CHAPTER 5

FIRE PUMPS, FIRE MAINS, WATER SERVICE PIPES, HYDRANTS, HOSES, NOZZLES, COUPLINGS AND INTERNATIONAL SHORE CONNECTIONS

Key Changes

Minor revision which incorporates the latest IMO Circulars, and updated guidance for these items/equipment.

All amendments are highlighted in yellow

5.1 Pumps

5.1.1 Power pumps

5.1.1.1 The output, capability and minimum pressure to be provided by power pumps are set out in the regulations. Note that the minimum pressures are to be attained at all hydrants, and will usually be lowest when measured at the highest hydrant. When assessing pump capacity, due regard must be taken of any additional water demands on the fire pumps over and above those of the fire hose jets, e.g. water spray systems covered in the Fire Protection Arrangements Instructions Chapter 8.3.3.

5.1.1.2 The regulations may require provision of fire pumps which are "independently driven". This may be interpreted as being independent of the main engine and, therefore, capable of operation at maximum output regardless of main engine speed.

5.1.1.3 The required nozzle size may be ascertained from the table shown in paragraph 5.3.2, using the minimum pressure and the smallest main fire pump allowed by the regulations. Pressure on the fire hoses should not, in general, be in excess of that at which one man can effectively control the jet of water produced by a hand held nozzle, and this should be demonstrated to the surveyor's satisfaction in all cases where the pressure at the hydrant exceeds 7 bar.

5.1.1.4 The pump, and its suction, should be so positioned that the pump will operate efficiently at the lightest draft likely to be encountered in service under all conditions of list, trim, roll and pitch, having regard to the probable deterioration of the pump, and internal growth of corrosion products in the suction pipe. In all ships fire pump suctions are expected to be of a permanent nature.

> *The ballast condition of a ship on entering or leaving a dry dock need not be considered a service condition.*

(Unified Interpretation - MSC/Circ. 847)

> *Where necessary to ensure priming, the emergency fire pump should be of the self priming type.*

(IACS Unified Interpretation SC 164)

5.1.1.5 A 'Throw-over' sea suction can only be accepted for the second fire pump, as required on existing vessels built prior to 16th December 1998 under the MCA LY1 Code, and whose surveys commenced before 1st June 2006. 'Throw-over' suctions should have sufficient weight and length to minimise the chances of loss of suction, and be of such construction that they will not nip or collapse under minimum expected (absolute) pressure.

5.1.1.6 Means of priming by air extraction should normally be fitted when the pump is sited more than 2 m above the lightest service draft, unless the pump

is of the positive displacement type, in which case it is recommended that the suction head should not exceed 4.5 m.

5.1.1.7 Connection of pumps to the fire main, additional to those designated as fire pumps (SOLAS II-2 Reg. 10.2.2.3.3)

> *This paragraph does not force designers to choose pumps with capacity and pressure characteristics other than that being optimal for the service intended, just to make their connection to the fire main possible, provided the required number and capacity of fire pumps are already fitted.*

(Unified Interpretation - MSC/Circ. 1120)

5.1.1.8 Primers are not required for additional pumps.

5.1.2 Emergency fire pumps in cargo ships

MSC.1/ Circ.1388 gives the unified interpretation of FSS Code Chapter 12, paragraph 2.2.1.3 for the suction head requirements for the emergency fire pumps in cargo ships, which should be applied to ships constructed on or after 1 January 2012.

5.1.3 Hand pumps and power pumps in lieu

5.1.3.1 Surveyors should be satisfied, by tests on board, that any hand pump provided in accordance with the regulations is of adequate strength and capacity, and that there is sufficient manpower on board the vessel to operate the pump, and handle its associated fire hose.

5.1.3.2 If the hand pump is arranged to discharge into a fire main, it should be capable of producing the required jet of water from the standard nozzles provided for the ship; a suitable isolating valve should be positioned in the fire main outside the machinery space. In such cases, the use of hand pumps with nozzles exceeding 12mm bore is not recommended.

