

RULES FOR CLASSIFICATION

Yachts

Edition October 2016

Part 3 Hull

Chapter 2 General arrangement design

The content of this service document is the subject of intellectual property rights reserved by DNV GL AS ("DNV GL"). The user accepts that it is prohibited by anyone else but DNV GL and/or its licensees to offer and/or perform classification, certification and/or verification services, including the issuance of certificates and/or declarations of conformity, wholly or partly, on the basis of and/or pursuant to this document whether free of charge or chargeable, without DNV GL's prior written consent. DNV GL is not responsible for the consequences arising from any use of this document by others.

**The electronic pdf version of this document, available free of charge
from <http://www.dnvgl.com>, is the officially binding version.**



FOREWORD

DNV GL rules for classification contain procedural and technical requirements related to obtaining and retaining a class certificate. The rules represent all requirements adopted by the Society as basis for classification.

© DNV GL AS October 2016

Any comments may be sent by e-mail to *rules@dnvgl.com*

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of DNV GL, then DNV GL shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.

In this provision "DNV GL" shall mean DNV GL AS, its direct and indirect owners as well as all its affiliates, subsidiaries, directors, officers, employees, agents and any other acting on behalf of DNV GL.

CURRENT – CHANGES

This document supersedes the December 2015 edition.

Changes in this document are highlighted in red colour. However, if the changes involve a whole chapter, section or sub-section, normally only the title will be in red colour.

Main changes October 2016, entering into force as from date of publication

- Sec.1 Subdivision arrangement
 - Sec.1 [2.1]: Better definition
 - Sec.1 [2.2.2]: Exception for smaller yachts included.

Editorial corrections

In addition to the above stated changes, editorial corrections may have been made.

CONTENTS

Current – changes.....	3
Section 1 Subdivision arrangement.....	5
1 General.....	5
2 Watertight bulkheads.....	5
3 Openings in watertight bulkheads.....	6
Section 2 Compartment arrangement.....	9
1 Cofferdams.....	9
2 Double bottom.....	9
3 Fore end compartments.....	10
4 Aft end compartments.....	10
5 Fuel oil tanks.....	11
6 Shaft tunnels.....	11
7 Steering gear compartment.....	11
Section 3 Access arrangement.....	12
1 Access to double bottom and compartments.....	12
2 Closed spaces.....	12
Changes – historic.....	13

SECTION 1 SUBDIVISION ARRANGEMENT

1 General

Beyond the requirements defined in this chapter, further subdivision requirements may result from the damage stability calculation, if requested.

2 Watertight bulkheads

2.1 Arrangement of watertight bulkheads

At least the following transverse watertight bulkheads are to be fitted on all yachts:

- collision bulkhead
- aftpeak bulkhead
- bulkhead at the forward and aft end of the machinery space.

2.2 Collision bulkhead

2.2.1 A collision bulkhead shall extend watertight up to the bulkhead deck. Steps or recesses may be permitted if the conditions [2.2.2] are observed.

2.2.2 Except for yachts with less than 500 gross tonnes (GT) the collision bulkhead shall be located at a distance from the forward perpendicular of not less than $0.05 L_{LL}$ or 10 m, whichever is the less, and not more than $0.08 L_{LL}$ or $0.05 L_{LL} + 3$ m, whichever is the greater.

Where any part of the yacht below the waterline extends forward of the forward perpendicular, e.g., a bulbous bow, the distances stipulated in this paragraph shall be measured from a point either:

- at the mid length of such extension,
- at a distance $0.015 L_{LL}$ forward of the forward perpendicular, or
- at a distance 3 m forward of the forward perpendicular, whichever gives the smallest measurement.

If collision bulkhead is located outside and more forward than the permissible range, the requirement may be substituted by proof of survivability of simultaneous two compartment damage of both foremost compartments according to the criteria defined in Sec.3.

2.2.3 In yachts having continuous or long superstructures, the collision bulkhead shall extend to the first deck above the bulkhead deck. The extension need not be fitted directly in line with the bulkhead below, provided the requirements of Ch.4 Sec.3 [10]. are fulfilled and the scantlings of the part of the bulkhead deck which forms the step or recess are not less than required for a collision bulkhead. Openings with weather tight closing appliances may be fitted above the bulkhead deck in the collision bulkhead and in the aforementioned step and recess. However the number of openings shall be reduced to the minimum compatible with the design and proper working of the yacht.

