PART 9

PUMPING AND PIPING SYSTEMS

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Section 9.1 – Oil tanks

9.1.1 Integral tanks for oil fuel may be constructed of steel as double bottoms, wing, or deep tanks incorporated within the structure of the vessel as detailed in Part 4. Such tanks are to be complete with washplates, baffles or internal flaws to prevent excessive free surface effects. Suitable access manholes are to be provided to ensure access to all parts of the tank. Manhole covers are to be fitted by bolting, and oil impervious gasket to heavy inserts or raised angle frames spacing of bolts is to be not greater than 5 times diameter of bolt. Covers mounted on vertical surfaces are to have save-alls fitted below to catch any leakage.

9.1.2 All plate and sections utilised for the construction of oil tanks are to be thoroughly descaled, cleaned, and free of priming coats.

9.1.3 Separate oil tanks (e.g. header or daily service tanks) are to be constructed of steel and complete with washplates and baffles where necessary. Such tanks are to be rigidly mounted to the vessel structure, and should not be situated directly above engines, heated surfaces, stairways, ladders, or electrical equipment other than unbroken runs of cable. Save-alls are to be fitted in way of all valves, fittings, and access plates. Separate tanks are to be tested to the requirements of Part 1, Section 1.4 prior to fitting onboard.

9.1.4 Sight glasses, contents gauges, or sounding pipes are to be fitted to all oil tanks. Sight glasses are to be adequately guarded and fitted with spring-loaded isolating valves or other approved shut-off device to prevent spillage in the event of breakage of the sight glass.

9.1.5 Sounding pipes are to be of steel and are to be led to the freeboard deck and should be fitted with a screw cap or cover indicating function. A striking plate is to be fitted below the open end within the tank. The sounding pipe is to be so arranged that in the event of the overfilling of the tank, spillage will not occur. Short sounding pipes (e.g. to wing tanks in engine rooms) are to be fitted with lever weighted cocks at the top of the pipe, complete with screwed access cap.

9.1.6 Integral oil tanks are to be fitted with a spring-loaded self-closing valve at the lowest practical point for drawing off water. Non-integral oil tanks are to be fitted with a sediment sump, complete with a self-closing draw-off cock. Adequate provision is to be made to prevent sediment, etc., being drawn into the fuel system. Draw-off cocks should be provided with save-alls or drip trays.

9.1.7 Fore peak tanks are not to be arranged for the stowage of oil fuel or hydraulic/lubricating oils.

Section 9.2 – Oil fuel systems

9.2.1 Oil fuel used in machinery is to have a flash point of not less than 60°C (closed cup test).

9.2.2 Tank filling pipes are to be of steel and permanently fitted with the filling connection positioned on an open deck, and either welded to the tank or secured by another means of approved connection. The filling pipes are to have a coaming height of 100mm less than that of the air venting pipe to that tank, and are to be fitted with a screwed cap and name plate inscribed 'OIL FUEL'. Filling arrangements should be so arranged that any overflow would not come into contact with any hot surface where it might be ignited, or discharge over deck or side of vessel.

9.2.3 Fuel filling and venting pipes are to be constructed of steel, adequately supported, and of sufficient dimensions to prevent spillage during filling. Venting pipes are to be led to the open atmosphere terminating in a position level with or higher than the fuel filling mouth, and where there is no danger of fire or explosion resulting from the emergence of oil vapour from the pipe (refer also to Paragraph 9.2.2). The open end of the pipe should be protected against:-

a) Water ingress - by ball float or equivalent means;

b) Flame ingress - by a corrosion-resistant gauze mesh (that can be detached for cleaning).

9.2.4 Where pipes also serve as overflow pipes, provision is to be made to prevent pollution of the sea. The overflow is not to run into or near a machinery space, galley, or other space where ignition may occur.

9.2.5 Air pipes from oil fuel tanks and levelling pipes attached to tanks are to have a net cross-sectional area not less than 1.25 times that of the filling pipes.

