CHAPTER 22

HIGH PRESSURE SEA WATER SYSTEMS AND ASSOCIATED FIREFIGHTING EQUIPMENT

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2201. General

a. The high pressure sea water (HPSW) system supplies seawater throughout the ship, usually by means of a ring main, to supply the following services:

(1) Firefighting installations including spray systems in machinery spaces, magazines, flammable stowages and other high risk areas.

(2) Prewetting systems.

(3) Domestic and sanitary services.

(4) Ballasting and de-ballasting water-compensated fuel tanks and other tanks used for stability purposes.

(5) Eductors for salvage and general drainage.

(6) Hangar spraying systems in aircraft carriers.

(7) Flight deck firefighting systems in aircraft carriers.

(8) Cooling of essential machinery and equipment.

b. Pumping, flooding and draining are dealt with in Chapter 27. Portable and mobile firefighting equipment, and fixed firefighting installations (other than those supplied from the HPSW system) are dealt with in Chapter 23. This chapter contains a general description of the HPSW installations and their associated firefighting equipment. For detailed information concerning specific ships, reference should be made to the appropriate CBRNDC Class Book.

2202. Intermediate Pressure and Low Pressure Sea Water Systems

Cooling for electrical and other equipment and emergency cooling for certain other items of machinery can be supplied by seawater, at reduced pressure, from the HPSW system.

2203. HPSW Pumps

Electrically driven pumps supply the HP sea water main with a capacity of 72-200 m^3/h according to the size of ship. They are designed to produce about 7 bar pressure in the system and are dispersed throughout the ship, inside and outside the machinery spaces. The number of pumps fitted in any ship is based on the water requirement for firefighting, de-ballasting or prewetting, whichever is the greatest, together with any essential service such as emergency cooling water for important equipment, plus allowance for breakdowns. The sole duty of these pumps is to supply the HPSW main. They normally take suction directly from the sea although one or more of the pumps can also take suction from the discharge side of the diesel generator heat exchanger, or some other hot discharge, so that warmed water can be delivered to the system in arctic conditions. This facility is not fitted in all ships.

2204. Domestic Services

If it is possible, domestic services such as supplies to bathroom eductors, sanitary services, garbage disposal, sewage plants, refrigerating plant and other similar services, are generally grouped together so that supplies can readily be isolated to enable adequate pressure to be maintained in the system in an emergency.

2205. HPSW Main

a. This can be a ring main, a single line of piping, or cross-connected double lines, running fore and aft with extensions and branches as necessary to carry seawater under pressure to all parts of the ship. Bands of green tape, marked 'SEA', around the piping, identify it. Branches for firefighting and spray systems are painted bright red throughout their length. The main usually runs fairly high in the ship above the waterline. It is intended to work at about 7 bar but damage (or other causes) may cause the pressure to drop below this and most appliances for use on the main are designed to work at pressures as low as 2.4 bar.

b. The pumps discharge through vertical pipes called rising mains, which lead into the HPSW main. The numbering system for HPSW main valves is detailed in Para 0332. To prevent flooding from, or loss of pressure in, a damaged main, isolating valves are fitted:

(1) On each side of the junction of the rising main with the HPSW main.

(2) In the rising main below its junction with the HPSW main.

(3) On each side of branches leading to spraying installations.

(4) At each watertight bulkhead (transverse or longitudinal) if there is no other isolating valve in that section.

(5) On each side of a cross connection junction with the main.

2206. Pressure Gauges

Direct reading pressure gauges are fitted in the HPSW main adjacent to each riser. For single spot helicopter decks a direct reading gauge is fitted in the branch from the main immediately upstream of the monitors and hangar spray system. In ships with between deck hangars pressure gauges are fitted in each hangar access lobby to indicate upper main pressure. The remote pressure information in each zone is displayed in the SCC/HQ1, HQ2 and/or AHQ and Section Bases. Where the main is fitted on port and starboard sides of the ship, as a ring main, they are treated as separate mains and each is fitted with pressure gauges.

2207. Shore Connections

Connections into the HPSW main are provided normally fore and aft port and starboard to enable shore-supply water to be used for firefighting purposes while the ship is in dock. These can also be used for rigging emergency fore-aft breeching hoses in the event of damage to the system. In ships with flooding systems, water can be supplied up to the sea inlet valves through flooding bonnets.

2208. Hydrants

These are fitted to the HPSW main throughout the ship, each consisting of a screw-down or single-action lever operated control valve controlling one or two outlets which should be blanked by caps when not fitted with ready-use hoses or required for use. The screw-down valve should be shut **HAND TIGHT** only, as over tightening will cause damage to the valve seat. The single action lever operated control valve should, when required to be operated, be opened slowly to avoid the possible displacement of the seal.

2209. Hoses

Impermeable lay-flat delivery hoses are supplied for use with the HPSW main, and they vary in length from 2 to 18 m in the following 3 sizes:

a. **No 1 Size.** For use with Multi Purpose nozzles.

