table 5.1 Aspect ratio factor κ_1

Λ	κ_1	Λ	κ_1
0,50	0,66	2,00	1,36
0,75	0,83	2,25	1,41
1,00	1,00	2,50	1,45
1,25	1,12	2,75	1,48
1,50	1,21	3,00	1,50
1,75	1,29	3,25	1,52

κ_2 = factor depending on type of craft
= 1,20 for lifeboats

C_H = hull factor
= 93 for **L** $\leq$ 20 m

v_o = ahead speed [kn] as defined in Section 1, B.7.1

2.2 Torsional moment

The torsional moment to be transmitted by the rudder operating gear is to be calculated in accordance with the following formula:

$$Q_R = C_R \cdot r \quad [Nm]$$

$r = x_C - f$ [m], see Fig. 5.1

$r_{min} = 0,1 \cdot c$

3. Scantlings of the rudder arrangement

3.1 Rudder stock

3.1.1 Solid rudder stocks

The diameter D_t of solid rudder stocks required for transmission of the torsional moment shall not be less than:

$$D_t = 3,8 \, (k \cdot Q_R)^{0,33} \quad [mm]$$

k = material factor
= $635 / (R_{eH} + R_m)$

R_{eH} = minimum nominal upper yield stress of material used [N/mm^2]

R_m = ultimate tensile strength of material used [N/mm^2]

$x_c = 0,3 \cdot c$

$c = \frac{A_1}{b}$

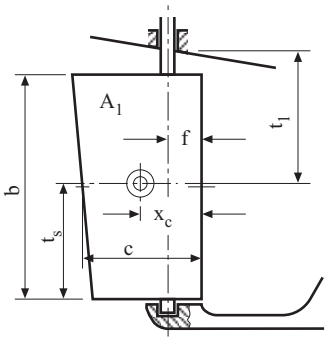

Fig. 5.1 Arrangement of a rudder with sole piece

Depending on their type of support, rudder stocks have to carry additionally bending moments and are to be reinforced in accordance with the following formula:

$$D_V = D_t \cdot \kappa_3 \quad [mm]$$

κ_3 = factor depending on the type of rudder support of rudder stock

= $[(1 / 12) \; (t_1 / r)^2 + 1]^{0,1666}$

= 1,0 if there is proof that the rudder stock is not subject to bending moments

t_1 = distance from centre of rudder area to upper bearing [m], see Fig.5.1

The rudder stock diameter D_V thus determined is to be maintained for at least 0,1 the distance between the lower main bearing and the next higher bearing above the lower bearing. The diameter may then be reduced to the diameter D_t necessary for the transmission of the torque at the tiller. Halfway along the shaft, the diameter may not be less than:

$$D_m = (D_V + D_t) / 2 \quad [mm]$$

The diameter necessary for transmission of the torque from the emergency tiller shall not be less than 0,9 x D_t.

Where the rudder stock enters the top of the rudder body it shall have the rule diameter D_V for at least 0,1 of its length; the diameter may then be reduced linearly towards the lower end.

3.1.2 Tubular rudder stocks

Tubular rudder stocks shall have the same section modulus as solid stocks. The relation between the diameters of the tubular rudder stock can be calculated from the following formula:

$$D_V = [(D_a^4 - D_i^4) / D_a]^{0,3333} \quad [mm]$$

D_a = external diameter of the tubular stock [mm]

D_i = internal diameter of the tubular stock [mm]

The minimum wall thickness of the tubular stock shall not be less than:

$$t_{min} = 0{,}1 \cdot D_a \quad [mm]$$

The stock is to be secured against axial movement. The amount of permissible axial play depends on the design of the steering gear and the supporting arrangements.

3.2 Horizontal rudder couplings

Design of the horizontal couplings shall be such that they are capable of transmitting the full torque applied by the rudder stock.

The diameter of the coupling bolts is not to be less than:

$$d = 0{,}65 \cdot D_V \, [235 / (R_{eH} \, . \, n)]^{0,5} \quad [mm]$$

D_V = shaft diameter according to 3.1 [mm]

n = number of coupling bolts
the minimum number of coupling bolts is 6

R_{eH} = minimum nominal upper yield stress of the bolt material [N/mm^2]

The yield stress of the coupling bolt material shall not be less than 235 N/mm^2

Material with a yield stress above 650 N/mm² shall not be used.

The distance of the axis of the coupling bolts from the edges of the coupling flange shall not be less 1,2 times the bolt diameter. Where horizontal couplings are used at least two bolts are to be forward of the shaft axis.

The coupling bolts are to be fitted bolts. Nuts and bolts are to be securely fastened against inadvertent slacking-back, e.g. by tab washers in accordance with DIN 432.

The thickness of the coupling flange is to be determined in accordance with the above formula for the coupling bolt diameter. For R_{eH}, the yield stress of the coupling flange material used is to be inserted. In order to reduce the load on the bolts, the coupling flanges are to be provided with a fitting key in accordance with DIN 6885.

The key may be omitted if the coupling bolt diameter is increased by 10 %.

The coupling flanges are either to be forged onto the rudder stock or welded to a collar headed onto the stock. The collar diameter shall be 1,1 D_V (at least D_V + 10 mm) and its thickness shall be at least equal to that of the flange.

3.3 Rudder construction

Rudder bodies may be made from FRP, steel or other metallic and non-metallic material. The body is to have horizontal and vertical stiffening members, to make it capable of withstanding bending and torsional loads. Proof of adequate strength, either by calculation or by a performance test on the prototype, is required. The rudder scantlings of the plating are to be as for shell bottom plating.

3.4 Rudder bearings

The rudder force C_R shall be distributed between the individual bearings according to the vertical position of the rudder's geometric centre of gravity, see Fig. 5.2.

The forces on the bearings are to be calculated as follows:

Bearing force $B_1 = (C_R \cdot t_2) / a$ [N]

Bearing force $B_2 = (C_R \cdot t_1) / a$ [N]

The mean surface pressure p is to be determined as follows:

$$p = P / (d \cdot h) \quad [N/mm^2]$$

P = bearing force (B_1 or B_2) [N]

d = bearing diameter [mm]

h = bearing height [mm]

= $\geq 1{,}2 \cdot d$

The mean surface pressure in the bearings shall not exceed the values defined in Table 5.2.

3.5 Rudder tube

3.5.1 Rudder tubes are to be as strong as the shell bottom laminate. They are to be adequately supported longitudinally and transversely and connected to the longitudinal and transverse structural members.

The minimum thickness s of the tube wall is to be determined according to the following formula:

for metallic materials:

$$s = 0{,}9 \, . \, L_{wl}^{0,5} \cdot k^{0,5} \quad [mm]$$

k = see 3.1.1

Fibre-reinforced plastic rudder tubes shall be of the same strength as the shell bottom laminate.

3.5.2 The rudder tube is to extend up through the hull to the deck. If this is not the case, the tube shall not end lower than 200 mm above the flotation plane at full load of the lifeboat and at the upper end of the tube, water is to be prevented from penetrating into the boat.

D. Manoeuvring Equipment

1. General

1.1 Scope

Herein the different elements for manoeuvring the lifeboat, like anchor, towing and mooring equipment as well as rowing equipment and fenders are summarized.

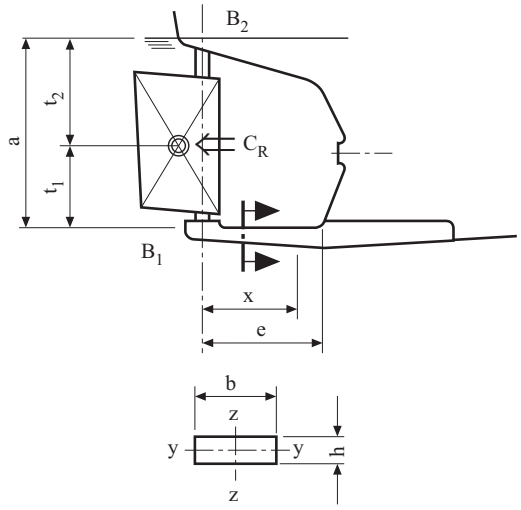

Fig. 5.2 Arrangement of rudder bearings for a rudder with sole piece

Table 5.2 Permissible surface pressure in bearings

Bearing material	Surface pressure p [N/mm²]
PTFE	2,5
PA PI	5,0
Bronce Steel Thordon XL	7,0
Trade names (selection): PTFE (politetrafluorethylene): Fluon, Hostaflon, TF, Teflon PA (poliamide): Degamid, Ultramid B, Duethan, Rilsan, Vestamid, Trogamid PI (polimide): Kapton, Vespel	

1.2 Connections to the hull

1.2.1 All connections of manoeuvring equipment to the hull shall be designed for the foreseeable forces and for a smooth force transfer to the main structural elements of the hull.

1.2.2 For metal hulls the connection may be established by welding, bolting or riveting. The requirements of the GL Rules II – Materials and Welding have to be observed.

1.2.3 For the connections to fibre reinforced plastic hulls special measures according to Section 4 have to be considered.

2. Anchor equipment

2.1 Lifeboats

One sea anchor of adequate size has to be provided as loose equipment, see K.2.6.

2.2 Lifeboats as Tenders

2.2.1 Anchors

2.2.1.1 Anchor types

A lifeboat used as a tender according to Section 9 has to be equipped with a bow anchor. The size shall be determined according to Table 5.3 using the equipment numeral Z, see 2.2.1.2.

The following types of anchors have so far been accepted as anchors with high holding power:

- BRUCE anchors
- CQR (plough) anchors
- Danforth anchors
- D'Hone anchors
- Heuss special anchors
- Pool anchors
- Kaczirek bar anchor

A stock anchor may be used if its weight is 1,33 times that in Table 5.3.

Other types of anchors require special GL approval. Procedure tests and holding trials shall be carried out in accordance with the GL Rules II – Materials and Welding, Part 1 – Metallic Materials.

2.2.1.2 Equipment numeral

The equipment numeral Z has to be calculated for determining the required equipment sizes for anchors, anchor lines and towing lines in Table 5.3:

$$Z = 0{,}6 \cdot L_1 \cdot B \cdot H_1 + A \quad [m^3]$$

$L_1 = (\mathbf{L} + \mathbf{L_{wl}}) / 2$

H_1 = depth H increased by 1/6 of the height of the keel measured at the side of the lifeboat halfway along $\mathbf{L_{wl}}$

A = 0,5 times the volume of the superstructures, if applicable [m^3]

Superstructures whose width is less than **B** / 4 may be disregarded

Table 5.3 Anchoring and towing equipment for tenders

Equipment numeral Z	Weight of anchor [1]	Chain cables		Towing line	
[m^3]	[kg]	Length [m]	Thickness [2] [mm]	Length [mm]	Diameter [3] [mm]
up to 10	9,0	20,0	6,0	$5 \cdot L_{wl}$	16
at 15	10,0	22,0	6,0		18
at 20	11,0	23,0	6,0		18
at 25	12,0	24,0	6,0		18
at 30	13,0	25,0	7,0		18
at 40	14,0	26,0	7,0		20
at 55	18,0	29,0	8,0		22
at 70	21,0	32,5	8,0	$4{,}75 \cdot L_{wl}$	22
at 90	25,0	36,0	9,0		22
at 110	29,0	38,5	10,0		24
at 130	34,5	42,0	10,0	$4{,}5 \cdot L_{wl}$	24
at 155	40,0	47,0	11,0		24
at 180	46,0	51,0	13,0		24
at 210	52,5	55,5	13,0		26

[1] weight applies to "high holding power anchors", a stock anchor of 1,33 times the weight may be used

[2] nominal thickness of round bar steel chain cable in accordance with ISO 4565, EN 24565, DIN 766

[3] 3-strand hawser-lay polyamide line in accordance with DIN 83330

2.2.1.3 Material

2.2.2 Chain cables/lines

2.2.2.1 Chain cables shall be determined in accordance with Table 5.3 using the equipment numeral Z.

2.2.2.2 If a synthetic fibre anchor line is used, it shall be 1,5 times as long as the stipulated anchor chain defined in Table 5.3. The fibre line shall have 1,2 times the thickness and maximum tensile strength as the relevant towing line defined in Table 5.3.

Between line and anchor a chain outboard shot is to be shackled whose nominal thickness is determined by the chain thickness given in Table 5.3. The length of this shot shall be about 1,5 m.

2.2.2.3 Chain cables and chain outboard shots are to have reinforced links at the ends. A swivel is to be provided between anchor and cable.

2.2.3 Anchor gear

2.2.3.1 For anchors weighing up to 30 kg no anchor winch is to be provided.

2.2.3.2 The chain cable/line end fastening to the hull shall allow that in the event of danger the chain cable or the line can be slipped at any time from a readily accessible position without endangering the persons on board. As regards strength, the end fastening is to be designed for at least 15 % but not more than 30 % of the nominal breaking load of chain or line.

2.2.3.3 A chain locker is not required.

3. Towing and warping equipment

3.1 At the bow

Every lifeboat shall be fitted with a device to secure a painter near its bow. The device shall be such that the lifeboat does not exhibit unsafe or unstable characteristics when being towed by the ship making headway at speeds up to 5 kn in calm water. (LSA 4.4.7.7)

Except for free-fall lifeboats (which need no assistance in launching), the painter securing device shall include a release device to enable the painter to be released from inside the lifeboat, with the ship making headway at speeds up to 5 kn in calm water. (LSA 4.4.7.7)

3.2 At the stern

Fittings for towing other lifeboats or liferafts, etc. have to be provided at the stern of the lifeboat. Suitable devices, which shall not have sharp edges, are:

- eyebolts fastened to the stern of small lifeboats
- two belaying cleats either side of the gunwhale
- a bollard mounted amidships

3.3 Connection to the hull

The design strength of the connection to the hull and the substructure is to be at least 120 % of the maximum tensile strength of the tow line.

3.4 Towing lines

Every lifeboat is to be equipped with two painters, see K.2.7.

Every tender shall be equipped with a towing line in accordance with Table 5.3.

Rescue boats are to be equipped with one buoyant line, see Section 10, C.2.1.6.

The minimum requirement is *to tow the largest liferaft carried on the ship loaded with its full complement of persons and equipment or its equivalent at a speed* v_{Tow} *of at least 2 kn. (LSA 4.4.6.8)*

Note

The horizontal force P_{Tow} *at the fitting may be estimated by following formula:*

$$P_{Tow} = 0{,}6 \cdot P \quad [kN]$$

P = *rated engine power [kW]*

4. Rowing equipment

The design of canopy or enclosure shall not hinder rowing of the lifeboat. The rowing equipment itself is defined in K.2.1.