5.1.3.3 Where an owner elects to fit a power pump in lieu of a hand pump, and it is arranged so as to discharge into a fire main, the pump should be capable of producing, from any of the fire hydrants, a jet of water having a throw of not less than 12m through a nozzle of the minimum size allowed by the regulations. Where such a pump is not arranged to discharge into a fire main, its capacity and performance need be no greater than that required for a hand pump.

5.1.3.4 It should comply with regulation requirements and be situated, with its power source, outside the machinery spaces. Where not specified by regulation, the power source should be adequate to power the pump for a minimum of 1 hour.

5.1.4 Arrangement of pumps

5.1.4.1 In all ships, where the arrangement of power pumps, and their sources of power, is such that a fire in one compartment would not put all the fire pumps out of action, the surveyor should be satisfied that in the event of fire in any space containing one of these pumps, access to another pump is always available, and security of its efficient operation and source of power is maintained.

5.1.4.2 Protection of access

> *When a single access to the emergency fire pump room is through another space adjoining a machinery space of category A or the spaces containing the main fire pumps, class A-60 boundary is required between that other space and the machinery space of category A or the spaces containing the main fire pumps.*

(IACS Unified Interpretation SC 114)

5.1.4.3 Clarification of fire proof separation:

> *Unless the two main fire pumps, their sea suctions and the fuel supply or source of power for each pump are situated within compartments separated at least by A0 divisions, so that a fire in any one compartment will not render both fire pumps inoperable, an emergency fire pump should be fitted.*
>
> *An arrangement in which one main fire pump is located in a compartment having more than one bulkhead or deck adjacent to the compartment containing the other main fire pump should also require an emergency fire pump.*

(IACS Unified Interpretation SC 162)

5.1.4.4 Electrical cables for the emergency fire pump (SOLAS II-2 Reg. 10.2.2.3.1.2)

> *So far as is reasonably practicable the electrical cables to the emergency fire pump are not to pass through the machinery spaces containing the main fire pumps and their source(s) of power and/or prime mover(s). Where the ship arrangements are such that the cables have to pass through these spaces the cables are to be of a fire resistant type and specially protected against mechanical damage, e.g. run in heavy gauge pipe. They are to be of a fire resistant type where they pass through other high fire risk areas, (in accordance with IACS unified Requirement E 15 Electrical Services Required to be Operable Under Fire Conditions and Fire Resistant Cables, paragraph 1).*

(IACS Unified Interpretation SC 165)

5.1.4.5 The same principles should be applied when a second main fire pump is fitted in lieu of an emergency fire pump.

5.1.5 Independently driven power operated emergency fire pumps

5.1.5.1 FSS Code Chapter 12 contains the general specifications for fixed independently driven power operated emergency fire pumps as required by SOLAS chapter II-2.

> *"Interpretation of chapter 12 of the FSS Code*
>
> *The emergency fire pump shall as a minimum comply with paragraph 2.2.1.1. Where a fixed water-based fire-extinguishing system installed for the protection of the machinery space in accordance with SOLAS regulation II-2/10.4.1.1 is supplied by the emergency fire pump, then the emergency fire pump capacity should be adequate to supply the fixed fire-extinguishing system at the required pressure plus two jets of water. The capacity of the two jets should in any case be calculated at not less than 25 m³/h.*
>
> *The minimum pressure referred to in paragraph 2.2.1.2 should be understood to mean 0.27 N/mm².*"

(Unified Interpretation - MSC.1/Circ.1314)

5.1.5.2 Where the regulations require an independently driven power operated emergency fire pump to be fitted, this can be met by a self-contained compression ignition engine driven unit, or an electrically or hydraulically driven unit. Such units, their sea suctions, means of priming, sources of power supply, switchboards, electric cables and hydraulic piping, as appropriate, must not be in the compartment containing the main fire pumps, but in a position not likely to be cut off by fire or smoke in that compartment, and be such that the supply of water is ensured at all times.

