



Hull Arrangement, Stability and Systems for Ships less than 500 GT

July 2018

**Rule Note
NR 566 DT R02 E**

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**BUREAU
VERITAS**

MARINE & OFFSHORE - GENERAL CONDITIONS

1. INDEPENDENCY OF THE SOCIETY AND APPLICABLE TERMS

- 1.1. The Society shall remain at all times an independent contractor and neither the Society nor any of its officers, employees, servants, agents or subcontractors shall be or act as an employee, servant or agent of any other party hereto in the performance of the Services.
- 1.2. The operations of the Society in providing its Services are exclusively conducted by way of random inspections and do not, in any circumstances, involve monitoring or exhaustive verification.
- 1.3. The Society acts as a services provider. This cannot be construed as an obligation bearing on the Society to obtain a result or as a warranty. The Society is not and may not be considered as an underwriter, broker in Unit's sale or chartering, expert in Unit's valuation, consulting engineer, controller, naval architect, manufacturer, shipbuilder, repair or conversion yard, charterer or shipowner; none of them above listed being relieved of any of their expressed or implied obligations as a result of the interventions of the Society.
- 1.4. The Services are carried out by the Society according to the applicable Rules and to the Bureau Veritas Code of Ethics. The Society only is qualified to apply and interpret its Rules.
- 1.5. The Client acknowledges the latest versions of the Conditions and of the applicable Rules applying to the Services' performance.
- 1.6. Unless an express written agreement is made between the Parties on the applicable Rules, the applicable Rules shall be the rules applicable at the time of the Services' performance and contract's execution.
- 1.7. The Services' performance is solely based on the Conditions. No other terms shall apply whether express or implied.

2. DEFINITIONS

- 2.1. "Certificate(s)" means class certificates, attestations and reports following the Society's intervention. The Certificates are an appraisal given by the Society to the Client, at a certain date, following surveys by its surveyors on the level of compliance of the Unit to the Society's Rules or to the documents of reference for the Services provided. They cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.
- 2.2. "Certification" means the activity of certification in application of national and international regulations or standards, in particular by delegation from different governments that can result in the issuance of a certificate.
- 2.3. "Classification" means the classification of a Unit that can result or not in the issuance of a class certificate with reference to the Rules.
- 2.4. "Client" means the Party and/or its representative requesting the Services.
- 2.5. "Conditions" means the terms and conditions set out in the present document.
- 2.6. "Industry Practice" means International Maritime and/or Offshore industry practices.
- 2.7. "Intellectual Property" means all patents, rights to inventions, utility models, copyright and related rights, trade marks, logos, service marks, trade dress, business and domain names, rights in trade dress or get-up, rights in goodwill or to sue for passing off, unfair competition rights, rights in designs, rights in computer software, database rights, topography rights, moral rights, rights in confidential information (including know-how and trade secrets), methods and protocols for Services, and any other intellectual property rights, in each case whether capable of registration, registered or unregistered and including all applications for and renewals, reversions or extensions of such rights, and all similar or equivalent rights or forms of protection in any part of the world.
- 2.8. "Parties" means the Society and Client together.
- 2.9. "Party" means the Society or the Client.
- 2.10. "Register" means the register published annually by the Society.
- 2.11. "Rules" means the Society's classification rules, guidance notes and other documents. The Rules, procedures and instructions of the Society take into account at the date of their preparation the state of currently available and proven technical minimum requirements but are not a standard or a code of construction neither a guide for maintenance, a safety handbook or a guide of professional practices, all of which are assumed to be known in detail and carefully followed at all times by the Client.
- 2.12. "Services" means the services set out in clauses 2.2 and 2.3 but also other services related to Classification and Certification such as, but not limited to: ship and company safety management certification, ship and port security certification, training activities, all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board.
- 2.13. "Society" means the classification society 'Bureau Veritas Marine & Offshore SAS', a company organized and existing under the laws of France, registered in Nanterre under the number 821 131 844, or any other legal entity of Bureau Veritas Group as may be specified in the relevant contract, and whose main activities are Classification and Certification of ships or offshore units.
- 2.14. "Unit" means any ship or vessel or offshore unit or structure of any type or part of it or system whether linked to shore, river bed or sea bed or not, whether operated or located at sea or in inland waters or partly on land, including submarines, hovercrafts, drilling rigs, offshore installations of any type and of any purpose, their related and ancillary equipment, subsea or not, such as well head and pipelines, mooring legs and mooring points or otherwise as decided by the Society.

3. SCOPE AND PERFORMANCE

- 3.1. The Society shall perform the Services according to the applicable national and international standards and Industry Practice and always on the assumption that the Client is aware of such standards and Industry Practice.

3.2. Subject to the Services performance and always by reference to the Rules, the Society shall:

- review the construction arrangements of the Unit as shown on the documents provided by the Client;
- conduct the Unit surveys at the place of the Unit construction;
- class the Unit and enters the Unit's class in the Society's Register;
- survey the Unit periodically in service to note that the requirements for the maintenance of class are met. The Client shall inform the Society without delay of any circumstances which may cause any changes on the conducted surveys or Services.

The Society will not:

- declare the acceptance or commissioning of a Unit, nor its construction in conformity with its design, such activities remaining under the exclusive responsibility of the Unit's owner or builder;
- engage in any work relating to the design, construction, production or repair checks, neither in the operation of the Unit or the Unit's trade, neither in any advisory services, and cannot be held liable on those accounts.

4. RESERVATION CLAUSE

- 4.1. The Client shall always: (i) maintain the Unit in good condition after surveys; (ii) present the Unit after surveys; (iii) present the Unit for surveys; and (iv) inform the Society in due course of any circumstances that may affect the given appraisal of the Unit or cause to modify the scope of the Services.
- 4.2. Certificates referring to the Society's Rules are only valid if issued by the Society.
- 4.3. The Society has entire control over the Certificates issued and may at any time withdraw a Certificate at its entire discretion including, but not limited to, in the following situations: where the Client fails to comply in due time with instructions of the Society or where the Client fails to pay in accordance with clause 6.2 hereunder.

5. ACCESS AND SAFETY

- 5.1. The Client shall give to the Society all access and information necessary for the efficient performance of the requested Services. The Client shall be the sole responsible for the conditions of presentation of the Unit for tests, trials and surveys and the conditions under which tests and trials are carried out. Any information, drawings, etc. required for the performance of the Services must be made available in due time.
- 5.2. The Client shall notify the Society of any relevant safety issue and shall take all necessary safety-related measures to ensure a safe work environment for the Society or any of its officers, employees, servants, agents or subcontractors and shall comply with all applicable safety regulations.

6. PAYMENT OF INVOICES

- 6.1. The provision of the Services by the Society, whether complete or not, involve, for the part carried out, the payment of fees thirty (30) days upon issuance of the invoice.
- 6.2. Without prejudice to any other rights hereunder, in case of Client's payment default, the Society shall be entitled to charge, in addition to the amount not properly paid, interests equal to twelve (12) months LIBOR plus two (2) per cent as of due date calculated on the number of days such payment is delinquent. The Society shall also have the right to withhold certificates and other documents and/or to suspend or revoke the validity of certificates.
- 6.3. In case of dispute on the invoice amount, the undisputed portion of the invoice shall be paid and an explanation on the dispute shall accompany payment so that action can be taken to solve the dispute.

7. LIABILITY

- 7.1. The Society bears no liability for consequential loss. For the purpose of this clause consequential loss shall include, without limitation:
 - Indirect or consequential loss;
 - Any loss and/or deferral of production, loss of product, loss of use, loss of bargain, loss of revenue, loss of profit or anticipated profit, loss of business and business interruption, in each case whether direct or indirect.

The Client shall save, indemnify, defend and hold harmless the Society from the Client's own consequential loss regardless of cause.

- 7.2. In any case, the Society's maximum liability towards the Client is limited to one hundred and fifty per-cents (150%) of the price paid by the Client to the Society for the performance of the Services. This limit applies regardless of fault by the Society, including breach of contract, breach of warranty, tort, strict liability, breach of statute.
- 7.3. All claims shall be presented to the Society in writing within three (3) months of the Services' performance or (if later) the date when the events which are relied on were first discovered by the Client. Any claim not so presented as defined above shall be deemed waived and absolutely time barred.

8. INDEMNITY CLAUSE

- 8.1. The Client agrees to release, indemnify and hold harmless the Society from and against any and all claims, demands, lawsuits or actions for damages, including legal fees, for harm or loss to persons and/or property tangible, intangible or otherwise which may be brought against the Society, incidental to, arising out of or in connection with the performance of the Services except for those claims caused solely and completely by the negligence of the Society, its officers, employees, servants, agents or subcontractors.

9. TERMINATION

- 9.1. The Parties shall have the right to terminate the Services (and the relevant contract) for convenience after giving the other Party thirty (30) days' written notice, and without prejudice to clause 6 above.

9.2. In such a case, the class granted to the concerned Unit and the previously issued certificates shall remain valid until the date of effect of the termination notice issued, subject to compliance with clause 4.1 and 6 above.

10. FORCE MAJEURE

10.1. Neither Party shall be responsible for any failure to fulfil any term or provision of the Conditions if and to the extent that fulfilment has been delayed or temporarily prevented by a force majeure occurrence without the fault or negligence of the Party affected and which, by the exercise of reasonable diligence, the said Party is unable to provide against.

10.2. For the purpose of this clause, force majeure shall mean any circumstance not being within a Party's reasonable control including, but not limited to: acts of God, natural disasters, epidemics or pandemics, wars, terrorist attacks, riots, sabotages, impositions of sanctions, embargoes, nuclear, chemical or biological contaminations, laws or action taken by a government or public authority, quotas or prohibition, expropriations, destructions of the worksite, explosions, fires, accidents, any labour or trade disputes, strikes or lockouts

11. CONFIDENTIALITY

11.1. The documents and data provided to or prepared by the Society in performing the Services, and the information made available to the Society, are treated as confidential except where the information:

- is already known by the receiving Party from another source and is properly and lawfully in the possession of the receiving Party prior to the date that it is disclosed;
- is already in possession of the public or has entered the public domain, otherwise than through a breach of this obligation;
- is acquired independently from a third party that has the right to disseminate such information;
- is required to be disclosed under applicable law or by a governmental order, decree, regulation or rule or by a stock exchange authority (provided that the receiving Party shall make all reasonable efforts to give prompt written notice to the disclosing Party prior to such disclosure).

11.2. The Society and the Client shall use the confidential information exclusively within the framework of their activity underlying these Conditions.

11.3. Confidential information shall only be provided to third parties with the prior written consent of the other Party. However, such prior consent shall not be required when the Society provides the confidential information to a subsidiary.

11.4. The Society shall have the right to disclose the confidential information if required to do so under regulations of the International Association of Classifications Societies (IACS) or any statutory obligations.

12. INTELLECTUAL PROPERTY

- 12.1. Each Party exclusively owns all rights to its Intellectual Property created before or after the commencement date of the Conditions and whether or not associated with any contract between the Parties.
- 12.2. The Intellectual Property developed for the performance of the Services including, but not limited to drawings, calculations, and reports shall remain exclusive property of the Society.

