

SECTION 8

FUEL OIL SYSTEMS

1 General

1.1 Applications

1.1.1 Scope

This section applies to oil fuel systems for the service of propulsion engines and auxiliary machines.

1.1.2 For fuel oil systems supplying any other kind of installation, additional requirements not contained in this section are given:

- for independent fuel oil tanks, in Pt B, Ch 10, Sec 5
- for fuel oil supply equipment forming part of engines, gas turbines and incinerators, in the corresponding sections
- for the location and scantling of tanks forming part of the yacht's structure, in Part B
- for helicopter refuelling facilities Ch 4, Sec 8, [4].

1.2 Principle

1.2.1 Fuel characteristics

Fuel oil systems are to be so designed as to ensure the proper characteristics (purity, viscosity, pressure) of the fuel oil supply to engines and boilers.

1.2.2 Design

Fuel oil systems are to be so designed as to prevent:

- overflow or spillage of fuel oil from tanks, pipes, fittings, etc.
- fuel oil from coming into contact with sources of ignition
- overheating and seizure of fuel oil.

2 Oil fuel system design

2.1 Application

2.1.1 Scope

The following requirements apply to a motor or sailing yacht whatever are the length and gross tonnage.

2.1.2 Alternative arrangements for yacht having the navigation notation **sheltered area** or **coastal area** or **unrestricted navigation limited to 60 nautical miles** as defined in Pt A, Ch 1, Sec 2, or for sailing yacht may be agreed on a case by case basis.

2.1.3 Additional requirements

- a) Additionally to this Article, the requirements of [3] apply to Yacht or Charter Yacht over 24 m and less than 500 GT
- b) Additionally to this Article and to [3], the requirements of [4] apply to Yacht or Charter Yacht over 500 GT or carrying more than 12 passengers.

2.2 General provisions

2.2.1 Definitions

Liquid fuels are classed in two categories:

- first category, liquid fuels of flash point less than 60 °C (closed-cup test), hereafter designed as "Gasoline"
- second category, liquid fuels of flash point equal or greater than 60 °C (closed-cup test), hereafter designed as "diesel oil".

2.2.2 Arrangement

- a) The entire oil fuel system is to be permanently installed
- b) Portable oil fuel tanks may be provided subject that they comply with requirements of [2.3]
- c) Individual components of the system, as well as the whole system, are to be designed and installed to withstand the combined conditions of pressure, vibration and movement encountered under normal operating conditions
- d) When first category liquid fuel is used, metallic components of the system are to be grounded to the engine block. Electrical continuity is to be maintained from the deck fuel plate on the deck to the engine. Where non-conducting materials are used, a bonding conductor is to be installed across the break
- e) Oil components under pressure are to be so located that in the event of a leakage the fuel oil cannot be pulverised onto the exhaust manifold.

2.2.3 Passage through particular compartments

- a) No fuel pipes are to pass through fresh water tanks and no fresh water pipes are to pass through fuel oil tanks
- b) No fuel pipes are to pass through accommodations
- c) Hot points and other sources of ignition, batteries, are to be kept clear from the vicinity of the oil fuel fittings, pumps and tanks.

2.2.4 Material

All materials used in the fabrication and installation of the tanks and component parts of the fuel system must be highly resistant to corrosion or degrading by the fuel for which the system is designed.

Cast metal fittings are to be pressure tested to a minimum pressure of 7 bars.

2.2.5 Provision to prevent overpressure

Provisions are to be made to prevent overpressure in any oil tank or in any part of the fuel oil system. Any relief valve is to discharge to a safe position.

2.2.6 Ventilation

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

2.2.7 Access

- a) Spaces where fuel oil is stored or handled are to be readily accessible
- b) Oil fuel valves, filters, strainers, pumps and other similar fittings are to be readily accessible for inspection and maintenance.

2.2.8 Pumps controls

The power supply to oil fuel transfer pumps and to other pumps of the oil fuel system as well as to oil fuel separators is to be capable of being stopped from an always accessible place in the event of fire within the compartment where these equipment are located.

2.2.9 Drip-trays and gutterways

Drip-trays or gutterways with appropriate discharge devices are to be fitted, when necessary:

- under pumps, valves and filters
- under oil fuel tanks and bunkers which are not part of the yacht's structure, as well as
- under all the accessories subject to oil fuel leakage.