9.2.6 Pipes used to convey fuel oil are to be of solid drawn seamless steel or other suitable material and are to be properly installed, taking into consideration vibration and chafing. Pipes, joints and fittings, before being put into service for the first time, are to be subjected to a test by hydraulic pressure to twice their maximum working pressure, and at any time thereafter are to be capable of withstanding such a test. Flexible pipes are to comply with Paragraph 9.2.16.

9.2.7 Means are to be provided to isolate a source of fuel or oil that may feed a fire in an engine space. A valve or cock, capable of being closed from a position outside the engine space, is to be fitted in the fuel feed pipe as close as possible to the tank and in an accessible position. Tanks to be considered for such an arrangement are those in excess of 65 litre capacity and fitted with an outlet valve, which may be left open during normal operation of the vessel. Inlet and re-circulation valves should be of the non-return type.

9.2.8 Outlet valves or cocks are to be fitted at each tank outlet position, with valves fitted directly to the tank plating and capable of being closed both locally and remotely. Remote operation position should always be readily accessible in the event of fire. Valve covers are to be so constructed that they will not become slack when the valves are operated. Heat sensitive materials are not to be used in the construction of valves and cocks used for fuel oil services.

9.2.9 Electric driven fuel pumps are to be fitted with a remote stop at a suitable position outside the machinery space.

9.2.10 Save-alls or equivalent means of containment of spillage should be provided below fuel pump(s), auxiliary engines, oil pumps and filter(s).

9.2.11 Piping systems used to convey oil fuel should be routed clear of engine exhausts and hot surfaces, but where pipe fracture, coupling or joint failure could result in oil fuel spraying onto hot surfaces, suitable screening is to be arranged to deflect the oil to a safe place.

9.2.12 Fuel supply lines to main propulsion and essential auxiliary machinery are to be provided with duplicate filters, so constructed that either filter may be dismantled for cleaning without interruption to the fuel supply through the filter in use.

9.2.13 Where daily service tanks are provided, overflow pipes are to be fitted which are led back to the top of the main tank from which they are supplied. Daily service tanks are to be provided with high and low level content alarms with an audible and visual alarm located at the tank and at the helm position. The overflow tank is to have an air vent pipe as required by Paragraphs 9.2.3 and 9.2.5, which should be positioned on an open deck in the vicinity of the main oil fuel-filling pipe.

9.2.14 Fuel return pipes are to be led back to the fuel tank and care is to be taken that where tanks can be isolated, the fuel is to be returned to the emptying tank.

9.2.15 All valves are to be labelled indicating service and function. Valve hand wheels are to be suitably retained on the spindles and marked to show the open and closed direction of operation.

9.2.16 Flexible piping and fittings will be considered with regard to the intended service and the properties of the material proposed, and are to be of robust construction complying with established standards. Plastic piping is not to be used for the fuel supply to the engine or fuel tanks, or for any purpose in the machinery space where destruction by fire or heat would present a safety hazard. An anti-vibration coil or a short length of approved fire-resistant flexible hose is to be incorporated into the metal fuel lines serving the engine(s).

Section 9.3 – Lubricating oil systems

9.3.1 Where lubricating oil for main propulsion engines is circulated under pressure, provision is to be made for the efficient filtration of the oil.

9.3.2 Where flexible pipes are fitted as part of the lubricating oil system and are within a high fire risk area, such pipes should be fireproof and capable of withstanding a fire test to 800°C for 30 minutes. One of the following standards may be used to verify such a test:-

BS ISO 15540:1999 - Fire resistance of hose assemblies - Test methods;

and

BS ISO 15541:1999 - Fire resistance of hose assemblies - Requirements for the bench test.

9.3.3 Where lubrication oil storage tanks are provided and tubular contents gauge glasses are fitted, they should be of substantial construction, adequately protected and fitted with self-closing arrangements at the tank position. Where draw-off taps are fitted, they are to be of an approved spring-loaded self-closing type.