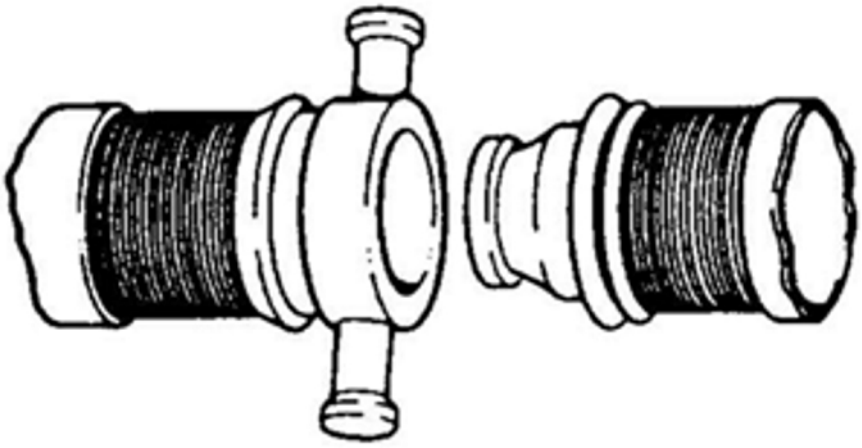
b. **No 2 Size.** For general use, located at all hydrants throughout the ship (except those fitted with No 3 hoses as sub para b below), 50 mm in diameter.

c. **No 3 Size.** For use with FB10X foam branchpipes and fixed inline inductors on flight decks and in hangar positions of some aircraft carriers, 70 mm in diameter. An allowance of No 3 hoses is also stowed at each Fire and Repair Party Post for use as a temporary HPSW main, as discharge hoses from portable pumps, discharge from Ramfans and on the inlet side of the controllable Y piece.

2210. Hose Couplings

Firefighting hoses are joined together and connected to the HPSW main by instantaneous couplings (Fig 22-1). Each coupling has a male and a female half. All hydrants have female connections so that when coupling a hose, **THE MALE END MUST BE TAKEN TO THE HYDRANT AND THE FEMALE END TOWARDS THE FIRE.** The marrying parts of the couplings are of one standard size but the tails are of a size to suit the hoses concerned. The female half of each coupling has a rubber seal that should be inspected regularly and maintained in good order.

Fig 22-1. Instantaneous Coupling



2211. Stowage of Hoses

WARNING

WITH THE EXCEPTION OF LPDS, HV SHIPS ARE TO DISCONNECT HOSES FROM HYDRANTS IN HV COMPARTMENTS AND ENSURE THE HYDRANT BLANKING CAPS ARE FITTED.

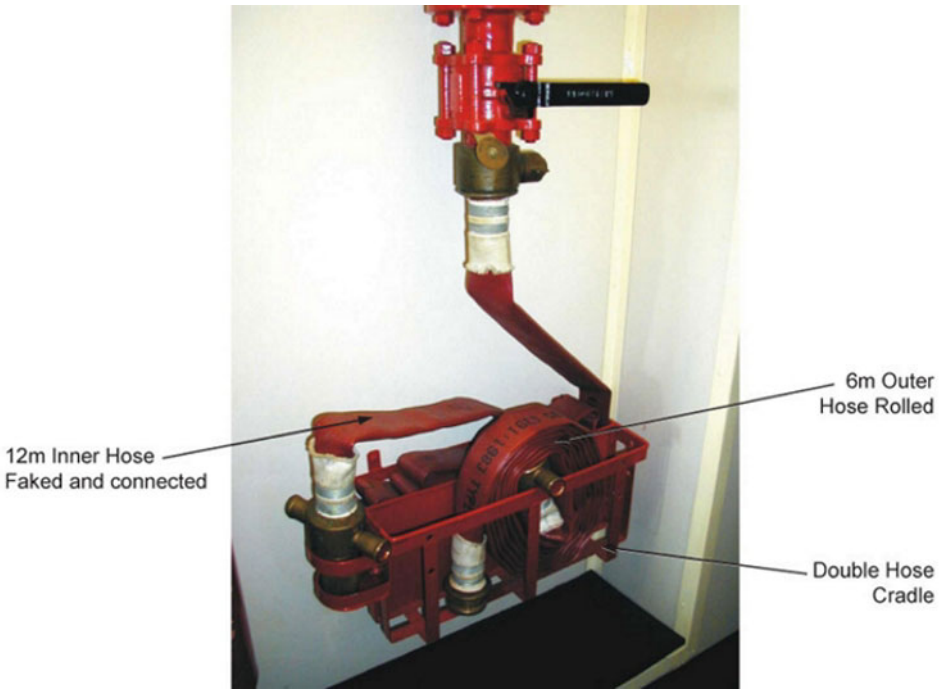
A hose should at all times be coupled to each hydrant and a nozzle connected to the hose so that water can be delivered immediately if it is needed (see WARNING). Although fairly robust, hoses need care if they are to be kept in good order, and the following instructions must be observed.

a. Hoses are to be faked down in their stowages ready for running out. Where double-hose baskets are fitted, the hose in the section of the basket closest to the bulkhead must be a faked 12 m hose (connected to the hydrant and with the correct nozzle), and that in the basket furthest from the bulkhead is to be a rolled 6 m hose. Where single baskets are fitted the 12 m hose is to be faked, connected to the hydrant with the correct nozzle fitted. Where applicable a rolled 6 m hose may be placed on top with the green transit straps removed to aid rapid deployment.

b. Hoses should not be left faked in their stowages for periods exceeding 4 months without being removed and run out for inspection. The position of the folds should be shifted when re-stowing.

c. Particularly when kinked, the hose should not be dragged over rough surfaces, especially when charged with water. To do so will subject it to severe local abrasion.

