

PART 3

HULL INTEGRITY AND ARRANGEMENT

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HULL INTEGRITY AND ARRANGEMENT

Section 3.1 – General

- 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 Particular attention should be paid to ensure that accesses and openings to machinery spaces are protected by strong and efficient structures, which should include weathertight or watertight means of closure depending on the position of the opening.
- 3.1.3 At the design stage of the vessel, hatches and doorways which may be open at sea, should normally be arranged as near as practical to the vessel's centreline. Due consideration should also be given to the risk of down flooding via any such hatch or doorway.
- 3.1.4 Vessels with wheelhouses fitted directly on the freeboard deck, which contain access hatch(es) to spaces below the freeboard deck, are to have the hatch(es) made weathertight and fitted on a coaming to the statutory height.
- 3.1.5 Wheelhouses, which are fitted to structures above the freeboard deck (e.g. on shelter decks), should have arrangements to allow water to rapidly drain over the side.
- 3.1.6 Openings in weathertight boundaries for warps or wires used in the fishing operations are to be kept as small as practicable. Consideration is to be given to down flooding angle as stated in the relevant code of practice.

Section 3.2 – Doors, hatchways and covers

- 3.2.1 In all vessels, watertight or weathertight doors and hatch covers are to be constructed to British Standards or equivalent. All doors and hatches are to be of equivalent strength to the surrounding structure. Doors and hatches are to be adequately framed, fitted with gaskets and securing arrangements and permanently attached to the surrounding structure.
- 3.2.2 Doors are to be arranged so that they may be operated easily and rapidly from each side of the bulkhead.
- 3.2.3 Hinge pins, bushes, screw toggles and securing nuts for all doors and hatch covers, should be of stainless steel or other approved corrosion-resistant material and fitted with adequate lubrication points where necessary. It is recommended that all clips are to be of the spring-loaded type.

- 3.2.4 Every hatchway and doorsill on the exposed freeboard deck should have a coaming of substantial construction, and the height of the coaming above the deck should not be less than 460mm. On exposed first tier superstructure decks, the coaming should not be less than 100mm.
- 3.2.5 Access and escape hatches are to have not less than 600mm x 600mm clear opening.
- 3.2.6 When essential for fishing operations and providing the safety of vessel is not impaired, hatch coamings may be reduced in height or be of a flush type, provided that it is capable of being rapidly closed watertight, and the opening kept as small as practicable.
- 3.2.7 Coamings may also be reduced or omitted for hatches that are provided on the freeboard deck when the hatchway is positioned within a shelter, superstructure or deckhouse, provided that such spaces are maintained weathertight whilst at sea, and providing that flooding hazards will not arise due to activities within those spaces.
- 3.2.8 The heights of sills to doors provided in exposed companionways, superstructures, deckhouses and machinery casings that give access to spaces leading below the freeboard deck, should not be less than those specified for hatchway coamings in Paragraph 3.2.4 for a similar position.

Section 3.3 – Air pipes

- 3.3.1 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.
- 3.3.2 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.
- 3.3.3 Air pipes used as tank vent pipes should have a cross-sectional area not less than 1.25 times that of the filling pipes.
- 3.3.4 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.
- 3.3.5 The air pipe/deck connection is to be by a welded through socket or welded pad of adequate thickness.
- 3.3.6 The open ends of tank air pipes are to be provided with a proprietary type ball float fitting or a gooseneck fitted with a means of closure.

- 3.3.7 The air pipes to oil fuel, hydraulic and lubricating oil tanks are to be led to the open deck, and are to be fitted with spark arresting gauze in addition to any method of closure.

Section 3.4 – Ventilators

- 3.4.1 The minimum height above the deck of ventilators other than machinery space ventilators, should be 760mm on an exposed freeboard deck, and 450mm on an exposed first tier superstructure deck.
- 3.4.2 Machinery space ventilators should be led as high as is reasonable and practicable and preferably be fitted well inboard, In no case less than that stated in paragraph 3.4.1 and the angle of initial downflooding should not be less than 40 degrees.
- 3.4.3 All ventilators should be of substantial construction and be provided with permanently attached means of watertight closure, except that watertight closing appliances need not be fitted to ventilators with a coaming extending more than 4.5m above the freeboard deck, or more than 2.3m above the superstructure deck.
- 3.4.4 Where watertight closures are omitted in relation to 3.4.3, fire flaps are to be fitted in machinery space ventilators.