2.2.10 Provision to prevent risk of spillage

Provisions are to be taken to the Society's Surveyor satisfaction in order to minimize the risk of oil fuel spillage or leakage, and of accumulation of flammable vapours into the yacht.

2.3 Oil fuel tank and bunkers

2.3.1 General

- a) First category liquid fuel tanks are not to be integral with the hull. They are to be located separately from the engine compartment
- b) If portable fuel tanks are used for first category liquid fuels, the tanks and their piping are to be type approved.
- c) Engine mounted integral tanks for either first or second category liquid fuels may be used only for small engines of 4 kW maximum installed in open areas and having a maximum capacity of 10 litres
- d) Second category liquid fuel tanks may be integral with the hull. If reinforced plastic laminated core construction is used where the tank is integral with the hull, the core material is not to be deteriorated from contact with diesel fuel and is not to permit fuel to migrate.

2.3.2 Materials

- a) Independent fuel oil tanks are to be made of steel material except when permitted in b)

- b) On yachts of less than 100 tons gross tonnage, independent fuel oil tanks may be made of:
 - copper, provided that copper tanks are tin coated internally when intended for first category fuel. They are not considered suitable for other liquid fuels
 - aluminium alloys or equivalent material, provided that the tanks are located outside the propulsion machinery spaces or, when located within such spaces, they are insulated to A-60 class standard
 - composite material, provided:
 - the total volume of tanks located in the same space does not exceed 4,5 m³, and
 - the properties of composite material, including fire resistance, comply with the relevant provisions of Ch 1, Sec 4, [5] to Ch 1, Sec 4, [7]
 - tanks are to comply with requirements of Ch 1, Sec 4, [5] to Ch 1, Sec 4, [7]
- c) Sheet steel tanks, when intended for first category liquid fuel, must be effectively protected internally and externally against corrosion. Where galvanising is used it must be by the hot dipped process. Sheet steel tanks intended for second category liquid fuel must not be galvanised internally
- d) Oil fuel tanks and bunkers are to be tested under the conditions specified in Part D, Ch 21, Sec 3, [1.3.3] of the Rules for Steel Ships.

2.3.3 Construction and design

- a) The scantling of oil fuel bunkers and tanks forming part of the yacht's structure are to comply with the requirements stated in Part B, Chapter 2
- b) The scantling of independent tanks are to be justified either by tests and calculations, or by sufficient experience in a similar service
- c) Any metallic independent tank of a capacity more than 500 litres are to comply with the requirements of Part B
- d) For metallic tanks all joints and seams must be either brazed, welded or equivalent
- e) Independent oil fuel tanks of capacity less than 500 l are to be self supported and are to be scantled and stiffened for their design internal pressure which must be taken equal to at least 0,2 bar at the tank top level
- f) Any oil fuel tank which length is more than 1000 mm, is to be provided with suitable baffle plates
- g) For first category liquid fuel tanks, the following requirements are to be satisfied:
 - bottoms are not to have pockets that will accumulate water or sediment
 - the fill and outlet pipes are not extend to more than 50 mm of the bottom of the tank
- h) For second category liquid fuel tanks, the following requirements are to be satisfied:
 - as a rule, for capacities of more than 75 litres, a suitable handhole or similar opening is to be provided to facilitate internal inspection and cleaning
 - a sump or pocket in the tank bottom is to be provided for the collection of water, with drains fitted with self-closing valves or cocks.

2.3.4 Installation

- a) Independent fuel tanks are to be permanently installed in such manner that they do not support decks, bulkheads or other structure. They are to be suitably supported and fixed
- b) Fuel tanks are to be sited in well-ventilated locations
- c) Location of oil fuel tanks and bunkers is to be chosen in a way to avoid any abnormal rise in temperature in these capacities
- d) The use of free standing oil fuel tanks is not permitted where spillage, leakage or vapour there from can constitute a hazard by falling on heated surfaces or where there is a risk of ignition.

2.3.5 Air and overflow pipes

Air and overflow pipes are to comply with Ch 1, Sec 7.