2.2.4 No doors, manholes, access openings, or ventilation ducts are permitted in the collision bulkhead below the bulkhead deck and above the double bottom.

Where pipes are piercing the collision bulkhead below the bulkhead deck, screw down valves are to be fitted directly at the collision bulkhead.

Where such valves are fitted within the forepeak they are to be operable from above the freeboard deck.

Where a readily accessible space which is not a hold space is located directly adjacent to the forepeak, e.g., a bow-thruster space, the screw down valves may be fitted within this space directly at the collision bulkhead and need not be operable from a remote position. For different space layouts alternative solutions with the safety level may be agreed by the Society.

Guidance note:

In cases of yachts complying with equivalent standards for SOLAS cargo vessels, the above calculation of the collision bulkhead position may be applied to the rule length and corresponding perpendiculars

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

2.3 Aft peak bulkhead

2.3.1 An aft peak bulkhead, enclosing the stern tube and rudder trunk in a watertight compartment, is to be provided. Where the shafting arrangements make enclosure of the stern tube in a watertight compartment impractical, alternative arrangements are specially considered.

2.3.2 The aft peak bulkhead may be stepped below the bulkhead deck, provided that the degree of safety of the ship as regards subdivision is not thereby diminished.

2.3.3 The aft peak bulkhead location on ships powered and/or controlled by equipment that do not require the fitting of a stern tube and/or rudder trunk are also subject to special consideration.

2.3.4 The aft peak bulkhead may terminate at the first deck above the deepest draught at the aft perpendicular, provided that this deck is made watertight to the stern or to the transom.

2.3.5 Aft peak/machinery space bulkheads may terminate as given in [2.3.4] when the aft space is not utilised for passengers.

2.4 Remaining watertight bulkheads

2.4.1 The remaining watertight bulkheads, which are in general depending on the type of the yacht and the requirements for damage stability defined in Ch.10, have extend to the bulkhead deck. Wherever practicable, they shall be situated in one frame plane, otherwise those portions of decks situated between parts of transverse bulkheads are to be watertight. In horizontal parts of bulkheads the requirements for decks according to Ch.4 Sec.3 [11] are to be applied.

2.4.2 Bulkheads shall be fitted separating the machinery spaces from service spaces and accommodation rooms forward and aft and made watertight up to the bulkhead deck.

3 Openings in watertight bulkheads

3.1 General

3.1.1 Type and arrangement of doors are to be submitted for approval.

Regarding openings in the collision bulkhead see Ch.4 Sec.3 [11].

3.1.2 In the other watertight bulkheads, watertight doors may be fitted.

3.1.3 Watertight doors are to be sufficiently strong and of an approved design. The thickness of plating is not to be less than the minimum thickness according to Ch.4 Sec.3 [4].

3.1.4 Openings for watertight doors in the bulkheads are to be effectively framed such as to facilitate proper fitting of the doors and to guarantee water tightness.

3.2 Bulkhead doors

3.2.1 Tests

Before being fitted, the watertight bulkhead doors, together with their frames, are to be tested by a head of water corresponding to the bulkhead deck height plus 1.0 meter or corresponding to the most unfavourable damage water line plus 1.0 meter, if that be greater.

After having been fitted, the doors are to be hose-tested for tightness and to be subjected to an operational test. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by means such as an ultrasonic leak test or an equivalent test to the satisfaction of our local surveyor.

A permissible leakage rate will be defined by the Society according to test conditions and sealing type of the door.

3.2.2 Hinged doors

Hinged doors are to be provided with rubber or equivalent sealing and toggles or other approved closing appliances which guarantee a sufficient sealing pressure. If the pressure in the sealing profile is declining beyond a certain level, an alarm shall be triggered. The toggles and closing appliances are to be operable from both sides of the bulkhead. Hinges are to have oblong holes if no pneumatic activation of the sealing is provided. Bolts and bearings are to be of corrosion resistant material.

3.2.3 Sliding doors

Sliding doors are to be carefully fitted and are to be properly guided in all positions. Heat sensitive materials are not to be used in systems which penetrate watertight subdivision bulkheads, where deterioration of such systems in the event of fire would impair the watertight integrity of the bulkheads.

