



INSTRUCTIONS FOR THE GUIDANCE OF SURVEYORS ON  
BILGE PUMPING ARRANGEMENTS

MSIS27 CHAPTER 5

Rev 09.21



## **PREFACE**

0.1 These Marine Survey Instructions for the Guidance of Surveyors (MSIS) are not legal requirements in themselves. They may refer to statutory requirements elsewhere. They do represent the MCA policy for MCA surveyors to follow.

0.2 If for reasons of practicality, for instance, these cannot be followed then the surveyor must seek at least an equivalent arrangement, based on information from the owner/operator. Whenever possible guidance should be sought from either Principal Consultant Surveyors or Survey Operation Branch, in order to maintain consistency between Marine Offices.

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## RECENT AMENDMENTS

The amendments made in the most recent publication are shown below, amendments made in previous publications are shown in the document Amendment History.

Version Number	Status / Change	Date	Author Reviewer	Content Approver	Next Review Date/Expiry Date
10.20	<ul style="list-style-type: none"> <li>Add requirement that bilge sensors in compartments containing pollutants shall not automatically start bilge pumps</li> <li>Requirements for supply of powered bilge starting arrangements through separate switchboard updated.</li> <li>Main watertight compartment is defined</li> </ul>	20/10/20	D Fenner	G Stone	20/10/22
09.21	<ul style="list-style-type: none"> <li>Amendments to reflect publication of MSN1871 Amendment No.2</li> </ul>	31/8/2021	D Fenner	G Stone	31/8/23

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## INTRODUCTION

This Chapter should be read in conjunction with [Chapter 4 and Annexes 3.1 to 3.6 of MSN1871 Amendment No.2](#), Chapter 4 of [MSN1872 Amendment No.1](#), Chapter 4 of [MSN1873 Amendment No.1](#)

Fishing Vessels of less than 15m LOA vessels should comply with the requirements of [Seafish or other recognised organisation prior to 21 July 2020](#) or the Standards contained in [MGN628](#) or other recognised organisation from that date forward. When inspecting these vessels, the relevant requirements in [MGN628](#) for sea water pipework may be used as a reference for renewal or repairs.

### 5.1 GENERAL

5.1.1 See [Chapter 4 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), Section 4.3.1 to 4.3.3 of [MSN1872 Amendment No.1](#), [section 7.5 to 7.7 and 7.9 of MGN629](#) and Sections 4.4.1 to 4.4.3 of [MSN1873 Amendment No.1](#)

5.1.2 It is required that provision should be made for effective pumping from any watertight compartment. This includes, for example, not just engine rooms, holds, steering compartments, sonar rooms, bowthrust but also any watertight aft compartments. [Where the watertight compartment is a main watertight compartment, for the purposes of section 4.3.2.1\(ii\) of MSN1872 Amendment No.1 and section 4.4.2.1\(ii\) of MSN1873 Amendment No.1](#) "main watertight compartment" means the space between the required bulkheads (e.g. the fish hold) and this in turn could be divided into smaller compartments which would have a single suction.

5.1.3 Wing bilge suctions are to be provided where necessary to drain compartments when the vessel is upright or listed 5° either way. In narrow compartments at the ends of the vessel one centre line suction may be sufficient. In compartments of unusual form, additional suctions may be required. Bilge wells of adequate capacity should be fitted where construction of the inner bottom requires wells to be provided.

5.1.4 In vessels with engine room having open floors, one bilge branch and one direct bilge suction should be fitted as near the centre line as possible if the rise of floor is 5° or more. If the rise of floor is less than 5°, additional bilge suctions may be required at the wings.

5.1.5 Surveyors should ensure that owners, skippers and crew are aware of the number of fishing vessels lost through flooding and draw their attention to [MGN165](#). These highlight the importance of effective bilge pumping arrangements. An adhesive safety checklist entitled 'FLOODING - DANGERS' is available from Marine Offices and if not already displayed surveyors should recommend that it is obtained and displayed in a prominent position.

5.1.6 It should be ensured that sea suction valves and direct bilge suction valves can be operated above floor plate levels. Valves should not be located in difficult to access areas or where they may become inaccessible before the bilge alarm has operated. Slush wells should be easily accessed with suitable covers in place; access with fish cargo in the hold should also be considered. Where impractical, fishrooms to have duplicate systems. Seacocks to be accessible and to operate freely.

5.1.7 Oil pollution of the sea from machinery spaces must be avoided. For guidance refer to chapter 15 of these instructions.