2.3.6 Level indicators

- a) Safe and efficient means of ascertaining the amount of fuel oil contained in any fuel oil tank are to be provided
Means are to be such that, in the event of a tank being overfilled, spillage through them shall not occur
- b) Gauge cocks for checking the level in the tanks are not to be used
- c) Sounding pipes of fuel oil tanks are to comply with the provisions of Ch 1, Sec 7, [1.3] and Ch 1, Sec 7, [2.3]
- d) Oil-level gauges complying with Ch 1, Sec 4, [8.5.2] may be used in place of sounding pipes

Where a level indicating gauge glass is fitted on a fuel tank, it is to be fitted with self-closing valves or cocks and made of heat resisting material. It is to be protected against shocks. Oil fuel tank soundings should not be located in crew accommodation

- e) Glass fuel level gauges fitted externally on the tanks are not to be used in first category liquid fuel systems
- f) Where the fuel transfer system does not include power pumps but only hand pumps, the valves to be provided at the lower end of level-indicators for fuel tanks, with the exception of daily service tanks, need not to be of the self-closing type. These valves are however to be readily accessible and instruction plates are to be fitted near these valves specifying that they are to be maintained closed except during transfer operations.

2.3.7 Testing

Oil fuel metallic independent type tanks are to be hydraulically tested prior to their installation inboard at a pressure of at least 0,24 bar.

2.4 Filling, venting and transfer pipes

2.4.1 Oil fuel lines

- a) The materials used are to be in accordance with Ch 1, Sec 4. Except for flexible pipes, the wall thickness of the fuel line is not to be less than 0,73 mm

- b) Fuel lines are to have a minimum of connections, all of which must be readily accessible
 - Soft solder connection are not to be used
 - Piping are to be connected by metal to metal joint of the conical type or by other approved type
- c) A short length of flexible pipe may be fitted to conduct any fuel by-pass back to the top of the tank or in the section of line between the engine bed and the fuel lift pump. Such flexible pipe is to be type approved. Hoses should be equipped with permanent end fittings; but where these are not available, the hose is to be secured with two non corrodable metallic clamps of an approved type
- d) Filling, vent and transfer lines are to be made in fixed lines.

2.4.2 Fuel tanks filling system

- a) All fuel tanks are to be fitted with a permanent filling pipe, of approved type led from the weather deck to the top of the tank. The minimum internal diameter of filling pipes is 38 mm. Suitable coamings and drains are to be provided to collect any leakage resulting from filling operations
- b) The deck filling plate is to be watertight designed and permanently stamped with a means of identifying the type of fuel the tank contains
- c) Separation between ventilation openings and fuel deck filling plate is to be at least 400 mm
- d) Refuelling instructions for first category liquid fuel should be permanently displayed in a position where they will be read by the operator. They should include warning against fire and explosion risks.

2.4.3 Fuel tanks venting system

- a) All tanks are to be fitted with air vents ending outside the yacht
- b) Vent pipes must begin from the highest point of the tank and discharge in a position reasonably remote from ports, windows, or similar openings in the accommodation. They are to be arranged to prevent the accidental entry of water
- c) In first category liquid fuel installations, pipes must be fitted with an approved flame screen at the outlet, having an effective area not less than the minimum required for the vent pipe. It must be arranged to permit easy cleaning
- d) For tanks of less than 30 litres capacity, separate vent pipes may be dispensed if the filling pipe is suitably arranged
- e) For normal hose filling, inside diameter of the vent pipe is to be 14 mm at least

When filling can be carried out under pressure (with airtight coupling), a special examination of the Society can be carried out.

2.4.4 Transfer system

- a) If main propulsion is ensured by engines and if transfer circuit of fuel liquid exists, this transfer is to be ensured by two pumps. One of these is to be manual

2.5 Oil fuel supply to engines

2.5.1 Suctions

The suction of engine fuel pumps are to be so arranged as to prevent the suction of gathered water and sludge likely to accumulate after decanting at the lower part of service tanks.

2.5.2 Valves and cocks

- a) A valve and cock are to be provided on fuel lines directly to the tank

If the complete fuel system is above the level of the tank, this requirement may be dispensed with

- b) These valves are to be capable of being closed from a safe position outside the space in which such tanks are situated in the event of a fire occurring in such space
- c) Heat sensitive or brittle materials are not to be used in the construction of valves or cocks.