Fig 22-2. Stowage of Fire Hose



d. Because of pump vibration, a hose may chafe where it first touches the deck after leaving a portable pump outlet. Wrapping rags around the hose should protect this point of contact. Similarly, protective padding should be used where the hose passes over sharp edges, such as door or hatch coamings.

e. To avoid subjecting the hose to sudden shock or strain, and to avoid possible displacement of the seal, hydrants and pump delivery valves should always be opened slowly, and sudden closure of the nozzle should be avoided.

f. Hoses must be drained and wiped down before being stowed. To expel water, hoses should not be walked along the deck but should be under-run at shoulder height.

g. Hoses and couplings must not be painted.

h. Hoses should be washed and flushed through after contamination with fuels, oils and greases, and after use with AFFF.

i. Hoses, which are not filled with water, catch fire or melt when in contact with excessive heat or fire and must be stowed away from hot pipes or structure.

j. Sea lashings may be fitted to upperdeck hose baskets in all vessels to prevent loss or damage to the rolled and faked hoses during rough weather and high sea states. However, they must not inhibit access to, and the operation of, the hoses during an emergency.

k. LPH hangar fire point basket(s) carry two No 3 hoses. The inboard hose is Dutch rolled (see Fig 22-17) the outer hose is faked down in its stowage.

2212. Nozzles

Three types of hand-held nozzle are in service in HM ships:

a. **Firefighter Nozzle** (Fig 22-3). The Firefighter nozzle is provided at all between deck fire and weatherdeck hydrants already connected to a 12 m faked hose. It is stowed in the shut position. To operate the nozzle turn it one eighth of a turn to the right to provide a 2 m flat disc for personal protection. A further turn of one eighth of a turn to the right produces a 60° ragged spray, which is used for fighting fires. The output from a firefighter nozzle ranges from 10 - 17m³/hr (see Table 22-1).

b. **Waterwall Nozzle** (Fig 22-4). Waterwall nozzles are stowed adjacent to flightdeck hydrants to cover all flying activities, within upperdeck re-entry lockers (URDL) and 5 in number provided in each FRPP and outside high risk compartments ie galleys and machinery spaces. These nozzles are used to provide waterwall protection to firefighters. They are stowed in the shut position, which is achieved by turning the rotating sleeve fully to the right. Opening the nozzle by rotating the sleeve to the left produces, initially, a jet, but the nozzle must be opened fully to produce the desired waterwall. Water discharge capacities are given in Table 22-1.

c. **Multi Purpose Nozzle** (see Fig 21B-2). The Multi Purpose nozzle has recently been introduced into service, initially for use on the QEC Class only, with planned roll out to the Fleet to follow in due course.

Note. *The waterwall nozzles incorporated in flightdeck fire hydrant layouts ie hydrants adjacent to or on the flight deck are to remain in place to provide a spray waterwall or watersnake if necessary.*

Fig 22-3. Firefighter Nozzle

Fig 22-4. Waterwall Nozzle

WARNING

THE TEAM LEADER MUST ALWAYS BACK UP THE WATERWALL OPERATOR BEFORE OPENING OR CLOSING THE WATERWALL NOZZLE.

Table 22-1. Water Capacities of Nozzles in m^3/h

Pressure	Waterwall			Firefighter			Hatch Waterwall
(bar)	Spray 110°	Spray 90°	Jet	Spray 45°	Spray 90°	Jet	
2.4	23.9	22.9	15.5	8.3	5.4	9.7	
3.5	28.7	27.4	18.3	10.2	6.4	11.5	
4.5	32.5	30.7	21.1	11.5	7.4	13.1	
5.5	36.4	34.0	23.9	12.7	8.1	14.7	
6.9	40.4	37.8	26.4	14.2	9.3	16.3	
7.0							10
8.3	44.3	42.2	28.7	15.7	10.2	17.8	

Note. *To convert m^3/h into litres/min (approximately) multiply m^3/h by 17.*

Table 22-2. Foam Producing Characteristics of Branchpipes

	FB5X Mk 2	FB10/10
Water pressure in bar	5.5	not less than 4.1
AFFF consumption in ltrs/min	13.5	25
Foam delivery in ltrs/min	2,250	4,540

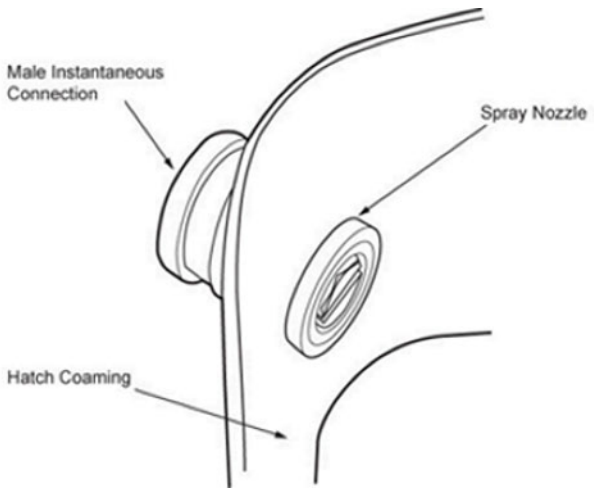
Table 22-3. Water Capacities of Branchpipes in m^3/h

Water Pressure in Bar	FB5X Mk 2	FB10/10
2.4	9.1	22.4
3.4	10.4	26.9
4.8	12.1	30.5
5.5	13.4	34.0
6.9	14.9	38.1
8.3	16.5	41.1

2213. Fixed Hatch Waterwall Nozzle

Fixed hatch waterwall nozzles are fitted primarily in the corners (their spray angle is approximately 120°) of all hatches leading to high fire risk compartments to facilitate re-entry when firefighting by providing a more effective sealing waterwall and possibly reducing the number of personnel in close proximity to the hatch. Where the fitting of these nozzles obstructs guardrail stanchions then the stanchions must be re-sited and their chains adjusted to length accordingly. The nozzle blanking cap is to bear the same watertight and gastight control marking as the hatch and is to be fitted when the nozzle is not in use. The use of the FHWW is to be closely controlled by HQ1 due to the possible hazards of electrical shock and the large amount of water that can be discharged into a compartment.

