

CHAPTER 27**PUMPING, DRAINING AND BALLASTING****CONTENTS****Para**

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CHAPTER 27**PUMPING, DRAINING AND BALLASTING****2701. General**

Pumping, draining and ballasting arrangements are provided in ships for the following main purposes:

- a. To pressurise the HP seawater system for firefighting, domestic use, etc, and to provide water via the LP seawater system for machinery cooling, etc.
- b. To remove water that has been let into the ship either deliberately or as a result of damage or firefighting.
- c. To introduce seawater into specified compartments to correct adverse heel and/or trim.
- d. To introduce seawater into specified compartments or into fuel displacement systems to maintain stability.

This chapter deals with the emergency arrangements provided for pressurising the HP seawater system for firefighting purposes, with the equipment for removing water, eg by pumping, educting or draining, and that for ballasting to control heel and/or trim and to maintain stability. [Annex 27A](#) to Annex 27E give brief details of portable and mobile pumps, used for damage control.

2702. Drainage Arrangements

- a. Weather decks and tops of superstructures are fitted with scuppers to drain loose water overboard. Pipes from the scuppers are led directly to ships side outlets and are not usually fitted with storm valves (simple flap valves). Drains from internal compartments are either led to drain tanks or sumps, or directly overboard. If the latter, they are fitted with storm valves which can be shut. Shutting the storm valve prevents flooding back into the compartment if the ship heels or trims after damage. Storm valves are usually operated from a higher deck through rod gearing. Drain tanks and sumps are pumped out by fixed or portable pumps or eductors. Scuppers and drains are not to be interconnected because of the risk of spreading flooding between compartments and of spreading contamination if prewetting is being operated in an CBRN environment. In ships with pressurised citadels, all drains serving compartments inside the citadel must be fitted with 150 mm 'U' water seals.
- b. In newer ships (T23 and later) screwed plugs are fitted in some decks to allow excessive water, due to firefighting, to be drained down to lower compartments which are fitted with fixed eductors. Permission to drain down water through these plugs must be given by HQ1 prior to use. Drain down plugs within or adjacent to the red risk zone are to be marked with red dots to indicate the need to ensure they are closed at the order **"Close all red openings"**.

2703. Ballasting Arrangements

The method used to fill a compartment with seawater is through fixed or portable connections from the HP seawater system to the designated compartments for either:

- a. Fuel compensation/displacement to maintain ship stability.
- b. Ballast tanks to compensate for consumed stores.
- c. To improve the ships attitude after collision or action damage.

In Assault ships, a number of ballast tanks are fitted for flooding and pumping to enable the ship to be used as a floating dock. The considerations that govern counterflooding action are referred to in [Para 1519](#).

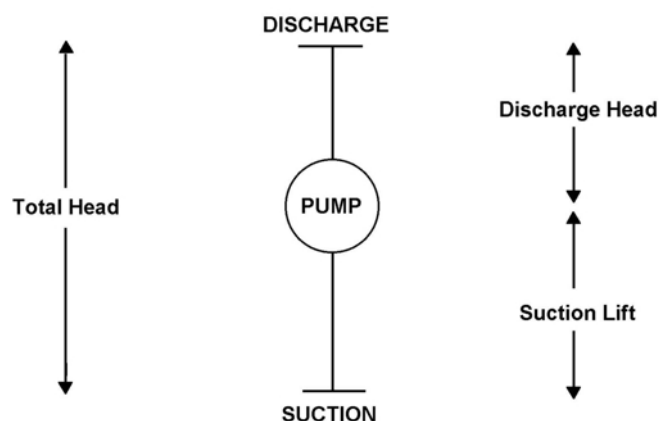
2704. Suction Lift and Discharge Head

Suction lift refers to the ability of a pump to lift water from below. In the ideal situation, with a perfect vacuum, water can be raised 10 m. In practice the pumps used in the RN will lift water through two decks (except for the Godiva GN 500 Pump, which will lift through one deck only). If the lift required is more than 5-6 m then a submersible pump must be selected. The head to which a pump will discharge depends on the pump discharge capacity.