## 5.2 PLANS AND PARTICULARS REQUIRED

5.2.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4 of MSN1873 Amendment No.1](#)

5.2.2 The following plans and particulars should be obtained from the builder before construction begins. They should be dealt with locally and need only be submitted to HQ for consideration in cases where the surveyor is in doubt regarding compliance with the relevant Regulations and these Instructions:

- Particulars of the vessel's intended service;
- The Principal Length, Breadth and Depth of the vessel and the length of each watertight compartment;
- The number, position, type and capacity of the pumps available for bilge pumping service and the arrangement of power supply and source for operating them;
- Plans showing:
  - the arrangement of watertight bulkheads and the allocation of spaces between the bulkheads;
  - the arrangement and sizes of the main and branch bilge suction pipe lines, the direct bilge suction, and the arrangements of the ballast pipe lines;
  - the arrangement and type of valves at the bilge pumps and in the distribution chests of the bilge suction system, and the positions from which the bilge suction valves and the main sea inlet and direct suction valves of the main engine circulating pumps can be operated; these to be above the floorplates for access;
  - the arrangements for draining all spaces below the freeboard deck;

- the means provided for preventing water from a damaged compartment finding its way into another compartment through a bilge suction system; and
- the sounding arrangements.

### 5.3 BILGE PUMPS

**5.3.1** See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

#### 5.3.2 Number and type of bilge pumps

5.3.2.1 On vessels over 15m LOA, two independent powered pumps are required. With regards to powered bilge pumps, “independent” means powered from two separate prime movers. On existing vessels under 24m, a hand pumping system or a salvage pump meets the requirement for the second pump, subject to meeting the required capacity. When the system is being replaced, it should comply with the requirements for a new vessel. Decked vessels of less than 15m LOA and Open Vessels of 7m Registered Length to less than 15m LOA should meet the requirements of the Seafish Construction Standards for that size of vessel prior to 21 July 2020 and [MGN628](#) from that date forward.

5.3.2.2 Ballast, sanitary and general service pumps may be accepted as powered bilge pumps if they are of suitable capacity and are fitted with connections to the bilge pumping system. Where relief valves are fitted to such pumps they should be arranged to discharge in conspicuous positions above floor plate level.

5.3.2.3 On new vessels, bilge ejectors are not accepted by this Administration in lieu of powered bilge pumps. Where a bilge ejector is additionally fitted the surveyor should be satisfied that the sea water pump fitted in combination with the ejector has sufficient capacity to eject bilge water at the required rate. The diameter of the discharge pipe should be sufficient to permit discharge at this rate. In no case should a bilge ejector be the sole means of draining a compartment and in vessels where only one power pump need be fitted (i.e. existing vessels of 15 metres to 24 metres in length) an ejector should not be fitted in combination with the power pump unless the power pump is fitted with a separate suction connection to the bilge main and a separate discharge pipe overboard. Where an ejector is installed the pipe should preferably be arranged to slope downwards to the outlet with a non return valve fitted before the ejector so that back flooding will not occur.

5.3.2.4 On existing vessels, existing arrangements e.g. an ejector or salvage pump, may continue to be accepted.

5.3.2.4 The surveyor should be satisfied that all vessels are provided with alternative pumping capability for use in case of emergency. If the second pump is electrically powered, this should be from a separate prime mover. Alternatively a mechanically driven unit should be available.

5.3.2.5 As a salvage pump can also be used as an emergency fire pump (noting that an engine room sprinkler system may be required to be adequately supplied), surveyors should recommend the carriage of such in addition to any minimum requirements.

### 5.3.3 Priming

5.3.3.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

5.3.3.2 Bilge pumps should be self-priming. Where bilge pumps are not self-priming an efficient central priming system in duplication may be accepted as a means of priming, but where such a system is proposed details should be submitted to the MCA.

5.3.3.2 Vessels over 24m require one of the main sea water circulating pumps to be fitted with an emergency bilge suction connection, however this pump need not be self-priming.

5.3.3.3 Bilge pumps are to be provided with suction pressure gauge.

### 5.3.4 Power bilge pumps

5.3.4.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

5.3.4.2 Electrical power pumps should be supplied by two generators but not through the same switch board. There should be two separate boards so that a single failure will not disable both pumps. Starters which are designed to enclose flame positioned at opposite ends of the switch board may be accepted. If that is not possible, one starter removed from the single main switch board may also be accepted

5.3.4.3 Independent power bilge pumps must be capable of giving a speed of water through the vessel's main bilge pipe of not less than 2 m/s.

