Requirements concerning FIRE PROTECTION

IACS Req. 2002

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F1 Cathodic protection on oil tankers

(1971) (Rev.1, June 2002)

F1.1 Impressed current systems are not permitted in oil cargo tanks.

F1.2 Magnesium or magnesium alloy anodes are not permitted in oil cargo tanks and tanks adjacent to cargo tanks.

F1.3 Aluminium anodes are only permitted in cargo tanks and tanks adjacent to cargo tanks in locations where the potential energy does not exceed 28 kg m (200 ft lb). The height of the anode is to be measured from the bottom of the tank to the centre of the anode, and its weight is to be taken as the weight of the anode as fitted, including the fitting devices and inserts. However, where aluminium anodes are located on horizontal surfaces such as bulkhead girders and stringers not less than 1 m wide and fitted with an upstanding flange or face flat projecting not less than 75 mm above the horizontal surface, the height of the anode may be measured from this surface. Aluminium anodes are not to be located under tank hatches or Butterworth openings (in order to avoid any metal parts falling on the fitted anodes), unless protected by adjacent structure.

F1.4 There is no restriction on the positioning of zinc anodes.

F1.5 The anodes should have steel cores and these should be sufficiently rigid to avoid resonance in the anode support and be designed so that they retain the anode even when it is wasted.

F1.6 The steel inserts are to be attached to the structure by means of a continuous weld of adequate section. Alternatively they may be attached to separate supports by bolting, provided a minimum of two bolts with locknuts are used. However, approved mechanical means of clamping will be accepted.

F1.7 The supports at each end of an anode should not be attached to separate items which are likely to move independently.

F1.8 When anode inserts or supports are welded to the structure, they should be arranged so that the welds are clear of stress raisers.

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F2 Aluminium Coatings on Board Oil Tankers and Chemical Tankers

(1971) (Rev. 1 May 1998)/ Corr.1, March 1999

The use of aluminium coatings is prohibited in cargo tanks, cargo tank deck area, pump rooms, cofferdams or any other area where cargo vapour may accumulate.

Aluminised pipes may be permitted in ballast tanks, in inerted cargo tanks and, provided the pipes are protected from accidental impact, in hazardous areas on open deck.

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F3 Tank cleaning openings

(1971)

Ullage plugs, sighting ports and tank cleaning openings are not to be arranged in enclosed spaces.

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F4 Deleted

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F5 Pump room alarms

(1971)
(Rev. 1
1973)

Where audible alarms are fitted to warn of the release of fire extinguishing medium into pump rooms, they may be of the pneumatic type or electric type.

(a) *Pneumatically operated alarms*

In cases where the periodic testing of such alarms is required,CO_2 operated alarms should not be used owing to the possibility of the generation of static electricity in the CO_2 cloud. Air operated alarms may be used provided the air supply is clean and dry.

(b) *Electrically operated alarms*

When electrically operated alarms are used, the arrangements are to be such that the electric actuating mechanism is located outside the pump room except where the alarms are certified intrinsically safe.

It was further agreed that the use of CO_2 operated alarms should be discouraged.

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F6 Standardization of flash points

(1971)
(Rev 1 1996)

In context of these Unified Requirements, oil tankers shall be considered as vessels capable of carrying oil having a flash point not exceeding 60°C (closed cup test).

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F7 Portable instruments for measuring oxygen and flammable vapour concentrations

(1971)
(Rev. 1 1989)
(Rev.2 May 1999)

Every oil tanker is to be provided with at least two portable gas detectors capable of measuring flammable vapour concentrations in air and at least two portable O_2 analysers.

In addition, for tankers fitted with inert gas systems, at least two portable gas detectors are to be capable of measuring concentrations of flammable vapours in inerted atomosphere.

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F8 Pressurisation of cargo tanks

(1971)
(Rev. 1
1989)

PV valves to oil tanks should not be set at pressures in excess of 0,21 bar unless the tank scantlings have been specially considered.

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F9 Lighting and sighting ports in pump room/engine room bulkheads

(1971)

F9.1 Where the pump room is illuminated through glazed ports, these are to be effectively protected from mechanical damage and are to have strong covers secured from the side of the sage space.

F9.2 Glazed ports are to be so constructed that glass and sealing will not be impaired by the working of the ship.

F9.3 The glass and the protection of the light fitting are not to impair the integrity of the bulkhead and are to be of equivalent strength.

F9.4 The fitting is to have the same resistance to fire and smoke as the unpierced bulkhead.

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F10 Deleted

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F11 Deleted

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F12 Deleted

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F13 Gland seals in pump room bulkheads

(1972)
(Rev. 1
1977)

Where drive shafts pass through pump room bulkhead or deck plating, gastight glands are to be fitted. The glands are to be efficiently lubricated from outside the pumproom. The seal parts of the glands are to be of material that will not initiate sparks. The glands are to be constructed and fitted in accordance with the relative rules for fittings attached to watertight bulkheads, and if a bellows piece is incorporated in the design, it should be pressure tested before fitting.

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F14 Deleted

- the requirements are now addressed by IMO Res. A.446 (XI)

F15 Piping passing through dangerous zones

(1982) (Rev. 4 1989) (Rev 5. 1996)

F15.1 Ballast piping passing through cargo tanks and cargo oil pipes passing through segregated ballast tanks, as permitted by MARPOL Annex 1 Reg. 13F, are to comply with the following requirements.