The closing mechanism is to be safely operable from each side of the bulkhead and from above the bulkhead deck by a power operated mechanism.

3.2.4 Operation requirements

Power-operated doors are to be capable of being reliably closed against an adverse list of 15°. The closing time, from the time each door begins to move to the time it reaches the completely closed position, shall in no case be less than 20 seconds or more than 40 seconds with the ship in upright position. Being closed from the central operating console all doors shall be in closed position within 60 seconds.

Hand-operated closing appliances are to be so designed that the doors can be closed against a list of 15° and that the closing time with the ship upright will not exceed 90 seconds.

Consideration shall also be given to the forces which may act on either side of the door as may be experienced when water is flowing through the opening applying a static head equivalent to a water height of at least 1 m above the sill on the centreline of the door.

3.2.5 Control

For doors in watertight bulkheads with a position at or below the equilibrium or intermediate water plane due to an assumed damage, the following measures have to be provided:

Position indicators are to be provided at all remote operating positions as well as locally at both sides of the doors, to show whether the doors are open or closed and, if applicable, with all toggles fully and properly engaged. An indication should be placed locally showing that the door is in remote control mode.

Doors which are to be capable of being remotely closed are to be provided with an audible alarm, distinct from any other alarm in the area, which will sound whenever such a door is remotely closed. In areas with high ambient noise, the audible alarms are to be supplemented by visual signals at both sides of the doors.

Doors which are normally closed at sea but not provided with means of remote closure are to have notices fixed to both sides of the doors stating: "To be kept closed at sea". The use of such doors shall be authorised by the officer of the watch.

Doors which are to be permanently closed at sea are to have notices fixed to both sides stating: "Not be opened at sea". The time of opening such doors in port and closing them before the ship leaves port shall be entered in the logbook

3.3 Penetration through watertight bulkheads

3.3.1 Bulkhead fittings at positions at or below the equilibrium or intermediate water plane due to an assumed damage shall normally be welding studs. Fittings penetrating watertight bulkheads, are only permitted in exceptional cases. If this seems necessary, special care is to be taken to maintain water tightness.

3.3.2 For penetrations through the collision bulkhead [\[2.2\]](#) of this section is to be observed.

SECTION 2 COMPARTMENT ARRANGEMENT

1 Cofferdams

1.1 Definition

A cofferdam is 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 kept gas-tight and is to be properly ventilated and of sufficient size to allow proper inspection, maintenance and safe evacuation.

1.2 Arrangement of cofferdams

1.2.1 Cofferdams shall be provided between compartments intended for liquid hydrocarbons (fuel oil, lubricating oil) and those intended for fresh water (drinking water, water for propelling machinery and boilers) as well as tanks intended for the carriage of liquid foam for fire extinguishing.

1.2.2 Furthermore, a cofferdam shall be arranged separating tanks carrying fresh water for human consumption from other tanks containing substances hazardous to human health.

Guidance note:

Normally, tanks for fresh water and water ballast are considered non-hazardous.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

1.2.3 Where a corner to corner situation occurs, tanks are not considered to be adjacent.

2 Double bottom

2.1 General

2.1.1 For sailing and motor yachts of 500 GT and more as well as for passenger yachts, a double bottom shall be fitted extending from the collision bulkhead to the afterpeak bulkhead, as far as this is practicable and compatible with the design and proper working of the ship.

2.1.1.1 In ships of 50 m and upwards but less than 61 m in length a double bottom shall be fitted at least from the machinery space to the forepeak bulkhead, or as near thereto as practicable.

2.1.1.2 In ships of 61 m and upwards but less than 76 m in length a double bottom shall be fitted at least outside the machinery space, and shall extend to the fore and after peak bulkheads, or as near thereto as practicable.

2.1.1.3 In ships of 76 m in length and upwards, a double bottom shall be fitted amidships, and shall extend to the fore and after peak bulkheads, or as near thereto as practicable.

2.1.1.4 For vessels assessed in accordance with the probabilistic means in accordance with Parts B-1 through B-4 of SOLAS, where it is deemed that the installation of a double bottom is impracticable in accordance with [2.1.1.3], the vessel must be able to demonstrate compliance with the enhanced survivability criteria defined in the Passenger Yacht Code (PYC) Part III section 4.30, following the occurrence of bottom damage in the area concerned.

