

PART 3

HULL INTEGRITY AND ARRANGEMENT

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WATERTIGHT AND WEATHERTIGHT INTEGRITY

Section 3.1 - Doors, hatchways, and coamings

- 3.1.1 All openings through which water may enter and endanger the vessel should be kept to a minimum and be provided with effective closing arrangements.
- 3.1.2 Weathertight doors and hatch covers should be of efficient construction, adequately framed, and fitted with gaskets and securing arrangements.
- 3.1.3 Entrance doors to deckhouses and other superstructures giving access to openings in the working deck should be constructed weathertight.
- 3.1.4 Doorways giving direct access to spaces located below the working deck are to be fitted with a permanent coaming 300mm in height above the deck. Doorways should be located as close as practicable to the centreline of the vessel, hinged out or forward against the weather and to be operable from both sides. Where a sliding door is proposed, details are to be submitted for approval.
- 3.1.5 Hatchways should be fitted with substantial coamings, complete with all necessary fittings and covers to ensure weathertight closure. Hatch covers and coamings are to be of strength equivalent to that of the surrounding deck or structure.
- 3.1.6 To prevent seizure, hinge pins, bushes, screw clips and securing nuts of doors, hatch covers, ventilator and air pipe closures, should be of stainless steel or other corrosion-resistant material and fitted with adequate lubricating points.
- 3.1.7 The height of hatch coamings above the working deck is not to be less than 300mm, excepting that where essential for fishing operations, such as warp leads to winches, etc., and for safe working on restricted decks, the coamings may be reduced in height or omitted, subject to the requirements for flush deck hatches and to the approval of the Surveyor.
- 3.1.8 Main access hatches should normally be 600mm x 600mm clear opening. Where space is restricted, hatches may have a minimum clear opening of 500mm x 500mm at the discretion of the Surveyor. See section 11.6 for escape arrangements.
- 3.1.9 For vessels less than 10m LOA, access hatches to unmanned spaces other than engine spaces may be of a reduced size, but in no case less than 500mm x 380mm, providing access is not required for any essential operation, including valve closure.
- 3.1.10 Hatch covers should preferably be secured by hinges on the forward side or otherwise permanently attached to the structure of the vessel by means of wire or chain.

- 3.1.11 Flush deck hatches are to be rigid in construction and secured by positive means such as recessed dog clips. A permanent notice is to be fitted on the hatch or in a visible location in close proximity stating **“HATCH TO BE KEPT CLOSED AT SEA”**.
- 3.1.12 Flush type hatches and ice scuttles are to have the covers permanently attached to the hull structure by means of hinges, wire or chain and are to be capable of being closed weathertight.
- 3.1.13 Where drain pipes are fitted from recessed channels of flush hatches to discharge at ship sides, non-return valves and shut off valves should be fitted. The following exemptions will be permitted in regard to this requirement.
- (i) The automatic non-return valve may be omitted if the drain pipe is less than 25mm in diameter. However, a shut-off valve must be fitted at the hull side and must be easily accessible.
 - (ii) Both the automatic non-return valve and shut-off valve may be omitted if the discharge is located higher than 300mm above the waterline and the drain pipe is of equivalent material and thickness to that of the hull, permanently moulded in place without separable joints, and with an inside diameter of at least 40mm.
- 3.1.14 It is recommended that access, loading, and discharge hatches on the working deck that are likely to be opened at sea, should be positioned on the centreline where practicable.

Section 3.2 - Air pipes

- 3.2.1 The lowest point at which water might gain access through an air pipe should be not less than 760mm above the exposed freeboard deck or less than 450mm above the exposed superstructure deck. The exposed portion of the air pipes should be of substantial construction.
- 3.2.2 A reduced height may be accepted if it can be shown that the rule air pipe height would interfere with essential operations and provided that an adequate height above the deck is maintained and an effective automatic means of closure is fitted.
- 3.2.3 Air pipes should be provided with an efficient means of watertight closure and provision should be made to prevent overpressure or vacuum occurring when the tanks are filled or emptied.
- 3.2.4 The air pipe/deck connection is to be by a welded through socket or welded pad of adequate thickness.
- 3.2.5 The open ends of tank air pipes are to be provided with a proprietary type ball float fitting or a gooseneck fitted with an automatic means of closure. Where the pipe internal diameter is 25mm or less, alternative arrangements may be considered.