Fig 22-5. Fixed Hatch Waterwall Nozzle



2214. Waterwall Nozzle Mounting Pole

The procedure, detailed in Annex 21A and in BR 4007, for fighting surface ship fires from below requires an operating waterwall nozzle to be raised through a hatchway from below. This is achieved by mounting the nozzle on a special, 1 m long, pole (see Fig 22-6). A separate, 2 m long, support pole (see Fig 22-7) is used for pushing the hatch open from the deck below. The V shaped cradle on this pole is used to assist in positioning the waterwall nozzle mounting pole in the hatchway. A lug on the waterwall mounting pole allows it to be located on the hatch coaming.

Fig 22-6. Waterwall Nozzle Mounting Pole

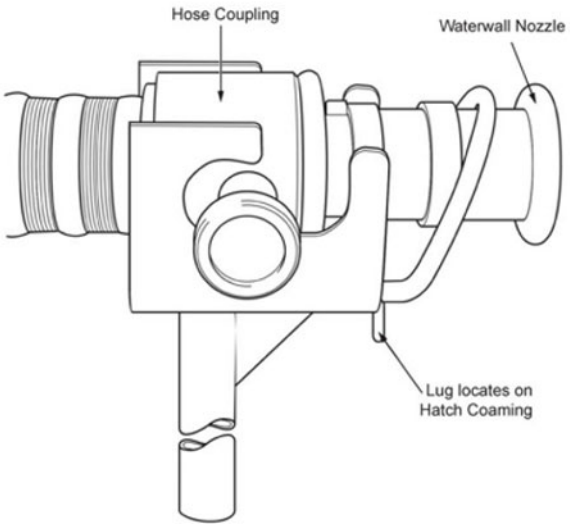
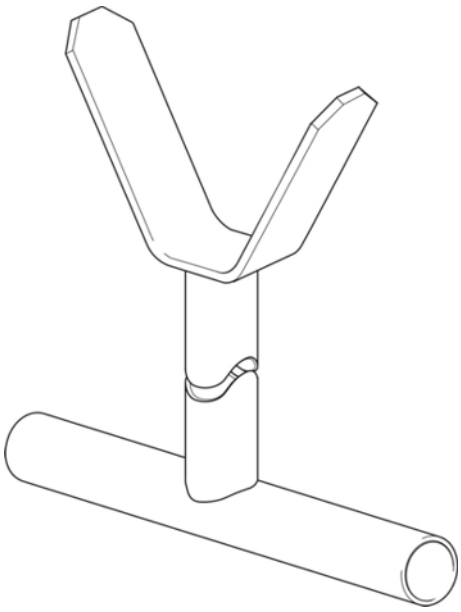


Fig 22-7. Support Pole



2215. Foam Making Branchpipes

The two types of foam making branchpipe used in ships are the FB5X Mk 2 and the FB10/10.

2216. FB5X Mk 2 Foam Making Branchpipe

The FB5X Mk 2 is a lightweight branchpipe for general use against liquid fires in ships, except in the hangar or on the flight deck. It is only to be used with size 2 hoses. Using size 2 hoses, the consumption rate for a 20 ltr container of AFFF is approx 60 seconds with a water pressure of 6.9 bar. A good backup supply of AFFF containers is therefore essential. The FB5X Mk 2 is fitted with an open/shut facility that enables the operator to control the foam discharge. It is also fitted with a foam mix selector that for RN application must always be pinned at the 6% AFFF position. The pick-up assembly (suction hose and spill) are attached to the branchpipe by a quick-release coupling. **The FB5X is to be stowed with the pick-up assembly attached.** To induce AFFF, the cap of the AFFF container must be removed and the spill pickup inserted. The FB5X is also used to put foam into machinery spaces through foam inlet tubes.

Fig 22-8. Foam Branchpipe FB5X Mk 2

2217. FB10/10 Foam Making Branchpipe

This is a high-output branchpipe used only on flight decks and aircraft carriers. Each of the hydrants in these positions has an FBU10 inline inductor bolted to the flange before the instantaneous coupling. The pick-up assembly is attached to the inductor and has a shut-off cock that is to remain in the open position. The inductor passes a mixture of AFFF and water through a No 3 hose to the branchpipe that aerates and delivers the foam at the rate of about 4540 ltrs/min. The branchpipe needs a HPSW main pressure of not less than 4.1 bar at the branchpipe to produce foam of good quality, and will consume about 25 ltrs of AFFF per minute. A handle at the output end of the branchpipe operates a swirl-vane selector that enables foam to be delivered to a distance like a jet or less forcibly as a spray. (A waterwall nozzle is stowed at each hydrant and can be attached to the hose in place of the branchpipe, with the pick-up shut off, to produce a waterwall spray protection). The FB10/10 is a commercial variant of the FB10X and is similar in design and performance; it replaces the FB10X only on a wastage basis.

2218. Characteristics of Foam Making Branchpipes

The foam-producing characteristics of the branchpipes are given in Table 22-2 and the water capacities in m^3/h of the branchpipes are given in Table 22-3.