Section 3.5 – Side scuttles (portholes) and windows

- 3.5.1 Side scuttles to enclosed superstructures, deckhouses or companionways on the freeboard deck are to be fitted with hinged deadlights capable of being closed watertight.
- 3.5.2 Every side scuttle should be fitted in a position such that it is still above a line drawn parallel to the freeboard deck at side having its lowest point 1 metre above the highest load waterline.
- 3.5.3 Side scuttles liable to damage from fishing gear or equipment should be of the fixed type and are to be suitably protected.
- 3.5.4 Side scuttles, glasses and deadlights are to meet the requirements of ISO 1095, ISO 1751 and ISO 5780, type B (medium duty grade), or equivalent standard in respect of nominal size and toughened safety glass thickness.
- 3.5.5 Side scuttles fitted in exposed areas and in the forward bulkheads of freeboard deck erections are to be of the non-opening type. Where a side scuttle or decklight is to form an escape, this will be given special consideration on submission of details.
- 3.5.6 Windows are not to be fitted below the freeboard deck.
- 3.5.7 Where windows are fitted in the forward or after bulkheads of exposed freeboard deck erections, efficient means of protection is to be provided.

- 3.5.8 Windows and their frames should meet the requirements of ISO 3903, ISO 3254 and ISO 5779, type E (heavy-duty grade), or an equivalent standard in respect of nominal size and toughened safety glass thickness.
- 3.5.9 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.
- 3.5.10 Where a wheelhouse entrance does not open to the outside deck, at least one of the windows is to be of the opening type to provide a means of escape, and is to have a minimum clear opening of 500mm x 380mm.
- 3.5.11 Opening windows may be of the vertically or horizontally sliding type, or hinged, providing that the window can be readily and efficiently secured in the closed position. Adequate save-alls and drains are to be provided.

Section 3.6 – Sea inlets and discharges

- 3.6.1 The number of inlets and discharges are to be kept to the operational minimum, consistent with the duties and operations required.
- 3.6.2 Every discharge leading through the hull from spaces below the freeboard deck or from within an enclosed superstructure or deckhouse on the freeboard deck, is to have an automatic non-return valve fitted at the hull with a positive means of closure from an accessible position. This may be a combined valve such as a screw down non-return valve.
- 3.6.3 In machinery spaces, valves for main and auxiliary sea inlets and discharges essential for the operation of machinery may be operated locally. The valves are to be readily accessible, above the floor plates (e.g. extended spindles) and be provided with indicators showing whether the valves are open or closed.
- 3.6.4 Where system valves are not fitted above the floor plates, rapid and practical means are to be provided to allow the valve to be operated from above floor plate level.
- 3.6.5 Soil pipes and other water drainage should be so arranged and fitted with such water seals, air vents and storm valves as are necessary to prevent siphoning, blowback or ingress of water. The hull closing arrangements are to be as detailed above.
- 3.6.6 Where scuppers from open decks penetrate the hull below the freeboard deck these are to be fabricated from piping with a wall thickness at least that of the pierced shell plate.
- 3.6.7 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.

- 3.6.8 Valves and cocks in FRP 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.