F15.1.1 The pipes are to be of heavy gauge steel of minimum wall thickness according to the table hereunder with welded or heavy flanged joints the number of which is to be kept to a minimum.

Expansion bends only ~~(~~not glands~~)~~ are permitted in these lines within cargo tanks for serving the ballast tanks and within the ballast tanks for serving the cargo tanks.

Nominal diameter (mm)	Minimum wall thickness (mm)
50	6,3
100	8,6
125	9,5
150	11,0
200 and above	12,5

F15.2 The thicknesses shown in the above table refer to carbon steel.

F15.3 Connection between cargo piping and ballast piping referred to above is not permitted except for emergency discharge as specified in the Unified Interpretation to Reg. 1 (17) of MARPOL 73/78, Annex 1.

Nevertheless, provision may be made for emergency discharge of the segregated ballast by means of a connection to a cargo pump through a portable spool piece. In this case non-return valves should be fitted on the segregated ballast connections to prevent the passage of oil to the ballast tanks. The portable spool piece should be mounted in a conspicuous position in the pump room and a permanent notice restricting its use should be prominently displayed adjacent to it.

Shut-off valves shall be provided to shut off the cargo and ballast lines before the spool piece is removed.

F15.4 The ballast pump is to be located in the cargo pump room, or a similar space within the cargo area not containing any source of ignition.

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F16 Bow and stern loading and unloading arrangements on oil tankers

(1972) (Rev.1 June 2000)

Where a cargo hose connection is arranged outside the cargo tank area, the pipe leading to such connections is to be provided with means of segregation such as a spectacle flange, removable spool piece or equivalent* located within the cargo area. The space within 3 m of the manifold is to be considered as a dangerous area with regard to electrical or incendive equipment.

* See MSC/Circ. 474.

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F17 Deleted

- this is of a general nature concerning operational matters and should not be categorosed as UR.

F18 Deleted (1997)

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F19 Deleted

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F20 Inert Gas Systems

(1984) (Rev.1 1983 (Rev. 2 1987) (Rev. 3 May,1998) (Corr. Sept.2001)

F20.1 General Requirements

F20.1.1 All types of inert gas systems are to comply with the following:

.1 Plans in diagrammatic form are to be submitted for appraisal and should include the following:

- details and arrangement of the inert gas generating plant including all control and monitoring devices;
- arrangement of the piping system for distribution of the inert gas.

.2 An automatic control capable of producing suitable inert gas under all service conditions is to be fitted.

.3 Materials used in inert gas systems are to be suitable for their intended purpose in accordance with the Rules of the Classification Society.

.4 All the equipment is to be installed on board and tested under working conditions to the satisfaction of the Surveyor.

.5 Subsequent surveys are to be carried out at the intervals required by the Classification Society Rules.

F20.2 Inert Gas Systems on Tankers Carrying Crude Oil and Petroleum Products

F20.2.1 The following requirements apply where an inert gas system based on boiler flue gas and oil fired inert gas generators is fitted on board tankers intended for the carriage of crude oil and petroleum products in bulk having a flashpoint not exceeding 60°C (closed cup test) as determined by an approved flashpoint apparatus, and a Reid vapour pressure which is below atmospheric pressure, and other liquid products having a similar fire hazard.

F20.2.2 The inert gas system is to comply with the requirements of Regulation 62 of Chapter II-2 of the International Convention for the Safety of Life at Sea, 1974, as amended, insofar as they are applicable to new ships only.

Any use of the word "Administration" in the Regulation is to be considered as meaning the relevant Classification Society.

F20.2.3 In addition to the requirements detailed in Regulation 62, the following is to be complied with:

.1 When two blowers are provided, the total required capacity of the inert gas system is preferably to be divided equally between the two blowers, and in no case is one blower to have a capacity less than 1/3 of the total capacity required.

.2 In particular those parts of scrubbers, blowers, non-return devices, scrubber effluent and other drain pipes which may be subjected to corrosive action of the gases and/or liquids are to be either constructed of corrosion resistant material or lined with rubber, glass fibre epoxy resin or other equivalent coating material.

.3 The compartment in which any oil fired inert gas generator is situated is to be treated as machinery space of Category A with respect to fire protection.

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F20 cont'd

.4 Arrangements are to be made to vent the inert gas from oil fired inert gas generators to the atmosphere when the inert gas produced is off specification, e.g., during start-up or in the event of equipment failure.

.5 Automatic shut-down of the oil fuel supply to inert gas generators is to be arranged on predetermined limits being reached with respect to low water pressure or low water flow rate to the cooling and scrubbing arrangement and with respect to high gas temperature.

.6 Automatic shut-down of the gas regulating valve is to be arranged with respect to failure of the power supply to the oil fired inert gas generators.

F20.3 Inert Gas Systems on Chemical Tankers

F20.3.1 The following requirements apply where an inert gas system based on oil fired inert gas generators is fitted on board chemical tankers.

F20.3.2 The inert gas system is to comply with the requirements of Resolution A.567(14).

Any use of the word "Administration" in the Resolution is to be considered as meaning the relevant Classification Society.

F20.3.3 As an alternative to the water seal in the inert gas line on deck, an arrangement consisting of two shut-off valves in series with a venting valve in between may be accepted (double block and bleed) . The following conditions apply:

- The operation of the valve is to be automatically executed. Signal(s) for opening/closing is (are) to be taken from the process directly, e.g. inert gas flow or differential pressure.