Section 3.3 – Ventilators

- 3.3.1 Ventilators should be of substantial and efficient construction and be provided with a permanently attached means of weathertight closure.
- 3.3.2 For vessels between 10m to 15m LOA, the height above deck of each ventilator should not be less than 600mm to the lowest point where water might gain access. For all other vessels less than 10m LOA, the height should be as high as practical but in no case less than 450mm depending on its position. Ventilators which must be kept open, e.g. for the supply of air to machinery or for the discharge of noxious or flammable gases, should be specially considered with respect to its location and height above deck.

Section 3.4 - Portlights

- 3.4.1 All portlights where fitted to superstructures, deckhouses and other weathertight structures, are to be fitted with hinged deadlights capable of being closed weathertight. Any port lights fitted are to be equivalent in strength to the surrounding structure.
- 3.4.2 Portlights should not be fitted in the hull below the working (freeboard) deck, nor in engine casings.
- 3.4.3 Portlights fitted within an enclosed superstructure are to be fitted at a minimum height of 1.50m to the centre above the working deck, except those used for escape which may be lower subject to Surveyors approval.
- 3.4.4 Any opening portlight should not exceed 250mm diameter or equivalent area, except where the portlight has been approved as a means of escape.
- 3.4.5 Glazing thicknesses should meet the requirements of ISO 12216 or other equivalent standard.

Section 3.5 - Skylights

- 3.5.1 Skylights leading to spaces below the working deck are to be of substantial construction and capable of being closed weathertight, operable from both sides, positioned clear of deck working areas, and fitted on or as near to the centreline as possible, and are to be mounted on substantial coamings of equivalent strength to the surrounding deck and as high as practicable.
- 3.5.2 Skylight glazing should meet the requirements of ISO 12216 or an equivalent standard.
- 3.5.3 Glass inserts, where fitted, are to have the framing material and fastenings of equivalent strength to the surrounding structure, and are to be protected against damage from warps and gear.

- 3.5.4 Skylights should not be fitted in way of machinery spaces, or other vulnerable positions. Where skylights are provided as a means of escape, they should be positioned clear of obstructions to enable rapid and easy access and be clearly marked “**EMERGENCY EXIT**”.

Section 3.6 - Windows

- 3.6.1 Windows are not to be fitted in the hull of any vessel.
- 3.6.2 Windows fitted in superstructures of decked or partially decked vessels of 7m LOA and over, are to be to ISO 12216 or other equivalent standard and fitted in metal frames, or frames of equivalent strength to that of surrounding material. Where windows are bonded to the surrounding structure of GRP vessels, the fixing method is to be compliant with ISO 12216 or other equivalent standard.
- 3.6.3 Where the wheelhouse entrance does not open to the outside deck, at least one window fitted in the wheelhouse is to be of the opening type arranged to permit a means of escape, as described in part 11 section 11.6
- 3.6.4 Opening windows may be hinged, vertically or horizontally sliding types, provided that the window can be readily and efficiently secured in the closed position.
- 3.6.5 Vertical sliding windows are to be fitted with adequate drainage arrangements discharging to the open deck, where practicable.
- 3.6.6 Polarised or tinted glass or glazing material susceptible to scratching must not be fitted at the helm or control position, where required for navigational visibility.

Section 3.7 - Exhaust outlets (through hull)

- 3.7.1 Exhaust pipes that penetrate the hull below the freeboard deck are to be fitted with a non-return valve, device, or flap to prevent the ingress of water at the outlet position. See Figures 3.11.1 and 3.11.2.
- 3.7.2 The lower edge of the discharge is to be a minimum of 100mm above the deepest load waterline.
- 3.7.3 The non-return device referred to in Paragraph 3.7.1 may be a proprietary fitting, water trap, built in valve, or an inverted “U” bend, fitted in the exhaust line.
- 3.7.4 For materials for exhaust systems see Part 8, Paragraph 8.1.9 also see Figures 3.12.1 and 3.12.2.