2.5.3 Filters

- a) Internal combustion engines intended for main propulsion are to be fitted with at least two filters, or similar devices, so arranged that one of the filters can be overhauled while the other is in use

Note 1: For yacht having the navigation notation **sheltered area** or **coastal area** or **unrestricted navigation limited to 60 nautical miles** as defined in Pt A, Ch 1, Sec 2, or for sailing yacht or where the propulsion plant consists of:

- two or more engines, each one with its own filter, or
- one engine with an output not exceeding 375 kW

the second filter may be replaced by a readily accessible and easily replaceable spare filter.

- b) Fuel filters are to be made of material highly resistant to mechanical impacts and thermal shocks
- c) Fuel filters must be fitted with drain plugs
- d) Filters must be tested to 2 bars or 1,5 times the design pressure, whichever is the greater.

2.5.4 Pumps

- a) In first category liquid fuel system, gravity feed systems is to be permitted only for small engines with a tank capacity not exceeding 10 litres
- b) When an fuel oil booster pump is fitted which is essential to the operation of the main engine, a stand-by pump, connected ready for immediate use, is to be provided

Note 1: Where the propulsion plant consists of:

- two or more main engines, each one with its own booster pump, or
- in yachts having main engine with an output not exceeding 375 kW,

the stand-by pump may be replaced by a complete spare pump of appropriate capacity ready to be connected.

- c) Excess fuel oil from pumps or injectors is to be led back to the service or settling tanks, or to other tanks intended for this purpose.

2.5.5 High pressure fuel oil pipe

All external high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors are to be protected with a shielded piping system capable of containing fuel from a high pressure line failure.

A shielded pipe incorporates an outer pipe into which the high pressure fuel pipe is placed forming a permanent assembly.

The shielded piping system is to include a means for collection of leakages and arrangements are to be provided for an alarm to be given in the event of a fuel line failure.

If flexible hoses are used for shielding purposes, these are to be approved by the Society.

3 Yacht or Charter Yacht equal or over 24 m and less than 500 GT

3.1 Application

3.1.1 Scope

The following requirements apply to motor or sailing yacht of 24 metres in load line length and over, and of less than 500 tons gross tonnage.

3.1.2 Alternative arrangements for yacht having the navigation notation **sheltered area** or **coastal area** or **unrestricted navigation limited to 60 nautical miles** as defined in Pt A, Ch 1, Sec 2, or for sailing yacht may be agreed on a case by case basis.

3.2 Principles

3.2.1 General

The use for propulsion engines and auxiliary machine of oil fuel having a flash point lower than 60°C is subject to a special examination by the Society.

3.2.2 Availability of fuel systems

- a) Fuel oil systems are to be so designed that, in the event that any one essential auxiliary of such systems becomes inoperative, the fuel oil supply to engines can be maintained. Partial reduction of the propulsion capability may be accepted, however, when it is demonstrated that the safe operation of the yacht is not impaired
- b) Fuel oil tanks are to be so arranged that, in the event of damage to any one tank, complete loss of the fuel supply to essential services does not occur.

3.2.3 Arrangement of fuel oil systems

- a) In yacht in which fuel oil is used, the arrangements for the storage, distribution and utilisation of the fuel oil are to be such as to ensure the safety of the yacht and persons on board
- b) The provisions of Ch 1, Sec 4, [9.10] are to be complied with.

3.3 Oil fuel tanks and bunkers

3.3.1 Filling and suction pipes

- a) All suction pipes to oil fuel tanks and bunkers, including those in double bottom, are to be provided with valves
- b) Where the filling pipes to oil fuel bunkers and tanks are not led to the upper part of the said bunkers and tanks, they are to be provided with non-return valves at their ends
- c) For storage tanks, filling pipes may also be used for suction purposes
- d) The valves requested in a), b) and c) are to be located on the tank or bulkhead itself. However, short distance pieces of rigid construction may be accepted, the length of which is not to exceed about 1,5 D of the pipe.

3.3.2 Remote control of valves

- a) Every fuel oil pipe which, if damaged, would allow oil to escape from a storage, settling or daily service tank having a capacity of 500 l and above situated above the double bottom, is to be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space in which such tanks are situated in the event of a fire occurring in such space
- b) Such valves and cocks are also to include local control and indicators are to be provided on the remote and local controls to show whether they are open or shut.