2705. Pump Performance

The capacity of a centrifugal pump is related to 'total head' which is the suction lift plus the discharge head (see [Fig 27-1](#)). Pumping capacity is affected by system head losses due to fittings in the pipework such as valves, bends etc, friction in the associated pipework and the difference in height between the suction point and the discharge point. Thus, when rigging a pump the shorter the suction hose, and hence suction lift, the better the pump performance for firefighting and pumping out (see [Annex 27A](#) to Annex 27E for pump capacities).

Fig 27-1. Pump Head



2706. Portable and Mobile Pumps

These pumps are defined by as follows:

- a. **Portable Pump.** A pump which can easily and quickly be moved without mechanical aids, between compartments and decks of a ship, and not having an appreciably greater weight than 100 kg.
- b. **Mobile Pump.** A pump that can be moved between compartments and decks of a ship falling outside the definition of a portable pump.

2707. Pump Allowances

The allowance, for RN surface ships and RFAs, of pumps and eductors detailed in BRd 2170(3), is based on the following criteria:

a. Firefighting

(1) **Multiple Damage Control Section Ships.** Four 100 m³/hr installed emergency diesel driven pumps are to be sited in the ship (except the hangar section). In addition four portable diesel driven pumps per ship are to be provided.

(2) **Single Damage Control Section Ships.** Two 100 m³/hr installed emergency diesel/gas turbine driven pumps, to be sited one forward and one aft. In addition, two portable diesel driven pumps per ship are to be provided for flexibility in firefighting.

(3) **Minor War Vessels.** One GN 500 emergency portable diesel driven pump per vessel.

b. Damage Control

(1) **Ships with 3 or more FRPPs.** Two submersible high capacity portable electric driven pumps are to be sited at or in the vicinity of each Fire and Repair Party Post.

(2) **Frigates/Destroyers with 2 FRPPs.** Three submersible high capacity portable electric driven pumps are to be sited at each Fire and Repair Party Post.

(3) **Minor War Vessels.** One or two high capacity electric driven pump(s) per vessel. Small vessels below 1000 tonnes may be fitted with one medium capacity electric driven pump. Where vessels are considered too small or are limited by their electrical supplies they are to utilise the portable diesel driven pump supplied for firefighting.

2708. Firefighting Pumps

Mobile and portable, independently driven, diesel pumps (Godiva GN 1700 and Desmi S100 LDW 2004) are provided for firefighting duties when normal HPSW main and electrical power supplies are damaged or destroyed. The Godiva GN 500 pump should never be connected to a pressurised HPSW main and should always be used independently. These pumps will also provide emergency standby firefighting capability for ships in dock, or alongside when ships generating capacity is not available and shore facilities are limited.

2709. Mobile Pump

The mobile diesel pump is to be semi-permanently installed in its working position adjacent, and connected by the portable hoses, to a sea suction standpipe and also the exhaust outlet. The two pump discharges are to be connected by two No 3 delivery hoses to the HPSW system via two hydrants sited in close proximity to the pump position, and two double male instantaneous coupling adaptors provided for this purpose.



Note. The mobile diesel pump is too heavy for normal mobility, as defined in Para 2706 [sub para b](#). In ships where a common working and storage position cannot be achieved a mobile gas turbine pump is provided.

2710. Portable Diesel Pump

- a. This pump is to be stowed in a readily accessible and sheltered position off the weatherdeck complete with suction, delivery and exhaust accessories. It may also be used for pumping out and for the assistance of other ships or services in distress.
- b. When diesel pumps are used outside the ship (or inside for pumping out free water), the suction hoses are to be fitted with a suction strainer at the free end. When used inside the ship for firefighting, the suction hose is to be coupled to a sea suction standpipe and flexible exhaust hoses (maximum 4 x 3 m lengths) are to be provided to carry the exhaust fumes to the open air through doors, hatches or the special exhaust outlets provided in the ships structure.