Section 3.8 - Sea inlets and discharges

- 3.8.1 All sea inlets and overboard discharges penetrating the hull below the working or freeboard deck are to be provided with a shut-off valve or cock. Those fitted within machinery spaces or below the design waterline are to be of metal or other approved type. If valves are used other than metal, a certificate attesting to their classification must be supplied from a recognised body.
- 3.8.2 In open vessels discharges are to be no less than 300mm above the design waterline.
- 3.8.3 In addition to the requirements of Paragraph 3.8.1, overboard discharges located below the weathertight or freeboard deck, are to be fitted with a non-return valve, which may be incorporated within the shut-off valve.
- 3.8.4 Valves and cocks fitted in metal hulls are to be connected to substantial pads welded to the hull plating, or to a welded-in short distance piece, to clear side or bottom stiffeners. Distance pieces, where fitted, are to have a wall thickness of at least the thickness of the connecting hull plating.
- 3.8.5 Valves and cocks in wood or GRP hulls are to be fitted and spigoted into a suitable pad and secured with an external non-corrodible ring under the bolts. Fittings up to 50mm diameter may be attached with threaded spigot pieces having an external collar and internal nut, provided that suitable hull reinforcement is provided where necessary. Those fitted within machinery spaces are to be of metal or other approved type.
- 3.8.6 Sea inlet and discharge valves are to be accessible for operation at all times, if necessary, by extended spindles or wire pulls to above the floor plating or above deck. See Part 9, Paragraph 9.1.4.
- 3.8.7 Sea inlet and overboard discharge valves are to be permanently labelled, indicating function, and open and closed position.

Section 3.9 – Freeboard

- 3.9.1 Open vessels are to have a minimum freeboard measured down from the lowest point of gunwale top to the design waterline. Freeboard measurements are to be not less than 400mm for a vessel of 7m LOA or less and 700mm for a vessel of 15m LOA. For a vessel of intermediate length the clear height should be determined by linear interpolation.
- 3.9.2 Open vessels are to be limited in their area of operation to 20 miles from a safe haven and in favourable weather conditions.
- 3.9.3 It is recommended that all open vessels are fitted with a notice visible at the helm position stating the limited area of operation.
- 3.9.4 Decked vessels with a continuous watertight weatherdeck are to have a minimum freeboard from the design waterline of not less than 300mm.

Freeboard is to be measured from the waterline to the lowest point of the deck at side.

- 3.9.5 Decked vessels with freeboard less than 300mm are to be limited in their area of operation to 20 miles from a safe haven and in favourable weather conditions and it is recommended that a visible notice is fitted as per 3.9.3.

Section 3.10 – Water freeing arrangements

Open Vessels

- 3.10.1 In open vessels where water coming on board normally drains to the bilge, the following provisions should apply:-
- 3.10.2 The height of any door sill above the fixed sole level in open type vessels should be as high as practical, but no less than 200mm. If hinged, the door should open outwards.
- 3.10.3 Air pipes and ventilators leading from below the level of the sole should have the open end as high as practical and be protected against mechanical damage.
- 3.10.4 Sole drainage on open vessels is to be given careful consideration. The level of the floor should not be positioned at such a height that it would have an adverse effect on the stability of the vessel, the following guidance is given:-
- (i) There should be effective drain openings fitted on each side of the sole to enable any water to drain directly to the bottom of the vessel. In the case of a vessel with a sealed sole, an aft sump is to be fitted, extending from the keel to deck.
 - (ii) It is recommended that the drainage area be at least 2% of the total bulwark area above the sole.
 - (iii) Open vessels are not to be fitted with freeing ports.
 - (iv) Any barrier or coaming which may be fitted to the sole to prevent the entry of rain water to the bottom of the vessel should not be at a height any greater than 25mm above the level of the sole.
 - (v) The bilge pumping intake should be at a readily accessible position.
 - (vi) Sole support structures that form buoyancy spaces are to be sealed and surfaces that may come into contact with water are to be sealed with gel coat or similar.
- 3.10.5 Open type vessels are to be fitted with bilge pumps as required by section 9.3 of these Standards.