- Alarm for faulty operation of the valves is to be provided, e.g. the operation status of "Blower stop" and "supply valve(s) open" is an alarm condition.

F20.3.4 In addition to the requirements detailed in Resolution A.567(14), the requirements for inert gas systems, contained in paragraphs F20.2.3.1 to F20.2.3.3, are to be complied with.

F20.4 Nitrogen Generator Systems

F20.4.1 The following requirements are specific only to the gas generator system and apply where inert gas is produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.

F20.4.2 Where such systems are provided in place of the boiler flue gas or oil fired inert gas generators referred to in sections F20.2 and F20.3, the following requirements of Reg.II-2/62 or equivalent requirements of Resolution A.567(14) remain applicable for the piping arrangements, alarms and instrumentation downstream of the gas generator: 9.1, 9.2, 11, 12, 13, 14, 16.1.1, 16.2, 16.3, 17, 18, 19.1.6, 19.1.8, 19.1.9, 19.3, 19.4, 19.6, 19.8, 21.

F20.4.3 A nitrogen generator consists of a feed air treatment system and any number of membrane or adsorber modules in parallel necessary to meet the required capacity which is to be at least 125% of the maximum discharge capacity of the ship expressed as a volume.

F20.4.4 The air compressor and the nitrogen generator may be installed in the engine room or in a separate compartment. A separate compartment is to be treated as one of "Other machinery spaces" with respect to fire protection.

F20.4.5 Where a separate compartment is provided, it is to be positioned outside the cargo area and is to be fitted with an independent mechanical extraction ventilation system providing 6 air changes per hour. A low oxygen alarm is to be fitted as well.

The compartment is to have no direct access to accommodation spaces, service spaces and control stations. ▶

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F20.4.6 The nitrogen generator is to be capable of delivering high purity nitrogen with O_2 content not exceeding 5% by volume. The system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation.

F20.4.7 The system is to be provided with two air compressors. The total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required.

Only one air compressor may be accepted provided that sufficient spares for the air compressor and its prime mover are carried on board to enable their failure to be rectified by the ship's crew.

F20.4.8 A feed air treatment system is to be fitted to remove free water, particles and traces of oil from the compressed air, and to preserve the specification temperature.

F20.4.9 Where fitted, a nitrogen receiver/buffer tank may be installed in a dedicated compartment or in the separate compartment containing the air compressor and the generator or may be located in the cargo area. Where the nitrogen receiver/buffer tank is installed in an enclosed space, the access is to be arranged only from the open deck and the access door is to open outwards. Permanent ventilation and alarm are to be fitted as required by paragraph F20.4.5.

F20.4.10 The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be discharged to a safe location on the open deck.

F20.4.11 In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.

F20.4.12 At least two non-return devices are to be fitted in the inert gas supply main, one of which is to be of the double block and bleed arrangement (refer to paragraph F20.3.3). The second non-return device is to be equipped with positive means of closure.

F20.4.13 Instrumentation is to be provided for continuously indicating the temperature and pressure of air:

.1 at the discharge side of the compressor,
.2 at the entrance side of the nitrogen generator.

F20.4.14 Instrumentation is to be fitted for continuously indicating and permanently recording the oxygen content of the inert gas downstream of the nitrogen generator when inert gas is being supplied.

F20.4.15 The instrumentation referred to in paragraph F20.4.14 is to be placed in the cargo control room and in the machinery control room (or in the machinery space).

F20.4.16 Audible and visual alarms are to be provided to indicate :

.1 low feed-air pressure from compressor as referred to in paragraph F20.4.13.1,
.2 high air temperature as referred to in paragraph F20.4.13.1,
.3 high condensate level at automatic drain of water separator as referred to in paragraph F20.4.8,
.4 failure of electrical heater, if fitted,
.5 oxygen content in excess of that required in paragraph F20.4.6,
.6 failure of power supply to the instrumentation as referred to in paragraph F20.4.14.

F20.4.17 Automatic shut-down of the system is to be arranged upon alarm conditions as required by paragraphs F20.4.16.1 to .5.

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F20.4.18 The alarms required by paragraphs F20.4.16.1 to .6 are to be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.

F20.5 Nitrogen /inert gas systems fitted for purposes other than inerting required by SOLAS Reg. II-2/60

F20.5.1 This section applies to systems fitted on oil tankers of less than 20.000 DWT, gas tankers or chemical tankers.

F20.5.2 The requirements of section F20.4 apply except paragraphs F20.4.1, F20.4.2, F20.4.3 and F20.4.7.

F20.5.3 Where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required by paragraph F20.4.12 may be substituted by two non-return valves.

F21 Pump room ventilation
(1974)

With the following arrangement of exhaust trunking there should be 20 air changes per hour on the total volume of the pump room:

(i) In the pump room bilges just above the transverse floor plates on bottom longitudinals, so that air can flow over the top from adjacent spaces.
(ii) An emergency intake located about 2 m above the pump room lower grating. This emergency intake would be used when the lower intakes are sealed off due to flooding in the bilges. The emergency intake should have a damper fitted which is capable of being opened or closed from the exposed main deck and lower grating level.
(iii) The foregoing exhaust system is in association with open grating floor plates to allow the free flow of air.
(iv) Arrangements involving a specific ratio of areas of upper emergency and lower main ventilator openings, which can be shown to result in at least the required 20 air changes per hour through the lower inlets, can be adopted without the use of dampers. When the lower access inlets are closed then at least 15 air changes per hour should be obtained through the upper inlets.