5.1.5.3 The emergency pump should generally be situated in a well ventilated space, having a safe access to the open deck, and be well clear of the machinery space containing the other fire pumps. When the emergency pump is the only means of providing water for the operation of, or use in connection with, a required fixed fire extinguishing installation for the machinery space, regard should be paid, particularly to the ready accessibility of the pump controls in all weather conditions, so that the system can be brought quickly into use. Diesel driven units should have the air inlet so situated as to minimise the risk of engine failure due to smoke or water ingress.

5.1.5.4 Where an emergency fire pump is situated in a steering gear flat, or similar space, and access from such space into the machinery or boiler space is to be provided at the specific request of the owner, the arrangement may be accepted providing the access is by means of an airlock, each of the two doors being self-closing. In such cases, a second means of access to the space containing the emergency fire pump should be provided.

5.1.5.5 In case of an airlock, the door of the machinery space should be of A-60 class standard, the other door should be at least of steel, both reasonably

gastight, self-closing and without any hold back arrangements, as per SOLAS Ch II-2 Reg. 10.2.2.3.2.2.

5.1.5.6 In ships with all aft machinery spaces, the position of the emergency fire pump should be carefully considered, due regard being paid to the possibilities of fire and explosion within the machinery spaces, including the pump room in the case of tankers.

5.1.5.7 In tankers, there should, in general, be a cofferdam or void space between the space containing the emergency fire pump and any adjacent cargo oil tank, unless the pump is driven from a prime mover situated in a non-hazardous area outside the space. The means for driving the pump, e.g. pneumatic or hydraulic transmission, should be safe and suitable for use within the space containing the emergency fire pump, and the pump suction and discharge valves should be capable of being operated from outside the space, and the prime mover should be in a non-hazardous area. Notwithstanding the above, it is considered undesirable for the emergency fire pump, so driven, to be placed in a hazardous area of a tanker having common boundaries with the machinery space containing the main fire pumps or their source of power. However, where it is impracticable for the pump to be sited elsewhere, proposals to locate it within the main cargo pump room would be considered on their merits.

5.1.6 Starting arrangements

5.1.6.1 Such arrangements for emergency fire pumps must be outside, and independent of, the space containing the main fire pumps, and should be accessible, easy to operate and capable of readily starting the engines when cold. When the emergency fire pump is electrically driven by an emergency generator, or a direct or hydraulically coupled compression ignition engine, the unit should be capable of being started manually. It is essential that such emergency units should be capable of being readily started when cold.

> *If the room for the diesel driven power source is not heated, the diesel driven power source for the pump should be fitted with electric heating of cooling water or lubricating oil.*

(Unified Interpretation - MSC/Circ. 1120)

5.1.6.2 When hand starting is impracticable, other means should be provided.

> *The other means of starting include those by compressed air, electricity, or other sources of stored energy, hydraulic power or starting cartridges.*

(Unified Interpretation - MSC/Circ. 1120)

5.1.6.3 The means of starting should be capable of providing not less than six starts in a period of thirty minutes, and at least two starts should be obtained in the first ten minutes. Such starting arrangements should be independent of sources of power in the machinery spaces.

5.1.6.4 Where air starting is used, an independent air compressor should be provided adjacent to the emergency unit, and the capacity of the air receiver, together with the independent air compressor, should be such as to provide for the number of starts in the times stated. The air compressor should be driven by a hand starting compression ignition engine. The air receiver should be reserved solely for the purpose of starting the emergency unit, and the air inlet pipe should be fitted with a non-return valve at the receiver.

5.1.6.5 In passenger ships, starting by means of electric batteries may be accepted, provided there is an alternative means of starting which may be compressed air. In cargo ships, where battery starting only is used, two sets of batteries, each capable of six starts without recharging, should be fitted. The arrangements should ensure that at least one set of batteries is always maintained in the fully charged condition, e.g. by trickle charging. Proposals to use only one set of batteries would be considered, if they were arranged to be kept fully charged in situ, e.g. by the provision of monitored trickle charging facilities providing visual and audible fault alarm. The condition of the batteries to give the required six starts should be checked at the initial survey.