Decked vessels

- 3.10.6 On decked vessels, where the fixed bulwarks, ends or sides of superstructures etc., form enclosed wells, means to clear entrapped water are to be provided and may comprise any, or any combination, of the following:-
- (i) Freeing ports with an attached means of closing (provided that the freeing port is closed only during fishing operations and that the closing device is easily operable and accessible, subject to the approval of the Surveyor).
 - (ii) Permanent openings in the bulwarks such as slots.
 - (iii) Apertures in and under bulwark or stern ramp doors.
 - (iv) Deck scuppers where the discharge is above the load waterline.
- 3.10.7 The minimum area for freeing ports on each side of the well or deck is to be not less than 3% of the total bulwark area each side. See figure 3.12.3.
- 3.10.8 Freeing ports are to be arranged throughout the length of the bulwark or well to provide maximum drainage under all normal conditions. At the discretion of the attending surveyor, up to one third of the freeing port area required at each side may be located in the transom bulwark, with the vessel centreline dividing the port and starboard side allocation. Where the freeing port area in the transom bulwark is greater than the maximum one third allowance per side, the excess area shall not be included in the total freeing port area provided.
- 3.10.9 Where deck erections within a well limit the volume of water that may be retained onboard, then the freeing port area may be reduced proportionally provided that such erections do not in themselves contribute to water retention.
- 3.10.10 The means of clearing water must not provide easy access for water to enter the enclosed deck space.
- 3.10.11 Any freeing port or slot in the bulwark is to have the bottom edge as close to the deck as possible. Freeing ports greater than 230mm in depth and wider than 350mm are to be fitted with bars.
- 3.10.12 Where freeing ports are fitted with hinged flaps or shutters, sufficient clearance to prevent jamming is to be provided and hinges are to be fitted with pins of non-corrodible material. Greasing points or nipples are to be provided where practicable.
- 3.10.13 Freeing ports are to be arranged throughout the length of the bulwark or well to provide maximum drainage under all normal conditions of trim.

- 3.10.14 Care is to be taken that deck pounds, machinery and net or gear stowage will not impede the free flow of trapped water to the freeing ports or slots.
- 3.10.15 Lift-up closing appliances fitted to freeing ports are to be so arranged that they are secure in the open position. Lift-up closing appliances should be fitted to no more than 50% of ports.
- 3.10.16 Where vessels are fitted with full or partial shelters which are left open at the stern, and where the passage of water forward is not restricted by watertight bulkheads, the freeing port area is to be increased by 1% over the requirement stated in section 3.10.7.

Section 3.11 - Watertight subdivision

- 3.11.1 All vessels below 7m LOA are to be fitted with at least one watertight bulkhead positioned according to the vessel's arrangement where it will be most effective to prevent flooding when in a damaged condition. To suit particular vessel arrangements, consideration may be given to the provision of intact buoyancy spaces below deck or floor areas in lieu of the provision of watertight bulkheads.
- 3.11.2 All vessels between 7m and 10m LOA are to be fitted with at least two watertight bulkheads. A collision bulkhead is to be positioned forward at a point no less than 0.5m and no greater than 1m from the stem, measured at the design waterline. A second bulkhead is to be positioned to separate the machinery space from the fish hold or accommodation spaces. See figure 3.12.4.
- 3.11.3 All vessels between 10m and 15m LOA are to be fitted with at least three watertight bulkheads. A collision bulkhead is to be positioned forward at a point no less than 0.75m and no greater than 2m from the stem, measured at the design waterline. The second and third watertight bulkheads should be positioned at each end of the engine room. Vessels with engines mounted forward where the collision bulkhead is the forward engine room bulkhead, should have a bulkhead positioned aft of the engine space and aft of the fish hold (aft peak bulkhead). See figure 3.12.4.
- 3.11.4 Where a vessel is of a catamaran design, a longitudinal watertight bulkhead is to be fitted between hulls to separate main engine compartments.
- 3.11.5 Where it is intended for a bulkhead to be fitted outside the stipulated parameters, details should be submitted for approval prior to construction.
- 3.11.6 In decked vessels, the collision bulkhead should extend from the keel or forefoot to the first weathertight deck or to a flat located no lower than 300mm above the estimated deepest operational waterline. Bulkheads in other positions should extend full height from the keel to the deck.

- 3.11.7 Access to the compartment forward of the collision bulkhead may be by a bolted watertight cover or watertight hatch normally closed at sea.
- 3.11.8 Doors should not normally be fitted in watertight bulkheads, but where these are necessary for the safe operation of the vessel, the doors are to be permanently attached to the bulkhead and are to be of equivalent strength to the unpierced bulkhead. Doors are to be watertight and capable of operation from both sides.
- 3.11.9 Where pipes and electrical cables are carried through a watertight bulkhead, the method of penetration must maintain the watertight integrity of the bulkhead.