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F22 Direct loading pipes to oil tanker cargo tanks
(1974)

In order to avoid the generation of static electricity when cargo is loaded direct into tanks, the loading pipes are to be led as low as practicable in the tank.

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F23 Deleted

- the requirements are overtaken by the development of MARPOL Convention.

F24 Temperature of Steam and Heating Media within the Cargo Area

(1971)
(Rev. 1 1975
(Rev. 2 May 1998)

On oil tankers, the steam and heating media temperature within the cargo area is not to exceed 220°C.

On gas carriers and chemical tankers, the maximum temperature is to be adjusted to take into account the temperature class of the cargoes.

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F25 Deleted

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F26 Safety aspects of double bottoms and duct keels under cargo oil tanks

(1977) (Rev 1 1996) (Rev.2 June 2000)

Pipe ducts in the double bottom shall comply with the following requirements:

(i) They should not communicate with the engine room.
(ii) Provision shall be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pumproom.
(iii) In the duct, provision shall be made for adequate mechanical ventilation.

Note: For ships to which the convention applies, refer to SOLAS 1974 (as amended), Regulation II-2/56.9.

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F27 Cargo openings in the bottoms of topside tanks of ships carrying alternatively oil and grain
(1978)

Ships carrying alternatively oil having a flash point not exceeding 60°C (closed cup test) or other cargoes.

When ships are designed to transport alternatively oil or dry cargoes, openings which may be used for cargo operations are not permitted in bulkheads and decks separating oil cargo spaces from other spaces not designed and equipped for the carriage of oil cargoes unless alternative approved means are provided to ensure equivalent integrity.

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F28 Deleted

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F29 Non-sparking fans

(1973)
(Rev. 1 1978)
(Rev. 2 1979)
Rev. 3 1980)
(Rev. 4 1983)
(Rev. 5 1994)

F29.1 Introduction

A fan is considered as non-sparking if in either normal or abnormal conditions it is unlikely to produce sparks.

F29.2 Design criteria

F29.2.1 The air gap between the impeller and the casing shall be not less than 0,1 of the shaft diameter in way of the impeller bearing but not less than 2 mm. It need not be more than 13 mm.

F29.2.2 Protection screens of not more than 13 mm square mesh are to be fitted in the inlet and outlet of ventilation ducts to prevent the entrance of objects into the fan housing.

F29.3 Materials

F29.3.1 The impeller and the housing in way of the impeller are to be made of alloys which are recognised as being spark proof by appropriate test.

F29.3.2 Electrostatic charges both in the rotating body and the casing are to be prevented by the use of antistatic materials. Furthermore, the installation on board of the ventilation units is to be such as to ensure the safe bonding to the hull of the units themselves.

F29.3.3 Tests may not be required for fans having the following combinations:

(i) impellers and/or housings of nonmetallic material, due regard being paid to the elimination of static electricity,
(ii) impellers and housings of non-ferrous materials,
(iii) Impellers of aluminium alloys or magnesium alloys and a ferrous (including austenitic stainless steel) housing on which a ring of suitable thickness on non-ferrous materials is fitted in way of the impeller,
(iv) any combination of ferrous (including austenitic stainless steel)impellers and housings with not less than 13 mm tip design clearance.

F29.3.4 The following impellers and housings are considered as sparking and are not permitted:

(i) impellers of an aluminium alloy or magnesium alloy and a ferrous housing, regardless of tip clearance,
(ii) housing made of an aluminium alloy or a magnesium alloy and a ferrous impeller, regardless of tip clearance,
(iii) any combination of ferrous impeller and housing with less than 13 mm design tip clearance.

F29.3.5 Type tests on the finished product are to be carried out in accordance with the requirements of the Classification Society or an equivalent national or international standard.

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F30 Emergency fire pumps in cargo ships

(1974)
(Rev. 1 1976)
(Rev. 2 1978)
Rev. 3 1980)
Rev. 4 1984)
Rev. 5 1995)
(Rev 6 1997)

F30.1 General Requirements

F30.1.1 In cargo ships of 500 tons gross tonnage and upwards, unless the two main fire pumps and the fuel supply or source of power for each pump are situated within compartments separated at least by A–O division, so that a fire in any one compartment will not render both fire pumps inoperable, a fixed independent power operated emergency fire pump is to be fitted.

An arrangement in which one main fire pump is located in a steel compartment having more than one bulkhead and/or deck adjacent to the compartment containing the other main fire pump will also require an emergency fire pump.

F30.1.2 Where a power operated emergency fire pump is fitted, its fuel or power supply is to be so arranged that it will not readily be affected by a fire in the compartment containing the main fire pumps.

F30.1.3 The emergency fire pump may also be used for other suitable purposes subject to approval in each case.

F30.1.4 The emergency fire pump and its prime mover are to be to the satisfaction of the Classification Society.

F30.2 Arrangement

30.2.1 The emergency fire pump and its power source are to be located in a safe and readily accessible position well clear of the compartment in which the main fire pumps and their power sources are arranged. Where this is impracticable, the emergency fire pump may be located in a compartment adjacent to that containing the fire pumps, provided that the bulkheads and decks separating the two compartments are insulated to at least A-60 standard. The insulation is to extend at least 450 mm outside the area of the joint bulkheads and decks.