13. ASSIGNMENT

- 13.1. The contract resulting from these Conditions cannot be assigned or transferred by any means by a Party to a third party without the prior written consent of the other Party.
- 13.2. The Society shall however have the right to assign or transfer by any means the said contract to a subsidiary of the Bureau Veritas Group.

14. SEVERABILITY

14.1. Invalidity of one or more provisions does not affect the remaining provisions.

14.2. Definitions herein take precedence over other definitions which may appear in other documents issued by the Society.

14.3. In case of doubt as to the interpretation of the Conditions, the English text shall prevail.

15. GOVERNING LAW AND DISPUTE RESOLUTION

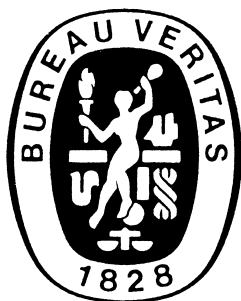
15.1. The Conditions shall be construed and governed by the laws of England and Wales.

15.2. The Society and the Client shall make every effort to settle any dispute amicably and in good faith by way of negotiation within thirty (30) days from the date of receipt by either one of the Parties of a written notice of such a dispute.

15.3. Failing that, the dispute shall finally be settled by arbitration under the LCIA rules, which rules are deemed to be incorporated by reference into this clause. The number of arbitrators shall be three (3). The place of arbitration shall be London (UK).

16. PROFESSIONAL ETHICS

- 16.1. Each Party shall conduct all activities in compliance with all laws, statutes, rules, and regulations applicable to such Party including but not limited to: child labour, forced labour, collective bargaining, discrimination, abuse, working hours and minimum wages, anti-bribery, anti-corruption. Each of the Parties warrants that neither it, nor its affiliates, has made or will make, with respect to the matters provided for hereunder, any offer, payment, gift or authorization of the payment of any money directly or indirectly, to or for the use or benefit of any official or employee of the government, political party, official, or candidate.
- 16.2. In addition, the Client shall act consistently with the Society's Code of Ethics of Bureau Veritas, <http://www.bureauveritas.com/home/about-us/ethics-and-compliance>



RULE NOTE NR 566

NR 566

Hull Arrangement, Stability and Systems for Ships less than 500 GT

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Chapter 3	ELECTRICITY AND AUTOMATION
Chapter 4	FIRE SAFETY

July 2018

Unless otherwise specified, these rules apply to ships for which contracts are signed after July 1st, 2018. The Society may refer to the contents hereof before July 1st, 2018, as and when deemed necessary or appropriate.

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CHAPTER 4

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**GENERAL ARRANGEMENT DESIGN,
STABILITY, HULL INTEGRITY**

SECTION 1	GENERAL REQUIREMENTS
SECTION 2	GENERAL ARRANGEMENT DESIGN
SECTION 3	STABILITY
SECTION 4	HULL INTEGRITY

SECTION 1

GENERAL REQUIREMENTS

1 General

1.1 Application

1.1.1 Requirements of these rules are specific to ships and non-propelled units of less than 500 GT without restriction in hull construction material.

However, the following types of ships are not covered by these rules (see separate rules):

- passenger ships with unrestricted navigation (see NR467 Rules for Steel Ships, Part D, Chapter 11)
- ro-ro passenger ships with unrestricted navigation (see NR467 Rules for Steel Ships, Part D, Chapter 12)
- fishing vessels (see NR467 Rules for Steel Ships, Part D, Chapter 20)
- high speed craft (see NR396 Rules for High Speed Craft)
- yachts (see NR500 Rules for Yachts)
- chemical tankers (see NR467 Rules for Steel Ships, Part D, Chapter 8)
- liquefied gas carriers (see NR467 Rules for Steel Ships, Part D, Chapter 9).

1.1.2 When the administration of the state whose flag the ship is entitled to fly refers to specific rules covering the subjects in Chapter 1 to Chapter 4, the Society may accept these rules in lieu of the present Rules.

In such cases a special notation regarding the above is entered on the Certificate of Class of the ship concerned.

1.1.3 All references to the Rules for Steel Ships refer to NR467 "Rules for the Classification of Steel Ships", as amended.

1.1.4 In the present Rules, length reference is Load Line Length L_{LL} unless expressly indicated.

1.1.5 Attention is to be drawn on the possible additional requirements of the flag administration.

1.1.6 Relaxations

Relaxations on requirements referred to in this chapter apply to the following ships:

- ships with navigation notation **sheltered area** or **coastal area**
- ships with service notation **launch** or **seagoing launch**
- ships with service notation **light ship** or **crew boat** and navigation notation **sea area 1**, **sea area 2**, or **sea area 3**.

1.2 Symbols

1.2.1

- L_{LL} : Load line length, in m, defined in [1.3.1]
 L_s : Subdivision length, in m, defined in [1.3.2]
 B : Moulded breadth, in m, defined in [1.3.3]
 D : Moulded depth, in m, defined in [1.3.4]
 d_1 : Moulded draught, in m, defined in [1.3.5]
 ∇ : Moulded volume, in m^3 , defined in [1.3.6]
 C_{bLL} : Block coefficient:

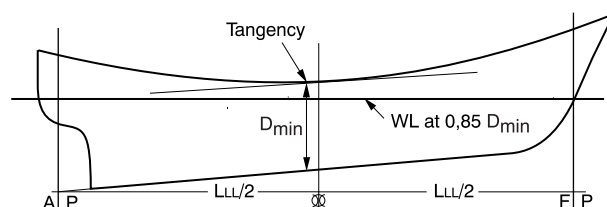
$$C_{bLL} = \frac{\nabla}{L_{LL} B d_1}$$

1.3 Definitions

1.3.1 Load line length

- a) the load line length L_{LL} is the distance, in m, on the waterline at 85% of the least moulded depth from the top of the keel, measured from the forward side of the stem to the centre of the rudder stock. L_{LL} is to be not less than 96% of the total length on the same waterline
- b) in ship design with a rake of keel, the waterline on which this length is measured is parallel to the designed waterline at 85% of the least moulded depth D_{min} found by drawing a line parallel to the keel line of the ship (including skeg) tangent to the moulded sheer line of the freeboard deck. The least moulded depth is the vertical distance measured from the top of the keel to the top of the freeboard deck beam at side at the point of tangency (see Fig 1).

Figure 1 : Length of ships with a rake of keel



1.3.2 Subdivision length

The subdivision length is the length measured between perpendiculars taken at the extremities of the deepest subdivision load line.

1.3.3 Moulded breadth

The moulded breadth B is the greatest moulded breadth, in m, measured amidships below the weather deck.

1.3.4 Moulded depth

The moulded depth D is the vertical distance measured from the top of the keel to the top of the freeboard deck beam at side. Where the form at the lower part of the mid-ship section is of a hollow character or where thick garboards are fitted, the distance is measured from the point where the line of the flat of the bottom continued inwards cuts the side of the keel.

In ships having rounded gunwales, the moulded depth is to be measured to the point of intersection of the moulded lines of deck and sides, the lines extending as though the gunwales were of angular design.

Where the freeboard deck is stepped and the raised part of the deck extends over the point at which the moulded depth is to be determined, the moulded depth is to be measured to a line of reference extending from the lower part of the deck along a line parallel with the raised part.

1.3.5 Moulded draught

The moulded draught d_1 is 85% of the least moulded depth.

1.3.6 Moulded volume

The moulded volume ∇ is the volume of the moulded displacement of the ship, excluding appendages, in a ship with a metal shell, and is the volume of displacement to the outer surface of the hull in a ship with a shell of any other material, both taken at the moulded draught.

1.3.7 Lightweight

The lightweight is the displacement, in t , without cargo, fuel, lubricating oil, ballast water, fresh water and feed water, consumable stores and passengers and crew and their effects, but including liquids in piping.

1.3.8 Deadweight

The deadweight is the difference, in t , between the displacement, at the summer draught in sea water of density $\rho = 1,025 \text{ t/m}^3$, and the lightweight.

1.3.9 Margin line

The margin line is a line drawn at least 76 mm below the upper surface of the bulkhead deck at side.

1.3.10 Freeboard deck

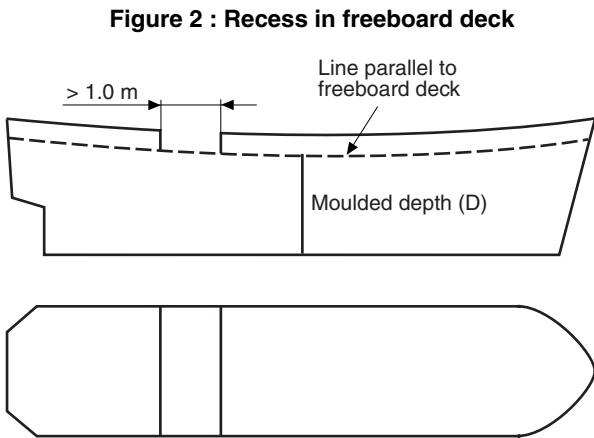
- a) The freeboard deck is normally the uppermost complete deck exposed to weather and sea, which has permanent means of closing of all openings in the weather part thereof, and below which all openings in the sides of the ship are fitted with permanent means of watertight closing
- b) Lower deck as freeboard deck

At the option of the owner and subject to the approval of the Society, a lower deck may be designated as the freeboard deck provided it is a complete and permanent deck continuous in a fore and aft direction at least between the machinery space and peak bulkheads and continuous athwartships

- when this lower deck is stepped the lowest line of the deck and the continuation of that line parallel to the upper part of the deck is taken as the freeboard deck
- when a lower deck is designated as the freeboard deck, that part which extends above the freeboard deck is treated as a superstructure so far as concerns the application of the conditions of assignment of freeboard. It is from this deck that the freeboard is calculated
- when a lower deck is designated as the freeboard deck, such deck as a minimum shall consist of suitably framed stringers at the ship sides and transversely at each watertight bulkhead which extends to the upper deck, within cargo spaces. The width of these stringers shall not be less than can be conveniently fitted having regard to the structure and the operation of the ship. Any arrangement of stringers shall be such that structural requirement can also be met.

c) Discontinuous freeboard deck, stepped deck

- 1) where a recess in the freeboard deck extends to the sides of the ship and is in excess of one meter in length, the lowest line of the exposed deck and the continuation of that line parallel to the upper part of the deck is taken as the freeboard deck (see Fig 2)
- 2) where a recess in the freeboard deck does not extend to the sides of the ship, the upper part of the deck is taken as the freeboard deck
- 3) recesses not extending from side to side in a deck below the exposed deck, designated as the freeboard deck, may be disregarded, provided all openings in the weather deck are fitted with weathertight closing appliances
- 4) due regard shall be given to the drainage of exposed recesses and to free surface effects on stability
- 5) provisions of 1) through 4) are not intended to apply to dredgers, hopper barges or other similar types of ships with large open holds, where each case requires individual consideration.



1.3.11 Bulkhead deck

The bulkhead deck in a passenger ship means the uppermost deck at any point in the subdivision length L_s to which the main bulkheads and the ship's shell are carried watertight. In a cargo ship the freeboard deck may be taken as the bulkhead deck.

1.3.12 Inner deck

The inner side is the longitudinal bulkhead which limits the inner hull for ships fitted with double hull.

1.3.13 Superstructure

A superstructure is a decked structure connected to the freeboard deck, extending from side to side of the ship or with the side plating not being inboard of the shell plating more than 0,04 B.