Figures and illustrations

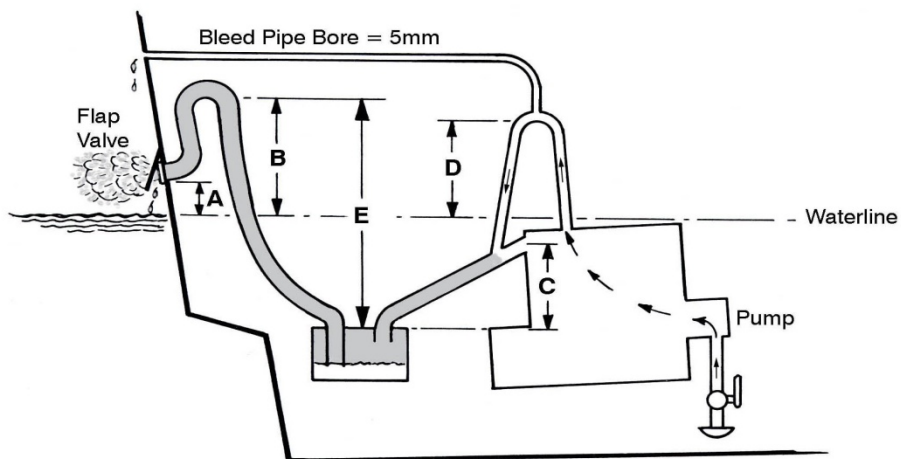
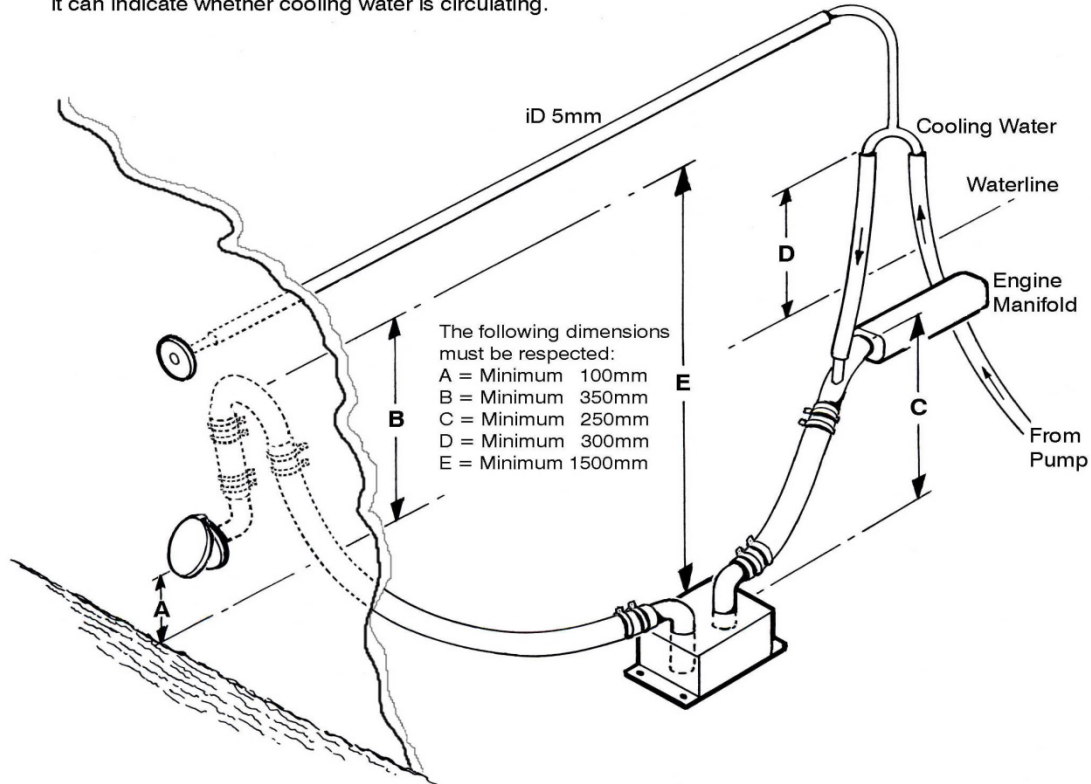
Illustrations shown in Figures 3.12.1 through to 3.12.4 are for guidance purposes only.