Fig 22-9. Foam Branchpipe FB10(X) or FB10/10

2219. Portable Inline Inductor FBU5X

This inductor is designed for use with the FB5X and **is to be stowed with the pick-up assembly attached.** Its purpose is to allow AFFF to be introduced into the hose line at or near the hydrant position and not directly into the branchpipe. This allows the operator much greater mobility in that he is no longer encumbered by AFFF containers and the pickup assembly when passing through doorways, hatches and when using ladders. The inline inductor comes complete with stowage bracket and a 2 m length of No 2 hose (for use between the hydrant and the inductor). The inline inductor is fitted with a quick release coupling which incorporates a non-return valve, this prevents the AFFF container being pressurised when the FB5X control valve is shut off. When the inline inductor is in use the branchpipe pick-up spill is not required (the spill connecting point on the branchpipes need not be blanked off). The inline inductor should not be used when the FB5X is being used to introduce foam via inlet tubes. The number of inductors onboard are small and they are best kept for use with firefighting hoses which are being moved around by operators, as opposed to static hoses, eg those led to foam inlet tubes.

Note. *When using the FB5X with its spill pickup assembly, the portable inline inductor should not be connected into the hose line, as this will induce air and prevent foam induction at the branchpipe.*

Fig 22-10. Portable Inline Inductor FBU5X

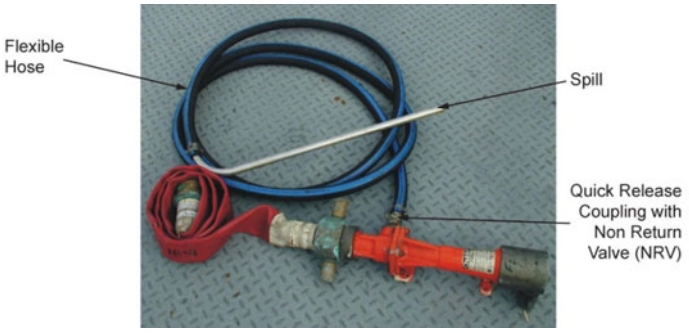


Fig 22-11. Spill Pickup Assembly In Use

2220. Controllable Y Piece

WARNING

'Y' PIECES ARE NOT TO BE USED TO PROVIDE A WATERWALL AND A FIREFIGHTING HOSE TO THE SAME TEAM OF FIREFIGHTERS. THE WATERWALL AND FIREFIGHTING HOSE MUST COME FROM DIFFERENT HYDRANTS.

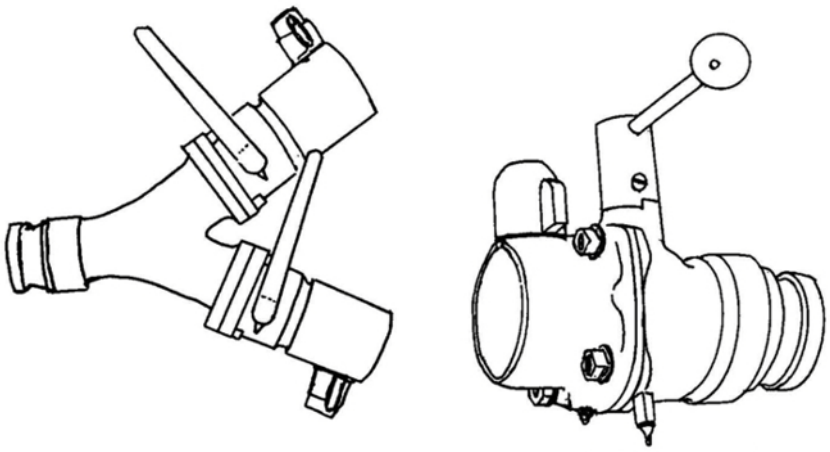
The controllable Y piece, shown in Fig 22-12a is manufactured from anodised aluminium and replaces the non-controllable gunmetal version. It is carried in ships in order that two hoses may be run from a single hose or hydrant. It is particularly useful in:

a. Boundary cooling.

b. Allowing the extension of a hose in either leg.

c. Isolating burst hoses.

Fig 22-12. Couplings and Adaptors



a. Controllable Y piece

b. Controllable Coupling

CAUTION

These aluminium Y pieces are only to be connected to hydrants using the 2 m length of No 3 hose provided. Connecting directly to the hydrant will cause the aluminium to fracture.

2221. Inline Controllable Coupling Piece

This coupling piece is shown in Fig 22-12b. It can be used:

a. To connect onto through-bulkhead connectors to facilitate zone isolation.

b. At clipped doors to enable closure in Condition Alfa.

c. On long hose runs to enable the hose handler to turn off and extend the run without going back to the hydrant.

2222. Double Ended Hose Adaptor

The double male and double female instantaneous adaptors, shown below, are provided to permit emergency runs of hoses between hydrants.

Fig 22-13. Double Ended Adaptor

2223. Flange Adaptors

A range of flange adaptors is provided to allow the HPSW main or firefighting pumps to be connected to other NATO ships or merchant ships. The adaptors are detailed in Chapter 27 and ship allowances are listed in BRd 2170(3).

2224. Emergency Bulkhead Hose Connections

The purpose of these connections is to allow a run of hoses, when the HP sea water main has been damaged, between adjoining watertight subdivisions without compromising watertight integrity by opening doors. They may also be used to help contain smoke when firefighting by allowing watertight doors on smoke boundaries to be kept closed. Connections are fitted in selected bulkheads, usually where the HPSW main is not duplicated and not adequately protected by structure, ie generally in the fore and after parts of the ship. Normally, the instantaneous coupling on the forward side of the bulkhead is female, and the after side is male. Where 2 connections are fitted in the same bulkhead, one will be male-aft and female-forward and one will be female-aft and male-forward. The blanking caps must always be kept fitted to bulkhead hose connections except when the connections are in use, to preserve watertight integrity, and they should bear the same WT and GT control marking as the adjacent door.