9.3.4 Visual and audible alarms in accordance with Paragraph 9.2.13 are to be provided for indicating of the loss of engine lubricating oil pressure.

9.3.5 Where spare lubricating or hydraulic oil is carried in drums, adequate stowage and securing arrangements are to be provided.

Section 9.4 – Sea water systems

9.4.1 All engine cooling, sea water piping and fittings are to comply with the engine Manufacturer's requirements, and are to be installed with easy bends as required. The piping may be of aluminium bronze, cupro-nickel or similar corrosion-resistant material. Valves, strainers and other fittings are to be of compatible material to avoid electrolytic action and wasting. Recommendations may also be found in MCA MGN 190 (F): Fishing Vessels - The Premature Failure of Copper Pipes in Engine Cooling Water Systems.

9.4.2 'Heavy wall' mild steel pipe for 'cross-vessel' inlet mains may be used, provided that the internal diameter is a minimum of 150mm or 50% greater in cross-sectional area than the largest branch pipe directly attached to it. The pipe is to be a minimum of schedule 80 and is to be galvanised internally after all fabrication work is complete.

9.4.3 Where sea water is used for cooling engines, either directly or using a fresh water/sea water heat exchanger, an efficient strainer is to be fitted between the sea inlet valve and the circulating pump. The strainer is to be readily accessible and capable of being cleaned without interruption of the supply of cooling water. There is to be at least two means capable of supplying water

to such cooling services. The total open area of the inlet strainer is to be at least three times the cross-sectional area of the pipes, which the strainer is to serve. Supply pipework is to be of corrosion- resistant material such as copper, cupro-nickel, aluminium bronze or other corrosion-resistant material.

9.4.4 All vessels are to be fitted with at least two main sea water cooling inlets, with one inlet fitted on each side of the vessel (except when 'keel cooling' or box cooling arrangements are fitted).

9.4.5 Where cooling water services are for the cooling of the propelling machinery, an alternative means of circulating water is to be provided in the event of failure of the primary source. Such alternative means should be demonstrated to the satisfaction of the Certifying Authority.

9.4.6 Keel cooling systems are to be approved by the engine Manufacturer to ensure that the cooling surface area and water flow is adequate to efficiently cool the engine in all operating conditions. Internal sacrificial anodes, if required, are to be to the engine or cooler Manufacturer's requirements.

9.4.7 Water velocities are to be assessed at the design stage and the materials of pipes, valves, etc., selected to suit the conditions. The water velocity in copper pipes is not to exceed 1.0m/s. The water velocity in the types of pipes listed below should normally not be less than 1.0m/s to avoid fouling and subsequent pitting, but should not be greater than the following:-

Aluminium brass	3.0m/s;
90/10 copper-nickel-iron	3.5m/s;
70/30 copper-nickel	5.0m/s.

9.4.8 Sea inlet and overboard discharge pipes are to be fitted with valves or cocks connected to substantial pads welded to the hull plating or to fabricated sea inlet boxes attached to the hull plating. Short steel distance pieces may be fitted between the valve and the hull plating, providing that their thickness is equivalent to the shell thickness or pipe, whichever is the greater. The arrangement of the pipe is to be such that the section of the pipe immediately inboard of the valve may be removed without affecting the watertight integrity of the vessel.

9.4.9 Sea water pipes, wherever practicable, should be connected by means of bolted flanges, visible and readily accessible for maintenance and inspection purposes.

9.4.10 Installations of sea water piping and fittings for cooling water systems are to be of aluminium bronze, cupro-nickel or similar corrosion-resistant material. 'Heavy wall' mild steel pipe for 'cross-vessel' inlet mains may be used, provided that the internal diameter is 150mm or greater and the pipe is galvanised internally after all fabrication work is complete. Care is to be taken to ensure that galvanic corrosion effects from dissimilar metals are prevented, by such means as isolation packing, washers and sleeves between the flanges and fasteners joining pipes. (Recommendations may

also be found in MGN 190(F): Fishing Vessels - The Premature Failure of Copper Pipes in Engine Cooling Water Systems).