3.12 Figures and illustrations

3.12.1 – Wet exhaust example

ENGINE MANIFOLD IS BELOW LOADED WATERLINE

When the engine has stopped, water will siphon in through the water pump, fill the exhaust system and enter the cylinders. An anti-siphoning bleed pipe, of internal bore 5mm and discharging overboard, must be connected to the cooling water pipe. If it is made of clear plastic and led through the deckhouse, it can indicate whether cooling water is circulating.

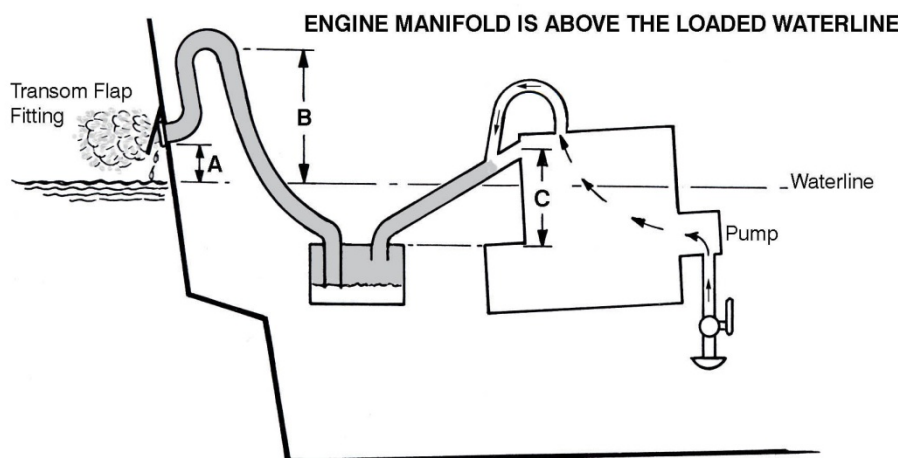
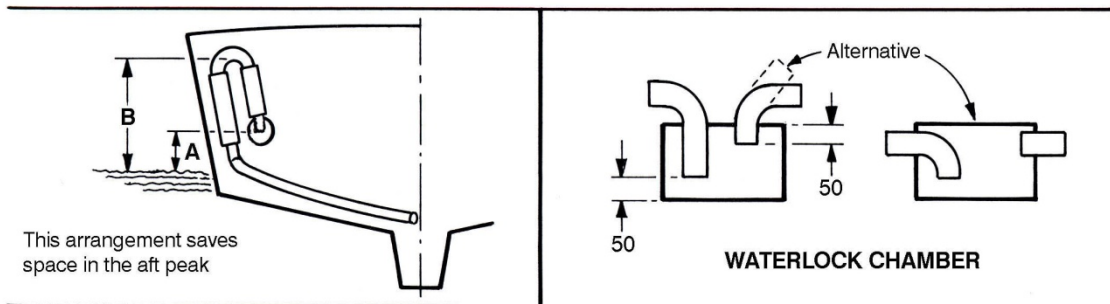
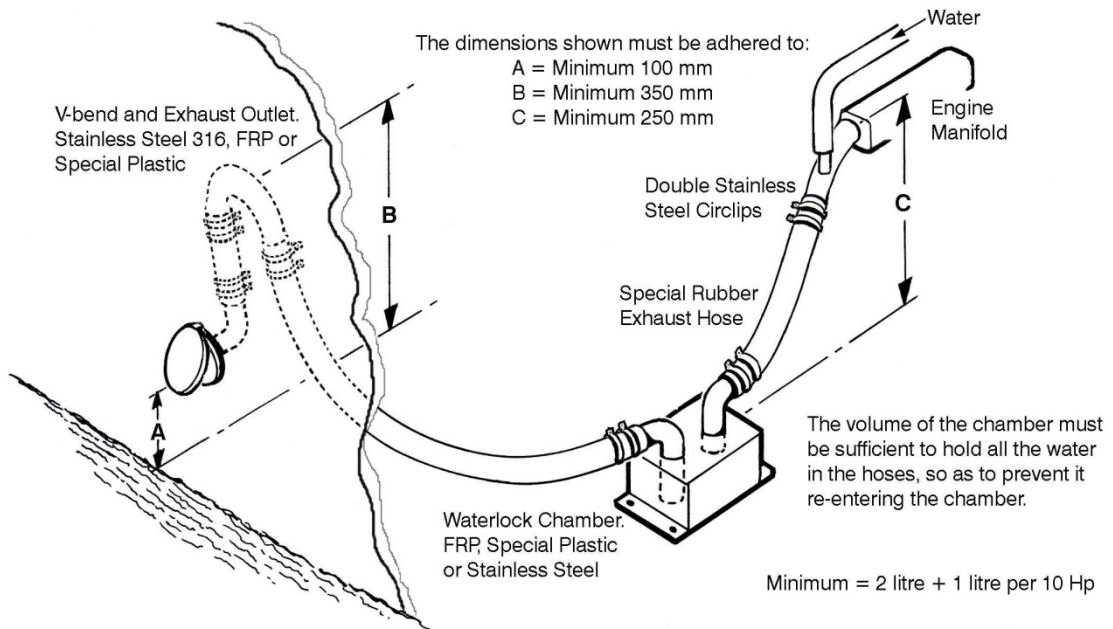