5.1.6.6 The stowage arrangements of batteries should be such as to ensure that they will not be subjected to low temperatures, which would affect their output. Consideration will be given to other methods of starting, e.g. inertia starters, hand, hydraulic, etc.

5.1.6.7 The fuel supply should be stored in a safe place having regard to adjacent fire hazards, e.g. engine exhaust pipes, switchboards, etc., see Fire Protection Arrangements Instructions Chapter 10.

5.1.6.8 Controls for remote operation of the valve for emergency generator fuel tank (SOLAS II-2 Reg.4.2.2.3.4)

The wording "separate location" does not mean separate spaces.
(Unified Interpretation - MSC/Circ. 1120)

5.1.6.9 Starting instructions should be displayed at each emergency fire pump.

5.2 Fire Mains, Water Service Pipes and Hydrants

5.2.1 General

5.2.1.1 Specific requirements for fire mains, water service pipes and hydrants are contained in the regulations under the various classes of ships. Spacing of hydrants will be governed by the lengths of hoses provided.

5.2.1.2 Hydrants in machinery spaces (SOLAS II-2 Reg.10.2.1.5.1)

At least one hydrant with hose, nozzle and coupling wrench should be provided in machinery spaces of category A.
(Unified Interpretation - MSC/Circ. 1120)

5.2.1.3 On non SOLAS ships, the above need not be applied if there is no space in the engine room to run out hoses and attack a fire from within.

5.2.1.4 For the purposes of the regulations, and these Instructions, the fire main should be deemed to start at the fire pump discharge valve, and hence includes all parts of the fire main and branches both within and outside the machinery space. Where centrifugal pumps are used, the discharge valve must be a non-return valve.

5.2.2 Hydrants

5.2.2.1 Where a fire hydrant is fitted in a shaft tunnel, the arrangements should ensure that the hydrant can be supplied by the emergency fire pump when the machinery space fire main is isolated. To maximise the advantage of attacking a machinery space fire from a low level, the provision of a light steel door at the tunnel entrance for fire fighting purposes is recommended. It should have an aperture, with hinged cover, through which a hose nozzle may be directed.

5.2.2.2 Where a ship is designed to carry a timber deck cargo or any deck cargo which, when loaded, would make difficult or prevent access to the deck fire main hydrants, such additional means or arrangements shall be provided, whereby the requisite number of jets of water can still be directed on to any part of the deck area normally accessible to the passengers, or crew, while the ship is being navigated and carrying the deck cargo in question.

5.2.2.3 Provision of hydrants where dangerous goods are carried is also covered in Fire Protection Arrangements Instructions Chapter 8.

5.2.2.4 It is recommended that if blank caps are fitted on the outlets of hydrant valves, they should be so designed, e.g. by the incorporation of radial vent holes, manually or automatically operated release valves, plastic plugs, etc., as to permit the safe release of any accumulated air or vapour pressure prior to the removal of the blank cap.

5.2.3 Use for purposes other than fire fighting

5.2.3.1 No permanent connections to the fire main are permitted, except that open deck fire main branches may be used for purposes other than fire fighting, (e.g. hawse pipes and deck washing arrangements), provided that isolation valves are installed. Exceptionally, where the use of water from the fire main is required to operate intermittently an isolated bilge water ejector or services of similar importance, the regulations will not be deemed to be contravened providing the water connection is temporary, i.e. by hose and the fire hydrants used are easily accessible, and in a place where they can easily be seen. In such cases, a suitable warning notice should be positioned adjacent to the hydrant stating that the hose should be disconnected when not in use. The position of the hydrant serving these ejectors should be indicated on the fire control plan.