Section 3.7 – Water freeing arrangements

- 3.7.1 When freeboard or first tier superstructure decks are fitted with bulwarks, deckhouses, erections or other arrangements such that wells are formed and shipped water may be retained onboard, then ample provision is to be made for rapidly freeing the decks of the water and for draining them overboard.
- 3.7.2 The means by which this water is freed may be by freeing ports, open rails, scuppers, or other suitable arrangements.
- 3.7.3 Where freeing ports cannot be fitted, other efficient means of clearing trapped water from the vessel are to be provided, and details submitted for approval.
- 3.7.4 Where bulwarks on weather parts of the working deck form wells, the minimum freeing port area (A) in m² on each side of the vessel for each well on the working deck, should be determined in relation to the length ('l') and height of bulwark in the well as follows:-
- a) $A = K \times ('l')$ ('l' need not be taken as greater than 0.7 L)
Where (L = registered length of vessel)
Where K = 0.07 for vessels of 24m in length, and 0.044 for vessels of 15m in length
The value of K is to be obtained by linear interpolation from between the two values of length given above.
 - b) Where the bulwark is more than 1200mm in average height, the required area should be increased by 0.004 m² per metre of length of well for each 100mm difference in height.
 - c) Where the bulwark is less than 900mm in height, the required area may be decreased by 0.004 m² per metre of length of well for each 100mm difference in height.
- 3.7.5 Where the vessel's sheer is not sufficient to ensure that the deck is rapidly and effectively freed of water, the freeing port areas obtained by the foregoing is to be increased to the satisfaction of the Surveyor.
- 3.7.6 Subject to the approval of the Certifying Authority, the minimum freeing port area for each well on the superstructure deck should be not less than 50% the area (A) given in Paragraph 3.7.4 above.

- 3.7.7 Freeing ports are to be arranged along the length of the bulwarks to ensure that the deck is freed of water rapidly and effectively. Lower edges of freeing ports are to be as near the deck as practicable.
- 3.7.8 Poundboards and means for stowage of fishing gear are to be arranged such that the effectiveness of freeing ports will not be impaired. Poundboards are to be so constructed that they can be locked in position when in use and do not hamper the discharge of shipped water.
- 3.7.9 Freeing ports over 300mm in depth and length greater than 450mm, are to be fitted with bars spaced not more than 230mm nor less than 150mm apart or provided with other suitable protective arrangements. Freeing port covers, where fitted, are to be of suitable construction. Where freeing port covers are locked during fishing operations, they are to be arranged to the satisfaction of the Surveyor and easily operable from a readily accessible position.
- 3.7.10 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.

Section 3.8 – Shelter drainage

- 3.8.1 Weathertight shelter spaces above the freeboard deck not utilised for wet fish processing, are to be provided with a means of adequate drainage by direct overboard discharge or by independent pumping system, or a combination of both.
- 3.8.2 Where wet fish processing takes place within a weathertight compartment that does not have sufficient freeboard to permit direct overboard discharge via scuppers or other arrangements, that space is to be provided with independent pumping arrangements having a capacity of at least 1.5 times the rate of water supply. Where pumping arrangements are intended to cater for solid waste, discharge should be arranged via local sumps with pumps suitable for pumping fish waste products.
- 3.8.3 Offal or gut chutes are to be fitted with a screw down non-return flap of non-corrosive material which will remain closed at 15° of adverse heel, and have an opening at the hull aperture no greater than 300mm x 300mm. Where other arrangements are proposed, details are to be submitted for consideration.
- 3.8.4 The access opening to the chute is to be at a minimum height of 900mm above the deepest operational waterline, and is to be fitted with a hinged weathertight cover secured with clips/toggles in addition to the flap required by Paragraph 3.8.3. Where other arrangements are proposed, details are to be submitted for consideration.
- 3.8.5 For shelter deck drainage see Section 7.8.