2711. Portable Submersible Pumps

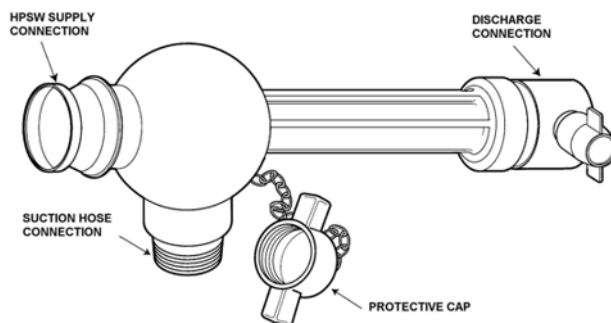
Portable, electrically driven, submersible pumps are provided for damage control duties. They are normally classified as drainage pumps rather than salvage pumps in order to differentiate between the damage control pumps used on warships for pumping out and the pumps used by specialised ships for salvage operations. The submersible electrically driven pumps are provided, primarily, for damage control duties but they can also, if needed, be used for firefighting subject to their limitations and the availability of electrical power. See [Annex 27A](#) for series connection of Weda pumps for firefighting.

2712. Eductors

There are two types of eductor, both using HPSW flow through a venturi to create a suction:

- a. **Fixed Eductors.** These are fitted in machinery spaces, cable lockers and other compartments, low down in the ship, with a high probability of water ingress.
- b. **Portable Eductors.** These are normally stowed at FRPP lockers and can quickly be rigged and supplied by hose from the HPSW main. They are supplied with non-collapsible suction hoses, clamps and a strainer. The discharge is led, by a No 3 hose, to an overboard discharge connection or to the upper deck.

Fig 27-2. Portable Eductor



2713. Overboard Discharge Connections

Overboard discharges are provided for use with portable pumps, in conjunction with collecting head adaptors, (twin female instantaneous connections) to enable a single or twin run of discharge hoses to be connected from a pump. Overboard discharges are fitted at readily accessible positions to a minimum of one in each watertight section along the lowest communication deck, and sited alternately on port and starboard sides of the ship. In larger ships, or where access is not available across the ship, two discharges are fitted in each watertight sub-division, one port and one starboard. Where discharges are sited in an enclosed compartment a tally plate worded **PORTABLE PUMP OVERBOARD DISCHARGE INSIDE COMPARTMENT** in black letters on a white background is to be sited adjacent to the door of the compartment, (and not obscured by it when it is open).

2714. Electric Submersible Pump Power Sockets

Power sockets for portable pumps are sited on, or near, the centre line of the ship on the lowest communicating deck, on the basis of one in each main WT sub-division in DD/FF and two in each main WT sub-division in larger ships (see [Chapter 19](#) for details).

2715. Pump Stowages

Stowages for portable pumps and their accessories are sited on the lowest communication deck adjacent to the FRPP lockers. Covers are provided for pumps that are not stowed within a locker. Securing arrangements are provided for all pumps.

2716. NATO Standard Flange Adaptors

a. A range of adaptors, specified in STANAG 1169, is carried by NATO ships to facilitate interchangeability of damage control and firefighting hose connections. This allows for the transfer of independently driven portable pumps between ships of different nations. One end of each adaptor has the appropriate national connection, but the common features are the standard NATO flanges at the other end:

- (1) **NATO Standard Delivery Flange.** 6.5 inch outside diameter, 2.5 inch inside diameter, 6 holes at 5.25 inch pitch circle diameter.
- (2) **NATO Standard Suction Flange.** 7.5 inch outside diameter, 3.5 inch inside diameter, 6 holes at 6.25 inch pitch circle diameter.

b. The allowances of the following adaptors, detailed in BRd 2170(3), are to be stowed in selected FRPP lockers:

- (1) NATO standard suction flange to 4.5 inch (OD) unified female thread (see [Fig 27-3](#)).
- (2) NATO standard suction flange to 4.5 inch (OD) unified male thread (see [Fig 27-4](#)).
- (3) NATO standard delivery flange to 2.5 inch male instantaneous connection (see [Fig 27-5](#)).
- (4) NATO standard delivery flange to 2.5 inch female instantaneous connection (see [Fig 27-6](#)).