9.4.11 Pipe connections are to be flanged and bolted, welded or brazed as appropriate, but must not in any circumstances be connected by soft soldered joints or non fire-resistant materials. The exception to this requirement is heat sensitive safety devices such as fusible links, etc. Fixed or loose pipe flanges may be used. The fixed flanges are to be attached to the pipes by fillet welds or by capillary brazing. Where welding is used, the fillet weld at the back is to be the strength weld, and that in the face a sealing weld.

9.4.12 All seacocks, filters, valves and piping are to be readily accessible and braced and supported against vibration. Seacocks and valves are to be clearly marked, indicating the direction of turn to open and close. All overboard discharge pipes are to be fitted with a shut-off valve at the hull together with a non-return valve. Valve chests are to be clearly labelled with regard to the function and position of each valve. Arrangements to prevent back flooding are to be incorporated in all systems by means of non-return valves.

9.4.13 Hand wheels and levers operating the main sea inlet valves for engine cooling purposes are to be capable of operation from, and be extended to, at least 300mm above the level of the engine room floor plates.

Section 9.5 – Bilge pumping systems

9.5.1 A vessel is to be provided with efficient means for removal of water entering any compartment below the weather deck (other than a tank permanently used for carriage of liquids that is provided with efficient means of pumping or drainage).

9.5.2 Every vessel should be provided with:-

a) Efficient means of draining any compartment, other than a compartment appropriated for the storage of oil or fresh water, when the vessel is upright or is listed not more than 5° either way. Suction(s) should be provided in the engine room and in the fish hold to the lowest drainage level of the compartment.

b) The bilge suctions and means of drainage should be so arranged that water entering any main watertight compartment could be pumped out through at least two independent bilge systems and suctions.

c) 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 arrangement (see Paragraph 2.2.6.2 of MCA Code), that space should be provided with independent pumping arrangements having a capacity of at least 1.5 times the wash 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.

9.5.3 Where peak compartments are incorporated in a vessel's design and are not used for ballasting purposes, an accessible drain cock may be fitted in lieu of a bilge suction, provided that any drainage will flow naturally to adjacent bilge suction. The drain cock is to be of an approved type with a securing handle permanently attached and so loaded that on being released will automatically close the cock.

9.5.4 Bilge pumping systems should be so arranged as to prevent water passing from the sea or from water ballast spaces into holds, or into machinery spaces or from one watertight compartment to another. The bilge connection to any pump that draws from the sea or from water ballast spaces should be fitted with either a non-return valve or a cock which cannot be opened simultaneously either to the bilge's and to the sea, or to the bilge's and water ballast spaces.

9.5.5 Where a vessel is fitted with an enclosed watertight compartment above the freeboard deck used for handling the vessel's catch, and which contributes to the vessel's stability restoring moment, a separate independent pumping arrangement is to be provided.

9.5.6 Valves in bilge distribution boxes are to be of a screw down non-return type. Non-return valves should be fitted in the discharge lines of hand operated bilge pumps unless the pumps are of suitable design and discharge directly onto the deck.

9.5.7 Small compartments may be drained by individual hand pump suctions. Hand operated pumps are to be installed above the freeboard deck.

9.5.8 Non-return valves are to be fitted in all suction pipes, and where two pumps are fitted, the system is to be so designed that either pump can draw from any compartment by the use of a suitable changeover arrangement.

9.5.9 Bilge systems and valves are to be clearly labelled with regard to the compartment served and the position of the valve.

9.5.10 All bilge suctions should be fitted with readily accessible strainers. The total area of the perforation in the strainer should be not less than twice the cross-sectional area of the bilge pipe.