Section 3.9 – Watertight bulkheads and subdivisions

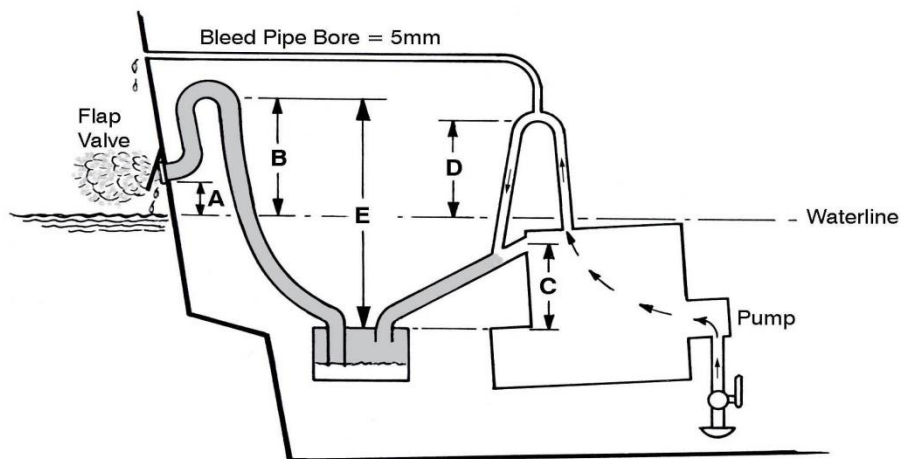
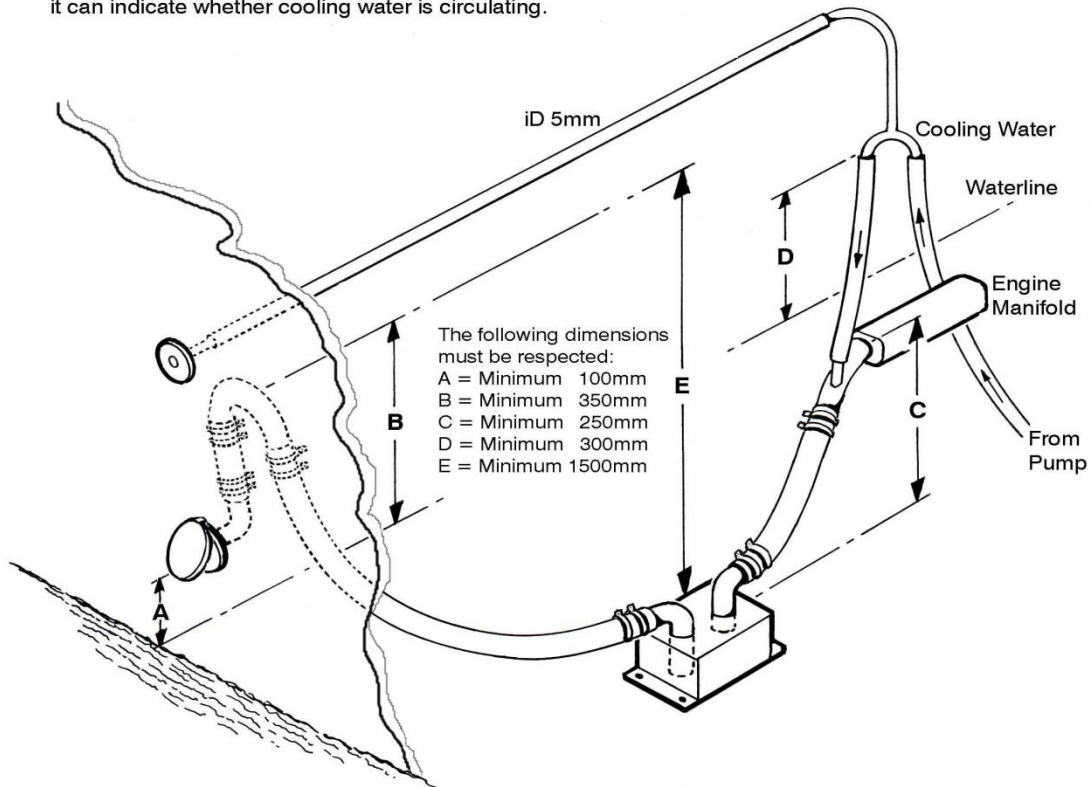
- 3.9.1 All decked vessels between 15m to 24m RL are to be fitted with at least three watertight bulkheads extending from keel to underside of deck. The collision bulkhead should be positioned forward at a minimum of 0.75m, and a maximum of 2.5m from the stem at the freeboard deck. The second and third watertight bulkheads should be positioned at each end of the engine room and be full height.
- 3.9.2 Vessels with engines mounted forward where the collision bulkhead is the forward engine room bulkhead, should have a bulkhead positioned aft of engine space and aft of the fish hold (aft peak bulkhead). For bulkheads that are to be fitted further aft than maximum stated, details are to be submitted for consideration.
- 3.9.3 The main and auxiliary machinery essential for the propulsion and safety of the vessel is to be situated in a watertight machinery compartment with watertight bulkheads provided at the fore and aft positions of that space. In the case of vessels with forward engine rooms, the forward engine room bulkhead may constitute the collision bulkhead. A watertight bulkhead is to be fitted in the after part dividing the fish room and accommodation spaces.
- 3.9.4 Such bulkheads are to extend up to the freeboard deck, and the number of openings fitted therein is to be the minimum compatible with the safe operational requirements of the vessel.
- 3.9.5 Plate thickness, stiffeners spacing, and section moduli of stiffeners of watertight bulkheads are as shown in Table 4.22.10.
- 3.9.6 When necessary for pipes, cables, etc. to penetrate watertight bulkheads, arrangements are to be made to maintain the watertight integrity of the bulkhead in way of such penetrations. The collision bulkhead is to have valves fitted on the aft side to all pipe penetrations and are to be capable of operation via an extended spindle led to above the freeboard deck.
- 3.9.7 Doors fitted in watertight bulkheads are to be of watertight construction and be arranged to be kept closed at sea.
- 3.9.8 Doors are not permitted in the collision bulkhead unless fitted in a bulkhead extension above the freeboard deck. Such doors are to be of weathertight construction and are to be kept closed at sea.