5.2.3.2 The fire main may be used for supplying a tank cleaning system in tankers, providing all the following conditions are satisfied:

(a) the vessel is equipped with a separate and complete deck foam system, the foam main of which can be used as a water main having hose connections identical to the hose connections fitted on the fire main;

(b) the main fire pumps are capable of supplying that part of the fire main serving the machinery and accommodation spaces, and the deck foam system, when tank cleaning is in progress using the tank deck fire main; and

(c) adequate means are provided against excessive pressure in the fire main if the tank washing pump is used on fire duty.

5.2.4 Materials

5.2.4.1 Materials readily rendered ineffective by heat must not be used for fire mains, hydrants, valves or cocks. Where doubt exists about the suitability of a particular fitting, full details should be submitted to Headquarters.

5.2.4.2 Where glands or couplings are used in fire mains, they should be of an approved type (see paragraph 5.2.4.3), and the surveyor should be satisfied with the arrangements provided to maintain their integrity under the action of the internal pressure. Acceptance of such fittings will be conditional on their suitability, taking into account loadline and sub-division requirements.

5.2.4.3 Materials with a melting point above 1000^{o}C may normally be accepted as meeting the above. Fittings which incorporate low melting point components may be accepted, provided they have passed a standard fire test, 800^{o}C for 10 mins. As the fire main cannot be guaranteed to be flooded at all times, this test must be carried out dry and the fitting tested for leakage after the fire test.

5.2.4.4 Where the working pressure in the fire main at the pump discharge exceeds 7 bar, the fire main, and its components, should be hydrostatically tested to 2.0 times the maximum working pressure to which the system can be subjected in service. Where the working pressure in the fire main at the pump discharge is less than 7 bar, the fire main, and its components, may be hydrostatically tested to 1.5 times the maximum working pressure to which the system can be subjected in service. Subject to the surveyor having witnessed such tests, or that such tests have been satisfactorily completed, then the fire main after installation need only be subjected to the maximum pressure attainable by the fire pumps under normal service conditions.

5.2.5 Availability of water supply

5.2.5.1 The requirements for the ready availability of water supply in passenger ships and cargo ships can be found under SOLAS Reg. II-2/10.2.1.2.

5.2.5.2 In a cargo ship, this facility may be provided by means of a pressurised system, with a small air reservoir and a pressure operated pump control, or by having suitably positioned remote starting facilities connected to a fire pump, permanently connected to the sea and fire main through locked or strapped open valves. To obtain the maximum benefits from such a pressurised system, it is desirable for permanently connected hose reel units, using smaller diameter non-collapsible hoses, to be provided in accommodation spaces; this will allow one person to attack any small fire without delay. Such hose reels, if provided, should be in addition to the hydrants and hoses required by the regulations, as the latter would still be required when fighting a larger fire. However the MCA would be prepared to consider the use of hose reels, for statutory purposes, having a throughput of about half that of a 12 mm nozzle at the appropriate pressure, with an acceptable throw, on the basis that two such reels, together with one hose and nozzle of regulation size, provide the equivalent throughput of two jets of water required by the regulations to be available at any part of the accommodation spaces. In such an arrangement, the hose reels must be served by the ship's fire main, and be at all times under a water pressure at least as great as that required by the regulations.

5.2.6 Isolating arrangements

5.2.6.1 The deck fire main should, in all cases, be fitted with means, outside the machinery space, for isolating it from the fire main within the machinery space. The arrangements should permit the supply of water from the emergency fire pump to the machinery space hydrants, e.g. the isolating valve may be a screw lift valve.

> *Any part of the fire main routed through a category A machinery space must be fitted with isolating valves outside of the space. The arrangements of the fire mains must allow for fire water from the fire pumps or emergency fire pump to reach all hydrants outside of the isolated space. Isolation requirements of SOLAS Reg. II-2/10.2.1.4.1 are not applicable to the piping from fire pumps located in other spaces other than category A machinery spaces.*

(IACS Unified Interpretation SC 121)

5.2.6.2 Exceptionally, short lengths of pipe, which comply with SOLAS Ch II-2 Reg.10.2.1.4, may be accepted within the machinery space where it is shown to be impracticable to route them externally.