3.12 Figures and illustrations

3.12.2 – Wet exhaust example

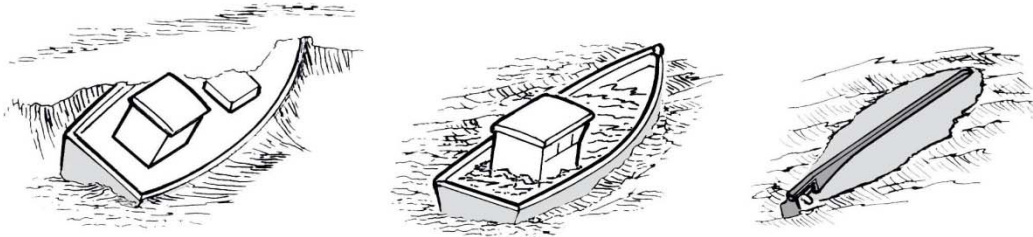
ENGINE MANIFOLD IS ABOVE THE LOADED WATERLINE

If the wet exhaust system is not correctly installed, water can enter into the cylinders through the exhaust. This will happen in rough seas and when the engine has stopped.



3.12 Figures and illustrations

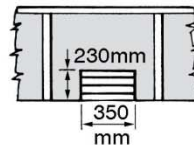
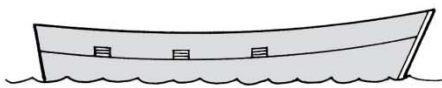
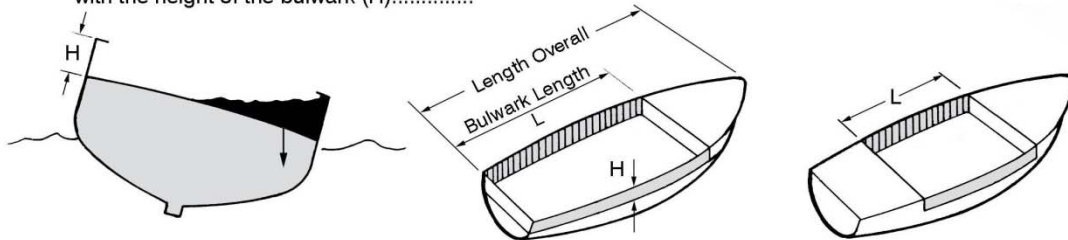
3.12.3 – Freeing ports



When a big wave breaks on the deck, leaves it awash and does not drain quickly, the boat may capsize, depending on the amount of water left on the deck. The purpose of providing freeing ports is to drain the water quickly.