3.10 Figures and illustrations

3.10.1 – 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.

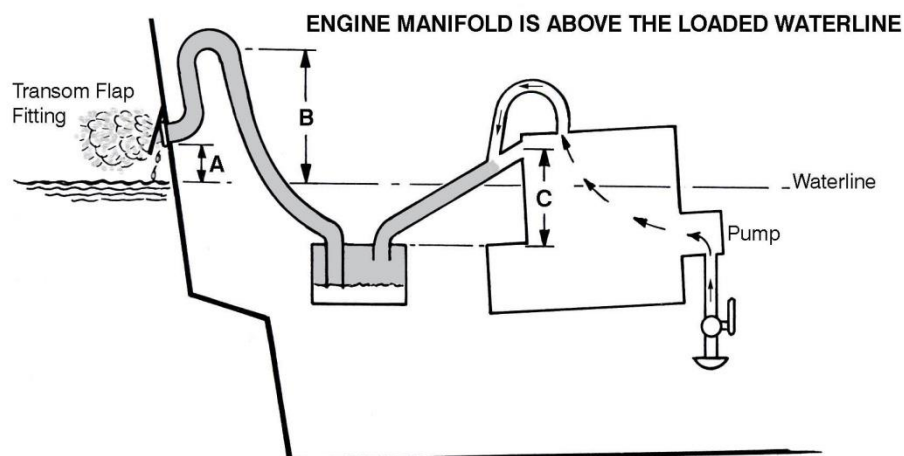
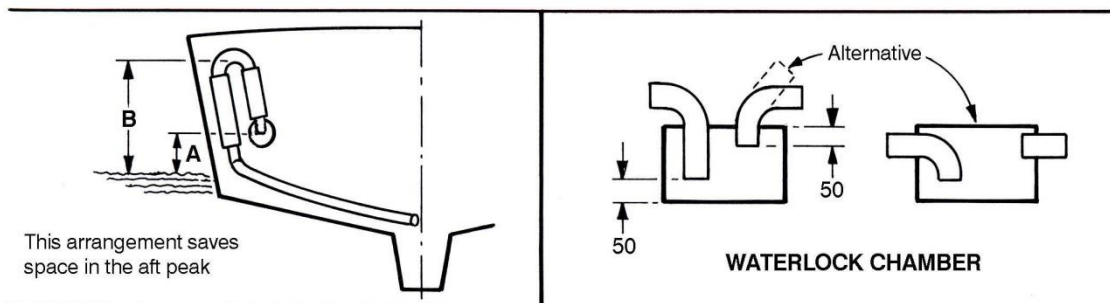
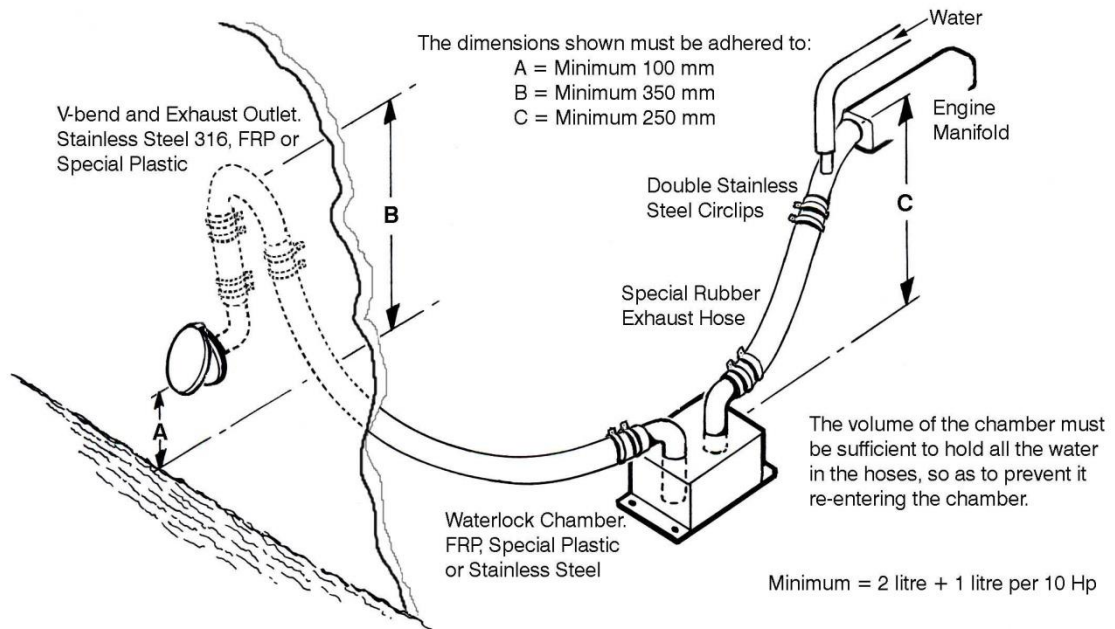