5.2.6.3 In tankers, required by the regulations to have fixed deck foam systems, isolating valves should be fitted in the fire main on the tank deck at the poop front in a protected position, and at intervals of approximately 40 m,

to protect the integrity of the fire main system in case of fire or explosion. Fire mains should be routed outside of tanker pump rooms. When this is impracticable details of the arrangements should be submitted to Headquarters for consideration.

5.2.7 Freezing

All water pipes should be provided with means for draining them in weather conditions where freezing may occur.

> *Special attention should be given to the design of the continuously pressurized pipelines for prevention of freezing in pipes where low temperatures may exist.*

(Unified Interpretation - MSC/Circ. 1120)

5.2.8 Bore of stand pipes and hydrant valves

In the interest of standardisation, and having regard to the loss of performance over a period of time due to internal corrosion, the internal bore of hydrant stand pipes of galvanised steel, and of hydrant valves of ferrous material should not, in general, be less than 64 mm, but a lesser diameter may be acceptable in small ships providing all requirements are complied with. Subject to the same proviso, stand pipes and hydrant valves of copper alloy may be accepted with bores not less than 50 mm.

5.3 Fire Hoses, Nozzles and Spray Nozzles

5.3.1 Hoses

5.3.1.1 The requirements concerning the number of hoses are specified in SOLAS Reg. II-2/10.2.3.2. The regulations require the provision of one fire hose and nozzle for each hydrant in the ship, unless there is complete interchangeability of fire hose couplings and nozzles. Machinery spaces of category A should normally have a hose and nozzle provided at each hydrant.

SOLAS specifies the following minimum and maximum hose lengths for ships >July 2002, however, UK regulations for older ships and for non SOLAS ships have no minimum length and different maximum lengths.

Fire hoses shall have a length of at least 10 m, but not more than:

.1 15 m in machinery spaces;

.2 20 m in other spaces and open decks; and

.3 25 m for open decks on ships with a maximum breadth in excess of 30 m.

5.3.1.2 In the interior locations in passenger ships, fire hoses should be connected to fire hydrants at all times, and it is recommended that in the machinery spaces of all ships, hoses should likewise be always connected to their fire hydrants.

5.3.1.3 Hoses should be bound to their end couplings by means of an even pressure over the complete perimeter of the hose against the coupling shank, normally by manufacturers binding, however, where a hose is repaired on board 2 stainless steel screw-tightened "jubilee" clips may be accepted, as a temporary repair, however, the hose should be correctly rebound as soon as possible.

5.3.1.4 On ships with power pumps, fire hoses of 64 mm diameter unlined are considered as standard, but lined fire hoses of smaller diameter may be accepted, provided tests have shown that the pressure drop across an 18 m length approximates to that across an 18m length of 64 mm diameter unlined canvas hose at corresponding pressures. Certain lined hoses of 45 mm bore, have been shown to have a throughput comparable to that of a 64 mm bore unlined canvas hose, and as the smaller bore hose is more easily handled its use is recommended, particularly for machinery spaces and other interior locations. Fire hoses of a diameter not less than 32 mm may be accepted in small passenger launches and other small craft with power pumps. On ships with hand pumps, hoses with smaller diameters may be accepted after a suitable test to show that the required jet can be delivered, and that the hose does not "nip" when lead around the ship.

5.3.2 Nozzles

5.3.2.1 The approximate discharges in m^3/hour, (which for practical purposes may be considered equivalent to tonnes/hour), through well designed plain nozzles of 12 mm, 16 mm and 19 mm for pressure drops of 2.1, 2.5, 2.7, 3.1 and 4 bars are given in the following table:-

5.3.2.2 Pressure discharge for various nozzle diameters m^3/hour

Pressure N/mm^2 (kPa)	Nozzle Diameter		
	12 mm	16 mm	19 mm
0.21 (210)	9	14	20.5
0.25 (250)	10	15	22.5
0.27 (270)	10.5	16	23.5
0.31 (310)	11	17	25
0.40 (400)	12	20	30

Note: nozzle sizes may be rounded up or down to the nearest standard dimension.

