

SECTION 5

BILGE SYSTEMS

1 General

1.1 Applications

1.1.1 This section applies to bilge systems.

1.2 Principle

1.2.1 An efficient bilge pumping system is to be provided, capable of pumping from and draining any watertight compartment other than a space permanently appropriated for the carriage of fresh water, water ballast, fuel oil or liquid cargo and for which other efficient means of pumping are to be provided, under all practical conditions. Efficient means is to be provided for draining water from insulated holds.

Bilge pumping system is not intended at coping with water ingress resulting from structural or main sea water piping damage.

2 Yacht or Charter Yacht of length less than 24 m

2.1 Application

2.1.1 Scope

The following requirements apply to motor or sailing yacht of less than 24 metres in load line length.

2.1.2 Alternative arrangements for yacht having the navigation notation **sheltered area** or **coastal area** or **unrestricted navigation limited to 60 nautical miles** as defined in Pt A, Ch 1, Sec 2 may be agreed on a case by case basis.

2.2 General provisions

2.2.1 Principle

A bilge pumping system or means capable to efficiently draining out water from any compartment of the boat is to be provided.

2.2.2 Pumps number

Depending of the boat length, the bilge system is to be at least:

- less than 5,5 m: one portable manual pump
- between 5,5 m and 10m: two manual pumps (one of which may be a portable pump)
- between 10 m and 24 m: one manual pump and one power pump.

2.2.3 Drained watertight compartments

A watertight compartment less than 7% of the total under deck volume may be drained into the adjacent compart-

ment by means of a self-closing valve or cock. The valve or cock are to be fitted outside the compartment to be drained and are to be operable from a readily accessible position.

2.2.4 Open Yacht

For open yacht having an overall length not greater than 5,5 m where there is no subdivision of the bottom by means of floors, buckets or bailers may be used in lieu of the manual bilge pumping system.

2.2.5 Progressive flooding

Where a permanent, fixed bilge pumping system is installed, care must be taken to preclude the risk of water flowing from one compartment to another by way of the bilge suction pipes. The bilge connection to any pump which draws from the sea is to be either a screw-down non return-valve or a cock which cannot be opened at the same time to the bilges and to the sea.

2.2.6 Electrical pumps

The electrically operated bilge-pumps are to be in accordance with international standard ISO 8849 when rated for less than 50 V direct current.

2.2.7 Bilge level device

A bilge level device connected to an audible or visible alarm should be fitted in all boats where the propelling machinery is below deck level and not visible from the steering position.

With the machinery operating under full power conditions, the alarm, when operated, is to be clearly audible or visible at the steering position.

2.3 Bilge pumps

2.3.1 Bilge pumps capacity

- a) The power bilge pumping capacity is not to be less than the value given by the formula:

$$Q = \frac{d^2}{300}$$

where:

Q : Minimum capacity of each pump, in m³/h
d : Internal diameter, in mm, of the bilge main

The internal diameter d, in mm, of the bilge main, is to be of the commercial size nearest to the diameter given in the following formula:

$$d = \frac{L}{1,2} + 25$$

where:

L : Rule length of the yacht, in m, defined in Pt B, Ch 1, Sec 2

- b) In no case the capacity of the power pumps is to be less than 2,7 m³/h

The capacity of the manual pumps is not to be less than 0,7 litre per stroke.

2.3.2 Pumps, valves and suctions location

Bilge pumps are to be sited in suitable locations, and valves, or other accessories which control them are to be easily accessible. Suction pipes are to be located as deep down as is possible and equipped with terminal efficient strainers. Drain holes and limbers are to be arranged in floors and framing to facilitate an easy flow of water from all parts of the yacht to the pump suction.

2.3.3 Self-priming type pumps

Bilge pumps are to be of the self priming type.

2.3.4 Other services

Bilge pumps may be used for other services such as deck washing, fire extinguishing, or stand-by cooling water duty, provided the system can be isolated by three ways valve or non-return valve to preclude the possibility of flooding from sea to bilge, in the event of a valve or cock being accidentally left open.