1.3.14 Enclosed and open superstructure

A superstructure may be:

- enclosed, where:
 - it is enclosed by front, side and aft bulkheads complying with the rules of the Society for the scantlings of superstructure and deckhouse
 - all front, side and aft openings are fitted with efficient weathertight means of closing.
- open, where it is not enclosed.

1.3.15 Bridge

A bridge is a superstructure which does not extend to either the forward or after perpendicular.

1.3.16 Poop

A poop is a superstructure which extends from the after perpendicular forward to a point which is aft of the forward perpendicular. The poop may originate from a point aft of the aft perpendicular.

1.3.17 Forecastle

A forecastle is a superstructure which extends from the forward perpendicular aft to a point which is forward of the after perpendicular. The forecastle may originate from a point forward of the forward perpendicular.

1.3.18 Full superstructure

A full superstructure is a superstructure which, as a minimum, extends from the forward to the after perpendicular.

1.3.19 Raised quarter deck

A raised quarterdeck is a partial superstructure of reduced height as defined in [1.3.24].

It extends forward from the after perpendicular and has an intact front bulkhead (sidescuttles of the non-opening type fitted with efficient deadlights and bolted man hole covers).

Where the forward bulkhead is not intact due to doors and access openings, the superstructure is then to be considered as a poop.

1.3.20 Superstructure deck

A superstructure deck is a deck forming the upper boundary of a superstructure.

1.3.21 Deckhouse

A deckhouse is a decked structure other than a superstructure, located on the freeboard deck or above.

1.3.22 Trunk

A trunk is a decked structure similar to a deckhouse, but not provided with a lower deck.

1.3.23 Well

A well is any area on the deck exposed to the weather, where water may be entrapped. Wells are considered to be deck areas bounded on two or more sides by deck structures.

1.3.24 Standard height of superstructure

The standard height of superstructure is defined in Tab 1.

Table 1 : Standard height of superstructure

Load line length L_{LL} in m	Standard height h_s , in m	
	Raised quarter deck	All other superstructures
$L_{LL} \leq 30$	0,90	1,80
$30 < L_{LL} < 75$	$0,9 + 0,00667 (L_{LL} - 30)$	1,80
$75 \leq L_{LL} < 125$	$1,2 + 0,012 (L_{LL} - 75)$	$1,8 + 0,01 (L_{LL} - 75)$
$L_{LL} \geq 125$	1,80	2,30

1.3.25 Type A ship

A Type A ship is one which:

- is designed to carry only liquid cargoes in bulk
- has a high integrity of the exposed deck with only small access openings to cargo compartments, closed by watertight gasketed covers of steel or equivalent material; and
- has low permeability of loaded cargo compartments.

A Type A ship is to be assigned a freeboard following the requirements reported in the International Load Line Convention 1966, as amended.

1.3.26 Type B ship

All ships which do not come within the provisions regarding Type A ships stated in [1.3.25] are to be considered as Type B ships.

A Type B ship is to be assigned a freeboard following the requirements reported in the International Load Line Convention 1966, as amended.

1.3.27 Position 1

Position 1 includes:

- exposed freeboard and raised quarter decks
- exposed superstructure decks situated forward of $0,25 L_{LL}$ from the perpendicular, at the forward side of the stem, to the waterline at 85% of the least moulded depth measured from the top of the keel.

1.3.28 Position 2

Position 2 includes:

- exposed superstructure decks situated aft of $0,25 L_{LL}$ from the perpendicular, at the forward side of the stem, to the waterline at 85% of the least moulded depth measured from the top of the keel and located at least one standard height of superstructure above the freeboard deck
- exposed superstructure decks situated forward of $0,25 L_{LL}$ from the perpendicular, at the forward side of the stem, to the waterline at 85% of the least moulded depth measured from the top of the keel and located at least two standard heights of superstructure above the freeboard deck.

1.3.29 Scuppers

Scuppers are piping systems for evacuation from or draining of open spaces situated above the freeboard deck. This includes the following arrangements:

- draining of exposed decks
- draining of open superstructures
- gravity sanitary evacuation from open superstructures.

1.3.30 Pipe discharges

Pipe discharges are piping systems for pump overboard discharges from spaces situated below the freeboard deck and evacuation from or draining of enclosed spaces situated above the freeboard deck. This includes the following arrangements:

- overboard discharges of pumps situated under the freeboard deck
- draining of enclosed superstructures
- gravity sanitary evacuation from enclosed superstructures.

1.3.31 Inboard end

The inboard end of discharge piping is the open end of the pipe situated inside the ship opposite to the end where the discharge is led through the hull.

1.4 Dangerous goods

1.4.1 In case of carriage of dangerous goods, the applicable requirements of the Rules for Steel Ships, Pt C, Ch 4, Sec 11 apply.

SECTION 2

GENERAL ARRANGEMENT DESIGN

1 Subdivision arrangement

1.1 Number of watertight bulkheads

1.1.1 General

All ships are to have at least the following transverse watertight bulkheads:

- one collision bulkhead
- one after peak bulkhead for **passenger ships, ro-ro passenger ships and crew boats**
- two bulkheads forming the boundaries of the machinery space in ships with machinery amidships, and a bulkhead forward of the machinery space in ships with machinery aft. In the case of ships with an electrical propulsion plant, both the generator room and the engine room are to be enclosed by watertight bulkheads.

Additional bulkheads may be required for ships having to comply with subdivision or damage stability criteria.

1.2 Collision bulkhead

1.2.1 A collision bulkhead is to be fitted which is to be watertight up to the bulkhead deck. This bulkhead is to be located at a distance from the forward perpendicular of not less than $0,05 L_{LL}$ and, except as may be permitted by the Society, not more than $(0,05 L_{LL} + 3)$ m or 5,5 m, whichever is the greater.

1.2.2 Where any part of the ship below the waterline extends forward of the forward perpendicular, e.g. a bulbous bow, the distances, in metres, stipulated in [1.2.1] are to be measured from a point either:

- at the midlength of such extension, or
- at a distance 1,5% of the length L_{LL} of the ship forward of the forward perpendicular, or
- at a distance 3 m forward of the forward perpendicular; whichever gives the smallest measurement.

1.2.3 The bulkhead may have steps or recesses provided they are within the limits prescribed in [1.2.1] and [1.2.2].

1.2.4 At Owner request, the Society may, on a case by case basis, accept a distance from the collision bulkhead to the forward perpendicular FP_{LL} greater than the maximum specified in [1.2.1] and [1.2.2], provided that subdivision and stability calculations show that, when the ship is in upright condition on full load summer waterline, flooding of the space forward of the collision bulkhead will not result in any part of the freeboard deck becoming submerged, or in any unacceptable loss of stability.

1.2.5 Where bow doors are fitted and a sloping loading ramp forms part of the extension of the collision bulkhead above the freeboard deck, the part of the ramp which is more than 2,3 m above the freeboard deck may extend forward of the limit specified in [1.2.1] and [1.2.2]. The ramp is to be weathertight over its complete length.

1.3 Height of transverse watertight bulkheads

1.3.1 Transverse watertight bulkheads are to extend watertight up to the bulkhead deck.

1.3.2 Where it is not practicable to arrange a watertight bulkhead in one plane, a stepped bulkhead may be fitted. In this case, the part of the deck which forms the step is to be watertight and equivalent in strength to the bulkhead.

1.4 Openings in watertight bulkheads and decks

1.4.1 Application

- requirements from [1.4.2] to [1.4.6] and [1.4.9] apply to all ships
- requirement [1.4.7] applies to passenger ships of $L_{LL} > 24$ m or carrying more than 200 passengers
- requirement [1.4.8] applies to ships other than passenger ships of $L_{LL} > 24$ m or carrying more than 200 passengers.

1.4.2 Definitions

Openings “used while at sea” are openings which are allowed to remain open during navigation.

Openings “normally closed at sea” are openings which are not allowed to be remained open but can be used during navigation. These openings are considered to be immediately closed after use.

Openings “permanently kept closed at sea” are openings which remain closed and are not used during navigation.

1.4.3 The number of openings in watertight subdivisions is to be kept to a minimum compatible with the design and proper working of the ship. Where penetration of watertight bulkheads and internal decks are necessary for access, piping, ventilation, electrical cables, etc., arrangements are to be made to maintain the watertight integrity.

1.4.4 No door, manhole, ventilation duct or any other opening is permitted in the collision bulkhead below the subdivision deck.

Table 1 : Doors

		Sliding type			Hinged type		
		Remote operation indication on the bridge	Indicator on the bridge	Local operation only	Remote operation indication on the bridge	Indicator on the bridge	Local operation only
Watertight	Open at sea	X					
	Normally closed (1)	X (4)	X (5)			X	
	Remain closed (1)			X (2) (3)			X (2) (3)
(1) Notice to be affixed on both sides of the door: "to be kept closed at sea".							
(2) The door is to be closed before the voyage commences.							
(3) If the door is accessible during the voyage, a device which prevents unauthorised opening is to be fitted.							
(4) For passenger ships of L _{LL} > 24 m or carrying more than 200 passengers.							
(5) For ships other than passenger ships of L _{LL} > 24 m or carrying more than 200 passengers.							

1.4.5 The requirements relevant to the degree of tightness, as well as the operating systems, for doors or other closing appliances complying with the provisions in [1.4.6] to [1.4.9], are specified in Tab 1.

1.4.6 Openings used while at sea

Doors provided to ensure the watertight integrity of internal openings which are used while at sea are to be sliding watertight doors capable of being remotely closed from the bridge and are also to be operable locally from each side of the bulkhead. Indicators are to be provided at the control position showing whether the doors are open or closed, and an audible alarm is to be provided at the door closure. The power, control and indicators are to be operable in the event of main power failure. Particular attention is to be paid to minimise the effect of control system failure. Each power-operated sliding watertight door is to be provided with an individual hand-operated mechanism.

1.4.7 Openings normally closed at sea for passenger ships of L_{LL} > 24 m or carrying more than 200 passengers

Doors provided to ensure the watertight integrity of internal openings which are normally closed at sea are to be sliding watertight doors capable of being remotely closed from the bridge and are also to be operable locally from each side of the bulkhead. Indicators are to be provided at the control position showing whether the doors are open or closed, and an audible alarm is to be provided at the door closure. The power, control and indicators are to be operable in the event of main power failure. Particular attention is to be paid to minimise the effect of control system failure. Each power-operated sliding watertight door is to be provided with an individual hand-operated mechanism.

1.4.8 Openings normally closed at sea for ships other than passenger ships of L_{LL} > 24 m or carrying more than 200 passengers

Doors provided to ensure the watertight integrity of internal openings which are normally closed at sea are to be provided with means of indication locally and on the bridge

showing whether these doors are open or closed. A notice is to be affixed to each such door or hatch cover to the effect that it is not to be left open.

1.4.9 Openings permanently kept closed at sea

Doors provided to ensure the watertight integrity of internal openings which are kept permanently closed at sea are to be provided with a notice which is to be affixed to each such closing appliance to the effect that it is to be kept closed. Manholes fitted with closely bolted covers need not be so marked.

2 Compartment arrangement

2.1 Cofferdams

2.1.1 Definition

A cofferdam means an empty space arranged so that compartments on each side have no common boundary; a cofferdam may be located vertically or horizontally. As a rule, a cofferdam is to be properly ventilated and of sufficient size to allow for inspection.