3.10 Figures and illustrations

3.10.2 – Wet exhaust example

ENGINE MANIFOLD IS ABOVE THE LOADED WATERLINE

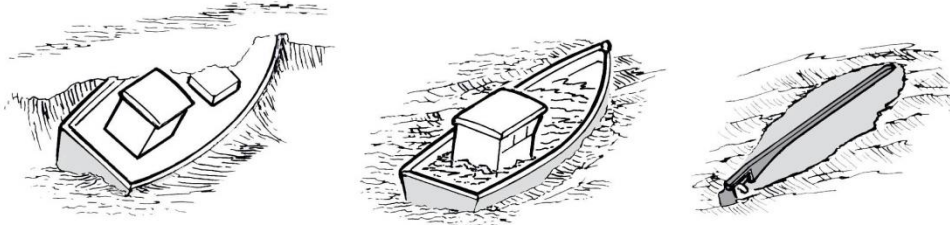
If the wet exhaust system is not correctly installed, water can enter into the cylinders through the exhaust. This will happen in rough seas and when the engine has stopped.



3.10 Figures and illustrations

3.10.3 – Freeing ports

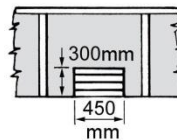
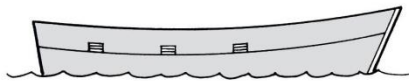
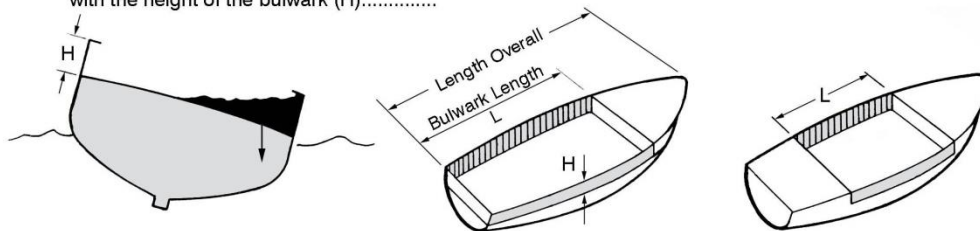
Why are freeing ports required?



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.