5. Fenders

5.1 *Lifeboats intended for launching down the side of the ship shall have skates and fenders as necessary to facilitate launching and/or prevent damage to the lifeboat. (LSA 4.4.7.9)*

5.2 *A totally enclosed lifeboat, except a free-fall lifeboat, shall be so constructed and fendered that the lifeboat renders protection against harmful accelerations from an impact of the lifeboat, when loaded with its full complement of persons and equipment, against the ship's side at an impact velocity of not less than 3,5 m/s. (LSA 4.6.5)* See also Section 1, D.1.1.6.4.

5.3 Construction

Fenders and skates shall be made of material that will maintain its quality for long time, in heat and cold and at repeated impacts during an evacuation. Furthermore the material shall be resistant to moisture, oil, etc.

If such fenders or skates will disturb the propulsion and manoeuvre qualities of the boat, the fender shall be easily releasable.

E. Release Mechanism

1. Launching by falls

1.1 Principle requirements

Every lifeboat to be launched by a fall or falls, except a free-fall lifeboat, shall be fitted with a release mechanism complying with the following requirements subject to 1.1.9: (*LSA 4.4.7.6)*

1.1.1 *The mechanism shall be so arranged that all hooks are released simultaneously.*

1.1.2 *The mechanism shall have two release capabilities: (LSA 4.4.7.6.2)*

- *normal (off-load) release capability*
- *an on-load release capability*

1.1.2.1 *The normal (off-load) release capability shall release the lifeboat when it is waterborne or when there is no load on the hooks, and not require manual separation on the lifting ring or shackle from the jaw of the hook.*

1.1.2.2 *The on-load release capability shall release the lifeboat with a load on the hooks. This release shall be arranged as to release the lifeboat under any conditions of loading from no load with the lifeboat waterborne to a load of 1,1 times the total mass of the lifeboat when loaded with its full complement of persons and equipment. This release capability shall be adequately protected against accidental or premature use. Adequate protection shall include special mechanical protection not normally required for off load release, in addition to a danger sign. To prevent a premature on-load release, on-load operation of the release mechanism shall require a deliberate and sustained action by the operator.*

1.1.3 *Prevent an accidental release during recovery of the boat, unless the hook is completely reset, either the hook shall not be able to support any load, or the handle or safety pins shall not be able to be returned to the reset (closed) position without excessive force. Additional danger signs shall be posted at each hook station to alert crew members to the proper method of resetting. (LSA 4.4.7.6.3)*

1.1.4 *The release mechanism shall be designed and installed that crew members from inside the lifeboats can clearly determine when the system is ready for lifting by: (LSA 4.4.7.6.4)*

1.1.4.1 *directly observing that the movable hook portion or the hook portion that locks the movable hook portion in place is properly and completely reset at each hook, or*

1.1.4.2 *observing a non-adjustable indicator that confirms that the mechanism that locks the movable hook position in place is properly and completely reset at each hook, or*

1.1.4.3 *easily operating a mechanical indicator that confirms that the mechanism that locks the movable hook in place is properly and completely reset at each hook.*

1.1.5 *Clear operation instructions shall be provided with a suitably worded warning notice using colour coding, pictograms, and/or symbols as necessary for clarity. If colour coding is used, green shall indicate a properly reset hook and red shall indicate danger or improper or incorrect setting. (LSA 4.4.7.6.5)*

1.1.6 *The release control shall be clearly marked in a colour that contrasts with its surroundings. (LSA 4.4.7.6.6)*

1.1.7 *Means shall be provided for hanging-off the lifeboat to free the release mechanism for maintenance.*

1.1.8 *The fixed structural connections of the release mechanism in the lifeboat shall be designed with a calculated factor of safety of 6 based on the ultimate strength of the materials used and the mass of the lifeboat when loaded with its full complement of persons, fuel and equipment, assuming the mass of the lifeboat is equally distributed between the falls, except that the factor of safety for the hanging-off arrangement may be based upon the mass of the lifeboat when loaded with its full complement of fuel and equipment plus 1000 kg. (LSA 4.4.7.6.8)*

1.1.9 *Where a single fall and hook system is used for launching a lifeboat or rescue boat in combination with a suitable painter, the requirements of 1.1.2.2 and 1.1.3 need not be applicable; in such an arrangement a single capability to release the lifeboat or rescue boat, only when it is fully waterborne, will be adequate. (LSA 4.4.7.6.9)*

1.2 Detailed design

The design of the central release mechanism shall follow the requirements of the GL Rules VI – Additional Rules and Guidelines, Part 2 – Loading Gear, Chapter 1 – Guidelines for Life Saving Launching Appliances, Section 6, A.

2. Free-fall launching

2.1 Principle requirements

Each free-fall lifeboat shall be fitted with a release system which shall: (LSA 4.7.6)

2.1.1 *Have two independent activation systems for the release mechanisms which may only be operated from inside the lifeboat and be marked in a colour that contrasts with its surroundings.*

2.1.2 *Be so arranged as to release the boat under any condition of loading from no load up to at least 200 % of the normal load caused by its fully equipped lifeboat when loaded with the number of persons for which it is approved.*

2.1.3 *Be adequately protected against accidental or premature use.*

2.1.4 *Be designed to test the release system without launching the lifeboat.*

2.1.5 *Be designed with a factor of safety of 6 based on the ultimate strength of the materials used.*

2.2 Situation of the ship

The lifeboat shall be capable of being safely launched under all conditions of trim of the ship up to 10° and a list up to 20° either way from the certification height when fully equipped and loaded, compare Section 1, D.1.4.2.3. *For oil tankers, chemical tankers and gas carriers a final angle of heel greater than 20° may be possible,* see Section 1, D.1.4.2.4.

2.3 Detailed design

The design of the release mechanism shall also meet the requirements of the GL Rules defined in 1.2.

F. Enclosures

1. Internal height

The vertical distance between the floor surface and the interior of the rigid cover or canopy over 50 % of the floor area shall be: (LSA 4.4.1.8)

- *not less than 1,3 m for a lifeboat permitted to accommodate nine persons or less*
- *not less than 1,7 m for a lifeboat permitted to accommodate 24 persons or more*
- *not less the distance as determined by linear interpolation between 1,3 m and 1,7 m for a lifeboat permitted to accommodate between 9 and 24 persons*

2. Enclosures for partially enclosed lifeboats

2.1 Permanently rigid covers

2.1.1 *Partially enclosed lifeboats shall be provided with permanently attached rigid covers extending over not less than 20 % of **L** from the stem and not less than 20 % of **L** from the aftermost part of the lifeboat. (LSA 4.5.2)*

2.1.2 If the shelters have bulkheads they shall have openings of sufficient size to permit easy access by persons each wearing an immersion suit or warm clothes and a lifejacket.

2.1.3 The rigid covers shall be so arranged that they include windows or translucent panels to admit sufficient daylight to the inside of the lifeboat with the openings or canopies closed so as to make artificial light unnecessary.

2.1.4 *The lifeboat shall have entrances at both ends and on each side. Entrances in the rigid covers shall be weathertight when closed. (LSA 4.5.2)*

2.1.5 *If a fixed two-way VHF radiotelephone apparatus is fitted in the lifeboat, it shall be installed in a cabin large enough to accommodate both the equipment and the person using it. No separate cabin is required if the construction of the lifeboat provides a sheltered place to the satisfaction of the Administration. (LSA 4.5.4)*

2.2 Canopy (LSA 4.5.2.1 – 8.)

2.2.1 For the remaining part of the length *the lifeboat shall be fitted with a permanently attached foldable canopy which together with the rigid covers completely encloses the occupants of the lifeboat in a weatherproof shelter and protects them from exposure. The canopy shall be so arranged that:*

- *it is provided with adequate rigid sections or battens to permit erection of the canopy*
- *it can be easily erected by not more than two persons*
- *it is insulated to protect the occupants against heat and cold by means of not less than two layers of material separated by an air gap or other equally efficient means; means shall be provided to prevent accumulation of water in the air gap*
- *its exterior is of highly visible colour and its interior is of a colour which does not cause discomfort to the occupants, compare B.2. and B.3.*
- *entrances in the canopy are to be provided with efficient adjustable closing arrangements which can be easily and quickly opened and closed from inside or outside so as to permit ventilation but exclude seawater, wind and cold; means shall be provided for holding the entrances securely in the open and closed position*
- *with the entrances closed, it admits sufficient air for the occupants at all times*
- *it has means for collecting rainwater*
- *the occupants can escape in the event of the lifeboat capsizing*

3. Enclosures for totally enclosed lifeboats

Every totally enclosed lifeboat shall be provided with a rigid watertight enclosure which completely encloses the lifeboat. The enclosure shall be so arranged that: (LSA 4.6.2.1 – 11)

- *it provides shelter for the occupants*
- *access to the lifeboat is provided by hatches which can be closed to make the lifeboat watertight*
- *except for free-fall lifeboats hatches are positioned so as to allow launching and recovery operations to be performed without any occupant having to leave the enclosure*
- *access hatches are capable of being opened and closed from both inside and outside and are equipped with means to hold them securely in open positions, see H.1.*
- *except for a free-fall lifeboat, it is possible to row the lifeboat*
- *it is capable, when the lifeboat is in capsized position with the hatches closed and without significant leakage, of supporting the entire mass of the lifeboat, including all equipment, machinery and its full complement of persons*
- *it includes windows or translucent panels on both sides which admit sufficient daylight to the inside of the lifeboat with the hatches closed to make artificial light unnecessary,* see H.2.
- *its exterior is of highly visible colour and its interior of a light colour which does not cause discomfort to the occupants,* see B.2. and B.3.
- *handrails provide a secure handhold for persons moving about the exterior of the lifeboat and aid embarkation and disembarkation,* see G.2.
- *persons have access to their seats from the entrance without having to climb over thwarts or other obstructions*
- *during operation of the engine with the enclosure closed, the atmospheric pressure inside the lifeboat shall never be above or below the outside atmospheric pressure by more than* 20 mbar, see Section 7, E.

G. Access to the Lifeboat

1. Principle requirements

1.1 *Every cargo ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 3 minutes from the time the instruction to board is given. Rapid disembarkation shall also be possible. (LSA 4.4.3.2)*

1.2 *Every passenger ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 10 minutes from the time the instruction to board is given. Rapid disembarkation shall also be possible. (LSA 4.4.3.1)*

1.3 Especially in totally enclosed lifeboats *persons shall have access to their seats from the entrance without having to climb over thwarts or other obstructions,* see F.3. *(LSA 4.6.2.10)*

1.4 *The lifeboat shall be so arranged that helpless people can be brought on board either from the sea or on stretchers. (LSA 4.4.3.4)*

2. Handholds

2.1 *Totally enclosed lifeboats shall be equipped with handrails providing a secure handhold for persons moving about the exterior of the lifeboat and aid embarkation and disembarkation,* see also F.3. *(LSA 4.6.2.9)*

2.2 *Except in the vicinity of the rudder and propeller, suitable handholds shall be provided or a buoyant lifeline shall be becketed around the outside of the lifeboat above the waterline and within the reach of a person in the water. (LSA 4.4.7.3)* The middle of the aft becket shall be placed approximately 1,5 m forward of the propeller.

The lifelines shall be properly fastened as close to the gunwhale as possible at a distance between fastening points of approximately 600 mm. The becket shall reach approximately 75 mm above light waterline of the lifeboat.

Other material than buoyant rope may be used, if it is buoyant, corrosion resistant, has necessary temperature insulation and is supplied with handgrips when the diameter is too small for gripping the rope directly.

2.3 *Lifeboats which are not self-righting when capsized, shall have suitable handholds on the underside of the hull to enable persons to cling to the lifeboat. The handholds are to be fastened to the lifeboat in such a way that, when subjected to an impact sufficient to cause them to break away from the lifeboat, they break away without damaging the lifeboat. (LSA 4.4.7.4)*

The handholds shall have a diameter of 25 mm at minimum. They shall be fitted about 75 mm above the shell plating, extend at least over one third of the length of the lifeboat and shall be above the water level when the boat is capsized.

3. Boarding ladder

Lifeboats shall have a boarding ladder that can be used at any boarding entrance of the lifeboat to enable persons in the water to board the lifeboat. The lowest step of the ladder shall not be less than 0,4 m below the lifeboat's light waterline. (LSA 4.4.3.3) The steps of the ladder shall be rigid.

4. Surfaces

All surfaces on which persons might walk shall have a non-skid finish. (LSA 4.4.3.5)

This non-skid finishing shall at least have the same effect as sand in the topcoat or painting or the deck areas shall be built with a non-skid moulded structure.

H. Doors, Hatches and Windows

1. Doors and hatches

1.1 Doors and hatches of totally enclosed lifeboats including their covers, securing and locking devices are to be adequately dimensioned and shall be watertight. Ventilation ducts shall be designed to avoid significant entrance of water in normal operation and in the event of capsizing. Details are to be submitted for approval.

1.2 All doors and escape hatches are to be operable from both sides.

2. Windows

2.1 Windows in the hull

Windows in the hull of lifeboats are not permitted.

2.2 Windows in rigid enclosures

2.2.1 Windows in rigid enclosures shall be at least 500 mm above the waterline at full load of the boat.

2.2.2 Window panes

Panes shall be preferably made of polycarbonate ("PC") or polymethylmethacrylate ("PMMA) material which shall be UV-stabilized. Scratch resistance is required if wipers are provided, otherwise it is recommended. Heat toughened safety glass may only be approved in connection with testing of strength and tightness emulating service conditions..

Note

If direct bonding is used, it shall only be done with materials approved by GL, by personnel certified by GL and considering the requirements of the GL Guideline II – Materials and Welding , Part 2 – Non-metallic Materials, Chapter 3 - Guidelines for Elastomeric Adhesives and Adhesive Joints.

2.2.3 Windows of the non-opening type

Windows shall be watertight and adequately dimensioned. Unless bonded a direct installation of window panes of polycarbonat or equivalent materials without framing is permitted if an adequate sealing material is provided between pane and enclosure wall and fastening bolts are closely spaced so as to guarantee watertightness. Tests emulating service conditions may be required to establish sufficient strength and tightness.

2.2.4 Windows of the opening type

Windows shall have adequately dimensioned framing and a closing mechanism which guarantees watertightness.