2.1.2 Cofferdams are to be provided between:

- fuel oil tanks and lubricating oil tanks
- compartments intended for liquid hydrocarbons (fuel oil, lubricating oil) and compartments intended for fresh water (drinking water, water for propelling machinery and boilers)
- compartments intended for liquid hydrocarbons (fuel oil, lubricating oil) and tanks intended for the carriage of liquid foam for fire extinguishing.

2.1.3 Cofferdams separating:

- fuel oil tanks from lubricating oil tanks
- lubricating oil tanks from compartments intended for fresh water or boiler feed water
- lubricating oil tanks from those intended for the carriage of liquid foam for fire extinguishing,

may not be required when deemed impracticable or unreasonable by the Society in relation to the characteristics and dimensions of the spaces containing such tanks, provided that:

- the thickness of common boundary plates of adjacent tanks is increased, with respect to the thickness obtained according to the applicable Rules for the calculation of tank scantlings, by 2 mm in the case of tanks carrying fresh water or boiler feed water, and by 1 mm in all other cases
- the sum of the throats of the weld fillets at the edges of these plates is not less than the thickness of the plates themselves
- the structural test is carried out with a head increased by 1 m with respect to the applicable Rules for tank test pressure.

2.2 Double bottoms

2.2.1 Double bottom for ships other than tankers

If fitted, double bottoms are to be in accordance with the applicable requirements of the Rules for Steel Ships, Part B.

2.2.2 Double bottom for tankers

Special requirements for tankers are specified in the Rules for Steel Ships, Part D, Chapter 7.

2.3 Compartments forward of the collision bulkhead

2.3.1 The fore peak and other compartments located forward of the collision bulkhead cannot be used for the carriage of fuel oil or other flammable products.

This requirement does not apply to ships of less than 400 tons gross tonnage, except for those where the fore peak is the forward cofferdam of tanks arranged for the carriage of flammable liquid products having a flash point not exceeding 60°C.

2.4 Shaft tunnels

2.4.1 Shaft tunnels are to be watertight.

3 Access arrangement

3.1 General

3.1.1 Access arrangements are to comply with the requirements of the Rules for Steel Ships, Pt B, Ch 2, Sec 3 or NR600 Ch2, Sec2, [5], as applicable.

4 Helicopter facilities

4.1 General

4.1.1 The applicable rules of the relevant chapters of the Rules for Steel Ships are to be complied with in case of the presence of helicopter facilities on board.

5 Accommodation

5.1 Seating of crew boats

5.1.1 For ships with service notation **crew boat**, a seat is to be provided for each personnel being carried and each crew for which the ship is certified to carry. Such seats are to be arranged in enclosed spaces.

6 Crew protection

6.1 Bulwarks and guard rails

6.1.1 Bulwarks and guard rails arrangements are to be in accordance with the provisions of the Rules for Steel Ships, Pt B, Ch 9, Sec 2.

6.1.2 For ships with specific operations at sea (Pilot boat for example), alternative arrangements such as safety harnesses and jack-stays may be accepted if they provide an equivalent level of safety.

SECTION 3

STABILITY

1 General

1.1 Application

1.1.1 Intact stability

Every ship is to comply with the provisions of Article [2], regarding intact stability.

1.1.2 Damage stability

The following ships are to comply with Article [3] regarding damage stability:

- passenger ships of $L_{LL} > 24$ m or carrying more than 200 passengers
- crew boats for which the additional class notation **SDS** has been requested.

Note 1: For other ships, the applicable requirements for the additional class notation **SDS** will be defined on a case-by-case basis.

1.2 Relaxation

1.2.1 Relaxation in the requirements of Article [3] could be accepted for ships with navigation notation **sheltered area**.

2 Intact stability

2.1 Requirements

2.1.1 The intact stability is to comply with the provisions of the Rules for Steel Ships, Part B, Chapter 3.

2.1.2 Additional criteria could be required for specific service notations as per the Rules for Steel Ships, Part D or Part E.

3 Damage stability

3.1 General

3.1.1 Taking into account, as initial conditions before flooding, the standard loading conditions as referred to in the Rules for Steel Ships, Part B, Chapter 3, the ship is to comply with the damage stability criteria as specified in [3.7].

3.2 Damage dimensions

3.2.1 The assumed extent of damage of the ship is assumed to occur anywhere in its length between transverse watertight bulkheads spaced at a distance of not less than the longitudinal extent of side damage specified in Tab 1.

Table 1 : Extent of damage, in m

Longitudinal extent	Transverse extent	Vertical extent
$1/3 L_s^{2/3}$	B/5 (1)	Full depth (2)
(1) Measured inboard from the side of the ship perpendicularly to the centreline at the level of the summer load waterline.		
(2) From the moulded line of the bottom shell plating at centreline upwards without limit.		

3.3 Progressive flooding

3.3.1 If pipes, ducts trunks or tunnels are situated within the assumed extent of damage, arrangements are to be made to ensure that progressive flooding cannot thereby extend to compartments other than those assumed to be floodable for each case of damage.

3.4 Minor damage

3.4.1 If damage of a lesser extent than that specified in [3.2] results in a more severe condition, such lesser extent is to be assumed.

3.5 Permeabilities

3.5.1 The permeability of spaces assumed to be damaged is to be as indicated in Tab 2.

Table 2 : Values of permeability

Spaces	Permeability
Appropriated to cargo	by calculation but not less than 0,60
Appropriated to stores	0,60
Occupied by accommodation	0,95
Occupied by machinery	0,85
Void spaces, empty tanks	0,95
Intended for liquids	0 to 0,95 (1)
(1) See [3.5.2]	

3.5.2 The permeability of partially filled compartments shall be consistent with the amount of liquid carried in the compartment. Whenever damage penetrates a tank containing liquids, it shall be assumed that the contents are completely lost from that compartment and replaced by salt water up to the level of the final plane of equilibrium.

3.6 Survival requirements

3.6.1 Compliance with the requirements of [3.7] is to be confirmed by calculations which take into consideration the design characteristics of the ship, the arrangements, configuration and permeability of the damaged compartments and the distribution, specific gravities and free surface effect of liquids.

3.7 Damage stability criteria

3.7.1 The final waterline, taking into account sinkage, heel and trim, is to be below the lower edge of any opening through which progressive flooding may take place. Such openings include air-pipes, ventilators and openings which are closed by means of weathertight doors or hatch covers but may exclude those openings closed by means of watertight manhole covers and flush scuttles, small watertight cargo tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors and sidescuttles of the non-opening type.

In no case shall the margin line be submerged in the final stage of flooding for passenger ships.

3.7.2 In the final stage of flooding, the angle of heel due to unsymmetrical flooding is not to exceed 7°. In the case of flooding involving the collision bulkhead, the angle of heel due to unsymmetrical flooding is not to exceed 12°. In special cases, additional heel may be allowed but in no case is the final heel to exceed 15°. Unsymmetrical floodings are to be kept to a minimum. The means adopted for equilization are, when practicable, to be self acting. In any case where controls to cross flooding fittings are provided, they are to be operable from above the bulkhead deck.

3.7.3 The initial metacentric height of the ship in the final stage of flooding for the static equilibrium position in case of symmetrical flooding and for the upright position in case of unsymmetrical flooding as calculated by constant displacement method is not to be less than 0,05 m before appropriate measures to increase the metacentric height have been taken.

3.7.4 The righting lever curve at the final stage of flooding is to have a minimum range of at least 20° beyond the position of equilibrium in association with a maximum residual righting lever of at least 100 mm within this range. Unprotected openings may not become immersed at an angle of heel within the prescribed minimum range of residual stability unless the space in question has been included as a floodable space in calculations for damage stability. Within this range, immersion of any of the openings referred to in [3.7.1], and any other openings capable of being closed weathertight may be authorised.

For passenger ships, a residual righting lever is to be obtained within the range of positive stability taking into account the greatest of the heeling moments as defined in [3.8], as calculated by the formula:

$$GZ \text{ (in metres)} = \frac{\text{heeling moment}}{\text{displacement}} + 0,04$$

However in no case this righting lever is to be less than 0,1 m.

3.7.5 In intermediate stages of flooding, the maximum righting lever shall be at least 0,05 m and the range of positive righting levers shall be at least 7°. In all cases, only one breach in the hull and only one free surface need to be assumed.

3.8 Heeling moments

3.8.1 For the purpose of [3.7.4], the following heeling moments are to be considered:

- a) Moment due to the crowding of passengers

The heeling moment is to be calculated assuming the passengers are distributed with 4 persons per square metre on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment. In doing so, a weight of 75 kg per passenger is to be assumed

- b) Moment due to launching of all fully loaded davit-launched survival craft on one side

$M_{\text{Survivalcraft}}$ is the maximum assumed heeling moment due to the launching of all fully loaded davit-launched survival craft on one side of the ship. It shall be calculated using the following assumptions:

- all lifeboats and rescue boats fitted on the side to which the ship has heeled after having sustained damage are to be assumed to be swung out fully loaded and ready for lowering
- for lifeboats which are arranged to be launched fully loaded from the stowed position, the maximum heeling moment during launching is to be taken
- a fully loaded davit-launched liferaft attached to each davit on the side to which the ship has heeled after having sustained damage is to be assumed to be swung out ready for lowering
- persons not in the life-saving appliances which are swung out are not to provide either additional heeling or righting moment
- life-saving appliances on the side of the ship opposite to the side to which the ship has heeled are to be assumed to be in a stowed position.

- c) Moment due to wind pressure

M_{wind} is the maximum assumed wind heeling moment, in t-m, acting in a damage situation:

$$M_{\text{wind}} = P \cdot A \cdot Z / (9,806 \cdot 10^3)$$

P : Wind pressure, in N/m², equal to:
P = 120 N/m²

A : Projected lateral area above waterline, in m²

Z : Distance, in m, from centre of lateral projected area above waterline to one half of the mean draught corresponding to the intact condition.

SECTION 4 HULL INTEGRITY

1 General

1.1 Application

1.1.1 This Section concerns the protection for intake of water for all openings in hull and superstructures.

1.1.2 Alternative arrangements for ships defined in Sec 1, [1.1.6] or for ships $L_{LL} < 24$ m may be agreed on a case-by-case basis.

2 External openings

2.1 General

2.1.1 All external openings leading to compartments assumed intact in the damage analysis, which are below the final damage waterline, are required to be watertight.

2.1.2 External openings required to be watertight in accordance with [2.1.1] are to be of sufficient strength and, except for cargo hatch covers, are to be fitted with indicators on the bridge.

2.1.3 Other closing appliances which are kept permanently closed at sea to ensure the watertight integrity of external openings are to be provided with a notice affixed to each appliance to the effect that it is to be kept closed. Manholes fitted with closely bolted covers need not be so marked.

2.2 Bow doors, inner doors, side doors and stern doors

2.2.1 Bow doors and inner doors

Bow doors and inner doors are to comply with the provisions of the Rules for Steel Ships, Part B, Ch 8, Sec 5 or NR600, Ch 5, Sec 2, [4], as applicable.

2.2.2 Side doors and inner doors

Side doors and stern doors are to comply with the provisions of the Rules for Steel Ships, Part B, Ch 8, Sec 6 or NR600, Ch 5, Sec 2, [5], as applicable.