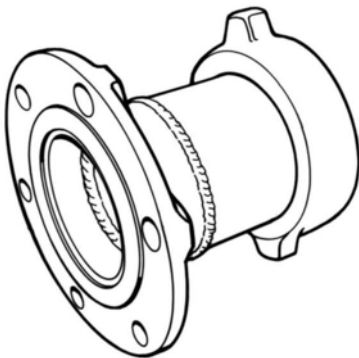
(5) NATO standard delivery flange to 7 inch international shore connection flange. This is referred to as a distance piece, because it is inserted between the NATO flange and the international flange (see [Fig 27-7](#)).

(6) **Storz Adaptor.** The Storz adaptor has been introduced to provide a simple means of transferring HPSW to the firemain of UK vessels from other NATO vessels via a common connection. The adaptor has a standard 2.5 inch instantaneous male delivery coupling on one end with a 65 mm Storz quick connection coupling on the other (see [Fig 27-8](#)). Fitting the Storz coupling should be possible by hand but coupling spanners are provided for use with tight couplings. Methods of use are as follows:

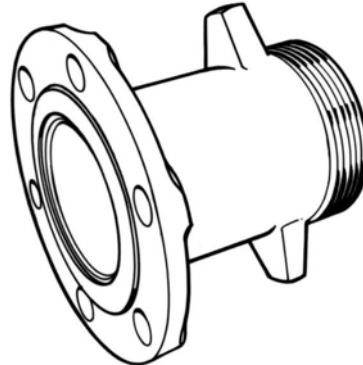
(a) **UK Vessel to NATO Vessel.** The adaptor is connected to the firemain via the 2.5 inch instantaneous male coupling and the Storz coupling is connected to the Storz coupling of the other vessel.

(b) **NATO Vessel to UK Vessel.** Similar method is adopted as before however a double ended 2.5 inch instantaneous female connection (NSN 4210-99-780-5667) is required to couple the adaptor and the RN vessels male hose connection together.

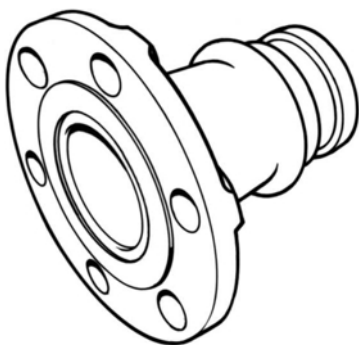
**Fig 27-3. NATO Suction Flange/
4.5 inch Female Thread Adaptor**



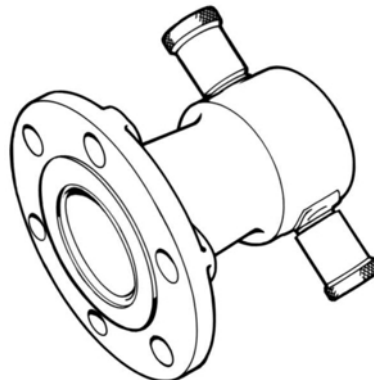
**Fig 27-4. NATO Suction Flange/
4.5 inch Male Thread Adaptor**

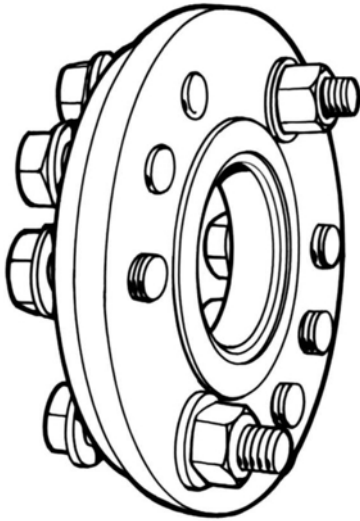


**Fig 27-5. NATO Delivery Flange/
Male Instantaneous Adaptor**



**Fig 27-6. NATO Delivery Flange/
Female Instantaneous Adaptor**



**Fig 27-7. NATO Delivery/International
Shore Flange Distance Piece****Fig 27-8. Storz Adaptor**