I. Seating

1. Seating for lifeboats launched by falls

1.1 Seating arrangement

1.1.1 The seats shall not interfere with the means of propulsion or the operation of any of the lifeboat's equipment.

1.1.2 As defined in Section 1, D.1.1.2 the number of seats that can be provided in a lifeboat is dependent on the seating arrangement according to Fig. 5.3. *The shapes may be overlapped as shown, provided footrests are fitted and there is sufficient room for legs and the vertical separation between the upper and lower seat is not less than 350 mm. (LSA 4.4.2.2.2)* The minimum height between seat and footrest shall be kept between seat and floor.

1.1.3 *Each seating position shall be clearly indicated in the lifeboat. (LSA 4.4.2.3)*

1.1.4 It is recommended to arrange a limited number of seats for persons with a size of 1,90 m and above.

1.1.5 It is recommended to allow for adjustment of height and distance to the rudder tiller of the seat provided for the helmsman of the lifeboat.

1.2 Loads

Seating shall be provided on thwarts, benches or fixed chairs which are constructed so as to be capable of supporting: (LSA 4.4.1.5.1 + 2.)

- *a static load equivalent to the number of persons, each weighing 100 kg, for which spaces are provided in compliance with the requirements of 1.1.2*
- *a load of 100 kg in any single seat location when a lifeboat to be launched by falls is dropped into the water from a height of at least 3 m*

1.3 Seat belts

In all types of self-righting lifeboats a safety belt shall be fitted at each indicated seating position. The safety belt shall be designed to hold a person with a mass of 100 kg securely in place when the lifeboat is in a capsized position. Each set of safety belts for a seat shall be of a colour which contrasts with the belts for seats immediately adjacent. (LSA 4.6.3.1)

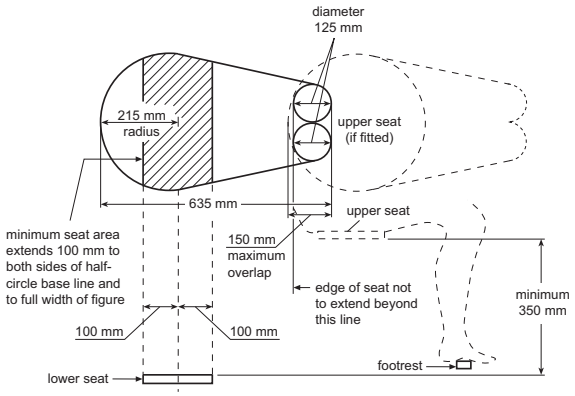

Fig. 5.3 Seating arrangement for lifeboats launched by falls

2. Seating for free-fall lifeboats

2.1 Seating arrangement

2.1.1 The seats shall not interfere with the means of propulsion or the operation of any of the lifeboat's equipment.

2.1.2 Seats shall be padded and provide, for each person, lateral support for head, torso and thigh in accordance with Fig. 5.4.

The width of the seat shall be at least 430 mm. Free clearance in front of the backrest shall be at least 635 mm. The backrest shall extend at least 1000 mm above the seat pan, in accordance with Fig. 5.4. (LSA 4.7.2) It is recommended that lifejackets be carried into the free-fall lifeboat and not worn until after the lifeboat has been launched.

2.2 Loads (LSA 4.4.1.5.3)

Seating shall be provided on fixed chairs which are constructed so as to be capable of supporting:

- *a load of 100 kg in any single seat location when a free-fall lifeboat is launched from its free-fall certification height*, see Section 1, B.13.1.

2.3 Safety harness

Free-fall lifeboats shall be fitted with a safety harness at each seat in contrasting colour designed to hold a person with a mass of 100 kg securely in place during a free-fall launch as well as with the lifeboat in capsized position. (LSA 4.6.3.1)

3. Tests

For the seating space and strength tests, the drop and impact test and the four point seat belt test see Section 11.

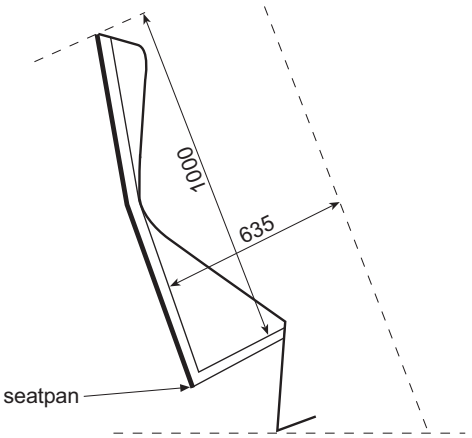

Fig. 5.4 Seating arrangement for free-fall lifeboats

J. Lockers and Compartments

1. *All lifeboats shall be fitted with sufficient watertight lockers or compartments to provide for the small items of equipment, water and provisions as defined in K. (LSA 4.4.7.5)*

2. The lockers can be designed as integrated parts of the construction of the lifeboat or as separate tanks, which are to be adequately secured against forces due to motions of the lifeboat. Lockers made of steel shall be galvanized. Alternatively corrosion resistant materials may be applied.

3. Hatches in the lockers shall have sufficient size to handle the goods. They shall be easily opened and closed watertight. Screw covers which are difficult to open are not recommended.

4. If lockers and tanks are not integrated in the construction their scantlings can be determined like detached tanks, considering a pressure height of at least h = 700 mm above the seat pan at any occupant seating position, see Section 3, B.2.2.

5. The national rules for potable water tanks have to be met, compare Section 7, D.11.3.

K. Miscellaneous Loose lifeboat equipment

1. Storage

All items of lifeboat equipment, whether required here or elsewhere in these Rules shall be secured within the lifeboat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements or other suitable means. However, in the case of a lifeboat to be launched by falls, boathooks shall be kept free for fending-off purposes. The equipment shall be secured in such a manner as not to interfere with any abandonment procedures.

All items of lifeboat equipment shall be as small and as of little mass as possible and shall be packed in a suitable and compact form.

2. Scope

The loose equipment of a lifeboat is in the majority not subject to Classification. Only equipment which is definitely required in the different Sections of these Rules will be included in the Classification Procedure.

However, to provide completeness of information the scope as defined by IMO Life Saving Appliances Code (LSA), Chapter IV, 4.4.8 is given herein.

Note

The normal equipment of every lifeboat shall consist of:

2.1 *Except for free-fall lifeboats sufficient buoyant oars to make headway in calm sea. Thole pins, crutches or equivalent arrangements shall be provided for each oar provided. Thole pins or crutches shall be attached to the boat by lanyards or chains.*

2.2 *Two boat-hooks.*

2.3 *A buoyant bailer and two buckets,* compare Section 7, D.9.

2.4 *A survival manual.* For operating instructions see Section 7, A.6.4.

2.5 *An operational compass which is luminous or provided with suitable means of illumination. In a totally enclosed lifeboat, the compass shall be permanently fitted at the steering position; in any other lifeboat, it shall be provided with a binnacle, if necessary to protect it from the weather, and suitable mounting arrangements.*

2.6 *A sea anchor of adequate size fitted with a shock-resistant hawser which provides a firm hand grip when wet. The strength of the sea anchor, hawser and tripping line, if fitted, shall be adequate for all sea conditions,* compare D.2.

2.7 *Two efficient painters of a length equal to not less than twice the distance from the stowage position of the lifeboat to the waterline in the lightest seagoing condition or 15 m, whichever is the greater.*

On lifeboats to be launched by free-fall launching, both painters shall be stowed near the bow ready for use.

On other lifeboats one painter attached to the release device according to D.3.1 shall be placed at the forward end of the lifeboat and the other shall be firmly secured at or near the bow of the lifeboat ready for use.

2.8 *Two hatchets, one at each end of the lifeboat.*

2.9 *Watertight receptacles containing a total of 3 l of fresh water for each person the lifeboat is permitted to accommodate, of which 1 l per person may be replaced by a desalting apparatus capable of producing an equal amount of fresh water in 2 days or 2 l per person may be replaced by a manually powered reverse-osmosis desalinator, as described in* Section 7, D.11.*, capable of producing an equal amount of fresh water in two days.*

2.10 *A rustproof dipper with lanyard.*

2.11 *A rustproof graduated drinking vessel.*

2.12 *Food rations totalling not less than 10 000 kJ for each person the lifeboat is permitted to accommodate. These rations shall be kept in airtight packaging and be stowed in a watertight container.*

These rations shall be palatable, edible throughout the recommended shelf life, and packed in a manner which can be readily divided and easily opened. (LSA 4.1.5.1.18)

2.13 *Four rocket parachute flares.*

2.14 *Six hand flares.*

2.15 *Two buoyant smoke signals.*

2.16 *One waterproof electric torch suitable for Morse signalling, together with one spare set of batteries and one spare bulb in a waterproof container.*

2.17 *One daylight signalling mirror with instructions for its use for signalling to ships and aircraft.*

2.18 *One copy of the life saving signals* on a waterproof card or in a waterproof container.

2.19 *One whistle or equivalent sound signal.*

2.20 *A first-aid outfit in a waterproof case capable of being closed tightly after use.*

2.21 *Anti-seasickness medicine sufficient for at least 48 hours and one seasickness bag for each person.*

2.22 *A jack-knife to be kept attached to the boat by a lanyard.*

2.23 *Three tin-openers.*

2.24 *Two buoyant rescue quoits, attached to not less than 30 m of buoyant line.*

2.25 *If the lifeboat is not automatically self-bailing, a manual pump suitable for effective bailing,* compare Section 7, D.9.

2.26 *One set of fishing tackle.*

2.27 *Sufficient tools for minor adjustments to the engine and its accessories*, compare Section 7, G. and Section 8, E.

2.28 *Portable fire-extinguishing equipment of an approved type suitable for extinguishing oil fires,* compare Section 6.

2.29 *A searchlight with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2500 cd which can work continuously for not less than 3 hours,* compare Section 8, D.

2.30 *An efficient radar reflector, unless a survival craft radar transponder is stowed in the lifeboat.*

2.31 *Thermal protective aids sufficient for 10 % of the number of persons the lifeboat is permitted to accommodate or two, whichever is the greater.*

A thermal protective aid shall be made of waterproof material having a thermal conductance of not more than 7800 W/(m^2K) and shall be so constructed that, when used to enclose a person, it shall reduce both the convectional and evaporative heat loss from the wearer's body. (LSA Chapter II, Reg. 2.5)

The thermal protective aid shall:

- *cover the whole body of persons of all sizes wearing a lifejacket with the exception of the face. Hands shall also be covered unless permanently attached gloves are provided*
- *be capable of being unpacked and easily donned without assistance in a lifeboat or rescue boat*
- *permit the wearer to remove it in the water in not more than 2 minutes, if it impairs to swim*

The thermal protective aid shall function properly throughout an air temperature range –30 °C to +20 °C.

2.32 *In the case of ships engaged on voyages of such a nature that, in the opinion of the Administration of the flag state, the items specified in 2.12 and 2.26 are unnecessary, the Administration may allow these items to be dispensed with.*

2.33 Arctic conditions

For lifeboats of ships operating in Arctic ice-covered waters the following additional aspects have to be considered according to IMO MSC/Circ.1056, 11.5.6 – 7:

Drinking water should be stored in containers that allow for expansion due to freezing.

Provision of additional emergency rations to account for high rates of energy expenditure under Arctic conditions.

L. Tests

Different elements of the hull outfit have to be tested. The details of these tests are given in Section 11, Part 1.

The following tests have to be carried out for prototypes or individual units:

- *seating strength test*
- *seating space test*
- *release mechanism test*
- *towing and painter release test*
- *canopy erection test*

Section 6

Fire Protection and Fire Extinguishing Equipment

A. General

1. Scope

1.1 The requirements of this Section are concerning the structural fire-protection of hull and cover as well as the fire extinguishing equipment for lifeboats.

1.2 Where the requirements of this Section need a particular fitting, appliance or apparatus to be fitted on the lifeboat, or that any particular provision shall be made, GL may allow other fitting, appliance or apparatus, or type thereof, to be fitted or carried or any other provision to be made on the lifeboat, if satisfied that it is at least as effective as that required by this Section.

1.3 Where compliance with any requirement of this Section is impracticable for the particular design GL may accept alternative requirements provided that equivalent safety is achieved.

1.4 The term “approved” relates to a material or construction, for which GL has issued an Approval Certificate. An Approval Certificate can be issued on the basis of a successful standard fire test, which has been carried out by a neutral and recognized fire testing institute.

2. Definitions

2.1 Fire-retardant material

Fire-retardant materials are those materials which have fire retardant properties in accordance with standards acceptable to GL.

2.2 Non-combustible material

Non-combustible material is a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750 °C, this being determined in accordance with the Fire Test Procedures Code [1]. (SOLAS II-2, Reg.3,33.)

3. Documents to be submitted

3.1 The following documentation is to be submitted:

– list of approved materials concerning the hull and the hull outfit (type, maker, approval number)

– list of approved fire fighting equipment

The documentation is to be submitted in triplicate.

3.2 GL reserve the right to ask for additional information and/or supplementary copies, if deemed necessary in particular cases.

B. Fire Protection

1. Hull

Hull and rigid cover of lifeboats shall be constructed of approved fire-retardant or non-combustible materials. (LSA 4.4.1.4. + MSC/Circ.1006)

2. Insulation materials

2.1 Where insulation is installed in areas in which it could come into contact with any flammable liquids or vapours, its surface shall be impermeable to such flammable liquids or vapours.

2.2 Any thermal and acoustic insulation shall be of non-combustible or of fire-retardant material. Vapour barriers and adhesives used in conjunction with insulation need not be non-combustible or fire-restricting, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame spread characteristics. [2]

3. Lifeboats with self-contained air support system

The design and arrangement of the self-contained air support system shall not increase the fire hazard of the lifeboat. For requirements on self-contained air support systems see Section 7, E.3.

4. Fire-protected lifeboats

In addition to complying with the requirements of 3., a fire-protected lifeboat when waterborne shall be capable of protecting the number of persons it is permitted to accommodate when subjected to a continuous oil fire that envelops the lifeboat for a period of not less than 8 minutes. (LSA 4.9)

In case a water spray system for the protection of the surface of the lifeboat above waterline is provided, the design has to follow Section 7, D.10.