3 Sidescuttles, windows and skylights

3.1 General

3.1.1 Application

The present Article [3] apply to sidescuttles and rectangular windows providing light and air, located in positions which are exposed to the action of sea and/or bad weather.

3.1.2 Sidescuttle definition

Sidescuttles are round or oval openings with an area not exceeding $0,16 \text{ m}^2$. Round or oval openings having areas exceeding $0,16 \text{ m}^2$ are to be treated as windows.

3.1.3 Window definition

Windows are rectangular openings generally, having a radius at each corner relative to the window size in accordance with recognised national or international standards, and round or oval openings with an area exceeding $0,16 \text{ m}^2$.

3.1.4 Number of openings in the shell plating

The number of openings in the shell plating are to be reduced to the minimum compatible with the design and proper working of the ship.

3.1.5 Material and scantlings

Sidescuttles and windows together with their glasses, deadlights and storm covers, if fitted, are to be of approved design and substantial construction in accordance with, or equivalent to, recognised national or international standards.

3.1.6 Means of closing and opening

The arrangement and efficiency of the means for closing any opening in the shell plating are to be consistent with its intended purpose and the position in which it is fitted is to be generally to the satisfaction of the Society.

3.1.7 Opening of sidescuttles

All sidescuttles, the sills of which are below the bulkhead deck for passenger ships or the freeboard deck for cargo ships, are to be of such construction as to prevent effectively any person opening them without the consent of the Master of the ship.

3.2 Opening arrangement

3.2.1 General

Sidescuttles are not to be fitted in such a position that their sills are below a line drawn parallel to the freeboard deck at side and having its lowest point $0,025B$ or $0,5 \text{ m}$, whichever is the greater distance, above the summer load waterline (or timber summer load waterline if assigned).

3.2.2 Cargo spaces

No sidescuttles may be fitted in any spaces which are appropriated exclusively for the carriage of cargo or coal.

Sidescuttles may, however, be fitted in spaces appropriated alternatively for the carriage of cargo or passengers, but they are to be of such construction as to prevent effectively any person opening them or their deadlights without the consent of the Master.

3.2.3 Non-opening type sidescuttles

If the required damage stability calculations indicate that the side scuttles would become immersed at any intermediate stage of flooding or the final equilibrium waterline, they shall be of the non-opening type.

3.2.4 Ships with several decks

In ships having several decks above the bulkhead deck, such as passenger ships, the arrangement of sidescuttles and rectangular windows is considered by the Society on a case-by-case basis.

Particular consideration is to be given to the ship side up to the upper deck and the front bulkhead of the superstructure.

3.2.5 Window arrangement

Windows may not be fitted below the freeboard deck, in first tier end bulkheads or sides of enclosed superstructures and in first tier deckhouses considered as being buoyant in the stability calculations or protecting openings leading below.

For ships specified in Sec 1, [1.1.6], windows could be accepted in the first tier end bulkheads or sides of enclosed superstructures and in the first tier deckhouses.

3.2.6 Skylights

Fixed or opening skylights are to have glass thickness appropriate to their size and position as required for sidescuttles and windows. Skylight glasses in any position are to be protected from mechanical damage and, where fitted in positions 1 or 2, to be provided with permanently attached robust deadlights or storm covers.

3.2.7 Gangway, cargo and fuelling ports

Gangway, cargo and fuelling ports fitted below the bulkhead deck of passenger ships and the freeboard deck of cargo ships are to be watertight and in no case they are to be so fitted as to have their lowest point below the summer load line.

3.3 Glasses

3.3.1 General

Glasses are to comply with the provisions of the Rules for Steel Ships, Part B, Ch 8, Sec 10 or NR600, Ch 5, Sec 1, [7.3], as applicable.

3.4 Deadlight arrangement

3.4.1 General

Sidescuttles to the following spaces are to be fitted with efficient, hinged inside deadlights:

- spaces below the freeboard deck
- spaces within the first tier of enclosed superstructures
- first tier deckhouses on the freeboard deck protecting openings leading below or considered buoyant in stability calculations.

Deadlights are to be capable of being closed and secured watertight if fitted below the freeboard deck and weather-tight if fitted above.

3.4.2 Openings at the side shell in the second tier

Sidescuttles and windows at the side shell in the second tier, protecting direct access below or considered buoyant in the stability calculations, are to be provided with efficient, hinged inside deadlights capable of being effectively closed and secured weathertight.

3.4.3 Openings set inboard in the second tier

Sidescuttles and windows set inboard from the side shell in the second tier, protecting direct access below to spaces listed in [3.4.1], are to be provided with either efficient, hinged inside deadlights or, where they are accessible, permanently attached external storm covers of approved design and substantial construction capable of being effectively closed and secured weathertight.

Cabin bulkheads and doors in the second tier separating sidescuttles and windows from a direct access leading below may be accepted in place of fitted deadlights or storm covers.

Note 1: Deadlights in accordance with recognised standards are fitted to the inside of windows and sidescuttles, while storm covers of comparable specifications to deadlights are fitted to the outside of windows, where accessible, and may be hinged or portable.

3.4.4 Windows in the first tier

When accepted in accordance with [3.2.5], the deadlight arrangement for these windows is to comply with the provisions of [3.4.2] and [3.4.3].

3.4.5 Deckhouses on superstructures of less than standard height

Deckhouses situated on a raised quarterdeck or on a superstructure of less than standard height may be treated as being on the second tier as far as the provision of deadlights is concerned, provided the height of the raised quarterdeck or superstructure is not less than the standard quarterdeck height.

4 Discharges

4.1 Arrangement of discharges

4.1.1 Inlets and discharges

All inlets and discharges in the shell plating are to be fitted with efficient and accessible arrangements for preventing the accidental admission of water into the ship.

4.1.2 Inboard opening of ash-chute, rubbish-chute, etc.

The inboard opening of each ash-chute, rubbish-chute, etc. is to be fitted with an efficient cover.

If the inboard opening is situated below the bulkhead deck for passenger ships or the freeboard deck for cargo ships, the cover is to be watertight, and in addition an automatic non-return valve is to be fitted in the chute in an easily accessible position above the deepest subdivision summer load line. When the chute is not in use, both the cover and the valve are to be kept closed and secured.

4.2 Arrangement of garbage chutes

4.2.1 Inboard end above the waterline

The inboard end is to be located above the waterline formed by an 8,5° heel, to port or starboard, at a draught corresponding to the assigned summer freeboard, but not less than 1000 mm above the summer load waterline.

Where the inboard end of the garbage chute exceeds 0,01 L_{LL} above the summer load waterline, valve control from the freeboard deck is not required, provided the inboard gate valve is always accessible under service conditions.

4.2.2 Inboard end below the waterline

Where the inboard end of a garbage chute is below the freeboard deck, then:

- the inboard end hinged cover/valve is to be watertight
- the valve is to be a screw-down non-return valve fitted in an easily accessible position above the deepest subdivision load line
- the screw-down non-return valve is to be controlled from a position above the bulkhead deck and provided with open/shut indicators. The valve control is to be clearly marked: "Keep closed when not in use".

4.2.3 Gate valves

For garbage chutes, two gate valves controlled from the working deck of the chute may be accepted instead of a non-return valve with a positive means of closing it from a position above the freeboard deck. In addition, the lower gate valve is to be controlled from a position above the freeboard deck. An interlock system between the two valves is to be arranged.

The distance between the two gate valves is to be adequate to allow the smooth operation of the interlock system.

4.2.4 Hinged cover and discharge flap

The upper gate valve, as required in [4.2.3], may be replaced by a hinged weathertight cover at the inboard end of the chute together with a discharge flap which replaces the lower gate valve.

The cover and discharge flap are to be arranged with an interlock so that the flap cannot be operated until the hopper cover is closed.

4.2.5 Marking of valve and hinged cover

The gate valve controls and/or hinged cover are to be clearly marked: "Keep closed when not in use".

4.3 Scantlings of garbage chutes

4.3.1 Material

The chute is to be constructed of steel. Other equivalent materials are considered by the Society on a case-by-case basis.

4.3.2 Wall thickness

The wall thickness of the chute up to and including the cover is to be of extra reinforced wall thickness in accordance with Ch 2, Sec 4, [2].

4.4 Scuppers

4.4.1 General

The definition of scuppers is given in Sec 1, [1.3.29].

Scuppers are to be led overboard. Exception is made for sanitary gravity evacuation systems which can be led to suitable sanitary tanks.

4.4.2 Normal arrangement

Scupper pipes originating at any level and led through the hull below the freeboard deck are to be provided with a non-return valve at the hull. This valve may be omitted if one of the following conditions is fulfilled:

- the end connection with the hull is situated at less than 450 mm below the freeboard deck and more than 600 mm above the summer load water line
- the part of the scupper piping below the freeboard deck is of extra reinforced thickness in accordance with Ch 2, Sec 4, [2].

4.5 Pipe discharges

4.5.1 General

The definition of pipe discharges is given in Sec 1, [1.3.30].

Pipe discharges can be led overboard or led to the bilge. In case of sanitary gravity evacuation systems, they are to be led either overboard or to suitable sanitary tanks.

4.5.2 Normal arrangement

Each separate pipe discharge led through the shell plating is to be provided with:

- an automatic non-return valve fitted with a positive means of closing from a position above the freeboard deck
- an automatic non-return valve and one closing valve controlled from above the freeboard deck.

4.5.3 Alternative arrangement when the inboard end of the discharge pipe is above the summer waterline by more than 0,01 L_{LL}

Where the vertical distance from the summer load waterline to the inboard end of the discharge pipe exceeds 0,01 L_{LL} , the discharge pipe may have two automatic non-return valves without positive means of closing, provided that:

- the inboard valve is above the level of the tropical load waterline so as to always be accessible for examination under service conditions, or
- where this is not practicable, a locally controlled closing valve is interposed between the two automatic non-return valves.

4.5.4 Alternative arrangement when the inboard end of the discharge pipe is above the summer waterline by more than 0,02 L_{LL}

Where the vertical distance from the summer load waterline to the inboard end of the discharge pipe exceeds 0,02 L_{LL} ,

4.5.5 Arrangement of pipe discharges through manned machinery spaces

Where pipe discharges are led overboard through the hull in way of manned machinery spaces, the means of closing as indicated in [4.5.2] can be locally operated.

4.6 Specific arrangements

4.6.1 Sea inlets

Sea inlets are, as a rule, considered as pipe discharges and therefore are to be in accordance with [4.5]. The automatic non-return valve with positive means of closing is however replaced by a closing valve.

4.6.2 Closed circuits

For closed circuits such as cooling systems or exhaust systems with closed piping between the sea inlet and the overboard discharge, the automatic non-return valve with positive means of closing as required in [4.5.2] could be replaced by a closing valve to the discretion of the Society.

4.6.3 Pumps

Pumps forming part of pipe discharge systems could be considered as an automatic non return valve if duly justified.

4.6.4 Remote control

The means of closing as indicated in [4.5.2] in other spaces as mentioned in [4.5.5] could be locally operated if it is duly justified that the valve is easily accessible, can be rapidly closed and that a water level detector is fitted in the space.