9.5.11 Piping used in bilge systems is to be of an approved metal. Joints are to be flanged. Metals for piping, valves and fittings are to be compatible in order to avoid electrolytic action and wasting. All bilge pipework is to be secured in position to prevent chafing or lateral movement. Long or heavy lengths of pipe are to be supported by bearers so that no undue load is carried by pipe connections or pumps and fittings to which they are attached.

9.5.12 The minimum thickness of steel pipes used for bilge and ballast systems is to be not less than 4mm. Where pipes run through ballast or oil fuel tanks, the pipe thickness is to be not less than 6mm. Copper pipes are not to be run inside tanks unless passing through via a 'welded-in' steel tube connected to each end of the tank. Joints in steel pipelines may be made by the following methods:-

Welded on bolted flanges;
Butt welds between pipes;
Socket welded joints;
Mechanical press systems;
Approved flexible couplings.

9.5.13 Screwed compression fittings are not to be used for bilge systems or below the level of the WL in any other SW system.

9.5.14 Fittings of malleable iron are not to be used.

9.5.15 Piping systems are to be designed and installed to enable any section to be removed for inspection/maintenance.

9.5.16 Slush wells, where fitted, are to be not less than 0.15m^3 capacity and are to be positioned such that water will drain to them under all normal conditions of trim. The slush wells are to be protected by a coarse perforated plate or grid to prevent debris being drawn into the pipe system.

9.5.17 A bilge alarm sensor should be fitted in the propulsion machinery space and fish hold(s) of the vessel. These alarms should be accessible for regular testing.

9.5.18 To prevent pollution, bilge sensors in compartments containing pollutants should not automatically start bilge pumps.

9.5.19 Any auto-start bilge pump serving a clean compartment should be fitted with an audible and visual alarm at the control position(s) so that the reason for pumping may be investigated. Such pumps should also be fitted with a 'manual override' to start the pump.

9.5.20 Each dry compartment provided with a bilge suction capability (built-in or portable) should be fitted with a bilge level alarm if the level of bilge water cannot be readily checked visually without entering the compartment. Alternatively, spring-loaded drain valves may be fitted outside the compartment as a means of checking the bilge level.

9.5.21 A bilge alarm should provide an audible and visual warning at the control position(s).

9.5.22 Each engine room bilge alarm system should be provided with:-

a) A secondary, independent bilge alarm system; or

b) A 'fail-safe' warning should the bilge alarm circuit become faulty.

9.5.23 Further guidance for bilge alarms and bilge pumps is provided in MGN 165(F).

9.5.24 Provision is to be made for pumping or draining from both port and starboard sides of any weathertight deck shelter.

9.5.25 All bilge suctions are to be fitted with readily accessible strainers. The total area of the perforation in the strainer is to be not less than twice the cross-sectional area of the bilge pipe.

9.5.26 Flexible piping for bilge duties may only be fitted for use as short terminal length on suction pipes where access for clearing debris at the tail pipe and mud box is required. Where fitted, the flexible pipe is to be of the smooth bore type with single or double closely woven integral wire braid reinforcement, and is to be of an approved fire tested type.

9.5.27 A system diagram is to be displayed in a prominent position.

Section 9.6 – Bilge pumps and capacities

9.6.1 All vessels should have:-

a) Not less than two separate bilge pumps, <u>each</u> having a minimum capacity (Q) calculate as follows:-

$Q = (0.00575)\ Dm^2$ (m^3 per hour)

Where Dm = bilge main diameter (mm) and
Dm = $30 + 1.68\sqrt{L(B+D)}$ or 50mm (whichever is the greater)
L = length of vessel (m)
B = breadth of vessel (m)
D = depth of vessel (m)

b) On new vessels, both pumps should be power driven, with at least one pump driven by independent means.

