

Chapter 10

AUXILLIARY SYSTEMS

PART A - GENERAL

10.1 General

10.1.1 Fluid systems should be constructed and arranged so as to assure a safe and adequate flow of fluid at a prescribed flow rate and pressure under all conditions of craft operation. The probability of a failure or a leakage in any one fluid system, causing damage to the electrical system, a fire or an explosion hazard should be extremely remote. Attention should be directed to the avoidance of flammable liquid impingement on hot surfaces in the event of leakage or fracture of the pipe.

10.1.2 The maximum allowable working pressure in any part of the fluid system should not be greater than the design pressure, having regard to the allowable stresses in the materials. Where the maximum allowable working pressure of a system component, such as a valve or a fitting, is less than that computed for the pipe or tubing, the system pressure should be limited to the lowest of the component minimum allowable working pressures. Every system which may be exposed to pressures higher than the system's maximum allowable working pressure should be safeguarded by appropriate relief devices.

10.1.3 Tanks and piping should be pressure tested to a pressure that will assure a safety margin in excess of the working pressure of the item. The test on any storage tank or reservoir should take into account any possible static head in the overflow condition and the dynamic forces arising from craft motions.

10.1.4 Materials used in piping systems should be compatible with the fluid conveyed and selected giving due regard to the risk of fire. Non-metallic piping material may be permitted in certain systems provided the integrity of the hull and watertight decks and bulkheads is maintained.

10.1.5 For the purposes of this chapter, the term "datum" means the datum described in 2.2.1.3.

10.2 Arrangement of oil fuel, lubricating oil and other flammable oil

10.2.1 The provisions of 7.1.2.2 apply to the use of oil as fuel.

10.2.2 Oil fuel, lubricating oil and other flammable oil lines should be screened or otherwise suitably protected to avoid, as far as practicable, oil spray or oil leakages onto hot surfaces, into machinery air intakes or other sources of ignition. The number of joints in such piping systems should be kept to a minimum. Flexible pipes carrying flammable liquids should be of an approved type.

10.2.3 Fuel oil, lubricating oils and other flammable oils should not be carried forward of public spaces and crew accommodation.

Oil fuel arrangements

10.2.4 In a craft in which oil fuel is used, the arrangements for the storage, distribution and utilisation of the oil fuel should be such as to ensure the safety of the craft and persons on board and should at least comply with the following provisions.

10.2.4.1 As far as practicable, all parts of the oil fuel system containing heated oil under pressure exceeding 0.18 N/mm² should not be placed in a concealed position such that defects and leakage cannot readily be observed. The machinery spaces in way of such parts of the oil fuel system should be adequately illuminated.

10.2.4.2 The ventilation of machinery spaces should be sufficient under all normal conditions to prevent accumulation of oil vapour.

10.2.4.3 Location of fuel tanks should be in accordance with 7.5.2.

10.2.4.4 No oil fuel tank should be situated where spillage or leakage therefrom can constitute a hazard by falling on heated surfaces. Reference is made to the fire safety requirements in 7.5.

10.2.4.5 Oil fuel pipes should be fitted with cocks or valves in accordance with 7.5.3.

10.2.4.6 Every fuel tank should, where necessary, be provided with savealls or gutters to catch any fuel which may leak from such tanks.

10.2.4.7 Safe and efficient means of ascertaining the amount of oil fuel contained in any oil fuel tank should be provided.

10.2.4.7.1 Where surrounding pipes are used they should not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise. In particular, they should not terminate in public spaces, crew accommodation or machinery spaces. Terminations should be provided with a suitable means of closure and provision to prevent spillage during refuelling operations.

10.2.4.7.2 Other oil-level gauges may be used in place of sounding pipes. Such means are subject to the following conditions:

10.2.4.7.2.1 In passenger craft such means should not require penetration below the top of the tank and their failure or overfilling of the tanks will not permit release of fuel.

10.2.4.7.2.2 The use of cylindrical gauge glasses should be prohibited. In cargo craft, the Administration may permit the use of oil-level gauges with flat glasses and self-closing valves between the gauges and fuel tanks. Such other means should be acceptable to the Administration and should be maintained in the proper condition to ensure their continued accurate functioning in service.

10.2.4.8 Provision should be made to prevent overpressure in any oil tank or in any part of the fuel system, including the filling pipes. Any relief valves and air or overflow pipes should discharge to a safe position and, for fuel of flashpoint less than 43° C, should terminate with flame arresters in accordance with the standard developed by the Organisation.

10.2.4.9 Oil fuel pipes and their valves and fittings should be of steel or other approved material, except that restricted use of flexible pipes should be permissible in positions where the Administration is satisfied that they are necessary. Such flexible pipes and end attachments should be approved fire-resisting materials of adequate strength and should be constructed to the satisfaction of the Administration.