5.3.4.4 The capacity of each can be determined by:

$$Q = 0.00575 d^2$$

where Q = capacity of pump in cubic metres per hour and



$d =$  internal diameter of the main bilge pipe in millimetres, minimum 50mm.

$$d = X + 1.68 \sqrt{L(B + D)}$$

L = Principal length of vessel (metres)

B = Principal breadth

D = Principal depth

X = 25 for vessels over 24m length and

X = 30 for vessels length 15 - 24m, (as recommended by MAIB report)

5.3.4.5 The connections at the bilge pumps should permit one unit to be opened up for overhaul without interfering with the efficient operation of the bilge pumping system.

5.3.4.6 It is required that one of the independent power bilge pumps should have a direct suction from the machinery spaces. On vessels over 75m this requirement applies to both pumps and the arrangements should permit direct suctions to be fitted to both sides of the machinery spaces. The diameter of the direct suctions should be not less than that of the vessel's main bilge pipe, and so arranged that the pump can discharge from the bilges at its full capacity in case of emergency.

5.3.4.7 On vessels under 24m bilge arrangements should contain bilge water in a central well.

5.3.4.8 Pumps required for essential services should not be fitted with common suctions or discharges unless the arrangements permit simultaneous operation of any of the pumps so connected.

### 5.3.5 Hand pumps

5.3.5.1 See Section 4.10 of [MSN1871 Amendment No.2](#), Section 9.3.1 of [MGN628](#), Section 4.3.2 of [MSN1872 Amendment No.1](#), sections 7.5 to 7.7 of [MGN629](#) and Section 4.4.2 of [MSN1873 Amendment No.1](#)

5.3.5.2 Hand bilge pumps must be operable from above the working deck. In such cases the suction lift should not exceed 5.0 metres when the pump is connected to the bilge main, or 7.3 metres when the pump has a single direct suction. A minimum capacity of 240 litres per minute should be achievable. The practical aspect of using a hand pump should not be overlooked, due consideration being given to bends, restrictions, etc. Also consideration of accepting hand pumps as the second required pump on existing vessels would be subject to the number of available crew to maintain the required capacity.

### 5.3.6 Factory deck pumps

5.3.6.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

5.3.6.2 The factory deck drain pumps and their sumps should be so disposed fore and aft as to ensure the most effective draining of the factory deck. To prevent malfunction if sea water is shipped, the pump motors should be at least heavy seas proof (IP56 standard). These pumps should be readily accessible and the grids fitted to the factory deck drain pumps sumps should be of such design and arranged to prevent the passage of large pieces of waste matter which could block the pump suctions. The pump should be designed to pump slurries and solids of moderate size and automatically come into operation when sumps become full.

5.3.6.3 The factory deck drainage and pumping should be independent of other pumping systems in the vessel with each sump served by a separate pump having a suction of adequate size to deal with the waste matter. The total output capacity of these drain pumps should be at least 1.5 x the maximum input from all sources capable of providing water to the factory deck.

### 5.3.7 Testing

5.3.6.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

5.3.6.2 All bilge pumps should be tested at each renewal and intermediate survey/inspection to confirm efficient and effective removal of bilge water from each compartment. In practice, it is commonly found that first attempts are futile, due to faulty pumps, blocked lines & strum boxes, leaking joints, distribution valve internals missing, or operator error.

- Hand pump failure is usually attributable to diaphragm or non-return valve rupture;
- Centrifugal pump failure is usually attributable to excessive clearance of wear rings or gland packing;
- Reciprocating pump failure is usually attributable to worn bucket rings or defective non-return valves.

## 5.4 BILGE PIPES

### 5.4.1 General

5.4.1.1 See Section 4.10 of [MSN1871 Amendment No.2](#), Section 9.3.1 of [MGN628](#), Section 4.3.2 of [MSN1872 Amendment No.1](#), sections 7.5 to 7.7 of [MGN629](#) and Section 4.4.2 of [MSN1873 Amendment No.1](#)

Bilge pipes fitted in machinery spaces should be of material having a melting point of not less than 800°C. Heat sensitive materials are not permitted in bilge systems. New and replacement pipes should be of aluminium bronze, cupro-nickel, galvanised steel or similar corrosion resistant material. Stainless steel is not recommended as most grades are unsuitable for use in sea water systems.

5.4.1.2 Bilge suction pipes should not be led through fuel oil, ballast, or double bottom tanks unless it is considered impracticable to comply with this requirement. In such cases the surveyor should be satisfied that the pipes are of sufficiently heavy gauge with flanged or welded joints. After installation the pipes and joints should be tested to 3.5 kg/cm<sup>2</sup>. Consideration should be given to fitting expansion bends within the tanks.