2225. Centre Feed Hose Reel

The Centre Feed Hose Reel (CFHR) is a first aid firefighting appliance, normally used in the FOAM mode, but with the facility to be used in the WATER mode for boundary cooling. The Mk 2 CFHR layout is shown at Fig 22-14.

2226. CFHR Standby Condition

a. The normal 'STANDBY CONDITION' for the 3 way selector valves is summarised as follows:

(1) Two HPSW Isolating Valves Fitted:

(a) HPSW isolating valve **PINNED OPEN.**

(b) HPSW valve adjacent to the inductor panel **SHUT.**

(c) Foam/Water selection lever set to **FOAM.**

(d) Nozzle valve **SHUT.**

(2) One HPSW Isolating Valve Fitted Adjacent to the Inductor Panel:

(a) HPSW valve adjacent to the inductor panel **SHUT.**

(b) Foam/Water selection lever set to **FOAM.**

(c) Nozzle valve **SHUT.**

b. At DC State 1, centre feed hose reels are to be de-isolated and pressurised up to the nozzle control valve. After use or when reverting to DC State 2 or 3 the hose reels are to be isolated and drained down.

c. After use in the foam mode the CFHR is to be flushed to remove any residue AFFF.

Fig 22-14. Centre Feed (Foam/Water) Hose Reel Unit (Mk 2)

2227. CFHR Operating Instructions

Operating instructions and a deck plan showing compartments served by that CFHR are to be displayed adjacent to each CFHR. The CFHR is operated as follows:

a. **First Aid Firefighters**

(1) Take hold of the pistol grip in the hand and place hose under the arm (left or right as preferred)(see Fig 22-15).

(2) Pull an adequate length of hose off the reel to manoeuvre.

(3) Check operating lever is in the off position.

(4) Check nozzle is in spray.

(5) De-isolate CFHR from the HPSW main.

(6) Check foam mode is selected on the induction panel (inductor handle pointing towards you).

(7) Place spill pick up into a drum of foam.

(8) Open nozzle in a safe direction to prove foam/CFHR works in spray.

(9) Once foam is produced dress the hose over the opposite shoulder then either:

(a) If CFHR is adjacent to the fire, get into position to fight the fire down on one knee. Turn the nozzle to provide a 30° cone of foam and fight the fire.

OR

(b) Isolate the nozzle, proceed to an area adjacent to the compartment of the fire. In a safe direction prove the foam in spray. When foam is produced continue into the compartment, down on one knee. Turn the nozzle to provide a 30° cone of foam and fight the fire.

(10) The next person on the scene is to check AFFF levels.

b. **Boundary Cooling**

(1) Take hold of the pistol grip in the hand and place hose under the arm (left or right as preferred).

(2) Pull an adequate length of hose off the reel to manoeuvre.

(3) Check the operating handle is in the off position.

(4) Check nozzle is in spray.

(5) De-isolate CFHR from the HPSW main.

(6) Check water mode is selected on the induction panel (handle against the wall).

(7) Open nozzle in a safe direction to prove CFHR works in spray.

(8) Turn of the nozzle.

(9) Dress the hose over the opposite shoulder and make your way to the compartment to boundary cool.

(10) Boundary cool using the minimum amount of water.

c. **In Use.** When operating the CFHR it is important to have total control of the nozzle at all times. The technique of 'dressing' the CFHR is to be adopted to provide greater nozzle control when advancing into a fire/boundary cooling situation with a CFHR (see Fig 22-15). This technique has an advantage in that there is no strain on the hose/nozzle connection when the CFHR is in use and aids better control of the nozzle. Operators are to dress in the appropriate firefighting rig as ordered (see Chapter 25).

d. **After Use**. Following the use of the CFHR in the foam mode, the CFHR is to be flushed through with water. Check the water mode is selected on the induction panel (handle against the wall). Operate the nozzle in the 'flush mode' in a safe direction, close the nozzle, isolate HPSW main, drain hose and turn the nozzle to the 'off' position. Re-select foam mode, stow hose on the reel taking care to rewind the hose in the correct direction to avoid kinking at the exit to the drum and stow spill pick up.

Fig 22-15. Dressing Technique Using the CFHR

2228. Ramfan

a. The Ramfan (see Fig 22-16) is a water driven turbine, one-man portable, fan. Its purpose is smoke clearance or double bottom venting. It is driven from the HPSW main and will accept any pressure from 2.75 to 12.4 bar (40 to 180 psi) via a male instantaneous inlet coupling. Water discharge is from a female outlet coupling to be connected, via a Size 3 hose, to any discharge overboard. Airflow is through 5 m lengths of 300 mm diameter hose.

This hose is rigid across its diameter but collapsible along its axis into half metre high bags, two of which can be carried by one person. A fan set comprises one fan and four lengths of hose. One set is kept at each FRPP.

b. Where there is a requirement over and above the capability of the ships ventilation system, to remove smoke from areas adjacent to a fire or remove smoke or fumes after the extinction of a fire, the Ramfan with its associated flexible ducting may be used in the Negative Pressure Ventilation (NPV) mode, ie fan suction, from the vented space. After use, the water turbine should be flushed through with fresh water to inhibit corrosion.