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[1] Reference is made to the Fire Test Procedure Code, Annex 1, Part 1 adopted by IMO by Resolution MSC 61(67)

[2] Reference is made to the Fire Test Procedure Code, Annex 1, Part 5 adopted by IMO by Res. MSC 61(67)

C. Fire Extinguishing Equipment

1. General

1.1 Lifeboats with permanently installed internal combustion engines are to be equipped with portable fire extinguishers for class A and B fires according to Table 6.1.

Table 6.1 Classification of extinguishing media

Fire class	Nature of burning material	Extinguishing media
A	solid combustible materials of organic nature, e.g. wood, fibre materials	water, dry powder, foam
B	Inflammable liquids, e.g. oils, fuel, tar oil	dry powder, foam, carbon dioxide

Preferably only dry powder extinguishers should be used.

Note

The use of extinguishers containing Halon is no longer permitted.

1.2 The charge of the extinguishers shall be at least 2 kg and should not to exceed 6 kg. [3]

1.3 The extinguishers are to be arranged conveniently and with suitable brackets.

1.4 For fighting a fire within the engine cover, closeable discharge ports are to be provided allowing the discharge of the extinguishing agent without prior removal or opening of parts or the whole engine cover.

1.5 All lifeboats are to be provided with two fire buckets as already defined for miscellaneous loose lifeboat equipment in Section 5, K.2.3.

2. Number of fire extinguishers

The number of fire extinguishers required is to be selected from the minimum total weight of extinguishing agent according to Table 6.2.

Table 6.2 Definition of weight of extinguishing agent

Power of inboard engine [kW]	Minimum weight of extinguishing agent [kg]
≤ 50 kW	2
≤ 100 kW	4
> 100 kW: per each 100 kW or part thereof	in addition 2

3. Surveys

Fire extinguishers are subject to inspection by a competent person every year. For further requirements see GL Rules Part 0 - Classification and Surveys, Section 3, C.1.1.4.

D. Tests

Fire-protected lifeboats have to be tested additionally. The details of these tests for prototypes and individual units are given in Section 11, Part 1.

The additional tests are:

– *fire test*

– *water spray tests*

[3] For lifeboats on ships flying the German flag extinguishers with 6 kg weight of charge shall be used.

Section 7

Machinery Installations

A. General

1. Scope

This Section defines the requirements for the complete propulsion system of the lifeboat and all auxiliary functions. Parts of the auxiliary systems are ventilation, water spray systems, generator drives and pumps. In addition the necessary spare parts and tools and the tests for the engine to proof its suitability are defined.

2. Rules and standards

2.1 The relevant international regulations are defined in Section 1, A.7.

2.2 National and regional rules and regulations beyond the requirements of these Rules remain unaffected.

2.3 Installations deviating from these Rules may be accepted if they have been assessed by GL for their suitability and have been approved as equivalent.

2.4 For machinery and technical installations not included in these Rules, GL may set special stipulations based on relevant Rules and technical regulations if deemed necessary for the safety of the lifeboat.

Furthermore GL reserve the right for all types of installations to state requirements beyond these Rules, if deemed necessary due to newly-acquired knowledge or operating experience.

3. Principle requirements

3.1 Machinery installations of lifeboats have to be designed, equipped and arranged that they fulfil the operational requirements – especially because of movement of the lifeboat, vibrations and influence of the weather – and that no persons are endangered.

Lifeboats have to be designed to fully meet the principle design requirements defined in Section 1, D. for the different types of lifeboats. Special attention shall be given to the required speeds and the volume of the fuel tanks according to the requirements of Section 1, D.1.1.5.

3.2 Scantlings of structural parts and components, materials and welding

All parts shall be able to withstand the specific stresses due to the lifeboat`s motion, heel, trim, vibration, corrosive action and, if applicable, also slamming. Where rules for the scantlings of components are not available, acknowledged engineering rules shall be applied.

3.3 Ambient conditions

Unimpaired operation of the machinery installations is to be safeguarded under the ambient conditions defined in Section 1, C.

3.4 Arrangement

3.4.1 Machinery installations shall be arranged with adequate access for operation, checking and routine maintenance.

3.4.2 Especially the following elements shall be easily accessible without the need for disassembling work:

- fuel, air and lubricating oil filters
- fuel pumps
- fuel valves
- cooling water pump
- operating devices of power starting systems and starting lever for manual starting

3.5 Foundations

Machinery installations shall be securely fastened to the lifeboat, taking into account the loads to be expected. Foundations and seating shall be properly integrated into the structure of the hull.

3.6 Ventilation

For partially or totally enclosed lifeboats adequate ventilation shall be provided, taking into account the air required for combustion and cooling of machinery, compare E.

4. Protective measures

4.1 Machinery installations shall be such that the risk of accidents is substantially excluded.

Exposed moving parts and rotating shafts are to be protected by means of suitable guards. This may be dispensed with if moving parts and rotating shafts are adequately protected by other permanently installed equipment.

4.2 Crank handles of internal combustion engines which can also be crank-started are to disengage automatically when the engine starts and are to be kick-back proof, see also B.3.

4.3 Insulating material for machinery installations shall be non-combustible according to **SOLAS** Chapter II-2, Reg. 3.1 or equivalent. The insulation shall be suitably protected against penetration by moisture or leakage oil. It is to be so applied that:

- maintenance can be carried out without damaging the insulation, or
- the insulation can be easily removed for maintenance or repairs and properly replaced on completion of the work

4.4 Components of the installation having a surface temperature ≥ 220 °C are to be properly insulated.

Components, which may be used without body protection (e.g. protective gloves) and with a contact time up to 5 s, are to have no higher surface temperature than 60 °C. Components made of materials with high thermal conductivity, which may be used without body protection and with a contact time of more than 5 s are not to achieve a surface temperature above 45 °C.

4.5 Painting

Only fire retardant paints are to be used on machinery and in areas where machinery is installed.

4.6 *The lifeboat's engine and accessories shall be designed to limit electromagnetic emissions so that engine operation does not interfere with the operation of radio life-saving appliances used in the lifeboat. (LSA 4.4.6.10)*

5. Operating and monitoring equipment

5.1 General

Operating and monitoring equipment is to be arranged suitably and distinct and provided with permanent identification.

5.2 Means of reversing

Lifeboats are to be equipped with means of reversing the direction of travel. Reversing levers are to be so arranged that their operating direction matches the desired direction of travel. If the reversing lever is arranged in transverse direction of the lifeboat a clear designation of the travel direction has to be provided.

5.3 Scope of warning devices

The control position is to be provided at least with optical/acoustical warning devices for oil pressure, cooling water temperature, if applicable, and battery charging. The alarm thresholds are to be set in accordance with the engine manufacturer's instructions. It is recommended to provide a revolution indicator for propulsion control, which is obligatory for tenders and fast rescue boats.

5.4 Speed regulator

Each engine is to be equipped with a safety or speed regulator which prevents the engine's rated rational speed being exceeded by more than 15 %.

5.5 Control arrangement

Fuel control and reversing levers as well as the rudder tiller have to be arranged in a way that the helmsman is able to operate them in a sitting position or in a standing position if the boat cover is built up.

6. Documents for approval

6.1 For checking compliance with the Rules, drawings and documentation giving clear indication of the arrangement and dimensions of the components are to be submitted in triplicate. If necessary these are to be supplemented by descriptions and data sheets, compare Section 2, B.2.

6.2 Supervision of construction is based on the approved documentation which shall be submitted before commencing construction.

6.3 The approved documentation is binding. Any subsequent changes shall have GL approval.

6.4 *Water-resistant instructions for starting and operating the engine shall be provided and mounted in a conspicuous place near the engine starting controls. (LSA 4.4.6.12)*

B. Internal Combustion Engines

1. General

1.1 For dimensioning the major engine components the GL Rules Part 1 – Seagoing Ships, Chapter 2 – Machinery Installations are to be applied analogously.

1.2 *Every lifeboat shall be powered by a compression ignition engine. No engine shall be used for any lifeboat if its fuel has a flashpoint of 43 °C or less (closed-cup test). (LSA 4.4.6.1)*

1.3 The rated power of the propulsion engine has to ensure the speed requirements defined in Section 1, D.1.1.5, D.2.5 and D.3.2.

1.4 *The engine shall be capable of operating for not less than 5 minutes after starting from cold with the lifeboat out of water. (LSA 4.4.6.3)*

1.5 *The engine shall be capable of operating when the lifeboat is flooded up to the centreline of the crankshaft, compare Section 1, C.1.4. (LSA 4.4.6.4)*

1.6 Internal combustion engines shall meet the requirements of the tests defined in Section 11, Part 1: 6.10.1. – 6.10.6. For totally enclosed lifeboats the requirements of Part 1: 6.14.6 - 6.14.8 have to be met additionally.

1.7 In addition the engines have to fulfil the regulations of the flag state of the ship for which the lifeboats are to be provided.

2. Foundations

2.1 Inboard engines

2.1.1 Except for free-fall lifeboats it is recommended that inboard engines are flexibly mounted on their foundations/seating. The recommendations for installation given by the engine manufacturers shall be observed.

2.1.2 If the mounting is flexible, the connections for fuel, cooling water, exhaust lines, etc. and also cables plus operating and monitoring equipment are to be made flexible.

2.1.3 Oil proof elastic mounts shall be used.

2.2 Outboard motors

2.2.1 Outboard motors are only permissible for rescue boats, see Section 10, B.4.

2.2.2 The fastening of outboard motors to the hull shall be turnable if directly used for steering and shall be in hinged form to protect motor and propeller against underwater obstacles. In addition, the motors have to be secured against accidental loss.

3. Starters

3.1 *The engine shall be provided with either: (LSA 4.4.6.2)*

- *a manual starting system, or*
- *a power starting system with two independent rechargeable energy sources*

3.2 The manual starter has to be arranged in the following way:

- the starting lever has to be mounted in a non-return way
- the starting lever shall disengage automatically if the engine starts to run
- the starting lever shall not be thrown out of its guidance if the engine starts to run
- the arrangement of the starting lever on the engine shall be in a way to ensure safe and practicable operation; if a chain transmission is provided, the chain has to be protected against corrosion
- to facilitate manual starting, the engine has to be provided with a decompression device
- manual starters are only to be provided, if the arrangement or disassembly of the floor plates, etc. guarantee a safe and effective place for the starting person even in a heavy seaway

3.3 A power starting system with two independent rechargeable energy sources may be:

- an electric starter, to be fed alternatively by two independent batteries
- an electric starter fed from only one battery and a spring power starter or a hydraulic starting device
- a spring power starter and a hydraulic starting device

For each independent power source three consecutive starts shall be possible.

3.4 Starters shall be reliable and safe to operate. It is preferable not to use key switches. If key switches for starters are used, they have to be secured to the motor against loosing by suitable chains or other means.

3.5 *Any necessary starting aids shall also be provided. The engine starting systems and starting aids shall start the engine at an ambient temperature of –15 °C within 2 minutes of commencing a start procedure unless, in the opinion of GL having regard to the particular voyages in which the ship carrying the lifeboat is constantly engaged, a different temperature is appropriate.*

The starting systems shall not be impeded by the engine casing, seating or other obstructions. (LSA 4.4.6.2)

4. Covers and noise protection (LSA 4.4.6.9)

4.1 In open lifeboats *the engine, transmission and engine accessories shall be enclosed in a fire-retardant casing or other suitable arrangements providing similar protection. Such arrangements shall protect the engine from exposure to weather and sea.* The engine casing has to be easily dismantled without using tools.

4.2 *Such arrangements shall also protect persons from coming in accidental contact with hot or moving parts, compare A.4.4.*

4.3 *Adequate means shall be provided to reduce the engine noise so that shouted orders can be heard.* It is recommended that the acoustic pressure does not exceed 60 dB(A) at 1 m distance from the engine casing.

4.4 For casings of batteries see Section 8.

5. Additional requirements for totally enclosed lifeboats

5.1 *The engine and engine installation shall be capable of running in any position during capsize and continue to run after the lifeboat returns to the upright or shall automatically stop on capsizing and be easily restarted after the lifeboat returns to the upright. (LSA 4.6.4.2)* The required additional tests are defined in Section 11, Part 1: 6.14.6 to 6.14.8.

5.2 *The design of the fuel and lubricating systems shall prevent a loss of fuel and the loss of more than 250 ml of lubricating oil from the engine during capsize. (LSA 4.6.4.2)*

5.3 *The engine and transmission shall be controlled from the helmsman's position. (LSA 4.6.4.1)*

5.4 Electrical installations at the engine, like starter or generators, shall be again ready for operation after capsizing and batteries shall not leak, compare Section 8.

C. Power Transmission

1. General

Power transmission includes propeller, propeller shaft, couplings and gearing.

The propeller shafting shall be so arranged that the propeller can be disengaged from the engine. Provision shall be made for ahead and astern propulsion of the lifeboat. (LSA 4.4.6.5)

2. Propellers

2.1 Propellers shall be of a proven design. Propellers deviating from standard design are to be approved by GL. For the dimensioning of the blades of the fixed pitch propellers 6.2 applies.

2.2 Propellers shall consist of a corrosion-free and erosion resistant material, such as stainless steel, cast copper alloy, etc.

2.3 The connection of the propeller to the propeller shaft shall be of proven design, such as flanged, key taper connection, hydraulic connection, and are to be designed for at least 2,3 times the nominal torque of the engine. The cap nut, as far as provided, shall be suitably secured.

2.4 *All propellers shall be designed with due regard to the safety of persons in the water and to the possibility of damage of the propulsion system by floating debris. (LSA 4.4.6.7)* In addition the engagement of towing lines and wires by the propeller shall be avoided.

2.5 For design of nozzles see GL Rules Part 1 – Seagoing Ships, Chapter 1 – Hull Structures, Section 14, H.

2.6 Free-fall lifeboats

Propeller and gearing of the propulsion system of free-fall lifeboats have to be so designed that the forces occurring during immersion do not cause any impermissible stresses. For the propeller about two thirds of the free-fall velocity can be used upon impact. As effective deadrise angle the pitch of the propeller blades can be taken.

In addition the foundations and supports for the propulsion system have to be designed to withstand mass forces because of deceleration during immersion.

3. Propeller shaft

3.1 The propeller shaft in the sense of these Rules is the shaft directly connected to the propeller.

3.2 Standard values for the propeller shaft diameter may be determined from 6.1. Regarding permissible torsional vibration stresses in the propeller shaft see 6.3.

3.3 In the case of application of cardan shafts GL type approved components should be used as a rule. The dimensioning has to comply with the manufacturer's recommendations. Forces from cardan shafts shall be transmitted directly to adequately dimensioned bearings.