F30.2.2 No direct access is to be permitted between the machinery space and the emergency fire pump room except that access through an air lock or through a watertight door may be accepted as outlined in SOLAS Reg. II-2/4.3.3.2.7.

F30.2.3 When the emergency fire pump is electrically driven, the power is to be supplied by a source other than that supplying the main fire pumps and be located outside the engine room, and separated from it by an A Class division, and the relevant electric cables are not to pass through the compartment containing the main fir e pump.

F30.2.4 The emergency fire pump prime mover is to be so arranged that an immediate start is possible under all prevailing temperature conditions. Diesel engines exceeding 15 kW are to be equipped with an approved auxiliary starting device, e.g. starting battery, independent hydraulic system or independent starting air system, having a capacity sufficient for at least six starts of fire emergency pump. For diesel engines of 15 kW and smaller, manual means of starting are sufficient.

F30.2.5 For the operation of the emergency fire pump, fuel is to be available from outside the main machinery space for at least 18h operation.

F30.2.6 The sea suction for the pump is to be fitted at a safe depth below the water line at any draught under all trim and heeling conditions. Emergency fire pumps are to be designed as self-priming types. The location of the pump is to be such that it is capable of pumping at any draught under all trim and heeling conditions. The sea valve is to be capable of being operated from a position near the pump. Where it is found necessary to locate the emergency fire pump sea suction in the space containing the main fire pumps, the sea valve is to be operable from a readily accessible position not likely to be affected by a fire in the space containing the main fire pumps.

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F30 cont'd

F30.2.7 The room where the emergency fire pump prime mover is located is to be illuminated from the emergency source of supply and is to be well ventilated. If the room is to be mechanically ventilated the power is to be supplied by the emergency source. The arrangements are to be such as to preclude, as far as practicable, the possibility of smoke from a machinery space fire entering or being drawn into that space.

F30.3 Capacity

F30.3.1 The emergency fire pump is to be capable of supplying at least two satisfactory jets of water using the available hydrants, hoses and nozzels, and is to be a capacity of at least 25 m^3/h.

F30.3.2 In addition to the capacity required by F30.3.1, the emergency fire pump is to be also capable of supplying the amount of water needed for any fixed fire extinguishing system provided to protect the space where the main fire pumps are located.

F30.4 Testing

F30.4.1 Upon completion of the emergency fire pump installation, a running test is to be carried out to the satisfaction of the Classification Society.

F30.4.2 The emergency generator and its prime mover and any emergency accumulator battery are to be so arranged as to ensure that they will function at full rated power when it is upright and when inclined at any angle of list up to and including 22½° either way or up to and including 10° inclination either way in the fore and aft direction, of is in any combination of angles within those limits.

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F31 (1976) Fire prevention for unattended machinery spaces

The whole UR F31 was deleted as the requirements are now covered by F35.

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F32 (1976) Fire detecting system for unattended machinery spaces

F32.1 An automatic fire detection system is to be fitted in the machinery spaces.

F32.2 The system is to be designed with self-monitoring properties. Power or system failures are to initiate an audible alarm distinguishable from the fire alarm.

F32.3 The fire detection indicating panel is to be located on the navigating bridge, fire control station, or other accessible place where a fire in the machinery space will not render it inoperative.

F32.4 The fire detection indicating panel is to indicate the place of the detected fire in accordance with the arranged fire zones by means of a visual signal. Audible signals clearly distinguishable in character from any other audible signals shall be audible throughout the navigating bridge and the accommodation area of the personnel responsible for the operation of the machinery space.

F32.5 Fire detectors are to be of types, and so located, that they will rapidly detect the onset of fire in conditions normally present in the machinery space. Consideration is to be given to avoiding false alarms. The type and location of detectors are to be approved by the Classification Society and a combination of detector types is recommended in order to enable the system to react to more than one type of fire symptom.

F32.6 Fire detector zones are to be arranged in a manner that will enable the operating staff to locate the seat of the fire. The arrangement and the number of loops and the location of detector heads is to be approved in each case. Air currents created by the machinery are not to render the detection system ineffective.

F32.7 When fire detectors are provided with the means to adjust their sensitivity, necessary arrangements are to be ensured to fix and identify the set point.

F32.8 When it is intended that a particular loop or detector is to be temporarily switched off, this state is to be clearly indicated. Reactivation of the loop or detector is to be performed automatically after a present time.

F32.9 The fire detection indicating panel is to be provided with facilities for functional testing.

F32.10 The fire detecting system shall be fed automatically from the emergency source of power by a separate feeder if the main source of power fails.

F32.11 Facilities are to be provided in the fire detecting system to release manually the fire alarm from the following places:

Passageways having entrances to engine and boiler rooms,
navigating bridge,
control station in engine room.

F32.12 The testing of the fire detecting system on board is to be carried out to the satisfaction of the individual Classification Society.

NOTE
Requirements on indication of the operation of each individual detecting head are left to the discretion of each Classification Society.

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F33 (1981) Prohibition of carriage in fore peak tanks of oil or other liquid substances which are flammable

In ships of 400 tons gross tonnage and above, compartments forward o f the collision bulkhead shall not be arranged for the carriage of oil or other liquid substances which are flammable.