Lubricating oil arrangements

10.2.5 The arrangements for the storage, distribution and utilisation of oils used in pressure lubrication systems should be such as to ensure the safety of the craft and persons on board. The arrangements made in machinery spaces and, whenever practicable, in auxiliary machinery spaces should at least comply with the provisions of 10.2.4.1, 10.2.4.4, to 10.2.4.8 except that:

10.2.5.1 this does not preclude the use of sight-flow glasses in lubricating systems provided they are shown by test to have a suitable degree of fire resistance; and

10.2.5.2 sounding pipes may be permitted in machinery spaces if fitted with appropriate means of closure; and

10.2.5.3 lubricating oil storage tanks with a capacity of less than 500 l may be permitted without remote operated valves as required in 10.2.4.5.

Arrangements for other flammable oils

10.2.6 The arrangements for storage, distribution and utilisation of other flammable oil employed under pressure in power transmission systems, control and activating systems and heating systems should be such as to ensure the safety of the craft and persons on board. In locations where means of ignition are present, such arrangements should at least comply with the provisions of 10.2.4.4 and 10.2.4.7 and with the provisions of 10.2.4.8 and 10.2.4.9 in respect of strength and construction.

Arrangement within machinery spaces

10.2.7 In addition to the requirements of 10.2.1 to 10.2.6, the oil fuel and lubricating oils systems should comply with the following:

10.2.7.1 Where daily service fuel tanks are filled automatically or by remote control, means should be provided to prevent overflow spillages.

10.2.7.2 Other equipment which treats flammable liquids automatically, such as oil fuel purifiers, which, whenever practicable, should be installed in a special space reserved for purifiers and their heaters, should have arrangements to prevent overflow spillages.

10.2.7.3 Where daily service oil fuel tanks or settling tanks are fitted with heating arrangements, a high temperature alarm should be provided if the flashpoint of the oil can be reached due to failure of the thermostatic control.

10.3 Bilge pumping and drainage systems

10.3.1 Arrangements should be made for draining any watertight compartment other than the compartments intended for permanent storage of liquid. Where in relation to particular compartments drainage is not considered necessary, drainage arrangements may be omitted but it should be demonstrated that the safety of the craft will not be impaired.

10.3.2 Bilge pumping arrangements should be provided to allow every watertight compartment other than those intended for permanent storage of liquid to be drained. The capacity or position of any such compartment should be such that flooding thereof could not affect the safety of the craft.

10.3.3 The bilge pumping system should be capable of operation under all possible values of list and trim after the craft has sustained the postulated damage in 2.6.5 and 2.6.8. The bilge pumping system should be so designed as to prevent water flowing from one compartment to another. The necessary valves for controlling the bilge suction should be capable of being operated from above the datum. All distribution boxes and manually operated valves in connection with the bilge pumping arrangements should be in positions which are accessible under ordinary circumstances.

10.3.4 The power operated self-priming bilge pumps may be used for other duties such as fire fighting or general service but not for pumping fuel or other flammable liquids.

10.3.5 Each power bilge pump should be capable of pumping water through the required bilge pipe at a speed of not less than 2 m/sec.

10.3.6 The diameter (d) of the bilge main should be calculated according to the following formula, except that the actual internal diameter of the bilge main may be rounded off to the nearest size of a recognised standard:

$$d = 25 + 1.68(L(B + D))^{0.5}$$

where :

d is the internal diameter of the bilge main (mm)

L is the length of the craft (m) as defined in Chapter 1

B is for monohull craft, the breadth of the craft in m as defined in Chapter 1
for multi-hull craft the breadth of a hull at or below the design waterline (m)

D is the moulded depth of the craft to the datum (m).

10.3.7 Internal diameters of suction branches should meet the requirements of the Administration but should not be less than 25 mm. Suction branches should be fitted with effective strainers.

10.3.8 An emergency bilge suction should be provided for each machinery space containing a propulsion prime mover. This suction should be led to the largest available power pump other than a bilge pump, propulsion or oil pump.

10.3.9 The spindles of the sea inlet valves should extend well above the machinery space floor plates.

10.3.10 All bilge suction piping up to the connection to the pumps should be independent of other piping.

10.3.11 Spaces situated above the water level in the worst anticipated damage conditions may be drained directly overboard through scuppers fitted with non-return valves.

10.3.12 Any unattended space for which bilge pumping arrangements are required should be provided with a bilge alarm.

10.3.13 For craft with individual bilge pumps, the total capacity Q of the bilge pumps for each hull should not be less than 2.4 times the capacity of the pump defined in 10.3.5 and 10.3.6.

10.3.14 In bilge pumping arrangements where a bilge main is not provided then, with the exception of the spaces forward of public spaces and crew accommodation, at least one fixed submersible pump should be provided for each space. In addition, at least one portable pump should be provided supplied from the emergency supply if electric, for use on individual spaces. The capacity of each submersible pump Q_n should not be less than:

$$Q_n = Q/(N-1) \text{ tonnes/h with a minimum of 8 tonnes/h}$$

where :

N = number of submersible pumps

Q = total capacity as defined in 10.3.13.