3.4 Propeller shafts installed in the hull are to be so supported that displacement of individual bearings caused by flexing of the hull does not cause excessive bearing pressures in the adjoining bearings or in the gear bearings. Bearings should be as wide apart as practicable. As a guidance for the maximum distances between bearings the following may be applied:

$$l_{max} = C\,(d/n)^{0,5} \quad [mm]$$

l_{max} = maximum distance between bearings [mm]

d = shaft diameter [mm]

n = shaft revolutions [min^{-1}]

C = 12000 for steel shafts

C = 8000 for bronze shafts

Where engine and gear are flexibly mounted and with the stern tube bearings of rubber, the C-value in above

formula should be at least C = 6000 if the propeller shaft is led directly from the gear output flange to the propeller. In such cases flexible mounting of the stern seal to the stern tube is to be applied.

3.5 Guidance for permissible values of bearing pressures p_{max} , peripheral speeds v_{max} and bearing clearance s_L in stern tube bearings is given in Table 7.1.

3.6 The propeller shaft shall consist of stainless steel material or otherwise is to be protected against corrosion assuming seawater environment.

3.7 Shaft and other rotating parts inside the lifeboat shall be protected at least by a screen.

Table 7.1 Permissible bearing parameters

Type of bearing	p_{max} [N/mm^2]	v_{max} [m/s]	s_L [mm]
Grey cast iron or bronze bearing, grease lubricated	0,5	2,5 – 5	~ 0,6
Rubber bearing, water lubricated	0,2	6	~ 0,5
White metal bearing, oil lubricated [1]	0,8	> 6	~0,4
[1] mainly applied for tenders used as rescue boats			

4. Gearing

4.1 The design of gearing for the propulsion of lifeboats is considered to be suitable, if i.a.:

- *the propeller can be disengaged from the engine (LSA 4.4.6.5)*
- *provision shall be made for ahead or astern propulsion (LSA 4.4.6.5),* the change of direction is to be possible at maximum speed of the lifeboat
- the control lever for the propulsion direction has to be moved in the direction of the movement
- the toothing is adequately dimensioned in accordance with the GL Rules Part 1 – Seagoing Ships, Chapter 2 - Machinery Installations, Section 5, or DIN 3990/ISO 6336
- gearing shafting is designed fatigue-resistant in accordance with standard engineering practice
- roller bearings are designed for a rated working life of at least 1000 hours at full load
- the lubricating oil temperature does not exceed 90 °C with a water temperature of 30 °C and operating at full load
- in case of hydraulically controlled reversing gears, a single emergency manoeuvre from "full ahead" to "full astern" does not cause damage to toothing, clutches, shafts and other components of the gearing

4.2 As regards additional stress due to torsional vibrations, reference is made to 6.3.

5. Flexible couplings

Flexible couplings between engine and gearing or between the flexibly mounted engine plus gear-box and the propeller shaft shall be of a proven type. The permissible loads recommended by the manufacturers of the coupling shall not be exceeded.

6. Calculations and guidance for permissible stresses

6.1 Propeller shaft diameter

The propeller shaft diameter d_p can be determined as a guidance as follows:

$$d_p = k\,(C \cdot P / n_2)^{0,33} \quad [mm]$$

P = propulsive power [kW]

n_2 = propeller shaft revolutions [min^{-1}]

k = 90 for shafts of corrosion-resistant steel [1], wrought copper alloys [2], nickel alloys (Monel) [3] or for non- corrosion resistant steel protected against contact with seawater

= 75 for shafts of high-tensile wrought nickel alloys [4]

C = 1,2 for lifeboats with one propulsion line

C = 1,0 for lifeboats with two propulsion units

6.2 Thickness of propeller blades

For standardized propellers a proven design is required. As a guidance values for the thickness $t_{0,25}$ of propeller blades at a radius of 0,25 R can be determined as follows:

$$t_{0,25} = k\,[C \cdot P \cdot 10^3 / (n_2 \cdot B \cdot z)]^{0,5} \quad [mm]$$

P = propulsive power [kW]

n_2 = propeller revolutions [min^{-1}]

B = width of blade at 0,25 R [mm]

z = number of blades

k = 50 for propellers of high-tensile cast brass

= 46 for propellers of corrosion-resistant austenitic steel

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1 preferably austenitic steels with 18 % chrome and 8 % nickel

2 e.g. wrought copper-nickel zinc alloy CuZn35Ni in acc. with DIN 1766

3 Nickel content > 60 %, tensile strength R_m > 400 N/mm^2

4 e.g. “Monel alloy K-500”, tensile strength R_m > 900 N/mm^2

= 42 for propellers of high-tensile nickel-aluminium-bronze

= 75 for propellers of an aluminium alloy (cast in chill mould)

= 100–120 for propellers of synthetic material

C = 1,2

6.3 Torsional-vibration stresses

To check the torsional-vibration behaviour of the propulsion plant, a torsional-vibration calculation shall be carried out.

6.3.1 Standard values for permissible torsional vibration stresses in the propeller shaft

The torsional vibration stresses τ_w permissible in the propeller shaft are calculated in accordance with the following formula:

$$\tau_w = (59 - 39 \cdot \lambda)\, C_K \quad [N/mm^2]$$

λ = partial load / full load rotational speed ratio

C_K = coefficient of influence for the fatigue strength of the shaft in the area between the aft stern tube bearing and the propeller

= 1,0 for propeller shafts of corrosion-resistant material if the hub is protected against the entry of water

6.3.2 Standard values for permissible torsional vibration stresses in gearing

In the higher speed range the torsional vibration stresses with gearing are not to exceed 30 % of the rated transmitted torque of the respective stage.

There shall not be any lifting of the toothing (load change) with the propeller clutched-in.

6.3.3 Permissible torsional-vibration stresses in flexible couplings

Flexible couplings in the propulsion plant shall be designed to withstand the alternating torques arising with the associated frequencies, over the entire range of rotational speeds.

D. Auxiliary Systems

1. Scope

These Rules apply to all auxiliary systems, including pipes, pumps and fittings for the operation of machinery, as well as for the operation of the lifeboat.

2. Materials

2.1 General

2.1.1 Materials for piping and fittings shall be suitable for their purpose.

2.1.2 Piping and fittings are preferably to be made of metal, except of aluminium. Where plastic pipes or hoses are used due to the installation conditions, the special requirements stated under 2.2 are to be observed.

2.2 Plastic pipes and hoses

2.2.1 Plastic pipes

2.2.1.1 The use of plastic pipes is restricted to seawater, fresh water, bilge water.

2.2.1.2 Plastic pipes may be used after special approval by GL considering IMO Resolution A.753 (18), "Guidelines for the Application of Plastic Pipes on Ships".

2.2.1.3 When laying plastic pipes, attention shall be paid to providing adequate and proper fastening devices and protection against unacceptable external heating.

2.2.2 Flexible hoses

2.2.2.1 Hoses shall be suitable for the media, operating pressures and temperatures.

2.2.2.2 For liquid fuels, lubricating oil or hydraulic oil, only type approved fire resistant hoses are permissible.

2.2.2.3 For connection to consumers, fittings, pipes, etc. hoses with fixed end fittings are to be used.

2.2.2.4 In fresh water systems with a working pressure ≤ 5 bar hoses may be fastened to pipe ends by double clips.

2.2.2.5 Hoses are to be so routed and fastened that movement due to vibration or motion of the lifeboat, chafing and unacceptable heating is avoided and visual checking is possible at any time.

Hose lines piercing structural components are to be suitably protected in way of the penetration.

3. Hull fittings

3.1 All connections to the hull below or near the waterline are to be provided with sea-cocks, fitted directly to the shell.

3.2 Sea-cocks shall be easy to reach; if necessary, extension rods are to be provided.

3.3 Sea-cocks and through hull fittings shall be of ductile metallic material.

Other materials, e.g. fibre reinforced plastics, may be allowed if proof of adequate strength and fire resistance at least equal to that of the hull has been provided.

4. Pumps

4.1 Pumps are to be securely fixed installed and are to be accessible.

4.2 Power pumps of the displacement type are to be fitted with means of overpressure protection if valves or cocks are fitted on the discharge side of the pump.

5. Fuel system

The fuel for lifeboats shall have a flashpoint ≥ 43 °C.

5.1 Fuel tanks

5.1.1 General

5.1.1.1 The size of the fuel tank has to meet the design requirements according to Section 1, D.1.1.5, D.2.5 and D.3.2.

5.1.1.2 Fuel tanks shall be made of a suitable corrosion-resistant material, if necessary fitted with wash plates and securely fastened to the lifeboat.

5.1.1.3 Fuel tanks shall be arranged such that unacceptable heating is avoided.

5.1.1.4 Pipe connections are preferably to be arranged in the tank top. They shall not weaken the tank; welded doubling plates are to be provided, if necessary. Through bolts are not permitted in tank boundaries.

5.1.1.5 Fuel tanks shall be provided with hand holes for cleaning.

5.1.1.6 Tanks and filler necks are to be earthed with a bonding wire of at least 4 mm^2.

5.1.2 Filling arrangements

5.1.2.1 A screw plug with a diameter of at least 1,5 inch shall be provided. The type of fuel shall be clearly marked near the plug.

5.1.3 Tank vent line

Each fuel tank shall be provided with adequate venting.

5.1.4 Fuel supply

The suction line is to be arranged sufficiently high above the tank bottom to prevent the entry of dirt and water.

5.1.5 Tank drainage

5.1.5.1 Tanks are to be provided with suitable drainage arrangements or alternatively water separators may be fitted in the fuel suction line.

5.1.5.2 Drainage fittings near the tank bottom shall be equipped with a valve which in addition is to be provided with a cap or plug.

5.1.5.3 Drainage arrangements shall be so arranged as to allow safe drainage into a collecting receptacle.

5.1.6 Tank sounding equipment

The tanks are to be provided with means for sounding or with a remote level indicator.

Gauge glasses, sight glasses or float indicators with mechanic transmission are not permitted.

5.1.7 Tests

Fuel tanks including all connections shall be subjected to pressure testing with the hydrostatic pressure corresponding to the height of 2000 mm above level of the tank top.

5.2 Fuel lines

5.2.1 Fuel lines are to be made of corrosion-resistant metal. The number of detachable connections shall be kept to a minimum.

5.2.2 Only approved screwed connections are permissible. Threaded sleeve joints requiring hemp, sealing strip, etc. may not be used.

5.2.3 Alternatively to 5.2.1 GL approved hoses may be used up to a length of 2 m.

5.2.4 Fuel lines are to be securely fastened and be arranged protected against damage.

5.2.5 The arrangement of fuel lines in the vicinity of machinery parts with hot surface temperatures and electrical appliances is to be avoided.

5.2.6 Fuel pipes are to be fitted with a valve or cock directly at the tank arranged in an accessible position.

5.2.7 The valve or cock may be omitted if the connection and piping is arranged such that fuel cannot be released from the tank in the event of damage to the piping. Siphoning of the piping is to be considered, if applicable.

5.2.8 Spill lines are to be connected at the tank top. Means of closure may not be fitted in the spill line.

5.2.9 Casings of fuel filters are to be of metal.

5.3 Capsizing

For totally enclosed lifeboats the design of the fuel system shall prevent the loss of fuel during capsize. (LSA 4.6.4.2)

5.4 Arctic conditions

The lifeboat engine fuel oil shall be suitable for operation in the minimum anticipated operating temperature under Arctic conditions, if applicable. *(MSC/Circ.1056, 11.5.5)*

6. Lubrication system

6.1 If the lubrication system is not an integrated part of the internal combustion engine, the system is subject to GL approval.

6.2 *For totally enclosed lifeboats the design of the lubrication system shall prevent the loss of more than 250 ml of lubricating oil from the engine during capsize. (LSA 4.6.4.2)*

7. Cooling system

7.1 Sea water system

7.1.1 A filter is to be fitted in the sea water supply line.

7.1.2 Drain fittings are to be arranged as necessary. It shall be possible to drain the entire sea water system.

7.1.3 Shell or keel coolers are to be fitted with vent valves at the highest point. The recommendations of the engine manufacturer have to be considered.

7.1.4 Sea water piping shall be made of corrosion resistant material.

For the use of hoses, 2.2 is to be observed.

7.2 Fresh water system

7.2.1 The engines of lifeboats with a self-contained air support system, see E.3., have to be equipped with a closed fresh cooling water system.

7.2.2 Walls of tanks for fresh water shall not have common walls with fuel tanks.

7.2.3 Fresh water tanks are to be provided with screw plug with a diameter of at least 1,5 inch for filling. A vent pipe of 10 mm bore is sufficient.

7.2.4 Filling connections for fresh water are to be clearly marked.

7.3 Ambient conditions

The water cooling systems have to be designed for the ambient conditions defined in Section 1, C. For Arctic conditions GL will decide if different temperatures are appropriate.

7.4 Air cooling system

7.4.1 *Air cooled engines* of totally enclosed lifeboats *shall have a duct system to take in cooling air from, and exhaust it to, the outside of the lifeboat. Manually operated dampers shall be provided to enable cooling air to be taken in from, and exhausted to, the interior of the lifeboat. (LSA 4.6.4.3)*

7.4.2 *The design of all engine air ducts shall be such that water is excluded from the engine when the lifeboat capsizes and re-rights. (LSA 4.6.3.4)*

8. Exhaust system

8.1 Engine exhaust lines are to be led to the open and are so insulated that the temperature within the range of passages does not exceed 80 °C.

8.2 *The exhaust pipe shall be so arranged as to prevent water from entering the engine in normal operation. (LSA 4.4.6.6)* If a water collector is provided, seawater resistant material has to be used. In this case the exhaust line from the engine has the be arranged with gradient to the collector.

8.3 For self-righting lifeboats water is to be also excluded from the engine when the lifeboat capsizes and re-rights.

8.4 In metallic exhaust lines, means of draining are to be provided at the lowest point. Cooling jackets of exhaust lines shall be capable of being drained completely.

8.5 Engine exhaust lines shall be so arranged that shouted orders can be heard.

9. Drainage system

9.1 Scope

9.1.1 *All lifeboats, except free-fall lifeboats, shall be provided with at least one drain valve fitted near the lowest point in the hull, which shall automatically open to drain water from the hull when the lifeboat is not waterborne and shall automatically close to prevent entry of water when the lifeboat is waterborne. Each drain valve shall be provided with a cap or plug to close the valve, which shall be attached to the lifeboat by a lanyard, a chain, or other suitable means. Drain valves shall be readily accessible from inside the lifeboat and their position shall be clearly indicated. (LSA 4.4.7.1)*

9.1.2 All lifeboats are to be provided with at least one manual bilge pump in accordance with Table 7.2.

The nominal flow rate of manual drain pumps shall be based on 45 strokes per minute.