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F34 Low-pressure carbon dioxide smothering systems

(1982) (Rev. 1 1989)

F34.1 General

F34.1.1 The rated amount of carbon dioxide, time of discharge into the protected space, location of nozzels in the protected spaces and signals warning that the smothering system is activated shall comply with the requirements of Classification Societies relating to CO_2 high-pressure systems.

F34.1.2 Vessel(s), refrigerating plants, control devices and other equipment of the smothering system shall be located in a space complying with rules applying to CO_2 high-pressure systems.

F34.2 Vessel(s) and Relevant Devices

F34.2.1 The rated amount of liquid carbon dioxide shall be stored in vessel(s) under the working pressure in the range of 18 to 22 barg. The normal liquid charge in the container is to be limited to provide sufficient vapour space to allow for expansion of the liquid under the maximum storage temperatures than can be obtained corresponding to the setting of the pressure relief valves but is not to exceed 95% of the volumetric capacity of the container.

F34.2.2 The vessel(s) shall be designed, constructed and tested in accordance with the requirements of Classification Societies for pressure vessels. For this purpose the design pressure shall be taken not less than the relief valve setting. Besides, provision shall be made for:

- pressure gauge
- high pressure alarm: not more than setting of the relief valve
- low pressure alarm: not less than 18 barg
- branch pipes with stop valves for filling the vessel
- discharge pipes
- liquid CO_2 level indicator, fitted on the vessel(s)
- two safety relief valves arranged so that either valve can be shut off while the other is connected to the vessel. The setting of the relief valves is to be not less than 1,1 times working pressure. The capacity of each valve is to be such that the vapours generated under fire condition can be discharged with a pressure rise not more than 20% above the setting pressure. The discharge from the safety valves is to be led to the open.

F34.2.3 The vessel(s) and outgoing pipes permanently filled with carbon dioxide shall have thermal insulation preventing the operation of the safety valve in 24 hours after de-energizing the plant, at ambient temperature of 45°C and an initial pressure equal to the starting pressure of the refrigeration unit. The insulating materials and their liners shall be to the satisfaction of Classification Societies, having in mind, in particular, their fire resistance and mechanical properties, as well as protection against penetration of water vapours.

F34.3 Refrigerating Plant

F34.3.1 The vessel(s) shall be serviced by two automated completely independent refrigerating units solely intended for this purpose, each comprising a compressor and the relevant prime mover, evaporator and condenser.

F34.3.2 The refrigerating plant shall comply with the relevant requirements of Classification Societies. The refrigerating capacity and the automatic control of each unit are to be so as to maintain the required temperature under conditions of continuous operation during 24 hours at the sea temperature up to 32°C and ambient air temperature up to 45°C.

F34.3.3 In the event of failure of either one of the refrigerating units the other shall be actuated automatically. Provision shall be made for local manual control of the refrigerating plant.

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F34.3.4 Each electric refrigerating unit shall be supplied from the main switchboard busbars by a separate feeder.

F34.3.5 Cooling water supply to the refrigerating plant (where required) shall be provided from at least two circulating pumps one of which being used as a stand-by. The stand-by pump may be a pump used for other services so long as its use for cooling would not interfere with any other essential service of the ship. Cooling water shall be taken from not less than two sea connections, preferably one port and one starboard.

F34.4 Pipes and Fittings

F34.4.1 The pipes, valves and fittings are to be in accordance with the requirements of Classification Societies for a design pressure not less than the design pressure of the CO_2 vessels.

F34.4.2 Safety relief devices shall be provided in each section of pipe that may be isolated by block valves and in which there could be a build-up of pressure in excess of the design pressure of any of the components.

F34.4.3 The piping system shall be designed in such a way that the CO_2 flows through in liquid phase up to the discharge nozzels. To this end the pressure at the nozzels shall be not less than 10 bar.

F34.5 Control of smothering system operation

The machinery alarm system shall be equipped with audible and visual alarms activated when:
- the pressure in the vessel(s) reaches the low and high values according to F34.2.2,
- any one of the refrigerating units fails to operate,
- the lowest permissible level of the liquid in the vessels is reached.

F35.6 Release control

F34.6.1 The release of CO_2 is to be initiated manually.

F34.6.2 If a device is provided which automatically regulates the discharge of the rated quantity of carbon dioxide into the protected spaces, it shall be also possible to regulate the discharge manually.

F34.6.3 If the system serves more than one space, means for control of discharge quantities of CO_2 shall be provided, e.g. automatic timer or accurate level indicators located at the control position(s).

F34.7 Testing

F34.7.1 The pipes, valves and fittings and assembled system shall be tested to satisfaction of Classification Societies.

F34.7.2 The pipes from the vessel(s) to the release valves on the distribution manifold shall be subject to a pressure test to not less than 1,5 times the set pressure of the safety relief valves.

F34.7.3 The pipes from the release valves on the distribution manifold to the nozzels shall be tested for tightness and free flow of CO_2, after having been assembled on board.

F34.7.4 The refrigerating plant, after having been fitted on board, shall be checked for its proper operation.

F34.7.5 At judgement of the Classification society, a discharge test may be required to check the fulfilment of the requirements of F34.4.4.