Fig 22-16. Ramfan and Ducting

2229. Flooding and Spraying Systems

Flooding systems are no longer fitted in main magazines but they are fitted to some magazine lockers on the upper deck of ships. A variety of fixed water spray systems are fitted in ships, mainly in magazines, machinery spaces, flammable stowages and aircraft hangars. The following paragraphs give a brief description of the most common types. Full details are given in class-specific Books of Reference. JSP 862 Parts 1, 2 and Addendum - MOD Maritime Explosive Regulations - Surface Ships, Submarines and MAPS gives generic instructions for magazine systems.

2230. Manually Operated Spray Systems

Each manually operated spray system is supplied with seawater from the HPSW system via an isolating valve, a strainer and a spray valve. The spray valve can be operated from two locations. Open ended sprinklers are normally fitted, although some explosive lockers have a perforated pipe instead. Some machinery space systems can also be used to spray foam.

2231. Automatic Spray Systems

Magazine automatic spray systems are permanently charged with fresh water, pressurised by the HPSW system. The spray valve and HPSW isolating valve are both locked open when a magazine contains ammunition. Each spray head incorporates a quartzoid bulb that bursts at a predetermined temperature to release the fresh water, followed by seawater from the HPSW system. A water flow alarm with remote indication is fitted to give warning when the system has operated automatically.

Fig 22-17. Sprinkler Head

2232. Pressurised Reservoir Systems

Magazines that contain a large amount of propellant and high explosive require an automatic system with an instant high flow rate of water. A pressurised fresh water reservoir is therefore fitted to give the initial flow, allowing time for extra HPSW pumps to be started. When one or more of the quartzoid bulbs bursts, water is expelled from the fresh water reservoir by compressed air pressure acting on a rubber diaphragm bag in the reservoir.

2233. Rapid Reaction Spray Systems (RRSS)

The magazine rapid reaction spray system is a pressurised reservoir system, activated by smoke detection. The pneumatically operated spray valve is opened automatically by a control system. When the spray valve opens, the ships HPSW pumps are automatically started sequentially to provide the required flow.

2234. Metron Activated Spray Systems (MASS)

The Metron activated spray system has quartzoid bulb spray heads in a pressurised system similar to that described in Para 2231. In addition to the normal activation by temperature, the quartzoid bulbs can also be burst by small charges, initiated by smoke detectors, via a control system. The control system can be switched to manual mode but it is normally left in automatic mode when ammunition is embarked.

2235. RRSS and MASS Operating Procedure Whilst Conducting Exercise Serials

a. With the introduction of optical and heat detectors replacing optical only detectors to RRSS and MASS systems concern has been raised that in the interim that there is a slight possibility that training smoke could inadvertently activate legacy, smoke detector systems when in the automatic mode of operation during Operational Sea Training (OST) and exercise serials (either in OST or day-to-day training plans).

b. To mitigate erroneous operation of MASS and RRSS, ships fitted with smoke detectors are to change the operating mode to manual prior to any serials where training smoke is likely to be used in support of the training serial in the vicinity of magazines. Whilst it is acknowledged that this reduces the overall effectiveness of these fire protection systems, the change of operating mode must be closely managed by the Explosive Responsible Officer to ensure that the safety of the magazine is not compromised. The routine to be carried out whilst conducting exercise serials is that all:

(1) Platforms fitted with RRSS and MASS systems with smoke and heat detectors are to be left in automatic mode at all times, except in the following instances when false activation is likely:

(a) T23 Gunbay system during Medium Range Gun firings.

(b) When undergoing routine maintenance.

(2) Platforms fitted with RRSS and MASS systems with smoke detectors are to be left in automatic mode at all times, except in the following instances when inadvertent activation is likely:

(a) Conducting CBRNDC training serials where training smoke is to be employed.

(b) T23 Gunbay system during Medium Range Gun firings.

(c) When undergoing routine maintenance.

2236. Hangar Spray Systems

Manually operated HPSW spray systems are fitted to aircraft hangars in ships. In larger hangars, the system is divided into separate grids, each with its own spray valve. Great care must be taken to prevent the accumulation of free surface water from hangar spray systems. Hangar scuppers must be kept clear at all times and they must be constantly checked when sprays are operated.

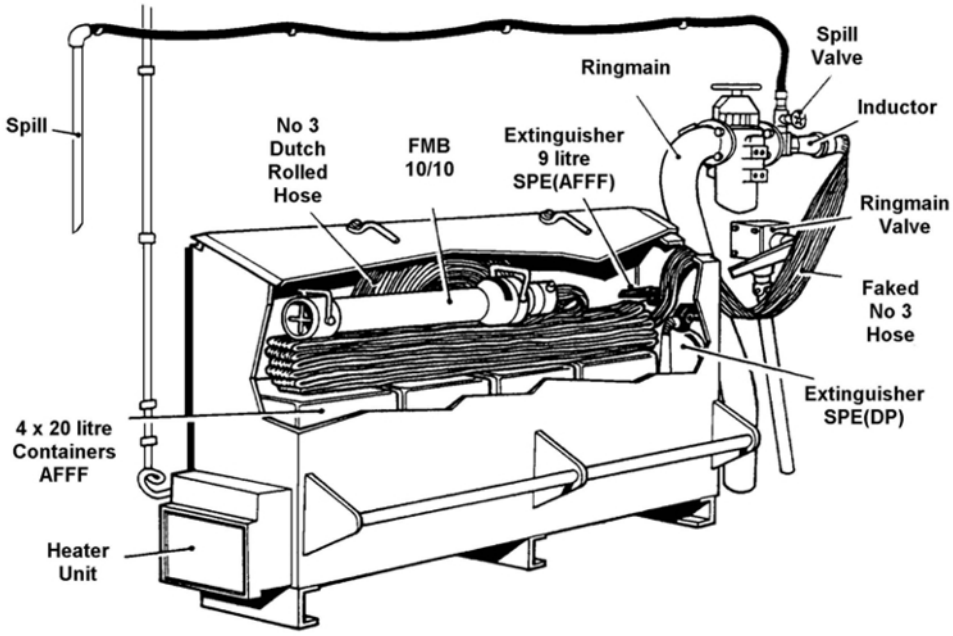
2237. Dry Risers

In some ships, minor compartments such as messdecks are fitted with dry HPSW or foam spray systems. Each system is terminated, outside the protected compartment, in a male instantaneous hose connection protected by a female blanking cap. If no isolating valve is fitted, the blanking cap is to bear the same watertight and gastight control marking as any adjacent door/hatch in the bulkhead/deck through which the system passes.