9.1.3 Lifeboats which are approved for more than 100 persons shall be provided with an electrically

driven power pump in addition to the manual pumping according to 9.1.2. The flow rate of pump is defined in Table 7.2.

Table 7.2 Drain pumps

Length L [m]	Hand pump flow rate [m^3/h]	Power pump flow rate [m^3/h]
< 8	1,5	–
< 10	3	6
< 15	4	7,5

9.2 Drain piping and suction

9.2.1 Drain piping are to be so arranged that also with unfavourable trim the lifeboat can be drained completely.

9.2.2 In the arrangement of drain suction devices the following shall be provided:

- free access for the bilge water
- each suction device shall have a protection screen or strainer basket
- accessibility for checking and maintenance

9.3 Overboard connections

It shall be ensured that water cannot enter the lifeboat through the drainage line. The drainage line is to be arranged with a loop as high as practicable above the water line.

The outlet at the lifeboat's side shall be fitted with a sea-cock.

10. Spray system for fire-protected lifeboats

Fire-protected lifeboats shall have a water spray fire-protection system complying with the following:

10.1 *Water for the system shall be drawn from the sea by a self-priming motor pump. It shall be possible to turn "on" and turn "off" the flow of water over the exterior of the lifeboat. (LSA 4.9.2.1)*

10.2 *The seawater intake shall be so arranged as to prevent the intake of flammable liquids from the sea surface. (LSA 4.9.2.2)*

10.3 *The system shall be arranged for flushing with fresh water and allowing complete drainage. (LSA 4.9.2.3)*

10.4 The starting and stopping of the water pump and of the water flow over the exterior of the lifeboat shall be easily possible for one person, preferably from near the steering position. The pump for the drenching system shall be capable for dry running.

10.5 Periodical testing when the lifeboat is afloat or not shall be possible.

10.6 The complete system, including arrangement and type of nozzles, has to be approved by GL.

11. Drinking water (LSA 4.4.7.5)

11.1 *The lifeboat shall be equipped with a means for collecting rainwater.*

11.2 *If required by the flag state Administration the lifeboat shall be equipped with a means for producing drinking water from seawater with a manually powered desalinator. The desalinator must not be dependent upon solar heat, nor on chemicals other than seawater.*

11.3 *Means shall be provided for the storage of collected* and produced *water,* compare Section 5, J.

E. Ventilation

1. Partially enclosed lifeboats

Entrances in the canopy are to be provided with efficient adjustable closing arrangements which can be easily and quickly opened and closed from inside or outside so as to permit ventilation but exclude seawater, wind and cold. Means shall be provided to hold the entrances securely in closed or open position. (LSA 4.5.2.5) The persons are to be protected from the effects of under and over pressure which might be created by the lifeboat's engine.

2. Totally enclosed lifeboats

2.1 In addition to the measures defined in 1. the ventilation system shall provide under all weather conditions and with all entrances closed enough fresh air for the approved number of persons and for the combustion air of the engine. Measures to achieve air circulation shall be observed.

2.2 *During operation with the enclosure closed, the atmospheric pressure inside the lifeboat shall never be above or below the atmospheric pressure by more than 20 mbar. (LSA 4.6.2.11)*

2.3 Ventilation openings shall be arranged to avoid ingress of water in case of capsizing.

3. Lifeboats with self-contained air support system

3.1 *In addition to complying with the requirements of 1. and 2., as applicable, a lifeboat with a self-contained air support system shall be so arranged that, when proceeding with all entrances and openings*

closed, the air in the lifeboat remains safe and breathable and the engine runs normally for a period of not less than 10 minutes. During this period the atmospheric pressure inside the lifeboat shall never fall below the outside atmospheric pressure nor shall it exceed it by more than 20 mbar. The system shall have visual indicators to indicate the pressure of the air supply at all times. (LSA 4.8)

3.2 The air support system has to meet the following requirements:

- the working pressure of the air bottles shall be maximum 300 bar
- for calculation of the air capacity a pressure in the bottles from 270 bar (full) to 10 bar (empty) shall be assumed
- at the steering position it shall be possible to read and adjust the pressure in the boat in relation to the outside pressure
- the air bottles shall be accepted by GL
- it shall be possible to fill the air bottles without taking them out of the boat
- the installed pipes shall be tested with a pressure of at least 1,5 times the maximum allowable working pressure
- hose assemblies used in the piping system shall be designed for a burst pressure of at least 5 times the maximum allowable working pressure; they shall be tested with a test pressure of 1,5 times the maximum allowable working pressure
- air nozzles shall be arranged to provide a uniform distribution of the air in the boat
- in the operation manual of the lifeboat a table has to be included to verify whether the quantity of the air in the bottles is satisfactory, when the actual temperature and pressure in the air bottles are considered

F. Steering Gear

1. Scope

In the following the mechanical part of the steering gear is defined. This comprises the steering mechanism and all elements for the transmission of the rudder force to a power drive, if applicable, and to the control devices of the lifeboat.

2. Modes of drive

All lifeboats shall be provided with a rudder and a tiller. When a wheel or other remote steering mechanism is also provided, the (emergency) *tiller shall be capable of controlling the rudder in case of failure of the steering mechanism. (LSA 4.4.7.2)* Both, power and manual, drive may be applied.

3. Design

3.1 Tiller

3.1.1 The tiller shall be permanently installed on, or linked to, the rudder stock; however, if the lifeboat has a remote steering mechanism, the tiller may be removable and securely stowed near the rudder stock. The rudder and tiller shall be so arranged as not to be damaged by operation of the release mechanism or the propeller. (LSA 4.4.7.2)

3.1.2 To allow the emergency tiller to be connected, the rudder stock is at the top end to be provided with a square of the following dimensions:

$$\text{width across flats} = 0{,}87 \cdot D_t \text{ [mm]}$$

$$\text{height} = 0{,}80 \cdot D_t \text{ [mm]}$$

D_t = diameter of solid rudder stock [mm]

= according to Section 5, C.3.

Other measures to be approved by GL.

3.2 Tiller and quadrant

3.2.1 If the hub of tiller or quadrant is shrunk onto the rudder stock or designed as a split hub or conical connection, this connection is to be additionally secured by a fitting key. The hub external diameter d may not be less than:

$$d = 1{,}9 \cdot D_t \cdot k^{0,5} \text{ [mm]}$$

D_t = see 3.1.2

k = material factor

= $635 / (R_{eH} + R_m)$

R_{eH} = minimum nominal upper yield stress of material used [N/mm^2]

R_m = ultimate tensile strength of material used [N/mm^2]

If a fitting key is not provided, the ability of torque transmission has to be proven to GL.

3.2.2 Split hubs are to have at least two bolts on each side of the stock, whose total root diameter shall not be less than:

$$f = 0{,}22 \cdot 10^{-2} \cdot D_t^3 / e \text{ [cm}^2\text{]}$$

D_t = see 3.1.2

e = distance of bolt axis from stock centre line [mm]

3.2.3 The arms of tiller and quadrant are to be so dimensioned that the equivalent stress from the bending plus shear does not exceed 0,35 times the material yield stress R_{eH}.

3.3 Cable operated steering gear

The minimum breaking strength of the steering cables shall not be less than:

$$P_S = 4 \cdot Q_R / e' \quad [N]$$

Q_R = torsional moment according to Section 5, C.2. [Nm]

e' = distance of the cable lead from rudder stock centreline [m]

The make of cables used is to be 6 x 19 DIN 3060 or equivalent and the cables shall be protected against corrosion.

3.4 Protection against overloading

3.4.1 Power-driven and manual-hydraulic steering gear shall be protected against overload (slipping clutch, safety valve) limiting the torque applied by the drive.

3.4.2 In the case of hydraulic steering gear, also inadmissible torque caused e.g. by grounding of the rudder, etc. are to be limited by safety valves. Safety valves which simultaneously are effective for both the driving and the driven end are permitted.

3.5 Rudder movement

3.5.1 Rudder angles

If a power steering gear is installed, it has to be provided with suitable devices (e.g. limit switches) limiting the possible travel such that the admissible rudder angle cannot be exceeded.

The travel of the rudder quadrant or the tiller is to be additionally limited in both directions by stoppers. The stoppers and their attachment to the hull are to be made so strong that the yield strength of the material used is not exceeded when the rudder stock reaches its yield bending moment.

In the case of hydraulic steering gears without an end position limitation of the tiller and similar components, an end position limiting device shall be fitted within the rudder actuator.

3.5.2 Rudder position indication

The midship position of the rudder shall be distinguishable at all times. Power driven steering gear is to be provided with a rudder position indicator.

3.6 Power

The steering gear is to be so designed that, with the lifeboat at full ahead the rudder can be put from hard-over to hard-over to either side without undue effort.

The time taken for this shall as a rule not exceed 35 s.

3.7 Steering gear for outboard motors

Outboard motors are only permissible for rescue boats, compare Section 10, and have to be fitted with a suitable tiller arm. Twin-engine plants are to have the two engines positively connected.

3.8 Dimensioning of transmission elements

The stresses arising in the transmission elements shall be safely, i.e. 50 % as a guidance, below the yield stress R_{eH} of the materials employed.

4. Testing

4.1 After installation the steering gear is to be submitted to a final survey and performance test.

4.2 Pressure components are to undergo a hydrostatic pressure test at 1,5 times the pressure setting of the safety valve. The complete system is to undergo a tightness test at the setting pressure of the safety valve.

G. Tools and Spare Parts

1. General

1.1 Sufficient tools are to be carried to allow for simple repair or maintenance work to be carried out as described in the operating and maintenance instructions.

1.2 The recommendations of component manufacturers are to be taken into account.

2. Scope

2.1 On each lifeboat

It is recommended that each lifeboat is equipped with tools and spare parts, e.g.:

- 1 set of tools with special spanners
- 1 set vee-belts
- 1 set filter fillings
- 1 pump impeller
- 1 pump if the pump impeller cannot be changed
- ignition aids, like roving, heater plugs, etc.

2.2 On the ship

Furthermore it is recommended to have available in the ship in addition to the lifeboat spare parts according to 2.1 a sufficient number of, e.g.:

- injection nozzles
- fuel pressure pipes
- sealings
- hydraulic hoses
- cylinder valves and springs
- piston rings for each type

H. Tests

For prototypes and individual units the machinery installations shall undergo successfully the following lifeboat operational tests depending on their use for non-self-righting or self-righting lifeboats. The details of the tests are given in Section 11.

- *operation of engine and fuel consumption test*
- *cold engine starting test*
- *engine-out-of-water test*
- *submerged engine test*
- *engine inversion test (for totally enclosed lifeboats)*
- *air supply test (for lifeboats with self-contained air support system)*
- *water spray tests (for fire protected lifeboats)*
- *measuring and evaluating of acceleration forces (free-fall lifeboats)*

Section 8

Electrical Installations

A. General

1. Scope

1.1 The requirements of this Section apply to lifeboats wiring systems for an operating voltage not exceeding 50 V.

1.2 These Rules apply to permanently installed electrical systems and equipment.

1.3 GL reserve the right to permit deviations from these Rules on an individual case by case basis or to make special demands in the case of novel installations or equipment.

2. Rules and standards

2.1 Where specifications for electrical installations and equipment are not provided in these Rules, the application of other rules and standards will be agreed, if appropriate, e.g. the publications of IEC, particularly all IEC-60092 publications.

2.2 Existing national and international rules and regulations concerning electrical installations are to be observed.

3. Principle requirements

3.1 Ambient conditions

Trouble free operation of the electrical installations is to be ensured under the ambient conditions defined in Section 1, C.

3.2 Materials

Materials for electrical machinery, cables and other electrical equipment are to be capable of withstanding humid air and seawater mist, seawater and oil vapour. They shall not be hygroscopic and shall be flame-retardant and self-extinguishing.

3.3 Dimensioning of components

All parts shall be designed to meet the special operating stresses due to lifeboat motion, heel, trim and vibration and be protected against moisture and corrosion.

3.4 Protection against foreign bodies and water

3.4.1 The grade of protection of electrical components against foreign bodies and water shall be suitable for the location where they are installed. The engine shall in any way be capable of operating when the lifeboat is flooded up to the centreline of the crankshaft, compare Section 7, B.1.5.

3.4.2 The grades of protection are to be ensured by the appliances directly or by appropriate constructional measures when installing them.

3.5 Explosion protection

No engine shall be used if its fuel has a flash point of 43 °C or less (closed cup test). (LSA 4.4.6.1)

4. Documentation for approval

4.1 The documentation listed in the following is to be submitted in triplicate for approval before construction starts. All documents are to be indicated with the type of boat and the name of the boatyard.

4.2 A general circuit diagram of the electrical installations showing the basic systems for power generation, energy storage and distribution with output data for generator, storage facilities, consumers including their fuses and the associated cable types and cross sections has to be provided. Arrangement and technical data are to be declared. Any non-standard symbols are to be explained in a key.

B. Power Supply

1. Generators

1.1 All generators are to be suitable for the supply of all consumers and the charging of the batteries.

1.2 Terminals shall be located in an easily accessible position and dimensioned in accordance with the cross section of the cable to be connected. The terminals are to be clearly identified.

1.3 Each generator has to have a manufacturer's name and rating plate fitted which contains all important operating data as well as the manufacturing number.

2. Storage batteries

2.1 General

2.1.1 These Rules apply to permanently installed storage batteries.

2.1.1 The storage batteries have to be suitable for lifeboats. The batteries have to meet the ambient conditions according to Section 1, C. For self-righting lifeboats maintenance-free closed valve regulated (VLRA) batteries according to IEC 60896-2 or equivalent have to be provided.

2.1.2 Each storage battery has to have a manufacturer's name and rating plate fitted which contains all important operating data as well as the manufacturing number.