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F35 Fire protection of machinery spaces

(1986) (Rev. 1 1989) (Rev. 2 1992) (Rev. 3 1995) (Rev. 4 1996) (Rev. 5 1997) (Rev. 6 June 1999)

1. Preamble

This unified requirement concerns machinery spaces as defined in Ch. II-2, Reg. 3.20 of the 1981 SOLAS Amendments, i.e.:

'Machinery spaces' are all machinery spaces of Category A as defined in 1981 SOLAS Amendments and all other spaces containing propulsion machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilising, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

Spaces which contain oil-fired equipment other than boilers, such as inert gas generators, incinerators, waste disposal units etc. shall be considered as machinery spaces of Category A.

"Oil fuel unit" as defined in SOLAS Amendments includes any equipment used for the preparation and delivery of oil fuel, heated or not, to boilers (including inert gas generators) and engines (including gas turbines) at a pressure of more than 0,18N/mm^2.

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2. Items to be considered for reducing the fire risk

2.1 Measures for the prevention of spillages of oil fuel, lubricating oil, hydraulic oil, thermal oil and other flammable liquids

2.1.1 Tanks

.1 Tanks used for the storage of oil fuel, lubricating oil, thermal oil and other flammable liquids together with their fittings shall be constructed so as to prevent overpressure and spillages due to leakage or overfilling.

.2 Air pipes from oil fuel tanks shall be led to a safe position on the open deck. They shall not terminate in any place where a risk of ignition is present.
Air pipes from lubricating oil storage tanks may terminate in the machinery space, provided that the open ends are so situated that issuing oil cannot come into contact with electrical equipment or heated surfaces.

.3 Any overflow pipe shall have a sectional area of at least 1,25 times that of the filling pipe and shall be led to an overflow tank of adequate capacity or to a storage tank having space reserved for overflow purposes.

An alarm device shall be provided to give warning when the oil reaches a predetermined level in the tank, or alternatively, a sight glass shall be provided in the overflow pipe to indicate when any tank is overflowing. Such sight glasses shall be placed on vertical pipes only and in readily visible positions.

.4 Safe and efficient means of ascertaining the amount of oil fuel contained in oil fuel tanks shall be provided.

Where sounding pipes are used, they shall not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise. In particular, they shall not terminate in passenger or crew spaces. As a general rule, they shall not terminate in machinery spaces. However, where the Society considers that these latter requirements are impracticable, it may permit termination of sounding pipes from tanks in machinery spaces, on condition that all of the following requirements are met:

– an oil level gauge is provided meeting the requirements of 2.1.1.6

Footnote:
1. The first sentence of para. F35.2.1.3.5 and the para. F35.2.4.3 were moved to Recommendation No. 58 by revision 6 in June 1999.

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– the sounding pipes terminate in locations remote from ignition hazards, unless precautions are taken such as the fitting of effective screens to prevent the oil fuel in the case of spillage through the terminations of sounding pipes from coming into contact with a source of ignition;

– the terminations of sounding pipes are fitted with self-closing blanking devices and with small-diameter self-closing control cock located below the blanking device for the purposes of ascertaining before the blanking device is opened that oil fuel is not present. Provision must be made so as to ensure that any spillage of oil fuel through the control cock involves no ignition hazard;

.5 Short sounding pipes may be used for tanks other than double bottom tanks without the additional closed level gauge provided an overflow system is fitted.

.6 Oil level gauges may be used in place of sounding pipes, subject to the following conditions:

– in passenger ships, such gauges shall not require penetration below the top of the tank and their failure or overfilling of the tanks will not permit release of fuel;

– in cargo ships, the failure of such gauges or overfilling of the tank shall not permit release of fuel. The use of cylindrical gauge glasses is prohibited. The Society may permit the use of oil-level gauges with flat glasses and self-closing valves between the gauges and fuel tanks.

.7 Level switches may be used provided they are contained in steel enclosure or other enclosure not destroyed by fire.

2.1.2 Control of pumps

The power supply to all independently-driven oil fuel transfer pumps, oil fuel unit pumps and all other fuel pumps shall be capable of being stopped from a position outside the space that will always be accessible in the event of fire occurring in the compartment in which they are situated, as well as from the compartment itself.

2.1.3 Distribution piping for flammable liquids

.1 Pipes, their joints and fittings shall comply with Unified Requirements P1 and P2.

Short lengths of flexible pipe may be permitted in positions where the Society is satisfied that they are necessary. Such flexible pipes and end attachments shall be of approved fire resisting materials(*) of adequate strength and shall be constructed to the satisfaction of the Society.

Hose clamps and similar types of attachments for flexible pipes are not permitted.

.2 Every oil fuel pipe, which, if damaged, would allow oil to escape from a storage, settling or daily service tank situated above the double bottom shall be fitted with a cock or valve directly on the tank, capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated. In the special case of deep tanks situated in any shaft or pipe tunnel or similar space, valves on the tank shall be fitted, but control in the event of fire may be effected by means of an additional valve on the pipe or pipes outside the tunnel or similar space. If such an additional valve is fitted in the machinery space, it shall be fitted as close as possible to the penetration of the pipe into the machinery space, and it shall be operated locally and from a position outside this space.

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*) To be type tested in accordance with UR F42 “Fire testing of flexible pipes”.

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.4 The oil fuel injection and return piping for internal combustion engines shall comply with SOLAS Chapter II-2 Reg.15.2.9.

Cocks or valves shall be provided for isolating instruments from the main pipes.

Temperature sensors shall be fitted in pockets.

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2.1.4 Leakage containment arrangements for engines, equipment and boilers

Containment provided for areas where frequent leakage may be expected such as oil burners, purifiers, drains and valves under daily service tanks etc. shall be fitted with adequate drainage. Where drain pipes are provided from collected leakages, they shall be led to a suitable oil drain tank not forming part of an overflow system.