4.6.5 Engine exhaust gas outlets under freeboard deck

In addition to the provisions of Ch 2, Sec 7 related to engine protection, the hull connection in way of engine exhaust gas outlets under freeboard deck is to comply with one of the following features, in order to respect hull integrity:

- the connection with the hull is fitted with a means of closure or a non-return valve
- the exhaust pipe arrangement is looped above the waterline to a minimum height of $0,02 L_{LL}$ and the pipe construction is of a strength equivalent to that of the hull structure.

4.7 Summary table of scupper and overboard discharge arrangements

4.7.1 The various arrangements acceptable for scuppers and sanitary overboard discharges are summarised in Fig 1.

Figure 1 : Overboard discharge arrangement

Discharges coming from enclosed spaces below the freeboard deck or on the freeboard deck				Discharge coming from other spaces	
General requirement Reg. 22(1) where inboard end < 0,01 L above SWL	Discharge through manned machinery space	Alternatives (Reg. 22(1)) where inboard end		outboard end > 450 mm below FB deck or < 600 mm above SWL Reg. 22(4)	Otherwise Reg. 22(5)
		> 0,01 L above SWL	> 0,02 L above SWL		
Superstructure or Deckhouse Deck 					
* control of the valves from an approved position Note 1: References are those corresponding to the International Convention on Load Lines, Rules are to be additionally be taken into account.		inboard end of pipes outboard end of pipes pipes terminating on the open deck	non return valve without positive means of closing non return valve with positive means of closing controlled locally valve controlled locally	remote control normal thickness substantial thickness	

5 Machinery space openings

5.1 Closing devices

5.1.1 Machinery casings

Openings in machinery space casings in positions 1 or 2 are to be fitted with doors of steel or other equivalent materials, permanently and strongly attached to the bulkhead, and framed, stiffened and fitted so that the whole structure is of equivalent strength to the unpierced bulkhead and weathertight when closed. The doors are to be capable of being operated from both sides and generally to open outwards to give additional protection against wave impact.

Other openings in such casings are to be fitted with equivalent covers, permanently attached in their proper position.

5.1.2 Machinery casings on Type A ships

Machinery casings on Type A ships are to be protected by an enclosed poop or bridge of at least standard height, or by a deckhouse of equal height and equivalent strength.

Machinery casings may, however, be exposed if there are no openings giving direct access from the freeboard deck to the machinery spaces.

However, a weathertight door is permitted in the machinery casing, provided that it leads to a space or passageway which is as strongly constructed as the casing and is separated from the stairway to the engine room by a second weathertight door of steel or other equivalent material.

5.1.3 Height of the sill of the door

The height of the sill of the door is to be not less than:

- 600 mm above the deck if in position 1
- 380 mm above the deck if in position 2
- 230 mm in all other cases.

For ships specified in Sec 1, [1.1.6], these values could be reduced to:

- 450 mm above the deck if in position 1
- 230 mm in all other cases.

5.1.4 Double doors

Where casings are not protected by other structures, double doors (i.e. inner and outer doors) are required for ships assigned freeboard less than that based on Table B of regulation 28 of the International Load Line Convention 1966, as amended. An inner sill of 230 mm in conjunction with the outer sill of 600 mm is to be provided.

5.2 Coamings

5.2.1 Coamings of any fiddly, funnel or machinery space ventilator in an exposed position on the freeboard deck or superstructure deck are to be as high above the deck as is reasonable and practicable.

In general, ventilators necessary to continuously supply the machinery space and, on demand, the emergency generator room are to have coamings whose height is in compliance with [8.1.2], but need not be fitted with weathertight closing appliances.

Where, due to the ship's size and arrangement, this is not practicable, lesser heights for machinery space and emergency generator room ventilator coamings, fitted with weathertight closing appliances in accordance with [8.1.2], may be permitted by the Society in combination with other suitable arrangements to ensure an uninterrupted, adequate supply of ventilation to these spaces.

6 Companionway

6.1 General

6.1.1 Openings in freeboard deck

Openings in freeboard deck other than hatchways, machinery space openings, manholes and flush scuttles are to be protected by an enclosed superstructure or by a deckhouse or companionway of equivalent strength and weathertightness.

6.1.2 Openings in superstructures

Openings in an exposed superstructure deck or in the top of a deckhouse on the freeboard deck which give access to a space below the freeboard deck or a space within an enclosed superstructure are to be protected by an efficient deckhouse or companionway.

6.1.3 Openings in superstructures having height less than standard height

Openings in the top of a deckhouse on a raised quarterdeck or superstructure of less than standard height, having a height equal to or greater than the standard quarterdeck height are to be provided with an acceptable means of closing but need not be protected by an efficient deckhouse or companionway provided the height of the deckhouse is at least the standard height of a superstructure.

6.2 Scantlings

6.2.1 Companionways on exposed decks protecting openings leading into enclosed spaces are to be of steel and strongly attached to the deck and are to have adequate scantlings.

6.3 Closing devices

6.3.1 Doors

Doorways in deckhouses or companionways leading to or giving access to spaces below the freeboard deck or to enclosed superstructures are to be fitted with weathertight doors. The doors are to be made of steel or other equivalent materials, to be capable of being operated from both sides and generally to open outwards to give additional protection against wave impact.

Alternatively, if stairways within a deckhouse are enclosed within properly constructed companionways fitted with weathertight doors, the external door need not be watertight.

Where the closing appliances of access openings in superstructures and deckhouses are not weathertight, interior deck openings are to be considered exposed, i.e. situated in the open deck.

6.3.2 Height of sills

The height above the deck of sills to the doorways in companionways is to be not less than:

- 600 mm in position 1
- 380 mm in position 2.

For ships specified in Sec 1, [1.1.6], these values could be reduced to:

- 380 mm in position 1
- 230 mm in all the other cases.

Where access is not provided from above, the height of the sills to doorways in a poop bridge or deckhouse on the freeboard deck is to be 600 mm.

Where access is provided to spaces inside a bridge or poop from the deck as an alternative to access from the freeboard deck, the height of the sills into the bridge or poop is to be 380 mm. This also applies to deckhouses on the freeboard deck.

7 Hatches

7.1 Hatchways

7.1.1 Coamings

The coamings of hatchways shall be constructed according to the provisions of the Rules for Steel Ships, Pt B, Ch 9, Sec 7 in accordance with their position and their height shall be at least as follows:

- 600 mm if in position 1
- 450 mm if in position 2.

For ships specified in Sec 1, [1.1.6] or with L_{LL} less than 24 m, these values could be reduced to:

- 450 mm in position 1
- 300 mm in position 2.

For ships with a length L_{LL} less than 24 m, the coaming height of hatches closed at sea may be reduced or omitted entirely, on condition that the Society is satisfied that the safety of the ship is not thereby impaired in any sea conditions.

7.1.2 Hatch covers

Hatch covers are to comply with the provisions of the Rules for Steel Ships, Part B, Ch 8, Sec 8 or NR600, Ch 5, Sec 2, [6], as applicable.

7.1.3 Manholes and flush scuttles

Manholes and flush scuttles in positions 1 or 2, or within superstructures other than enclosed superstructures, are to be closed by substantial covers capable of being made watertight. Unless secured by closely spaced bolts, the covers are to be permanently attached.

8 Ventilation openings

8.1 Ventilation openings

8.1.1 General

Ventilator openings are to be provided with efficient weathertight closing appliances of steel or other equivalent material.

8.1.2 Closing appliance exemption

Ventilators need not be fitted with closing appliances, unless specifically required by the Society, if the coamings extend for more than:

- 4,5 m above the deck in position 1
- 2,3 m above the deck in position 2.

The closing appliances are to be permanently attached to the ventilator coamings.

8.1.3 Ventilation of machinery spaces and emergency generator room

In order to satisfactorily ensure, in all weather conditions:

- the continuous ventilation of machinery spaces, and, when necessary
- the immediate ventilation of the emergency generator room,

the ventilators serving such spaces are to comply with [8.1.2], i.e. their openings are to be so located that they do not require closing appliances.

8.1.4 Reduced height of ventilator coamings for machinery spaces and emergency generator room

Where, due to the ship's size and arrangement, the requirements in [8.1.3] are not practicable, lesser heights may be accepted for machinery space and emergency generator room ventilator coamings fitted with weathertight closing appliances in accordance with [8.1.1] and [8.1.2] in combination with other suitable arrangements, such as separators fitted with drains, to ensure an uninterrupted, adequate supply of ventilation to these spaces.

8.1.5 Closing arrangements of ventilators led overboard or through enclosed superstructures

Closing arrangements of ventilators led overboard to the ship side or through enclosed superstructures are considered by the Society on a case-by-case basis. If such ventilators are led overboard more than 4,5 m above the freeboard deck, closing appliances may be omitted provided that satisfactory baffles and drainage arrangements are fitted.

8.2 Coamings

8.2.1 General

Ventilators in positions 1 or 2 to spaces below freeboard decks or decks of enclosed superstructures are to have coamings of steel or other equivalent material, substantially constructed and efficiently connected to the deck.

Ventilators passing through superstructures other than enclosed superstructures are to have substantially constructed coamings of steel or other equivalent material at the freeboard deck.

8.2.2 Coaming height

Ventilators shall have coamings of a height above the deck of at least:

- 900 mm in position 1
- 760 mm in position 2.

For ships specified in Sec 1, [1.1.6] or with L_{LL} less than 24 m, these values could be reduced to:

- 760 mm in position 1
- 380 mm in position 2.

Where the coaming of any ventilator exceeds 900 mm in height it shall be specially supported (suitably stiffened or supported by stays).

In exposed locations or for the purpose of compliance with buoyancy calculations, the height of coamings may be required to be increased to the satisfaction of the Society.

9 Air pipes

9.1 General

9.1.1 Height of air pipes

- the height of air pipes extending above the freeboard deck or superstructure deck from the deck to the point where water may have access below is to be at least:
 - 760 mm on the freeboard deck, and
 - 450 mm on the superstructure deck.

This height is to be measured from the upper face of the deck, including sheathing or any other covering, up to the point where water may penetrate inboard.

- where these heights may interfere with the working of the ship, a lower height may be approved, provided the Society is satisfied that this is justified by the closing arrangements and other circumstances. Satisfactory means which are permanently attached are to be provided for closing the openings of the air pipes
- the height of air pipes may be required to be increased for the purpose of compliance with buoyancy calculations.
The air pipe of tanks other than oil tanks may discharge through the side of the superstructures
- the height of air pipes discharging through the side of the superstructure is to be at least 2,3 m above the summer load waterline.

- for ships specified in Sec 1, [1.1.6] or with L_{LL} less than 24 m, the height of air pipes extending above the freeboard deck or superstructure deck from the deck to the point where water may have access below is to be at least:
 - 380 mm on the freeboard deck, and
 - 225 mm on the superstructure deck.

9.1.2 Fitting of closing appliances

- satisfactory appliances which are permanently attached are to be provided for closing the openings of air pipes in order to prevent the free entry of water into the spaces concerned
- an automatic closing appliance could be required on an air pipe end if compliance with stability rules depends on the automatic closing of this air pipe
See also Sec 3.
- automatic closing appliances are to be of a type approved by the Society. Requirements for type tests are given in Ch 2, Sec 4, [6]
- where the tank venting system is not of an automatic type approved by the Society, provision is to be made for relieving vacuum when the tanks are being pumped out, and for this purpose a hole of about 10 mm in diameter in the bend of the air pipe, or at a suitable position in the closing device, is acceptable.