2.3.5 Non-return valves

A non-return valve may be used, if necessary, to prevent an automatic bilge pump from cycling on-and-off due to back flow from the discharge line.

2.3.6 Non-submersible pumps

Motors of non-submersible bilge pumps are to be located above the maximum anticipated bilge water level.

2.3.7 Remote operation of bilge valves and pumps

Manually operated pumps and necessary control valves are to be located in such manner they can be operable from position above the waterline and outside the machinery space.

2.3.8 Overboard discharge

Overboard discharge on the hull are to be above the maximum heeled waterline (angle of 7° heel for non-sailing yacht and 30° heel for sailing yacht), unless a seacock is installed and there is a mean to prevent backflow into the boat.

2.4 Bilge piping

2.4.1 Pipes

Pipe work and associated valves in the machinery spaces are to be preferably of metal.

2.4.2 Non-metallic pipes

Non-metallic pipe work and associated valves may be accepted, provided the material of such non-metallic pipe work and associated valves has an appropriate resistance to salt water, oil, heat and vibration and be capable of operating under suction without collapse (see Ch 1, Sec 4, [5] to Ch 1, Sec 4, [7]).

2.4.3 Connections

- a) Clamping or devices for bilge piping systems are to be made of non-corrodable material
- b) The nominal bore of a manually operated pump is to be consistent with the bore of the associated piping.

3 Yacht or Charter Yacht equal or over 24 m and less than 500 GT

3.1 Application

3.1.1 Scope

The following requirements apply to motor or sailing yacht of 24 metres in load line length and over, and of less than 500 tons gross tonnage.

3.1.2 Alternative arrangements for yacht having the navigation notation **sheltered area** or **coastal area** or **unrestricted navigation limited to 60 nautical miles** as defined in Pt A, Ch 1, Sec 2 may be agreed on a case by case basis.

3.2 General provisions

3.2.1 Principle

All yachts are to be provided with efficient means for pumping and draining any watertight space with at least one suction pipe when the yacht is on an even keel and either is upright or has a list of up to 10°.

3.2.2 Availability of the bilge system

The bilge system is to be able to work while the other essential installations of the yacht, especially the fire-fighting installations, are in service.

3.2.3 Independence of the lines

As a general rule, bilge lines are to be entirely independent and distinct from other lines.

However, this requirement need not be applied to pipes located between collecting boxes and pump suctions or between pumps and overboard discharges.

3.2.4 Design of bilge systems

- a) The bilge pumping system is to consist of pumps connected to a bilge main line so arranged as to allow the draining of all spaces through bilge branches, distribution boxes and bilge suctions, except for some small spaces where individual suctions by means of hand pumps may be accepted as stated in [3.6.2] and [3.6.3]
- b) If deemed acceptable by the Society, bilge pumping arrangements may be dispensed with in specific compartments provided the safety of the yacht is not impaired.

3.2.5 Intactness of watertight subdivision

Bilge lines are to be so arranged as to avoid inadvertent flooding of any dry compartment.

The lines and accessories are to be so arranged as to prevent intercommunication of compartments which are to remain segregated from each other or the accidental connection of these compartments directly to the sea.

3.2.6 Number and distribution of suction

- a) Draining of watertight spaces is to be possible, when the yacht is on an even keel and either is upright or has a list of up to 10°, by means of at least:
 - two suction in machinery spaces, including one branch bilge suction and one direct suction and, in addition, for spaces containing propulsion machinery, one emergency bilge suction
 - one suction in other spaces
- b) In all cases, arrangements are to be made such as to allow a free and easy flow of water to bilge suction
- c) The suction are to be located at the lowest points of the compartment
- d) Additional suction may be required if the flow of water towards the suction is disturbed by irregularities of the bottom.

3.2.7 Bilge level alarm

A bilge level device connected to an audible and visible alarm are to be fitted at the steering position and in the Master's cabin.

3.3 Pumps and ejectors

3.3.1 Pumps

- a) At least two power bilge pumps are to be provided; one of these pumps may be driven by a main propulsive engine
- b) The Society may permit, after special consideration, that one of the pumps be replaced by an ejector. In this case its suction capacity is not to be less than the required capacity of the pump it replaces
- c) The bilge pumps are to be connected to the bilge main mentioned in [3.2.4]
- d) Small compartments may be drained by means of portable or fixed hand pumps.