2238. Flight Decks

In aircraft carriers an independent sea water main is run under the flight deck supplied by its own pumps which produce about 7-9 bar pressure to the hydrants located on the flight deck and on the catwalks. At each hydrant (fire point) a metal locker provides a degree of protection for fire equipment against the weather and downwash from aircraft. Inside the locker, at the bottom, 4 x 20 ltr canisters of AFFF are stowed alongside a 9 ltr SP AFFF and a 9 ltr SP dry powder extinguisher. A No 3 hose is faked across the top of the AFFF containers and the female end connected to a Foam Making Branchpipe 10/10, the male end being routed outside the top of the locker and connected to the inductor. An additional No 3 hose is also stowed in the locker and is Dutch rolled. A waterwall nozzle stowed in the locker can replace the branchpipe, providing spray waterwall if necessary. Fig 22-18 shows a typical flight deck arrangement.

Fig 22-18. Typical Flight Deck Fire Hydrant Arrangement



2239. Dutch Rolling of Hoses

On flight decks manned by aircraft handlers, ie on multi-spot decks, spare fire hoses are stowed using the Dutch rolled method. Stowage and deployment of Dutch rolled hoses is achieved as follows:

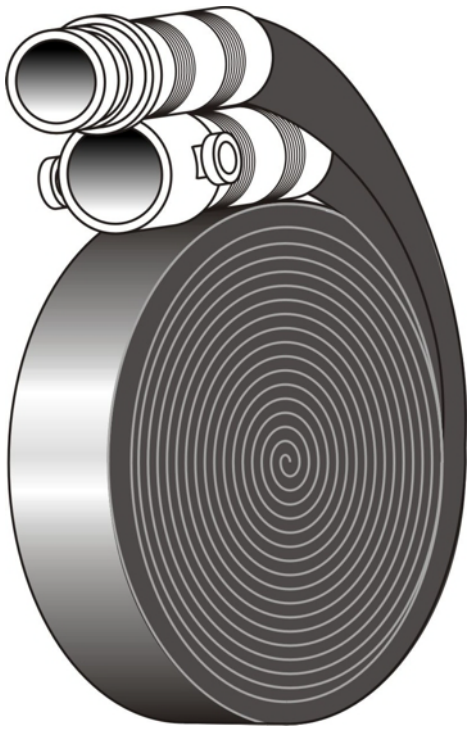
a. **Stowing the Hose.** Lay the hose out flat. Draw the female coupling back along the hose length to 10 cms short of the male coupling. Once the upper layer has been aligned precisely over the lower layer the hose can be rolled up from the bight with the couplings coming together on the outside of the roll.

b. **Deploying the Hose.** To deploy the hose after removing it from its stowage, it should be held in front of the couplings with one hand supporting the roll of the hose. The hose is then rolled away so that it uncoils itself leaving a loop of hose on the deck. The male coupling can then be attached to the pump/hydrant/hose and the female coupling taken towards the fire.

c. **Stowing Dutch Rolled Hose**. The Dutch rolled hose is to be stowed as shown in Fig 22-19.

Note. *The Dutch rolled hose method is only to be used on flight decks and also in hangars of QEC, LPD, LPH and RFA ARGUS. Its use between decks, in any ship, is prohibited.*

Fig 22-19. Dutch Rolled Hose



2240. Flight Deck Monitor

a. The flight deck monitor is used to project foam onto the area of an aircraft landing spot. The type of monitor varies between ship classes; the automatic oscillating type is illustrated at Fig 22-21. In this type, a Pelton wheel water motor, using a small amount of HPSW, provides the power for oscillation. The frequency of oscillation is dependent on HPSW supply pressure, but it is typically eight cycles per second at 7 bar. The range of oscillation and nozzle elevation are set during installation, but must be confirmed by a full functional check if adjusted during maintenance work. When not in use, the monitor is to be set in the automatic oscillating mode, with the nozzle centred. Monitors that do not have the automatic oscillating mode must be traversed and elevated manually. Monitors are supplied with 1% AFFF, the concentrate being stored in a dedicated tank.

b. **AFFF Storage Tanks**. These tanks are to be marked with 20 mm white letters on a red background stating: 'Time' in minutes (total capacity of AFFF), the % concentration of AFFF and the AFFF LIFEX date as shown in Fig 22-20.

Fig 22-20. Marking of Bulk AFFF Storage Tank

AFFF BULK STORAGE TANK

X MINUTES TOTAL CAPACITY OF AFFF

Y% CONCENTRATION

LIFEX XX(DAY)XXX (MONTH) XXXX (YEAR)

Note. *Time in minutes (X), percentage concentration (Y%) and date for each tank onboard to be added using Fig 22-20 as a template.*

Fig 22-21. Automatic Oscillating Monitor