2.1.3 Independent battery systems are to be provided for:

- starting of the engine
  two independent batteries if manual starting is not possible
- radio installation, if it is fixed installed

2.2 Capacity

2.2.1 The capacity shall have a size to safeguard the following functions without intermediate recharging and with a deviation of the nominal voltage of less than 12 % over the whole operation time:

- 3 consecutive starts of the internal combustion engine for each independent battery, if applicable
- starting aid for the internal combustion engine by preheating
- lighting of the internal space according to D.2. for at least 12 hours
- operation of the lamp on the top of cover or enclosure according to D.3.1 for at least 12 hours
- operation of a search light according to D.3.2 for not less than 3 hours
- illumination of the compass according to D.3.3

2.2.2 The capacity for the radio installation according to D.4. has to be provided.

2.3 Arrangement

2.3.1 Storage batteries are to be so located that escaping gases or electrolyte can neither endanger persons nor damage equipment.

2.3.2 When locating the storage batteries, the output of the associated chargers is to be taken into account. The charging capacity is to be calculated from the charger maximum current and battery rated voltage.

2.3.3 *Storage batteries shall be provided with casings which form a watertight closure around the bottom and sides of the batteries. The battery casings shall have a tight fitting top which provides for necessary gas venting. (LSA 4.4.6.9)*

2.3.4 Storage batteries shall be safeguarded against slipping or turning over of the lifeboat. Supports shall not impair ventilation.

2.4 Ventilation

All battery boxes are to be so constructed and ventilated that any development of ignitable gas mixtures is prevented.

The ventilation can lead directly to the open air or through the interior space of enclosed boats to the top of the enclosure and from there to the open air in a sufficient manner.

2.5 Charging

2.5.1 *Means shall be provided for recharging all engine starting, radio or searchlight batteries. Radio batteries shall not be used to provide power for engine starting. (LSA 4.4.6.11)*

2.5.2 Charging devices have to be provided in the lifeboat to load the storage batteries automatically if the engine is running. The indication of a charging failure is recommended.

2.5.3 *Means shall be provided for recharging the lifeboat batteries from the ship's power supply at a supply voltage not exceeding 50 V* (compare IEC Standard 92-101) *which can be disconnected at the lifeboat embarkation station, or by means of a solar battery charger. (LSA 4.4.6.11)*

Note

Details of the design of such a supply connection have to be coordinated with the ship's electrical system and the scope of supply is to be clarified.

C. Distribution System

1. General

1.1 Only those systems are permitted in which all operationally current-carrying conductors are laid insulated. Hull return systems are only allowed for locally restricted installations, e.g. the electrical equipment of the internal combustion engine.

1.2 If it is intended to earth the on-board mains, the negative pole of the power supply is to be earthed centrally and shall be suitable to be disconnected for checking.

Possible earths are the metal hull of the lifeboat, a metallic ballast keel not laminated in or an earthing plate locally submerged.

1.3 The standardized voltages 12 V and 24 V are preferably to be used for board mains.

2. Switchboard and switchgear

2.1 Switchboard and switchgear locations are to be easily accessible.

2.2 Switchboards are to be made of metal or of a flame-retardant and self extinguishing material.

3. Fuses and switches

Storage batteries are to be protected against short circuits by fuses nearby.

A main switch for disconnecting the batteries is to be provided close to them. The length of cable between batteries and main switch shall be as short as possible.

4. Cables, lines and their installation

4.1 Cables and insulated lines are to be according to a recognized standard, e.g. IEC.

4.2 The conductors in the cables are to be of electrolyte copper and multi or fine stranded.

4.3 Cables and lines are not to be loaded and fused above the values given in Table 8.1.

Permanently installed power cables shall have a minimum cross sectional area of 1,5 mm^2, control cables an area of 0,75 mm^2.

4.4 Cable cross sections for the electric starters of internal combustion engines are to be dimensioned in accordance with the data furnished by the engine manufacturer.

4.5 The voltage drop between power source and consuming device shall not exceed 7 %, for navigation lights 5 % respectively.

Table 8.1 Conductor cross sectional area and allowable continuous current

Cross sectional area	Maximum current [A] for single conductors at insulation temperature ratings		
[mm^2]	60 °C	70 °C	85 °C to 90 °C
0,75	8	10	12
1	12	14	18
1,5	16	18	21
2,5	20	25	30
4	30	35	40
6	40	45	50
10	60	65	70
16	80	90	100

4.6 Cables and lines are to be so installed and fastened that the movements of the lifeboat cannot cause them to shift. They are to be laid at a safe distance from exhaust ducts and other sources of heat.

5. Cable accessories and installation material

Cable and line connections shall, in principle, be made by using terminals with core protection or via screwed connections by means of crimped lugs. Soldered connections are not to be used.

D. Consumers

1. Starting

1.1 The starting motor shall be suitable and accepted by GL, provided no special requirements are contained in this Section.

1.2 The starting motor has to have a manufacturer's name and rating plate fitted which contains all important operating data as well as the manufacturing number.

1.3 In general key switches for the starter are not allowed. But if the design of the motor requires starting with key, the key is to be connected with a non-detachable stainless chain or wire to the motor.

2. Internal lighting

A manually controlled interior light shall be fitted inside the lifeboat capable of continuous operation for a period of at least 12 hours. It shall produce an arithmetic mean luminous intensity of not less than 0,5 cd when measured over the entire upper hemisphere to permit reading of survival and equipment instructions; however oil lamps shall not be permitted for this purpose. (LSA 4.4.7.11)

3. Navigation

3.1 *A manually controlled lamp shall be fitted. The light shall be white and capable of operating continuously for at least 12 hours with a luminous intensity of not less than 4,3 cd in all directions of the upper hemisphere. However, if the light is a flashing light, it shall flash at a rate of not less than 50 flashes and not more than 70 flashes per minute for the 12 h operating period with an equivalent effective luminous intensity. (LSA 4.4.7.10)*

3.2 Search lights

A search light with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2500 cd which can work continuously for not less than 3 hours shall be provided, compare Section 5, K.2.29. *(LSA 4.4.8.29)*

3.3 Compass

The operational compass shall be luminous or provided with suitable means of illumination. In totally enclosed lifeboats the compass shall be fitted at the steering position, compare Section 5, K.2.5. *In any other lifeboat, it shall be provided with the binnacle if necessary to protect it from the weather and suitable mounting arrangements. (LSA 4.4.8.5)*

4. Communication

4.1 *Every lifeboat which is fitted with a fixed two-way VHF radiotelephone apparatus with an antenna which is separately mounted shall be provided with arrangements for siting and securing the antenna in its operating position. (LSA 4.4.7.8)*

4.2 *If a fixed two-way radiotelephone is fitted in a partially enclosed lifeboat, it shall be installed in a cabin large enough to accommodate both the equipment and the person using it. No separate cabin is required if the construction of the lifeboat provides a sheltered space to the satisfaction of the flag state Administration. (LSA 4.5.4)*

4.3 Interference elimination

The lifeboat engine and accessories shall be designed to limit electromagnetic emissions so that engine operation does not interfere with the operation of radio life-saving appliances in the lifeboat (LSA 4.4.6.10).

E. Spare Parts

It is recommended that the following spares are taken on board of the lifeboat:

- 1 set of electric bulbs for lights
- 1 set of fuses unless all appliances are protected by automatic cut-outs

F. Tests

For prototypes and individual units the electrical installation of lifeboats and rescue boats has to be tested. The details of these tests are given in Section 11, Part 1:

- *lifeboat operational test*
- *lifeboat light test*
- *operation test for rescue boats*
- *test for outboard motors for rescue boats*
- *position-indicating lights test for lifeboats and rescue boats*
- *searchlights test for lifeboats and rescue boats*

Section 9

Special Requirements for Lifeboats used as Tenders

A. General

1. Definition

Tender boats are lifeboats which are considered suitable and safe for transfer of considerable numbers of persons to the shore and back to the passenger ship if it cannot enter into the harbour. In case of emergency the tender boat serves as a lifeboat.

B. Lifeboat Service

1. Type

The tender has to be classified into the relevant types of lifeboats. In the most cases this will be the type of a:

- davit-launched,
- partially enclosed,
- non self-righting

lifeboat.

2. Requirements

According to the relevant lifeboat type the requirements for lifeboats of these Rules have to be met.

C. Tender Service

1. Design

1.1 Reduced capacity

For the tender service only the seats which require no special handling and which are more comfortable are utilized and the full capacity will only be used for lifeboat service.

1.2 Hull structure

The hull structure has also to be designed according to the requirements defined in Section 4.

1.3 Steering

Special attention shall be given to the fact that tender boats will usually be provided with a remote steering mechanism for the rudder. Besides of that the tender has to be provided additionally with a tiller, see Section 7, F.3.1.1.

2. Additional equipment

2.1 If a tender is used continuously for the passenger transport from the ship to the shore and vice versa, additional equipment has to be provided:

- anchoring equipment according to Section 5, D.2.2
- extended mooring equipment, like enforced clamps, etc.
- one buoyant towing line according to Section 5, D.3.4
- positioning lighting in accordance with the Convention of the International Regulations for Preventing Collisions at Sea, 1972
- fixed fire extinguishing system for the engine room (preferably gas fire extinguishing system)
- radio communication equipment to establish communication with the ship during all cases of tender service
- lifejackets of appropriate sizes for all persons on board in tender service

2.2 Safety Certificate

If required by the boatyard or the owner, GL will issue a Safety Certificate for Lifeboat / Tender after checking all additional requirements for each individual case. An example of this Certificate is shown in Fig. 9.1.

The tender will then be surveyed periodically together with the ship and the Certificate renewed if the survey is satisfactory.

Fig. 9.1 Example for a Safety Certificate for Lifeboat / Tender

(See the two following pages)

Section 10

Special Requirements for Rescue Boats and Fast Rescue Boats

A. General

1. Definitions

1.1 Rescue boats

Rescue boats shall have sufficient mobility and manoeuvrability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship. (LSA 5.1.1.7)

1.2 Fast rescue boats

Fast rescue boats have the same tasks as rescue boats according to 1.1. Because of a higher speed up to 20 kn they can be used for much quicker rescue operations. Special requirements for this boat type are defined in E.

1.3 Lifeboats as rescue boats

A lifeboat may be approved and used as rescue boat if it meets all of the requirements of this Section, if it successfully completes the testing for a rescue boat required in F. *and if its stowage, launching and recovery arrangements on the ship meet all of the requirements for a rescue boat. (LSA 5.1.1.1)*

2. Principle design parameters

Rescue boats have to be designed for the following principle design parameters.

2.1 Length L

*The length **L** shall not be less than 3,8 m and not more than 8,5 m. (LSA 5.1.1.3.1)*

2.2 Carrying capacity

The rescue boat shall be capable of carrying at least five seated persons and a person lying on a stretcher all wearing immersion suits and lifejackets if required. (LSA 5.1.1.3.2) For the space requirements see B.2.4.

2.3 Speeds

2.3.1 Manoeuvring speed v_0

Rescue boats shall be capable of manoeuvring at a speed v_0 *of at least 6 knots and maintaining that speed for a period of at least 4 hours, when loaded with its full complement of persons and equipment.(LSA 5.1.1.6)*

Sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates has to be provided.

2.3.2 Towing speed v_{Tow}

The towing speed v_{Tow} shall be *at least 2 knots when towing the largest liferaft carried on the ship when loaded with its full complement of persons and equipment or its equivalent. (LSA 5.1.1.7)* Alternatively the maximum towing force shall be determined, compare Section 11, Part 1: 7.1.2.

3. Construction type

3.1 *Rescue boat hulls may be either of rigid or inflated construction or a combination of both. (LSA 5.1.1.3)*

3.2 *Rescue boats which are a combination of rigid and inflated construction shall comply with the appropriate requirements of this Section to the satisfaction of GL. (LSA 5.1.1.4)*

B. Requirements for the Design

1. Hull

1.1 The design of the hull of the rescue boat shall follow the requirements of Section 4.

1.2 Buoyancy and stability

1.2.1 The conditions of Section 3 have to be met.

1.2.2 *Notwithstanding the requirements of Section 3, B.2.1, required buoyant material for rescue boats may be installed external to the hull, provided it is adequately protected against damage and is capable of withstanding exposure as specified for inflated rescue boats according to D. (LSA 5.1.1.2)*

1.3 Rescue operations

If the side walls of the hull are too high to bring a person safely from the sea into the rescue boat, a special rescue device at the sides or a rescue platform near the waterline at the stern of the boat has to be provided.

2. Hull outfit

2.1 Marking

The marking of the rescue boats shall be done according to Section 5, B.1. *(defined in LSA 5.1.1.1)*

2.2 Manoeuvring equipment

2.2.1 *Arrangements for towing shall be permanently fitted in rescue boats and shall be sufficiently strong to marshal and tow other boats and liferafts as defined in A.2.3.2. (LSA 5.1.1.9)*

Near the bow a device to secure a painter according to Section 5, D.3.1 shall be fitted.

2.2.2 *Rescue boats intended for launching down the side of the ship shall have skates and fenders as necessary to facilitate launching and prevent damage to the lifeboat according to Section 5, D.5. (defined in LSA 5.1.1.1)*

2.2.3 A launching mechanism according to Section 5, E.1. shall be provided.

2.3 Enclosures

Unless the rescue boat has adequate sheer, it shall be provided with a bow cover extending for not less than 15 % of ***L****. (LSA 5.1.1.5)*

2.4 Seating

Except for the helmsman, seating *may be provided on the floor, provided that the seating space analyses in accordance with* Section 5; I.1. *uses shapes similar to* Fig. 5.3*, but altered to an overall length of 1190 mm for extended legs. No part of the seating space shall be on the gunwhale, transom, or inflated buoyancy at the sides of the boat. (LSA 5.1.1.3)*

2.5 Lockers and compartments

Rescue boats shall be fitted with weathertight stowage for small items of equipment. (LSA 5.1.1.11) Lockers for water and provisions according to Section 5, J.1. may not be provided.

2.6 Miscellaneous loose equipment

The requirements of Section 5, K. are fully replaced by the requirements defined in C.

2.7 For further details see Section 5.

3. Fire protection and fire extinguishing equipment

The requirements of Section 6, A. and B. apply to fire protection, for fire extinguishers see Section 6, C.