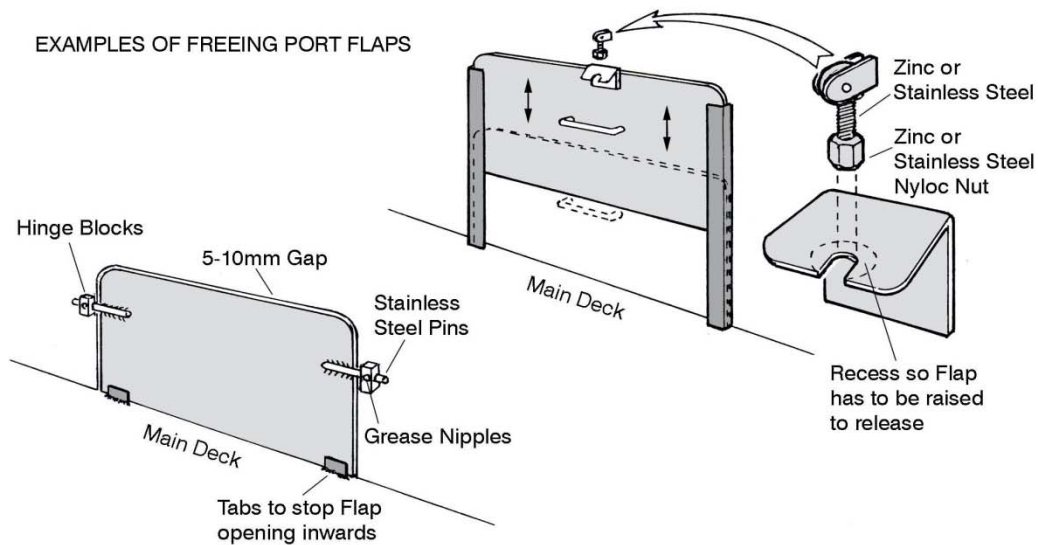
The amount of water trapped will increase with the height of the bulwark (H).....

.....and the effective length (L) of the bulwark



Large freeing ports must have bars fitted when greater than shown measurements.

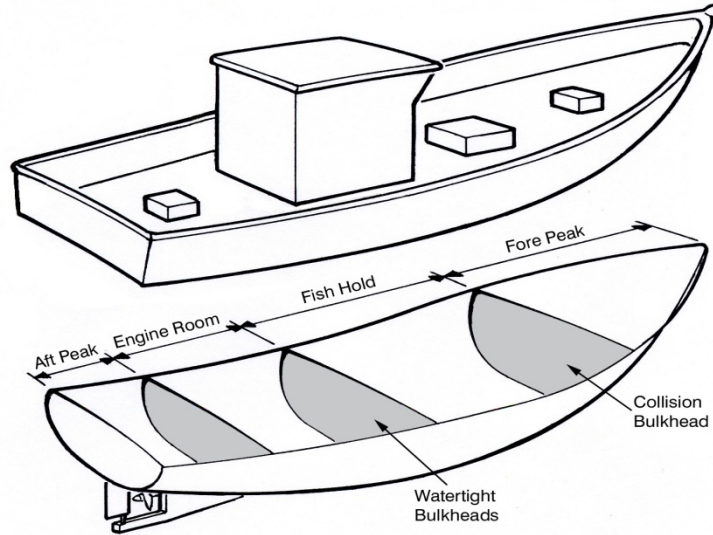
EXAMPLES OF FREEING PORT FLAPS



3.12 Figures and illustrations

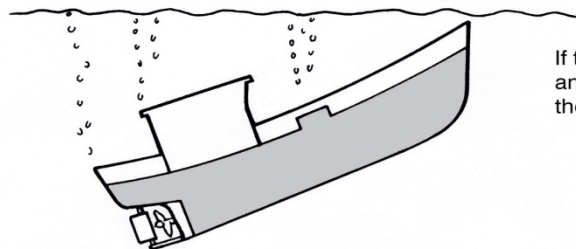
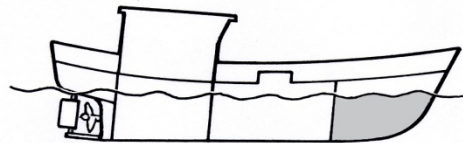
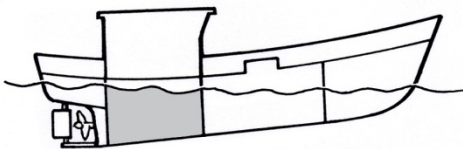
3.12.4 – Watertight bulkheads

If a heavy leak develops, watertight bulkheads that divide the boat into compartments will prevent flooding of the whole boat.



Leaks in the engine room are often caused by a corroded seacock, damaged seawater hoses, poor quality and installation of wet exhaust hose and a faulty stuffing box in the stem tube. If the buoyancy of the aft peak is sufficient, the boat will float.

A collision with a boat, a log or a rock could lead to flooding of the boat. A forward watertight bulkhead will prevent flooding of the whole boat.



If the boat has no watertight bulkheads and if the bilge pump cannot cope with the leak, the boat will certainly sink.