9.1.3 Exposed part of air pipes

Where air pipes extend above the freeboard deck or superstructure deck, the exposed parts of the pipes are to be of reinforced thickness in accordance with Ch 2, Sec 4, [2].

10 Tank cleaning openings

10.1 General

10.1.1 Ullage plugs, sighting ports and tank cleaning openings may not be arranged in enclosed spaces.

11 Freeing ports

11.1 General

11.1.1 The freeing port arrangement is to be in accordance with the provisions of the Rules for Steel Ships, Pt B, Ch 8, Sec 10, [6]. Reductions on the freeing port area as defined in [11.2.1] or in [11.2.2] could however be applied for ships of less than 24 m in length (these requirements are not to be used simultaneously).

11.2 Ships of less than 24 m in length

11.2.1 The freeing port area calculated in [11.1.1] can be reduced considering the following formula:

$$A_4 = c A_n$$

where:

- A_4 : Reduced freeing port area
- c : Coefficient having the following values:
- $c = 0,4$ for ships defined in Sec 1, [1.1.6]
 - $c = 0,75$ for other ships
- A_n : Area of freeing ports A_1 , A_2 and A_3 calculated in [11.1.1].

11.2.2 For wells with a volume of less than 18 m^3 , the total freeing port area of the well can be reduced considering the following formula:

$$A_5 = 0,02 V$$

where:

- A_5 : Reduced freeing port area
- V : Volume taking into account the corresponding deck area and height to top of bulwark, with deduction of volume of hatches, deckhouse, etc.

12 Minimum bow height

12.1 General

12.1.1 This Article applies only for ships with a length L_{LL} greater than 24 m.

12.1.2 The bow height F_b defined as the vertical distance at the forward perpendicular between the waterline corresponding to the assigned summer freeboard and the designed trim and the top of the exposed deck at side, is to be not less than:

$$F_b = \{6075 (L_{LL}/100) - 1875 (L_{LL}/100)^2 + 200 (L_{LL}/100)^3\} \cdot \{2,08 + 0,609 C_{bLL} - 1,603 C_{wf} - 0,0129 (L_{LL}/d_1)\}$$

where:

- F_b : Calculated minimum bow height, in mm
- d_1 : Draught at 85% of the least moulded depth, in m, as defined in Sec 1, [1.3.5]
- C_{wf} : Waterplane area coefficient forward of $L_{LL}/2$:

$$C_{wf} = \frac{A_{wf}}{\frac{L_{LL}}{2} B}$$

- A_{wf} : Waterplane area forward of $L_{LL}/2$ at draught T_1 , in m^2 .

For ships to which timber freeboards are assigned, the summer freeboard (and not the timber summer freeboard) is to be assumed when applying the formula above.

12.1.3 Where the bow height required in [12.1.2] is obtained by sheer, the sheer is to extend for at least 15% of the length of the ship measured from the forward perpendicular. Where it is obtained by fitting a superstructure, such superstructure is to extend from the stem to a point at least $0,07 L_{LL}$ abaft the forward perpendicular and is to be enclosed as defined in Sec 1, [1.3.14].

12.1.4 Ships which, to suit exceptional operational requirements, cannot meet the requirements in [12.1.2] and [12.1.3] will be considered by the Society on a case-by-case basis.

12.1.5 The sheer of the forecastle deck may be taken into account, even if the length of the forecastle is less than $0,15 L_{LL}$, but greater than $0,07 L_{LL}$, provided that the forecastle height is not less than one half of standard height of superstructure between $0,07 L_{LL}$ and the forward perpendicular.

12.1.6 Where the forecastle height is less than one half of the standard height of superstructure, the credited bow height may be determined as follows:

- a) where the freeboard deck has sheer extending from abaft $0,15 L_{LL}$ by a parabolic curve having its origin at $0,15 L_{LL}$ abaft the forward perpendicular at a height equal to the midship depth of the ship, extended through the point of intersection of forecastle bulkhead and deck, and up to a point at the forward perpendicular not higher than the level of the forecastle deck (see Fig 2). However, if the value of the height denoted h_i in Fig 2 is smaller than the value of the height denoted h_b , then h_i may be replaced by h_b in the available bow height, where:

$$h_i = Z_b \left(\frac{0,15 L_{LL}}{x_b} \right)^2 - Z_t$$

Z_b, Z_t : As defined in Fig 2

h_i : Half standard height of superstructure.

- b) where the freeboard deck has sheer extending for less than $0,15 L_{LL}$ or has no sheer, by a line from the forecastle deck at side at $0,07 L_{LL}$ extended parallel to the base line to the forward perpendicular (see Fig 3).

12.1.7 All ships assigned a type B freeboard, other than oil tankers, chemical tankers and gas carriers, are to have additional reserve buoyancy in the fore end. Within the range of $0,15 L_{LL}$ abaft the forward perpendicular, the sum of the projected area between the summer load waterline and the deck at side (A_1 and A_2 in Fig 4) and the projected area of an enclosed superstructure, if fitted, is, in m^2 , to be not less than:

$$A_3 = \{0,15 F_{\min} + 4 (L_{LL}/3 + 10)\} \cdot L_{LL}/1000$$

where:

- $F_{\min}$: $F_{\min} = (F_0 \cdot f_1) + f_2$
- F_0 : Tabular freeboard, in mm, taken from the International Convention on Load Lines, as amended, Table 28.2, corrected for regulation 27(9) or 27(10), as applicable
- f_1 : Correction for block coefficient given in the International Convention on Load Lines, as amended, regulation 30
- f_2 : Correction for depth, in mm, given in the International Convention on Load Lines, as amended, regulation 31.

Figure 2 : Credited bow height where the freeboard deck has sheer extending from abaft 0,15 L_{LL}

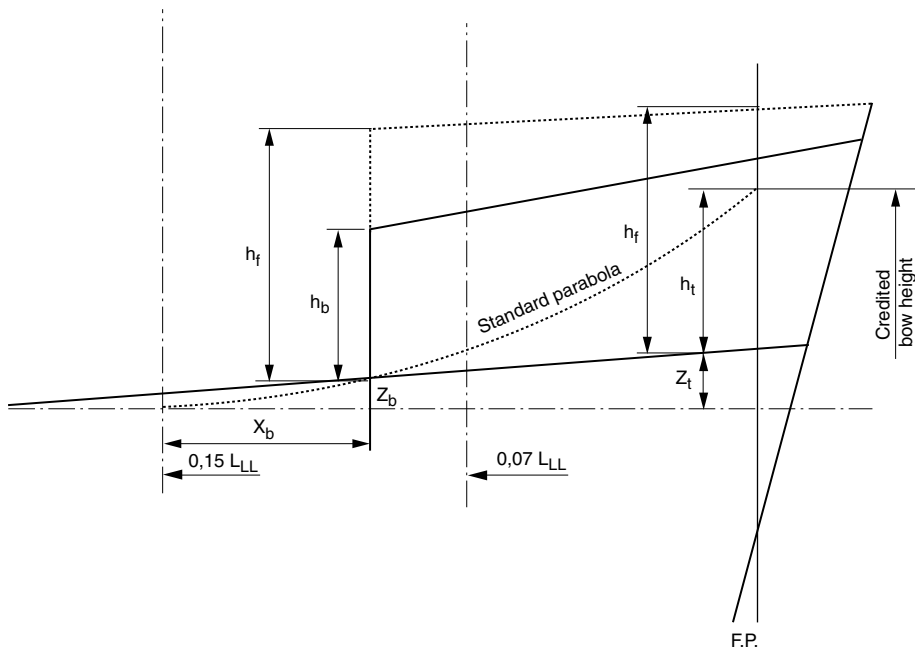


Figure 3 : Credited bow height where the freeboard deck has sheer extending for less than 0,15 L_{LL}

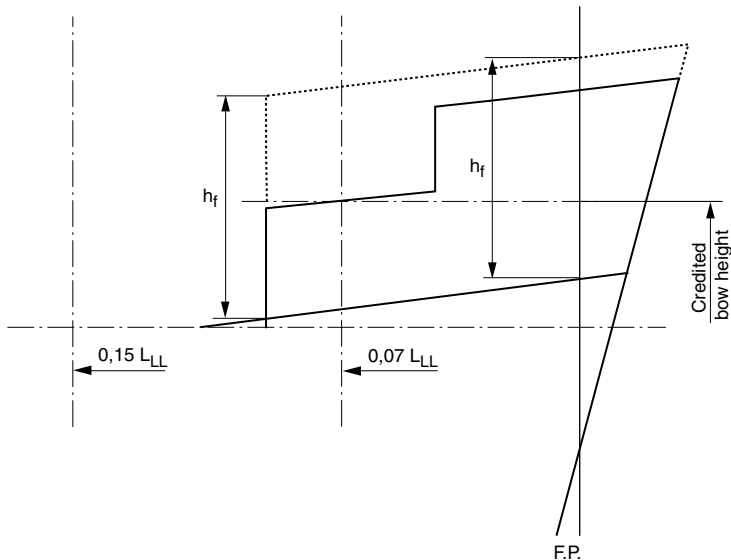
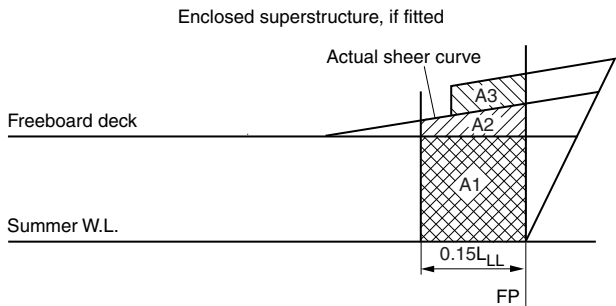


Figure 4 : Areas A1, A2 and A3



SECTION 1	GENERAL REQUIREMENTS AND APPLICATION
SECTION 2	PROPELLING AND AUXILIARY MACHINERY
SECTION 3	STEERING GEAR
SECTION 4	ARRANGEMENT AND INSTALLATION OF PIPING SYSTEMS
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SECTION 1

GENERAL REQUIREMENTS AND APPLICATION

1 General

1.1 Application

1.1.1 The present Chapter 2 applies to the design, construction, installation, tests and trials of main propulsion and essential auxiliary machinery systems and associated equipment, pressure vessels, piping systems, and steering and manoeuvring systems installed on board classed ships, as indicated in each Section of this Chapter and as far as class is concerned only.

1.1.2 Relaxations

Relaxations on requirements referred to in this chapter apply on the following ships:

- ships with navigation notation **sheltered area** or **coastal area**
- ships with service notation **launch** or **seagoing launch**
- ships with service notation **light ship** or **crew boat** with operating area notation **assisted operating area** as defined in NR467 Rules for the Classification of Steel Ships Pt A, Ch 1, Sec 2 [5.3.4].

1.2 Documentation to be submitted

1.2.1 Before the actual construction is commenced, the Manufacturer, Designer or ship builder is to submit to the Society the documents (plans, diagrams, specifications and calculations) requested in the relevant Sections of this Chapter.