3.3.2 Choice of the pumps

- a) Bilge pumps are to be of the self-priming type. Centrifugal pumps are to be fitted with efficient priming means, unless an approved priming system is provided to ensure the priming of pumps under normal operating conditions
- b) Cooling water pumps connected to an emergency bilge suction need not be of the self-priming type
- c) Sanitary, ballast and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system
- d) Hand pumps are to have a maximum suction height not exceeding 7,30 m and to be operable from a position located above the load waterline.

3.3.3 Capacity of the pumps

The capacity of the bilge pumps is to be such that a speed of water not less than 1,22 m/s may be obtained in the bilge main the diameter of which is given in [3.5.1]. The capacity of each pump is therefore not to be less than:

$$Q = 0,00345 d_1^2$$

where:

- Q : Minimum capacity of each pump, in m³/h
 d₁ : Internal diameter, in mm, of the bilge main as defined in [3.5.1].

3.3.4 Use of other pumps for bilge duties

- a) Other pumps may be used for bilge duties, such as fire, general service, sanitary service or ballast pumps, provided that:
 - they meet the capacity requirements
 - suitable piping arrangements are made
 - pumps are available for bilge duty when necessary
- b) The use of bilge pumps for fire duty is to comply with the provisions of Part C, Chapter 4.

3.4 Individual pumps

3.4.1 Alternative arrangement

As an alternative to [3.3.4], craft may be fitted with individual bilge pumps. In such case the total capacity Q_t of the bilge individual pumps for each hull is not to be less than 2,4 times the capacity of the pump defined in [3.3.3] and [3.5.1].

3.4.2 Individual pumps capacity

In bilge pumping arrangements where a bilge main is not provided, then, with the exception of the spaces forward of public spaces and crew accommodation, at least one fixed submersible pump is to be provided for each space. In addition, at least one portable pump is to be provided supplied from the emergency supply, if electric, for use on individual spaces. The capacity of each submersible pump Q_n is not to be less than:

$$Q_n = Q_t / (N - 1) \text{ ton/h with a minimum of } 6 \text{ m}^3/\text{h}$$

where:

- Q_t : Total capacity as defined in [3.4.1]
 N : Number of individual submersible pumps.

3.5 Size of bilge pipes

3.5.1 Bilge main

The internal diameter, in mm, of the bilge main, is to be of the commercial size nearest to the diameter given in the following formula, in mm:

$$d_1 = 1,68 \sqrt{L(B + C)} + 25$$

in addition, d₁ is not to be less than 35 mm

where:

- L : Rule length of the yacht, in m, defined in Pt B, Ch 1, Sec 2
 B : For monohull craft: breadth of the yacht, in m, as defined in Pt B, Ch 1, Sec 2
 For multi-hull craft: breadth of a hull at or below the design waterline, in m
 C : Moulded depth of the yacht, in m, at the free-board deck.

3.5.2 Suctions machinery spaces

The internal diameter, in mm, of bilge pipes situated between collecting boxes and suctions in holds and machinery spaces, is to be of the commercial size nearest to the diameter given by the following formula, in mm:

$$d_2 = 2,16\sqrt{L_1(B + C)} + 25$$

in addition, d_2 is not to be less than 35 mm

where:

B, C : Dimensions having the same meaning as in [3.5.1]

L_1 : Length of the compartment, in m.

3.6 Draining of dry spaces other than machinery spaces

3.6.1 Draining of dry spaces

All spaces, as cofferdams or accommodations, are to be provided with suction pipes.

3.6.2 Draining of fore and aft peaks

Where the peaks, if any, are not used as tanks and bilge suctions are not fitted, drainage of both peaks may be effected by hand pump suction provided that the suction lift is well within the capacity of the pump and in no case exceeds 7,3 m.