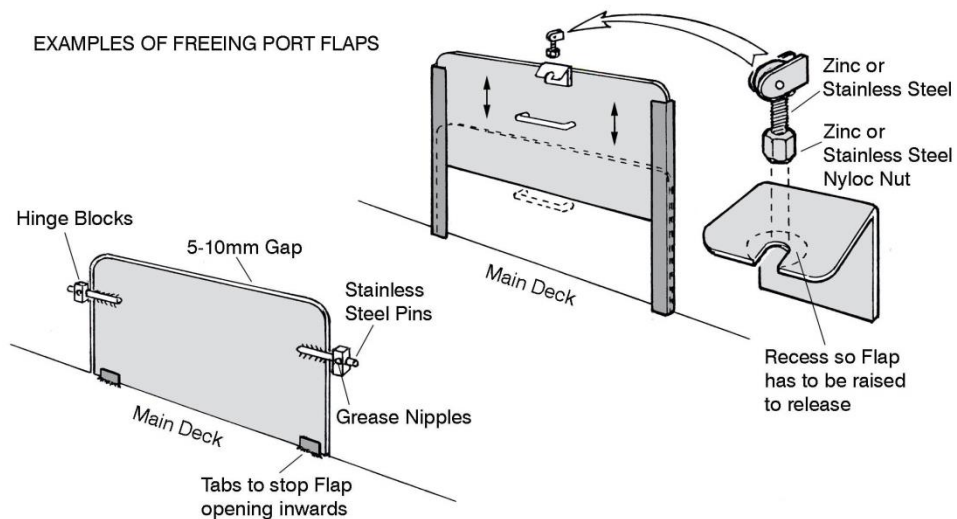
The amount of water trapped will increase with the height of the bulwark (H).....

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



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

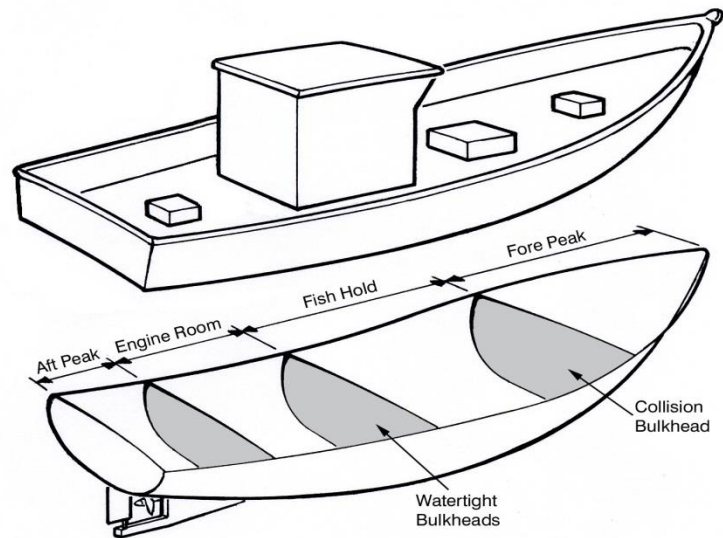
EXAMPLES OF FREEING PORT FLAPS



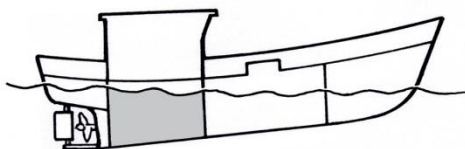
3.10 Figures and illustrations

3.10.4 – Watertight bulkheads

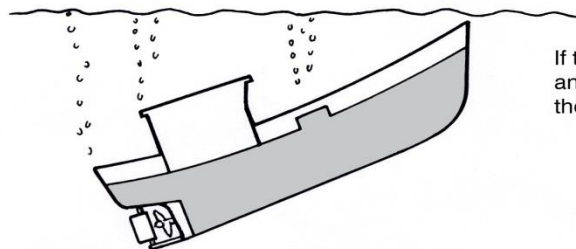
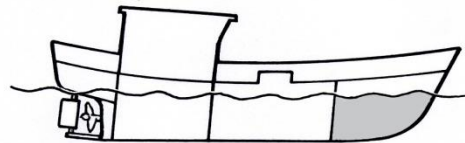
If a heavy leak develops, watertight bulkheads that divide the boat into compartments will prevent flooding of the whole boat.



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.