1.3 Definitions

1.3.1 Machinery spaces

Machinery spaces are machinery spaces of category A and other spaces containing propulsion machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

1.3.2 Machinery spaces of category A

Machinery spaces of category A are those spaces and trunks to such spaces which contain either:

- internal combustion machinery used for main propulsion, or
- internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW, or
- any oil-fired boiler or oil fuel unit, or any oil-fired equipment other than boilers, such as inert gas generators, incinerators, etc.

1.3.3 Fuel oil unit

Fuel oil unit is the equipment used for the preparation of fuel oil for delivery to an oil fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0,18 N/mm².

2 Design and construction

2.1 General

2.1.1 The machinery, pressure vessels, associated piping systems and fittings are to be of a design and construction adequate for the service for which they are intended and are to be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards.

The design is to have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

2.2 Materials, welding and testing

2.2.1 General

Materials, welding and testing procedures are to be in accordance with the requirements of NR216 Materials and Welding and those given in the other Sections of this Chapter. In addition, for machinery components fabricated by welding, the requirements given in [2.2.2] apply.

2.2.2 Welded machinery components

Welding processes and welders are to be approved by the Society in accordance with NR216 Materials and Welding, Chapter 5.

References to welding procedures adopted are to be clearly indicated on the plans submitted for approval.

Joints transmitting loads are to be either:

- full penetration butt-joints welded on both sides, except when an equivalent procedure is approved
- full penetration T- or cruciform joints.

For joints between plates having a difference in thickness greater than 3 mm, a taper having a length of not less than 4 times the difference in thickness is required. Depending on the type of stress to which the joint is subjected, a taper equal to 3 times the difference in thickness may be accepted.

T-joints on scalloped edges are not permitted.

Lap-joints and T-joints subjected to tensile stresses are to have a throat size of fillet welds equal to 0,7 times the thickness of the thinner plate on both sides.

In the case of welded structures including cast pieces, the latter are to be cast with appropriate extensions to permit connection, through butt-welded joints, to the surrounding structures, and to allow any radiographic and ultrasonic examinations to be easily carried out.

Where required, preheating and stress relieving treatments are to be performed according to the welding procedure specification.

2.3 Vibrations

2.3.1 Shipyards and manufacturers are to give special consideration to the design, construction and installation of propulsion machinery systems and auxiliary machinery so that any mode of their vibrations shall not cause undue stresses in this machinery in the normal operating ranges.

2.4 Operation in inclined position

2.4.1 Main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the ship are, as fitted in the ship, to be designed to operate when the ship is upright and when inclined at any angle of list either way and trim by bow or stern as stated in Tab 1.

The Society may permit deviations from angles given in Tab 1, taking into consideration the type, size and service conditions of the ship.

Machinery with a horizontal rotation axis is generally to be fitted on board with such axis arranged alongships. If this is not possible, the Manufacturer is to be informed at the time the machinery is ordered.

2.5 Ambient conditions

2.5.1 Machinery and systems covered by the Rules are to be designed to operate properly under the ambient conditions specified in Tab 2, unless otherwise specified in each Section of this Chapter.

2.6 Power of machinery

2.6.1 Unless otherwise stated in each Section of this Chapter, where scantlings of components are based on power, the values to be used are determined as follows:

- for main propulsion machinery, the power/rotational speed for which classification is requested
- for auxiliary machinery, the power/rotational speed which is available in service.

Table 1 : Inclination of ship

Installations, components	Angle of inclination (degrees) (1)			
	Athwartship		Fore and aft	
	static	dynamic	static	dynamic
Main and auxiliary machinery	15,0	22,5	5,0	7,5
Safety equipment, e.g. emergency power installations, emergency fire pumps and their devices	22,5	22,5	10,0	10,0
Switch gear, electrical and electronic appliances (2) and remote control systems	(3) (4)	(3) (4)		
(1) Athwartship and fore-and-aft inclinations may occur simultaneously.				
(2) Up to an angle of inclination of 45° no undesired switching operations or operational changes may occur.				
(3) In sailing ships, auxiliary engines must operate satisfactorily after being heeled to a larger angle of 30° a long time.				
(4) In sailing ships, where main and/or auxiliary engines are intended to supply energy to a ship sailing heeled a long time, the subject engines must operate satisfactorily to an angle of 30°.				

Table 2 : Ambient conditions

AIR TEMPERATURE	
Location, arrangement	Temperature range (°C)
In enclosed spaces	between 0 and +45 (1)
On machinery components, boilers	According to specific local conditions
In spaces subject to higher or lower temperatures	
On exposed decks	between – 25 and + 45 (2)

WATER TEMPERATURE	
Coolant	Temperature (°C)
Sea water or, if applicable, sea water at charge air coolant inlet	up to +32
(1) Different temperatures may be accepted by the Society in the case of ships specified in [1.1.2]	
(2) Electronic appliances are to be designed for an air temperature up to 55°C (for electronic appliances see also Chapter 3).	

2.7 Astern power

2.7.1 Where power exceeds 5 kW, means for going astern is to be provided to secure proper control of the ship in all normal circumstances.

The main propulsion machinery is to be capable of maintaining in free route astern at least 70% of the maximum ahead revolutions for a period of at least 30 min.

For main propulsion systems with reversing gears, controllable pitch propellers or electrical propeller drive, running astern is not to lead to an overload of propulsion machinery.

During the sea trials, the ability of the main propulsion machinery to reverse the direction of thrust of the propeller is to be demonstrated and recorded (see also Sec 8).

2.8 Safety devices

2.8.1 Where risk from overspeeding of machinery exists, means are to be provided to ensure that the safe speed is not exceeded.

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

2.8.3 Where applicable, main internal combustion propulsion machinery and auxiliary machinery are to be provided with automatic shut-off arrangements in the case of failures, such as lubricating oil supply failure, which could lead rapidly to complete breakdown, serious damage or explosion.

The Society may permit provisions for overriding automatic shut-off devices.

See also the specific requirements given in the other Sections of this Chapter.

2.9 Fuels

2.9.1 Fuel oils employed for engines and boilers are, in general, to have a flash point (determined using the closed cup test) not less than 60°C. However, for engines driving emergency generators, fuel oils having a flash point less than 60°C but not less than 43°C are acceptable.

For ships specified in [1.1.2], or whenever special precautions are taken to the Society's satisfaction, fuel oils having a flash point less than 60°C but not less than 43°C may be used for engines and boilers, provided that, from previously effected checks, it is evident that the temperature of spaces where fuel oil is stored or employed will be at least 10°C below the fuel oil flash point at all times.

For ships less than 12 m in length, fuel oils having a flash point less than 43°C could be used for engines with arrangements specially approved by the Society.

Fuel oils having a flash point less than 43°C may be employed on board provided that it is stored outside machinery spaces and the arrangements adopted are specially approved by the Society.

3 Arrangement and installation on board

3.1 General

3.1.1 Provision is to be made to facilitate cleaning, inspection and maintenance of main propulsion and auxiliary machinery, including boilers and pressure vessels.

Easy access to the various parts of the propulsion machinery is to be provided by means of metallic ladders and gratings fitted with strong and safe handrails.

Spaces containing main and auxiliary machinery are to be provided with adequate lighting and ventilation.

3.2 Gratings

3.2.1 Gratings in engine rooms, if any, are to be divided into easily removable panels.

3.3 Bolting down

3.3.1 Bedplates of machinery are to be securely fixed to the supporting structures by means of foundation bolts which are to be distributed as evenly as practicable and of a sufficient number and size so as to ensure proper fitting.

Where the bedplates bear directly on the inner bottom plating, the bolts are to be fitted with suitable gaskets so as to ensure a tight fit and are to be arranged with their heads within the double bottom.

Continuous contact between bedplates and foundations along the bolting line is to be achieved by means of chocks of suitable thickness, carefully arranged to ensure a complete contact.

The same requirements apply to thrust block and shaft line bearing foundations.

Particular care is to be taken to obtain levelling and general alignment between the propulsion engines and their shafting (see also Sec 2, [7]).

3.3.2 Chocking resins are to be type approved.

3.3.3 Where stays are provided for fixing the upper part of engines to the ship's structure in order, for example, to reduce the amplitude of engine vibrations, such stays are to be so designed as to prevent damage to these engines further to deformation of the shell plating in way of the said stays. The stays are to be connected to the hull in such a way as to avoid abnormal local loads on the structure of the ship.

3.4 Safety devices on moving parts

3.4.1 Suitable protective devices on access restrictions are to be provided in way of moving parts (flywheels, belts, couplings, etc.) in order to avoid accidental contact of personnel with moving parts.

3.5 Gauges

3.5.1 Gauges are to be clearly visible, with indication of type of fluid.

3.6 Ventilation in engine or machinery spaces

3.6.1 Engine or machinery spaces are to be sufficiently ventilated so as to ensure that when machinery or boilers therein are operating at full power in all weather conditions, including heavy weather, a sufficient supply of air is maintained to the spaces for the operation of the machinery.

This sufficient amount of air is to be supplied through suitably protected openings arranged in such a way that they can be used in all weather conditions, taking into account the provisions of Ch 1, Sec 4, [8].

Special attention is to be paid both to air delivery and extraction and to air distribution in the various spaces. The quantity and distribution of air are to be such as to satisfy machinery requirements for developing maximum continuous power.

The ventilation is to be so arranged as to prevent any accumulation of flammable gases or vapours.

3.7 Hot surfaces and fire protection

3.7.1 Surfaces, having temperature exceeding 60°C, with which the crew are likely to come into contact during operation are to be suitably protected or insulated.

Surfaces of machinery with temperatures above 220°C, e.g. steam, thermal oil and exhaust gas lines, silencers, exhaust gas boilers and turbochargers, are to be effectively insulated with non-combustible material or equivalently protected to prevent the ignition of combustible materials coming into contact with them. Where the insulation used for this purpose is oil absorbent or may permit the penetration of oil, the insulation is to be encased in steel sheathing or equivalent material.

Fire protection, detection and extinction are to comply with the provisions of Chapter 4.

3.8 Machinery remote control, alarms

3.8.1 For remote control systems of main propulsion machinery and essential auxiliary machinery and relevant alarms and safety systems, the requirements of Ch 3, Sec 5 and Ch 3, Sec 6 apply.

3.9 Pressure vessels

3.9.1 Pressure vessels are to be reviewed, constructed, installed and tested in accordance with the applicable requirements of the Rules for Steel Ships, Pt C, Ch 1, Sec 3. The acceptance of national and international standards as an alternative may be considered by the society on a case-by-case basis.

4 Tests and trials

4.1 Works tests

4.1.1 Equipment and its components are subjected to works tests which are detailed in the relevant Sections of this Chapter. The Surveyor is to be informed in advance of these tests.

Where such tests cannot be performed in the workshop, the Society may allow them to be carried out on board, provided this is not judged to be in contrast either with the general characteristics of the machinery being tested or with particular features of the shipboard installation. In such cases, the Surveyor is to be informed in advance and the tests are to be carried out in accordance with the provisions of NR216 Materials and Welding, relative to incomplete tests.

All boilers, all parts of machinery, all steam, hydraulic, pneumatic and other systems and their associated fittings which are under internal pressure are to be subjected to appropriate tests including a pressure test before being put into service for the first time as detailed in the other Sections of this Chapter.

4.2 Trials on board

4.2.1 Trials on board of machinery are detailed in Sec 8.