2.1.2 A double bottom need not to be fitted in way of watertight compartments used exclusively for the carriage of liquids, provided the safety of the ship in the event of a bottom damage is not thereby impaired.

2.1.3 Any part of the yacht that is not fitted with a double bottom in accordance with [2.1.1] shall be capable of withstanding bottom damages.

Guidance note:

Bottom arrangements regulated under SOLAS Convention that are not in compliance with Reg.II-1/9 are subject to acceptance by the administration.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

2.1.4 Subject to agreement with the Society, the double bottom may be specially considered for vessels up to 500 GT.

2.2 Height of double bottom

Where a double bottom is required to be fitted the inner bottom shall be continued out to the ship side in such a manner as to protect the bottom to the turn of bilge. Such protection will be deemed satisfactory if the inner bottom is not lower at any part than a plane parallel with the keel line and which is located not less than a vertical distance h measured from the keel line, as calculated by the formula:

$$h = 1000 \cdot B/20 \text{ (mm)}, \text{ minimum } 760 \text{ mm}$$

The height, h , need not be taken more than 2000 mm.

The height shall be sufficient to give good access to all parts of the double bottom. For ships with large rise of floor, the minimum height may have to be increased after special consideration.

2.3 Small wells in double bottom tank

Small wells constructed in the double bottom, shall not extend in depth more than necessary. In no case shall the vertical distance from the bottom of such a well to a plane coinciding with the keel line be less than 500 mm. Other wells (e.g., for lubricating oil under main engines) may be permitted if the arrangement gives protection equivalent to that afforded by a double bottom complying with this regulation.

3 Fore end compartments

The fore peak and other compartments located forward of the collision bulkhead may not be arranged for the carriage of fuel oil or other flammable products.

4 Aft end compartments

4.1 Sterntube

Stern tubes are to be enclosed in a watertight space (or spaces) of moderate volume. In case the stern tube terminates at an aft peak bulkhead also being a machinery space bulkhead, a pressurized stern tube sealing system may be accepted as an alternative to the watertight enclosure. Other measures to minimise the danger of water penetrating into the ship in case of damage to stern tube arrangement may be taken at the discretion of the Society.

Guidance note:

If requirements overlap or contradict to [6], there will be consideration case-by-case.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

4.2 Propulsion thruster compartment

The propulsion thruster compartment shall comply with the requirements given in SHIP Pt.4 Ch.5 Sec.3 [6].

5 Fuel oil tanks

Fuel oil tanks are to be arranged in accordance with the requirements in SOLAS Ch II-2, Reg 4.2 and MARPOL, Annex I, Ch.3, Reg 12A, as applicable.

6 Shaft tunnels

In ships with engine room situated amidships, a watertight shaft tunnel shall be arranged. Openings in the forward end of shaft tunnels shall be fitted with watertight sliding doors capable of being operated from a position above the load waterline.

The shaft tunnel may be omitted in ships up to 500 GT and with service restriction notation **R3** and **RE** provided the shafting is otherwise effectively protected. Bearings and stuffing boxes shall be accessible.

7 Steering gear compartment

The steering gear compartment shall be readily accessible and separated from machinery spaces. See also [Pt.4 Ch.10](#) for additional requirements to the steering gear compartment.

SECTION 3 ACCESS ARRANGEMENT

1 Access to double bottom and compartments

Manholes shall be cut in the inner bottom, floors and longitudinal girders to provide access to all parts of the double bottom. The vertical extension of lightening holes shall not exceed one half of the girder height. The edges of manholes shall be smooth. Manholes in the inner bottom plating shall have reinforcement rings. The access opening to pipe tunnel shall be visible above the floor plates and shall be fitted with a rigid, watertight closure.

A notice plate shall be fitted stating that the access opening to the pipe tunnel shall be kept closed. The opening shall be regarded as an opening in a watertight bulkhead.

2 Closed spaces

In general, all closed spaces shall be accessible for easy inspection. Special measures for inspection and maintenance shall be put in place for small closed spaces for which the design causes impracticality for the access.

Closing of spaces of limited size, that are not possible to enter for inspection and maintenance, may be accepted after special consideration.



CHANGES – HISTORIC

December 2015 edition

General

This is a new document.

The rules enter into force 1 July 2016.

DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16 000 professionals are dedicated to helping our customers make the world safer, smarter and greener.

SAFER, SMARTER, GREENER