3.6.3 Draining of spaces above fore and aft peaks

- Provision is to be made for the drainage of the chain lockers and watertight compartments above the fore peak tank, if any, by hand or power pump suctions
- Steering gear compartments or other small enclosed spaces situated above the aft peak tank, if any, are to be provided with suitable means of drainage, either by hand or power pump bilge suctions. However, in the case of rudder stock glands located below the summer load line, the bilge suctions of the steering gear compartment are to be connected to the main bilge system.

3.7 Arrangement of bilge lines and their accessories

3.7.1 Passage of pipes through certain compartments

If not contained in pipe tunnels, the part of bilge pipes passing through compartments intended to contain oil fuel are to have reinforced thickness and are to consist of a single piece. These pipes are to be provided with non-return valves at their ends in the holds.

3.7.2 Passage through watertight bulkheads

No bilge cock or similar device is to be fitted on the collision bulkhead.

The fitting of bilge cocks or similar devices on other watertight bulkheads is to be avoided as far as possible. However, where such accessories are provided, they are to be accessible at any time and capable of being closed from positions above the deck. An indication is to be provided to show whether these valves are open or close.

3.7.3 Non-return valves

To prevent intercommunication of compartments or lines which are to remain segregated from each other, non-return valves or similar devices are to be fitted, namely on the pipe connections to bilge distribution boxes or to the alternative cocks, if any.

3.7.4 Strainers and mud boxes

- Strainers are to be fitted on each bilge pump suction lines
- Mud boxes are to be fitted on bilge lines wherever they are necessary.

3.7.5 Access to valves and distribution boxes

All distribution boxes and manually operated valves in connection with the bilge pumping arrangement are to be in positions which are accessible under ordinary circumstances.

3.8 Bilge piping systems

3.8.1 Pipes

Pipe work and associated valves in the machinery spaces are to be preferably of metal.

3.8.2 Non-metallic pipes

Non-metallic pipe work and associated valves may be accepted, provided the material of such non-metallic pipe work and associated valves has an appropriate resistance to salt water, oil, heat and vibration and be capable of operating under suction without collapse (see Ch 1, Sec 4, [5] to Ch 1, Sec 4, [7]).

3.8.3 Connections

- Clamping or devices for bilge piping systems are to be made of non-corrodable material
- The nominal bore of a manually operated pump is to be consistent with the bore of the associated piping.

4 Yacht or Charter Yacht equal or over 500 GT

4.1 Application

4.1.1 Scope

The following requirements apply to motor or sailing yacht of 500 tons gross tonnage and over.

In addition, the requirements of [3] are also to be complied with.

4.2 Principle

4.2.1 Bilge main

- A bilge main is to be provided for draining the different compartments, as described in [3.2.4]
- Individual pumps as defined in [3.4] are not permitted.

4.3 Draining of machinery spaces

4.3.1 Direct suction

The direct suction is to be led directly to an independent power bilge pump and so arranged that it can be used independently of the main bilge line.

4.3.2 Emergency bilge suction

- The emergency bilge suction is to be led directly from the drainage level of the machinery space to a main cooling pump and fitted with a non-return valve
- In yachts where, in the opinion of the Society, the main cooling pump is not suitable for this purpose, the emergency bilge suction is to be led from the largest available independent power driven pump to the drainage level of the machinery space. Such a pump is not to be a bilge pump. Its capacity when the emergency suction is operating is to be at least equal to the required capacity of each bilge pump as determined in [4.4.2]
- The emergency bilge suction is to be located at the lowest possible level in the machinery spaces.

4.4 Bilge pumps

4.4.1 Number and arrangement of pumps

- Each pump may be replaced by a group of pumps connected to the bilge main, provided their total capacity meets the requirements specified in [4.4.2]
- Alternative arrangements, such as the use of a hand pump in lieu of a power pump, will be given special consideration by the Society.

4.4.2 Capacity of the pumps

- Each power bilge pump is to be capable of pumping water through the required main bilge pipe at a speed of not less than 2 m/s
- The capacity of each pump or group of pumps is not to be less than:

$$Q = 0,00565 d^2$$

where:

Q : Minimum capacity of each pump or group of pumps, in m³/h

d : Internal diameter, in mm, of the bilge main as defined in [3.5.1]

- The capacity of hand pumps is to be based on one movement once a second.