10.3.15 Non-return valves should be fitted in the following components:

- .1 bilge valve distribution manifolds;
- .2 bilge suction hose connections where fitted directly to the pump or to the main bilge suction pipe; and
- .3 direct bilge suction pipes and bilge pump connections to main bilge suction pipe.

10.4 Ballast systems

10.4.1 Water ballast should not in general be carried in tanks intended for oil fuel. In craft in which it is not practicable to avoid putting water in oil fuel tanks, oily water separating equipment should be fitted, or other alternative means such as discharge to shore facilities should be provided for disposing of the oily water ballast. The provisions of this paragraph are without prejudice to the provisions of the International Convention for the Prevention of Pollution from Ships in force.

10.4.2 Where a fuel transfer system is used for ballast purposes, the system should be isolated from any water ballast system and meet the requirements for fuel systems and the International Convention for the Prevention of Pollution from Ships in force.

10.5 Cooling systems

The cooling arrangements provided should be adequate to maintain all lubricating and hydraulic fluid temperatures within the manufacturer's recommended limits during all operations for which the craft is to be certificated.

10.6 Engine air intake systems

Arrangements should provide sufficient air to the engine and should give adequate protection against damage as distinct from deterioration, due to ingress of foreign matter.

10.7 Ventilation systems

Machinery spaces should be adequately ventilated so as to ensure that when machinery therein is operating at full power in all weather conditions including heavy weather, an adequate supply of air is maintained to the spaces for the safety and comfort of personnel and the operation of the machinery. Auxiliary machinery spaces should be adequately ventilated appropriate for the purpose of those spaces. The ventilation arrangements should be adequate to ensure that the safe operation of the craft is not put at risk.

10.8 Exhaust systems

10.8.1 All engines exhaust systems should be adequate to assure the correct functioning of the machinery and that safe operation of the craft is not put at risk.

10.8.2 Exhaust systems should be so arranged as to minimise the intake of exhaust gases into manned spaces, air-conditioning systems, and engine intakes. Exhaust systems should not discharge into air cushion intakes.

10.8.3 Pipes through which exhaust gases are discharged through the hull in the vicinity of the waterline should be fitted with erosion/corrosion resistant shut-off flaps or other devices on the shell or pipe end and acceptable arrangements made to prevent water flooding the space or entering the engine exhaust manifold.

10.8.4 Gas turbine engine exhausts should be arranged so that hot exhaust gases are directed away from areas to which personnel have access, either on board the craft or in the vicinity of the craft when berthed.

PART B REQUIREMENTS FOR PASSENGER CRAFT

10.9 Bilge pumping and drainage systems

10.9.1 For Category B craft at least three and for Category A craft at least two power bilge pumps should be fitted connected to the bilge main, one of which may be driven by the propulsion machinery. Alternatively, the arrangement may be in accordance with the requirements of 10.3.14.

10.9.2 The arrangements should be such that at least one power bilge pump should be available for use in all flooding conditions which the craft is required to withstand as follows:

- .1 one of the required bilge pumps should have an emergency pump of a reliable submersible type having an emergency source of power; or
- .2 the bilge pumps and their sources of power should be so distributed throughout the length of the craft that at least one pump in an undamaged compartment will be available.

10.9.3 On multi-hull craft each hull should be provided with at least two bilge pumps.

10.9.4 Distribution boxes, cocks and valves in connection with the bilge pumping system should be so arranged that in the event of flooding, one of the bilge pumps may be operative in any compartment. In addition, drainage to a pump or its pipe connecting to the bilge main should not put the bilge system out of action. When in addition to the main bilge pumping system, an emergency bilge, pumping system is provided, it should be independent of the

main system and so arranged that a pump is capable of operating in any compartment under flooding conditions as specified in 10.3.3. In that case only the valves necessary for the operation of the emergency system need be capable of being operated from above the datum.

10.9.5 All cocks and valves referred to in 10.9.4 which can be operated from above the datum should have their controls at their place of operation clearly marked and should be provided with means to indicate whether they are open or closed.

PART C REQUIREMENTS FOR CARGO CRAFT

10.10 Bilge pumping systems

10.10.1 At least two power pumps connected to the main bilge system should be provided, one of which may be driven by the propulsion machinery. If the Administration is satisfied that the safety of the craft is not impaired, bilge pumping arrangements may be dispensed with in particular compartments. Alternatively, the arrangement may be in accordance with the requirements of 10.3.14.

10.10.2 On multi-hull craft each hull should be provided with at least two power pumps, unless a bilge pump in one hull is capable of pumping bilge in the other hull. At least one pump in each hull should be an independent power pump.