9.6.2 Bilge branch suction pipes diameters should be not less than:-

$Db = 30 + 2.15\sqrt{C(B+D)}$

Where Db = internal bilge branch line diameter or 40mm (whichever is the greater)
C = length of compartment (m)
B = breadth of vessel (m)
D = depth of vessel (m)

9.6.3 A general service pump of minimum capacity (Q), may be used as a power driven bilge pump.

9.6.4 Bilge ejectors do not meet the requirements of a power driven bilge pump.

9.6.5 Bilge pumps should be self-priming. Pumps, whether operated by hand or power, should be capable of drawing water from any space as required by Paragraph 4.3.1.1 of MCA Code.

9.6.6 Distribution boxes, valves and cocks fitted in bilge pumping systems should be in accessible positions.

9.6.7 In every vessel:-

a) Pipes from the pumps for draining hold spaces or any part of the machinery space should be independent of pipes that may be used for filling or emptying spaces in which water or oil is carried;

b) Bilge pipes should be of steel or other suitable material having flanged joints wherever practicable. Flexible piping, if accessible for inspection and jointed with suitable clamps, may be installed where necessary.

9.6.8 Bilge main pipe diameters should be in accordance with Paragraph 9.6.1.

Section 9.7 – Machinery space bilge pumping

9.7.1 The bilge pumping arrangements are to comply with Section 9.5 with the exception of the system draining the machinery space, which is to be arranged such that any water that enters this compartment must be able to be pumped out through at least two bilge suctions, see Paragraph 9.5.2, under all conditions of trim and list in the maximum assumed damage condition.

9.7.2 Where a bilge main is fitted, one of the suctions referred to in Paragraph 9.5.1 is to be a branch bilge suction connected to the bilge main. The second bilge suction is to be a direct bilge suction led to an independent pump and so arranged that the direct suction can be used independently of the main bilge line suctions.

9.7.3 The machinery space direct bilge suction is to be of a diameter not less than that required for the bilge branch suction as defined in Paragraph 9.6.2.

9.7.4 Provision is to be made for pumping oily bilge water from the machinery space to a suitable position above the freeboard deck, via a suitable pipework and valve arrangement to comply with national sea water pollution requirements.

9.7.5 The bilge pipework installed in machinery spaces is to be of steel or other approved metal having a melting point of not less than 800°C.

Section 9.8 - Shelter deck drainage (enclosed shelters)

9.8.1 Shelter decks and weathertight spaces above the freeboard deck that contributes to the vessel's stability restoring moment, are to be provided with an independent pumping system or other approved overboard discharge being in addition to the requirements of Section 9.5 and 9.7.

9.8.2 The pumps are to be capable of automatic operation via a float switch arrangement, which is also to activate an alarm at the helm/control position to indicate that the individual pump is operating.

9.8.3 Each pump is to be positioned to draw directly from a sump arrangement positioned at each side of the shelter deck or weathertight space.

9.8.4 The independent pumping system is to be provided with a back-up arrangement to enable suction from the deck sumps by use of the main hull bilge pumping system.

Section 9.9 – Water tanks

9.9.1 Integral and non-integral fresh water tanks are to be constructed of steel or other approved material. Steel tanks are to be treated with an approved non-toxic coating to the satisfaction of the Surveyor. The non-integral tanks are to be securely fastened on suitable seats to the hull structure. An inspection manhole is to be fitted to facilitate cleaning. The tanks are to be fitted with baffles and installed with all necessary cocks, valves, vents, filling pipes, sounding pipes or contents gauges. Fresh water tanks are not to have a common bulkhead with fuel or lubricating oil tanks.

Section 9.10 – Hydraulic systems

9.10.1 Hydraulic equipment should be installed in accordance with the best marine engineering practice, these Standards, and to the Manufacturer's requirements. Installers should take all necessary precautions to avoid contamination, and all systems shall be flushed and cleansed prior to commissioning.

9.10.2 All equipment is to be designed to produce the specified performance when operating at the maximum design pressure.