5.4.1.3 Bilge branch pipes, subject to a minimum diameter of 40mm, have size determined by:

$$\text{Internal diameter} = X + 2.15 \sqrt{C(B+D)}$$

where

C = Compartment length (m)

B = Principal breadth

D = Principal depth, and

X = 30 for vessels over 24m length, and

X = 35 for vessels length 15 - 24m, (as recommended by MAIB report)

Existing vessels may be exempt from the dimension requirement, which can remain as acceptable until the system is replaced. A replacement system must be in accordance with the requirements for a new vessel.

5.4.1.4 Piping arrangements should prevent back flooding from the sea or from other compartments. Non return valves should be fitted on pump suctions, distribution boxes and on lines to other watertight compartments or to the shipside. This equally applies to new and existing vessels. On collision bulkheads an isolation valve having positive means of closure is required. This must be operable from the freeboard deck if situated on the forward side. It is also recommended if the valve is situated on the after side, but this is not a requirement.

## 5.4.2 Installation

5.4.2.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), Section 4.3.2 of [MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and Section 4.4.2 of [MSN1873 Amendment No.1](#)

5.4.2.2 The component parts of the bilge pumping system should be installed with reasonable access for maintenance. Pipes should be adequately supported with due allowance for expansion. Suction pipes in machinery spaces must have a vertical pipe direct from above the bottom to the strum box (filter) which is above the floorplates, for ease of cleaning a blockage. Bilge suction strainers to have area of perforation not less than double the cross sectional area of the pipe.

5.4.2.3 Non-return valves should be fitted in the discharge lines of hand operated bilge pumps except where such pumps discharge directly on to the deck and can be otherwise effectively sealed to prevent the ingress of water when the pump plunger or bucket is removed. Where bilge pipes are liable to damage, e.g. in fish holds or chain lockers, the surveyor should ensure that the pipes are adequately protected. Circular flanges should be used for joining pipes except where lack of space prevents their use when alternative methods can be considered.

5.4.2.4 Bilge pipes should be independent of pipes to or from water, oil and fuel tanks. Suitable insulating jointing should be utilised to avoid galvanic corrosion of dissimilar metals. The minimum radius of any bend should not be less than three times the pipe diameter.

5.4.2.5 All bilge valves, cocks and strum boxes should be installed at or above platform level in the machinery space and should be provided with easily legible nameplates. They should be capable of opening without breaking any part of the piping.

5.4.2.6 The surveyor should be satisfied that any flexible piping is kept to a minimum and that it is installed only where it is impracticable to fit fixed piping e.g. due to vibration or in confined spaces. Construction should be of smooth bore reinforced type and it should be readily visible and accessible for repair or replacement. To prevent a fire in a machinery space from impairing the functioning of the system, it is preferable to be used only for the terminal lengths of suction pipes, otherwise fire proofing should be employed. Flexible piping should not normally be used on the discharge side of pumps. However, this may be accepted on smaller vessels which utilise engine mounted pumps. Clamps or other means of end fixing should be robust and suitable for their purpose and location.

## 5.4.4 Inspection

5.4.1 See [Section 4.10 of MSN1871 Amendment No.1](#), [Section 9.3.1 of MGN628](#), Section 4.3.2 of [MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and Section 4.4.2 of [MSN1873 Amendment No.1](#)

5.4.2 All pipework, valves and pipe supports should be inspected externally, and where possible sections removed for internal inspection. Thickness measurements may be of assistance to identify suspect areas e.g. sharp bends where turbulent flow may occur. Temporary repairs e.g. glass fibre tape, should have the pipe section replaced. Replacement pipes should not contain threaded joints and unnecessary bends. Replacement of complete systems should be undertaken to the requirements specified for a new vessel. All valves should be tested and the means of operation made accessible.

## 5.5 REMOTE OPERATED BILGE VALVES

5.5.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

5.5.2 Bilge pumping systems in which the valves are remotely operated by power may be accepted subject to the following conditions:

- actuators and indicating mechanism operating satisfactorily when submerged by a head of water up to the vessel's freeboard deck. (Generally a test to 15 metres head is sufficient to simulate this condition.) In view of this, exhausts may have to be led to a position above the freeboard deck;
- all indicators being fitted above the freeboard deck;
- the remote control station being situated above the freeboard deck;
- the remote control of bilge valves overriding manual or local control operation, when provided;
- indicators being available showing 'valve open', 'valve closed' and 'power off' for each bilge valve and, in the event of damage between the valve and control station, the last position of the valve;
- The air for pneumatic valve actuators should be taken from the main air receivers and also from an emergency source. A suitable independent air compressor should be installed in a position above the freeboard deck discharging to an independent air receiver or to the emergency generator starting air receiver.