4. Machinery installations

4.1 *A Rescue boat shall be fitted with an inboard engine or outboard motor. If it is fitted with an outboard motor, the rudder and tiller may form part of the engine. Notwithstanding the requirements of Section 7, D.5., petrol-driven outboard engines with an approved fuel system may be fitted in rescue boats provided the fuel tanks are specially protected against fire and explosion. (LSA 5.1.1.8)*

4.2 *Unless expressly provided otherwise, every rescue boat shall be provided with effective means of bailing or be automatically self-bailing. (LSA 5.1.1.10)*

4.3 Equipment for collecting rain water and a desalinator according to Section 7, D.11. may not be provided.

4.4 For further details see Section 7.

5. Electrical installations

5.1 Navigation

A manually controlled lamp according to Section 8, D.3.1 shall be fitted. *(defined in LSA 5.1.1.1)*

5.2 Communication

A two-way VHF radio telephone apparatus according to Section 8, D.4.1 may not be provided. *(defined in LSA 5.1.1.1)*

5.3 For further details see Section 8.

C. Rescue Boat Equipment

1. Storage

All items of rescue boat equipment, with the exception of boat-hooks which shall be kept free for fending-off purposes, shall be secured within the rescue boat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements or other suitable means. The equipment shall be secured in such a manner as not to interfere with any launching or recovery procedures.

All items of rescue boat equipment shall be as small and of as little mass as possible and shall be packed in a suitable and compact form.

2. Scope

The loose equipment of a rescue boat is in the majority not subject to Classification. Only equipment which is definitely required in the different Sections of these Rules will be included in the Classification procedure.

However, to provide completeness of information the scope as defined by the International Life-Saving Appliance Code (LSA) Chapter V, 5.1.2 is given herein.

Note

2.1 *The normal equipment of every rescue boat shall consist of:*

2.1.1 *Sufficient buoyant oars or paddles to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar. Thole pins or crutches shall be attached to the boat by lanyards or chains.*

2.1.2 *A buoyant bailer.*

2.1.3 *A binnacle containing an efficient compass which is luminous* or provided with suitable means of illumination.

2.1.4 *A sea anchor and tripping line, if fitted, with a hawser of adequate strength not less than 10 m in length,* compare Section 5, D.2.

2.1.5 *A painter of sufficient length and strength, attached to the release device complying with the requirements of Section 5, D.3.1 and placed at the forward end of the rescue boat.*

2.1.6 *One buoyant line, not less than 50 m in length, of sufficient strength to tow a liferaft as defined in A.2.3.2.*

2.1.7 *One waterproof electric torch suitable for Morse signalling, together with one spare set of batteries and one spare bulb in a watertight container.*

2.1.8 *One whistle or equivalent sound signal.*

2.1.9 *A first-aid outfit in a waterproof case capable of being closed tightly after use.*

2.1.10 *Two buoyant rescue quoits, attached to not less than 30 m of buoyant line.*

2.1.11 *A searchlight with a horizontal and vertical sector of at least 6° and a measured luminous intensity of 2500 cd which can work continuously for not less than 3 hours.*

2.1.12 *An efficient radar reflector (radar transponder recommended)*

2.1.13 *Thermal protective aids complying with the requirements of* Section 5, K.2.31 *sufficient for 10 % of the number of persons the rescue boat is permitted to accommodate or two, whichever is the greater.*

2.1.14 *Portable fire-extinguishing equipment of an approved type suitable for extinguishing oil fires* according to IMO Res. A.951(23), compare Section 6.

2.2 *In addition to the equipment required by* 2.1*, the normal equipment of each rigid rescue boat shall include: (LSA 5.1.2.3)*

2.2.1 *A boat hook.*

2.2.2 *A bucket.*

2.2.3 *A knife or hatchet.*

2.3 *In addition to the equipment required by* 2.1*, the normal equipment of every inflated rescue boat shall consist of: (LSA 5.1.2.4)*

2.3.1 *A buoyant safety knife.*

2.3.2 *Two sponges.*

2.3.3 *An efficient manually operated bellows or pump.*

2.3.4 *A repair kit in a suitable container for repairing punctures.*

2.3.5 *A safety boat-hook.*

D. Additional Requirements for Inflated Rescue Boats

1. General

The requirements of Section 6, B.1. *and* Section 1, D.1.1.6.3 *do not apply to inflated rescue boats. (LSA 5.1.3.1)*

2. Special loads (LSA 5.1.3.2)

An inflated rescue boat shall be constructed in such a way that, when suspended by its bridle or lifting hook:

2.1 *It is of sufficient strength and rigidity to enable it to be lowered and recovered with its full complement of persons and equipment.*

2.2 *It is of sufficient strength to withstand a load of four times the mass of its full complement of persons and equipment at an ambient temperature of 20 +/- 3 °C, with all relief valves inoperative.*

2.3 *It is of sufficient strength to withstand a load of 1,1 times the mass of its full complement of persons and equipment at an ambient temperature of – 30 °C, with all relief valves operative.*

3. Exposure

Inflated rescue boats shall be so constructed as to be capable of withstanding exposure: (LSA 5.1.3.3)

– *when stowed on an open deck on a ship at sea*

– *for 30 days afloat in all sea conditions*

4. Hull and buoyancy

4.1 *The buoyancy of an inflated rescue boat shall be provided by either a single tube subdivided into at least five compartments of approximately equal volume or two separate tubes, neither exceeding 60 % of the total volume. The buoyancy tubes shall be so arranged that the intact compartments shall be able to support the number of persons which the rescue boat is permitted to accommodate, each having a mass of 75 kg, when seated in their normal positions with positive freeboard over the rescue boat's entire periphery under the following conditions: (LSA 5.1.3.5)*

- *with the forward buoyancy compartment deflated*
- *with the entire buoyancy on one side of the rescue boat deflated*
- *with the entire buoyancy on one side and the bow compartment deflated*

4.2 *The buoyancy tubes forming the boundary of the inflated rescue boat shall, on inflation, provide a volume of not less than 0,17 m^3 for each person the rescue boat is permitted to accommodate. (LSA 5.1.3.6)*

4.3 *Each buoyancy compartment shall be fitted with a non-return valve for manual inflation and means of deflation. A safety relief valve shall also be fitted unless* GL *is satisfied that such an appliance is unnecessary. (LSA 5.1.3.7)*

5. Hull outfit

5.1 *Underneath the bottom and on vulnerable places on the outside of the inflated rescue boat, rubbing strips shall be provided to the satisfaction of* GL. *(LSA 5.1.3.8)*

5.2 *Where a transom is fitted it shall not be inset by more than 20 % of the overall length* **L** *of the rescue boat. (LSA 5.1.3.9)*

5.3 *Suitable patches shall be provided for securing the painters for and aft and the becketed lifelines inside and outside the boat. (LSA 5.1.3.10)*

6. Marking

In addition to complying with the requirements of Section 5, B.1.*, inflated rescue boats shall be marked with a serial number, the maker's name or trade mark and the date of manufacture. (LSA 5.1.3.4)*

E. Additional Requirements for Fast Rescue Boats

In addition to the general requirements for rescue boats the following special requirements have to be met.

1. Principle design parameters

1.1 Length

The length **L** *of the hull shall not be less than 6,0 m and not more than 8,5 m, including inflated structures or fixed fenders. (LSA 5.1.4.3)*

1.2 Carrying capacity

The carrying capacity is with at least five seated persons and one person lying down the same as for rescue boats. (A.656, 1.2.2)

The crew of the fast rescue boat shall consist of at least the helmsman and two crew members trained and drilled regularly having regard to Seafarers' Training, Certification and Watchkeeping (STCW) Code and recommendations adopted by IMO. (MSC 4.1.12)

1.3 Speed

Fast rescue boats shall be provided with sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates, and be capable of manoeuvring, for a period of at least 4 hours, at a speed of at least 20 kn in calm water with a crew of 3 persons and at least 8 knots when loaded with its full complement of persons and equipment. (LSA 5.1.4.4)

The towing speed v_{Tow} of at least 2 kn and the towing conditions are the same as for rescue boats. (LSA 5.1.4.2)

2. Hull

2.1 Material

The hull of fast rescue boats may be of rigid, inflated or rigid/inflated construction. Fast rescue boats which are a combination of rigid and inflated construction shall comply with the appropriate requirements Guidelines to the satisfaction of GL. *(A.656, 1.2+1.3)*

2.2 Loads

A rigid fast rescue boat shall be constructed in such a way that, when suspended by its lifting point it is of sufficient strength to withstand a load of load of 4 times the mass of its full complement of persons and equipment without residual deflection upon removal of the load. (LSA 5.1.4.10)

The lifeboat overload test according to Section 11, Part 1: 6.3 as well as the lifeboat seating strength test according to Section 11, Part 1: 6.6.2 shall not be performed. (LSA 5.1.4.2)

2.3 Buoyancy and stability

A fast rescue boat shall be self-righting or capable of being readily righted by not more than two of their crew. (LSA 5.4.1.5)

A capsize protection with a floating box of suitable size situated on a fixed frame above the hull may have to be provided. Alternatively GL may accept inflatable systems if the same effect is proven.

3. Hull outfit

3.1 Launching

The fast rescue boat shall be so constructed as to be capable of being safely launched and retrieved under adverse weather and sea conditions. (LSA 5.1.4.1)

Fast rescue boats shall, if possible, be equipped with an easily and safely operated fixed single-point suspension arrangement or equivalent. (LSA 5.1.4.9)

Hooks and fastening devices for lowering and hoisting fast rescue boats shall be so designed as to have a safety factor of 6 on the ultimate strength in relation to the loads which occur in a fully loaded condition. (IMO A.656, 2.6)

3.2 Towing arrangement

Arrangements for towing shall be permanently fitted in fast rescue boats and shall be sufficiently strong to marshal or tow liferafts as required in A.2.3.2 (A.656, 1.11)

3.3 Steering

Fast rescue boats shall be steered by a wheel at a helmsman's position remote from the tiller. An emergency steering system providing direct control of the rudder, water jet or outboard motor shall also be provided. (LSA 5.1.4.7)

The requirements of Section 7, F.2. and F.3.1 are not valid for fast rescue boats.

4. Machinery installations

4.1 Engine

A fast rescue boat shall be fitted with an inboard engine or engines or an outboard motor or motors commensurate with its speed, size and displacement. For propulsion control a revolution indicator has to be provided. For petrol driven outboard motors the requirements of B.4.1 apply. (A656, 1.8)

Engines shall stop automatically or be stopped by the helmsman's emergency release switch should the rescue boat capsize. When the rescue boat has righted, each engine or motor shall be capable of being restarted, provided the helmsman's emergency release, if fitted, has been reset. (LSA 5.1.4.8)

The design of the fuel and lubricating systems shall prevent the loss of more than 250 ml of fuel or lubricating oil from the propulsion system should the rescue boat capsize. (LSA 5.1.4.8)

4.2 Bailing

Fast rescue boats shall be self-bailing or be capable of being rapidly cleared of water. (LSA 5.1.4.6)

5. Electrical installations

5.1 Communication

The normal equipment of the fast rescue boat shall include a VHF radiocommunication set which is hands-free and watertight. (LSA 5.1.4.11)

6. Fast rescue boat equipment

6.1 Storage

For storage of the equipment, etc. see the requirements for rescue boats in C.1.

6.2 Scope

The loose equipment is not subject to Classification, it is defined herein only for completeness.

Note

For the scope see the requirements for rescue boats, items C.2.1.1 to C.2.1.13.

The additional equipment for every rigid fast rescue boat is identical to the requirements of C.2.2.

The additional equipment for every rigid/inflated and every inflated fast rescue boat is identical to the requirements in C.2.3.

F. Tests

Depending on their type of construction rescue boats have to be specially tested in addition to tests described for lifeboats. The details of all tests are given in Section 11.

The special procedure for rescue boats includes the following tests for prototypes and individual units:

1. Rigid rescue boats

For rigid rescue boats the following special tests have to be carried out:

- *towing test*
- *seating test*
- *overload test*
- *operation tests*
- *righting test*
- *manoeuvrability test*
- *detailed inspection*

2. Inflated rescue boats

For inflated rescue boats the following special tests have to be carried out:

- *drop tests*
- *loading tests*
- *stability test*
- *damage test*
- *simulated heavy weather test*
- *swamp test*
- *overload tests*
- *material tests*
- *mooring out test*
- *detailed inspection*

3. Rigid/inflated rescue boats

Rigid/inflated rescue boats shall be subjected to a series of tests selected from the tests for rigid lifeboats and inflated rescue boats, see Section 11, C.

4. Rigid fast rescue boats

Rigid fast rescue boats shall be subjected to a series of tests selected from the tests for rigid lifeboats and rigid rescue boats, see Section 11, C. In addition the following tests have to be carried out:

- *overload test*
- *operation of engine test and fuel consumption test*
- *righting test (if boat is not self-righting)*

5. Inflated fast rescue boats

Inflated fast rescue boats shall be subjected to a series of tests selected from the tests for lifeboats and inflated rescue boats, see Section 11.

6. Rigid/inflated fast rescue boats

Rigid/inflated fast rescue boats shall be subjected to a series of tests selected from the tests for fast rigid and fast inflated rescue boats, see Section 11

7. Outboard motors

When rescue boats are fitted with outboard motors, the following tests shall be applied to the motor replacing the engine tests for lifeboats, see Section 11, Part 1.:

- *power test*
- *water drench test*
- *hot start test*
- *manual start test*
- *cold start test*
- *engine out of water test*
- *engine inversion test (for engines destined for fast rescue boats only)*

Section 11

Tests for Lifeboats and Rescue Boats

A. General

1. Consolidated definition of tests

The definition of the tests is identical with the requirements of the resolution MSC.81 (70) of the International Maritime Organisation (IMO). Attached herein is a version including MSC.200(80) and MSC.226(82) consolidated by GL.

2. Standardized test reports

For the reports on the necessary tests the Standardized Life-Saving Appliance Evaluation and Test Report Forms according to IMO resolution MSC/Circ.980/Add.1 and 2 may be used by the Surveyors. A copy is not attached to these Rules.

3. Responsibility for execution

The responsibility for the execution of the tests is with the manufacturer of the lifeboats or rescue boats. The GL Surveyor is only witnessing the correct test procedures and takes no responsibility for any failure and destruction.

4. Overview of tests

The scope of the different types of tests is summarized for the previous Sections at the end of the respective Section.

The tests are structured in the following way:

Part 1 – Prototype Tests for Life-Saving Appliances:

– *Tests for Lifeboats (6.)*

– *Tests for Rescue Boats and Fast Rescue Boats (7.)*

– *Tests for Position-Indicating Lights for Life-Saving Appliances (10.)*

– *Tests for Searchlights for Lifeboats and Rescue Boats (13.)*

Part 2 – Production and Installation Tests:

– *Lifeboat and Rescue Boat Tests (1., 5.2, 5.3)*