3.3.3 Drains

Daily service tanks are to be provided with drains permitting the evacuation of water and impurities likely to accumulate in the lower part of these tanks.

These drains are to be fitted with self-closing valves or cocks.

3.4 Control and monitoring

3.4.1 Monitoring

Fuel oil systems are to be fitted with the following alarms:

- a) when fuel oil overflow tank is fitted, a high level alarm or a sightglass is to be fitted
- b) daily service tank is to be fitted with a low level alarm with a local indication or a sightglass.

3.4.2 Remote controls

- a) The remote control arrangement of valves fitted on fuel oil tanks is to comply with [3.3.2]
- b) The positions of the remote controls are also to comply with Part C, Chapter 3.

3.5 Materials - Construction

3.5.1 Flexible pipes

- a) Flexible pipes are to be type approved by the Society
- b) Flexible pipes are to be as short as possible.

3.5.2 Materials

- a) Low-pressure oil fuel pipes are generally to be made of steel. Where the internal diameter of these pipes does not exceed 25 mm, they may be of seamless copper or copper-alloy unless they pass through oil fuel tanks
- b) Transfer oil fuel pipes may be of non metallic hoses in the conditions stated in Ch 1, Sec 4, [5] to Ch 1, Sec 4, [7]
- c) For valves fitted to fuel oil tanks and which are under a static pressure head, steel or nodular cast iron may be accepted. However, ordinary cast iron valves may be used in fuel piping systems where the design pressure is lower than 0,7 MPa and the design temperature is below 60°C.

3.5.3 Pipe thickness

The thickness of pipes conveying fuel oil, as well as their flanges, is to be calculated for a design pressure determined in accordance with Ch 1, Sec 4, Tab 4.

3.5.4 Connections

- a) The pipes are to be connected by means of close-fitting flanges or other devices deemed equivalent for the application considered. The materials of the joints are to be impervious to liquid hydrocarbons
- b) Where flexible pipes are used, connections are to be of a screw type or equivalent approved type.

4 Yacht or Charter Yacht over 500 GT or carrying more than 12 passengers

4.1 Application

4.1.1 Scope

The following requirements apply to motor or sailing yacht of 500 tons gross tonnage and over, or carrying more than 12 passengers.

In addition, the requirements of [3] are to be complied with.

4.1.2 Alternative arrangements for yacht having the navigation notation **sheltered area** or **coastal area** or **unrestricted navigation limited to 60 nautical miles** as defined in Pt A, Ch 1, Sec 2, or for sailing yacht may be agreed on a case by case basis.

4.2 Arrangement of fuel oil tanks and bunkers

4.2.1 Location of fuel oil tanks

- a) No fuel oil tank is to be situated where spillage or leakage there from can constitute a hazard by falling on heated surfaces
- b) As far as practicable, fuel oil tanks are to be part of the yacht's structure and are to be located outside machinery spaces of category A. Where fuel oil tanks, other than double bottom tanks, are necessarily located adjacent to or within machinery spaces of category A, at least one of their vertical sides is to be contiguous to the machinery space boundaries, and is preferably to have a

common boundary with the double bottom tanks, and the area of the tank boundary common with the machinery spaces is to be kept to a minimum. Where such tanks are situated within the boundaries of machinery spaces of category A, they are not to contain fuel oil having a flash point of less than 60°C.

Note 1: Machinery spaces of category A are defined in Ch 4, Sec 1.

4.3 Design of fuel supply systems

4.3.1 General

Fuel oil lines supplying propulsion machinery and those supplying auxiliary engines are to be independent.

4.3.2 Fuel oil service tanks

Two fuel oil service tanks for each type of fuel used on board necessary for propulsion and vital systems, or equivalent arrangements, are to be provided on each new yacht, with a capacity of at least 8 h at maximum continuous rating of the propulsion plant and normal operating load at sea of the generator plant.

4.3.3 Fuel oil supply to internal combustion engines

In multi-engine installations which are supplied from the same fuel source, means of isolating the fuel supply and spill piping to individual engines are to be provided. The means of isolation are not to affect the operation of the other engines and are to be operable from a position not rendered inaccessible by a fire on any of the engines.