5.3.2.3 Where dual purpose nozzles are provided, they should be capable of a performance in the plain jet setting as indicated above, without undue spread, and have a throw of at least 12 m. The spray setting should produce a reasonably fine spray, which can be arranged to form a curtain, behind which,

it would be possible to approach a fire. An acceptable diameter of the cone of spray would be 5 m at a distance of 2 m from the end of the nozzle.

5.3.2.4 Nozzles should be of approved type, robust construction, easy to operate and made of materials suitable for the intended duty.

Aluminium alloys may be used for fire hose couplings and nozzles, except in open deck areas of oil tankers and chemical tankers.
(IACS Unified Interpretation SC 146)

Fire hose nozzles made of plastic type material, e.g. polycarbonate, are considered acceptable provided capacity and serviceability are documented and the nozzles are found suitable for the marine environment.
(IACS Unified Interpretation SC 98)

5.3.3 Portable Foam Applicators

5.3.3.1 FSS Code Chapter 4 contains the specifications for portable foam hose.

5.3.3.2 Foam concentrates used with portable foam applicators should be checked in accordance with MSC.1/Circ.1312 – Revised Guidelines for the Performance and Testing Criteria, and Surveys of Foam Concentrates for Fixed Fire-Extinguishing Systems.

5.4 International Shore Connections

FSS Code Chapter 2 contains the specifications for the International Shore Connections.

5.5 Testing

5.5.1 Initial Survey

The following items should be checked during on board initial surveys:-

Fire main:-
- correct materials used, joints of approved type (5.2.4)
- pressure tested (5.2.4.4)
- non-return valves fitted and accessible (5.2.1.4)
- isolation valves fitted, labelled and working (5.2.6)
- any insulated sections in the machinery space satisfactory (5.2.6.2)

Hydrants/hoses:-
- correct lengths/diameters supplied (5.3.1)
- couplings correct (5.3.1.3)
- nozzle size/type correct (5.3.2)

- required number of jets can be delivered to required locations
- required length of jets
- hoses can be controlled (5.1.1.3)

Fire pumps:-
- remote/ automatic start tested
- pumps run efficiently, priming systems work (5.1.1.4 and 5.1.1.6)
- deliver correct hydrant pressures at the highest hydrant (5.1.1.1)
- any additional pumps operate satisfactorily (5.1.1.7)

Emergency fire pump:-
- separation from main pumps satisfactory (5.1.4)
- remote power sources separated from machinery spaces (5.1.4.4)
- heating arrangements satisfactory (5.1.6.1)
- starting systems tested (5.1.6.3 - 6)
- fuel supply adequate (immediate, and reserve if required) (5.1.6.7 - 8)
- pump runs efficiently, priming systems work
- deliver correct hydrant pressure (5.1.5.1)

5.5.2 Re-Survey

The following items should be checked during on board re-survey:-

Fire main:-
- leak tested at maximum service pressure
- isolation valves accessible, maintained and working (5.2.6)
- any insulated sections in the machinery space remain satisfactory (5.2.6.2)

Hydrants/hoses:-
- hoses in good condition
- correct lengths/diameters supplied (5.3.1)
- couplings still secure (5.3.1.3)
- nozzle size/type correct, maintained and working (5.3.2)
- hydrants accessible, maintained and working

Fire pumps:-
- remote/ automatic start tested
- pumps run efficiently, priming systems work (5.1.1.4)
- deliver correct hydrant pressures at the highest hydrant (5.1.5.1)
- any additional pumps operate satisfactorily (5.1.1.7)

Emergency fire pump:-
- separation from main pumps remains satisfactory (5.1.4)
- heating arrangements satisfactory (5.1.6.1)
- starting systems tested (5.1.6.3 - 6)
- fuel supply adequate (immediate, and reserve if required) (5.1.6.7 - 8)
- pump runs efficiently, priming systems work

- delivery pressure adequate

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