4.4.3 Electrical supply of submersible pump motors

- Where submersible bilge pumps are provided, arrangements are to be made to start their motors from a convenient position above the bulkhead deck
- Where an additional local-starting device is provided at the motor of a permanently installed submersible bilge pump, the circuit is to be arranged to provide for the disconnection of all control wires therefrom at a position adjacent to the starter installed on the deck.

4.5 Bilge accessories

4.5.1 Drain valves on watertight bulkheads

- The fitting of drain valves or similar devices is not allowed on the collision bulkhead
- On other watertight bulkheads, the fitting of drain valves or similar devices is allowed unless practical alternative draining means exist. Such valves are to be easily accessible at all times and operable from above the freeboard deck. Means indicating whether the valves are open or closed are to be provided.

4.5.2 Bilge wells

- The wells provided for draining the various compartments are to be of a capacity not less than 0,15 m³. In small compartments, smaller cylindrical wells may be fitted
- Bilge wells are to comply with the relevant provisions of Part B.

4.6 Materials

4.6.1 All bilge pipes used in or under fuel storage tanks or in machinery spaces, including spaces in which oil-settling tanks or fuel oil pumping units are situated, are to be of steel or other suitable material non-sensitive to heat.

4.7 Bilge piping arrangement

4.7.1 Passage through double bottom compartments

Bilge pipes are not to pass through double bottom compartments. If such arrangement is unavoidable, the parts of bilge pipes passing through double bottom compartments are to have reinforced thickness, as per Ch 1, Sec 4, Tab 7 for steel pipes.

4.7.2 Connections

Connections used for bilge pipes passing through tanks are to be welded joints or reinforced flange connections.

5 Yacht or Charter Yacht carrying more than 12 passengers

5.1 Application

5.1.1 Scope

The following requirements apply to a motor or sailing yacht carrying more than 12 passengers whatever is the gross tonnage.

In addition, the requirements of [3] or [4] are also to be complied with according to the yacht tonnage.

5.1.2 Sailing Yacht and Short Range Yacht

Alternative arrangement for short range operation yacht or sailing yacht may be agreed on case by case basis.

5.2 Specific provisions

5.2.1 Number of bilge pumps

At least three power bilge pumps are to be fitted connected to the bilge main, one of which may be driven by the propulsion machinery.

5.2.2 Bilge pumps location

Where practicable, the power bilge pumps are to be placed in separate watertight compartments and so arranged or situated that these compartments will not be flooded by the same damage. If the main propulsion machinery, auxiliary machinery are in two watertight compartments, the pumps available for bilge service are to be distributed as far as is possible throughout these compartments.

The arrangements are to be such that at least one power bilge pump is to be available for use in all flooding conditions which the yacht is required to withstand as follows:

- a) one of the required bilge pumps is to be an emergency pump of a reliable submersible type having an emergency source of power; or
- b) the bilge pumps and their sources of power are to be so distributed throughout the length of the yacht that at least one pump in an undamaged compartment will be available.

The “emergency source” is to be located above the bulkhead deck.

5.2.3 Operating in case of flooding

- a) Distribution boxes, cocks and valves in connection with the bilge pumping system are to be so arranged that in the event of flooding one of the bilge pumps may be operative in any compartment. In addition, damage to a pump or its pipe connecting to the bilge main outboard of a line drawn at one fifth or the breadth of the ship shall not put the bilge system out of action
- b) If there is only one system of pipes common to all the pumps, the necessary valves for controlling the bilge suction must be capable of being operated from above the bulkhead deck
- c) When, in addition to the main bilge pumping system, an emergency bilge puning system is provided, it shall be independent of the main system and so arranged that a pump is capable of operating in any compartment under flooding conditions as specified in [5.2.2]. In that case only the valves necessary for the operation of the emergency system need to be capable of being operated from above the bulkhead deck.

5.2.4 Valve controls

All cocks and valves referred to in which can be operated from above the bulkhead deck are to have their controls at their place of operation clearly marked and are to be provided with means to indicate whether they are open or closed.