If air is drawn from the emergency generator starting system, the capacity of the system should be such that after starting tests have been carried out (i.e. 4 starts in 10 minutes), sufficient air is available to open and close three bilge valves as well as closing any sea connections. In hydraulic-electric systems the pumping unit should be supplied from the main and emergency sources of power.

- The working pressure in the system should be not less than 25 per cent greater than the pressure required to open a valve to the full open position, particularly when pneumatic opening only is employed and the valve is kept closed by a spring or similar device.
- Control pipes should be of steel, copper or other equivalent material, copper being preferred in pneumatic systems. Approved pipe couplings only should be used.
- Electric valve position indicators should take their electrical supply from both main and emergency sources, the associated wiring should be protected against fire.
- Valve on collision bulkhead must be operable above the freeboard deck.

### 5.5.3 Prototype tests

5.5.3.1 See [Section 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 of MGN629](#) and [Section 4.4.2 of MSN1873 Amendment No.1](#)

5.5.3.2 Valves should be capable of operation when compartments are flooded to the freeboard deck and the spring, when fitted, should be non-corrodible and strong enough to keep the valve closed under this condition of flooding with bilge suction open to the sea. Before acceptance of any type of remote operated valve can be given, prototype tests should be carried out to simulate the above conditions.

5.5.3.3 A prototype valve, complete with actuator and position switch, should also be subjected to the following test:

- The valve assembly should be placed in a tank of water pressurised to at least an equivalent head of water from the tank top to the bulkhead deck and operated one hundred times to test the control and indicating systems. The valve and actuator should then be opened for inspection.

5.5.3.3 After installation a selected valve should also be tested to determine the minimum operating air or fluid pressure required to lift the spindle to the fully open position; also the minimum pressure required to just raise the valve off its seat.

## 5.6 SOUNDING ARRANGEMENTS

5.6.1 See [Sections 4.9 and 4.10 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Sections 4.1.13.3 and 4.3.2 of MSN1872 Amendment No.1](#), [sections 7.5 to 7.7 and 7.9 of MGN629](#) and [Sections 2.2.10, 4.1.13.3, 4.4.2 and 10.6.2 of MSN1873 Amendment No.1](#)

5.6.2 Sounding arrangements are required for all tanks and watertight spaces and shall extend to readily accessible positions above the freeboard deck.

5.6.3 However, short sounding pipes serving the engine room may be permitted provided they are readily accessible from within the engine room and are fitted with cocks having parallel plugs with permanently secured handles so loaded that on being released they automatically close the cocks ('dead man' handles).

5.6.4 Sounding pipes for bilges must be 65mm diameter minimum.

## 5.7 BILGE ALARMS

5.7.1 See [Section 4.11 of MSN1871 Amendment No.2](#), [Section 9.3.1 of MGN628](#), [Section 4.3.3 of MSN1872 Amendment No.1](#), [section 7.5 of MGN629](#) and [Section 4.4.3 of MSN1873 Amendment No.1](#)

5.7.2 To provide sufficient warning of water ingress, bilge sensors are required to give alarm. They must be in accessible positions for maintenance and testing, also located so as to provide warning before water reaches a level which would disable pumping.

5.7.3 Sensors are required in the engine room and the fish hold(s) and other watertight spaces, to give audible and visual warning at the control position. The control position is usually the wheelhouse, but in larger vessels an engine control room is acceptable. The engine room alarm must be either failsafe or duplicated.

5.7.4 Refrigeration of fish holds does not exclude the fitting of bilge alarms.

5.7.5 Vessels over 24m length require two level sensors, or an approved failsafe device. Also that single level alarms are fitted in all other significant watertight compartments e.g. sonar room, bowthrust, aft compartments, etc.

5.7.6 To prevent pollution, bilge sensors in compartments containing pollutants shall not automatically start bilge pumps – See MARPOL

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10.20	<ul style="list-style-type: none"> <li>• Add requirement that bilge sensors in compartments containing pollutants shall not automatically start bilge pumps</li> <li>• Requirements for supply of powered bilge starting arrangements through separate switchboard updated.</li> <li>• Main watertight compartment is defined</li> </ul>	20/10/20	D Fenner	G Stone	20/10/22
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