9.10.3 Hydraulic pumps are to be capable of safe operation with the prime mover running at its maximum speed. All motors and valves should be capable of accepting the oil flow under the stipulated conditions.

9.10.4 All hydraulic piping, except for pump suction pipes, is to be of cold drawn mild steel to BS 3502 (or equivalent), reinforced rubber hose to BS EN 853 1997 or BS EN 856 1997 (or equivalent), or other approved material, and is to conform with current statutory requirements.

9.10.5 All pump suction piping, return, and relief valve drain piping is to be capable of accepting the full flow under maximum operating conditions.

9.10.6 All pressure piping is to be designed to operate at pressure of not less than 20% above the specified maximum operating pressure of the systems.

9.10.7 Every care should be taken in installation to avoid confusing piping of the same external diameter, but differing bore.

9.10.8 All pump and motor drain piping is to be capable of accepting flows of twice the Manufacturer's stated leakage flow rate. If no leakage flow rate is available, a value of 15% of the input flow rate should be assumed. Drain piping is to be rated to withstand pressures of not less that 10 Bar.

9.10.9 All pressure and return piping should be connected by means of approved high pressure couplings rated to withstand operating pressures of not less than 120% of the normal maximum working pressure, and should be tested to twice maximum working pressure prior to commissioning. Re-usable hose fittings of the screw threaded inner type are not to be used.

9.10.10 Oil reservoirs should, unless formed as an integral unit with the pump, be sited to provide an effective static head of oil in accordance with the requirements of the pump Manufacturer. Oil supply piping from the reservoir to the pump is to be arranged to provide a continuous fall to the pump suction. Small radius bends or elbow fittings are not to be fitted unless supplied as the pump Manufacturer's standard fittings.

9.10.11 Reservoir tanks may be free-standing or built-in, and are to be fitted with an oil level indicator which is easily visible. Where tanks are built-in, to avoid condensation contamination of the oil, the shell plating should not form a tank boundary.

9.10.12 Where the reservoir capacity is greater than 75 litres, the filling system is to incorporate a manual or powered pump delivering to the reservoir through a filter of not more that 25 microns.

9.10.13 Circuited filtration is to be provided in accordance with the following requirements:-

a) High pressure, not more than 10 microns.

b) Low pressure, not more than 25 microns.

c) The inlet filter should be capable of accepting at least twice the maximum rated pump flow.

d) A magnetic drain plug should be fitted in the reservoir, or some such similar device shall be incorporated in the system.

9.10.14 Filters should be sited so as to permit easy access for cleaning and replacement of their elements. Blockage indicators, if fitted, are to be clearly visible.

9.10.15 All piping is to be installed clear of all sources of extreme heat. Where practicable, the use of flexible pipes is to be avoided in engine rooms, but when fitted, should not be run over engines or adjacent to heat sources or exceed a maximum length of 1.50m. Installations of flexible pipe systems in small vessels will be specially considered on submission of details.

9.10.16 Where piping is routed through fish room areas above the fish storage levels, the use of pipe couplings is to be avoided and arrangements should be incorporated to protect the catch from accidental oil leakage.

9.10.17 An oil temperature gauge is to be provided on the pressure side of the system, or suitable provision made for monitoring the oil temperature.

9.10.18 A pressure gauge is to be fitted in a visible location capable of indicating the maximum system pressure.

9.10.19 The type and viscosity of the hydraulic oil should be clearly displayed at the oil reservoir or other convenient prominent location. Proposals to use water-based hydraulic fluids are to be submitted for consideration.

9.10.20 Where oil coolers are sea water cooled, the sea water inlet, discharge valves and piping are to be as required for engine cooling systems.

9.10.21 An emergency stop facility is to be fitted at the helm position for all hydraulically operated deck equipment. Where a winch or hauler is controlled from the helm position, a local emergency stop device is to be fitted at the winch or hauler (see Paragraph 11.22.10).