2.1.5 Valve for oil fuel pumps

Stop valves or cocks shall be fitted on both suction and delivery sides of oil fuel pumps. All oil fuel pumps shall be provided with pressure relief valves on the discharge side so that the discharged oil may be led to the suction side of the pump.

Pressure relief valves need not be fitted when the system is served only be centrifugal pumps, so designed that the pressure delivered cannot exceed that for which the piping is designed.

2.2 Overheating and seizure - oil heaters

.1 Where steam heaters or heaters using other heating media are provided in fuel or lubricating oil systems, they shall be fitted with at least a high temperature alarm or low flow alarm in addition to a temperature control, except where the temperature dangerous for the ignition of the medium cannot be reached.

.2 When electric heaters are fitted, means shall be provided to ensure that heating elements are permanently submerged during the operation.

In order to avoid in any case a surface temperature of heating element above 220°C, a safety temperature switch, independent from the automatic control sensor, shall be provided. The safety switch should cut off the electrical power supply in the event of excessive temperature and shall be provided with manual reset.

2.3 Flash point of oil fuel

.1 Oil fuels with a flash point of less than 60°C (closed cup) is not permitted, except for the following:

– Ships certified for restricted service within areas having a climate ensuring that ambient temperatures of spaces where such fuel oil is stored will not rise to within 10°C below its flash point, may use oil fuel with flash point below 60°C but not less than 43°C;

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– installations complying with UR M24 regarding use of crude oil as fuel;

– in emergency generators oil fuel with a flash point of not less than 43°C may be used.

.2 Oil fuel in storage tanks are not to be heated to temperatures within 10°C below the flash point of the fuel oil, except that where oil fuel in service tanks, settling tanks and any other tanks in supply system is heated the following arrangements are to be provided:

- the length of the vent pipes from such tanks and/or a cooling device is sufficient for cooling the vapours to below 60^{o}C, or the outlet of the vent pipes is located 3m away from a source of ignition;
- the vent pipes are fitted with flame screens ;
- there are no openings from the vapour space of the fuel tanks into machinery spaces (bolted manholes are acceptable);
- enclosed spaces are not to be located directly over such fuel tanks, except for vented cofferdams;
- electrical equipment is not to be fitted in the vapour space of the tanks, unless it is certified to be intrinsically safe.

2.4 Hot surfaces

.1 All surfaces of machinery with high temperatures above 220°C e.g. steam, thermal oil and exhaust gas lines, silencers, exhaust gas boilers, turbo blowers, etc and which may be impinged as a result of leakage of flammable fluid, shall be effectively insulated with non-combustible material to prevent the ignition of combustible materials coming into contact with them. Where the insulation used for this purpose is oil absorbent or may permit the penetration of oil, the insulation shall be encased in steel sheathing or equivalent material.

.2 Boilers shall be suitably insulated with non-combustible material and sheathed with steel or other non-combustive material. The clearance spaces between the boilers and tops of the double bottom tanks, and between the boilers and the sides of the storage tanks in which oil fuel and cargo oil is carried, shall be adequate for the free circulation of the air necessary to keep the temperature of the stored oil sufficiently below its flash point, except in the case of tanks complying with Section 2.3.2.

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2.5 Oil spillages coming into contact with hot surfaces, electrical installations or other sources of ignition

.1 Precautions (e.g. shielding) shall be taken to prevent oil that may escape under pressure from any pump, filter or heater or piping from coming into contact with sources of ignition.

.2 Oil tanks, pipes, filters, heaters etc. shall not be located immediately above or near units of high temperature including boilers, steam pipe lines, exhaust manifolds, silencers or other equipment required to be insulated, and electrical equipment and, as far as practicable, are to be arranged far apart therefrom. In particular, fuel oil filters under pressure for diesel engines shall be located such that in the event of leakage oil cannot be sprayed onto the exhaust manifold.

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.3 Oil filters fitted in parallel for the purpose of enabling cleaning without distributing oil supply to engines (e.g. duplex filters) are to be provided with arrangements that will minimize the possibility of a filter under pressure being opened by mistake. Filters/filter chambers shall be provided with suitable means for:

– venting when put into operation
– depressurizing before being opened.

Valves or cocks with drain pipes led to a safe location shall be used for this purpose.

.4 Hydraulic units with working pressure above 15 bar shall preferably be placed in separate spaces. If it is impracticable to locate such units in a separate space, adequate shielding shall be provided.

2.6 Faults in boiler firing, scavenging manifold, boiler uptakes and exhaust gas uptakes

.1 The oil burners shall be so arranged that they cannot be withdrawn unless the oil supply to the burners is cut off.

.2 The fuel supply to all burners shall be capable of being automatically cut off in case of total lack of flame in the combustion chamber; moreover, this shall be warned by a visual audible alarm. The alarms need not be fitted for domestic boilers.

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3. Thermal oil installations

3.1 System arrangements

.1 The inlet and outlet valves of oil-fired thermal oil heaters and exhaust-fired thermal oil heaters shall be controllable from outside the compartment where they are situated. As an alternative, an arrangement for quick gravity drainage of the thermal oil contained in the system into a collecting tank is acceptable.

.2 Heating of liquid cargoes with flash points below 60°C shall be arranged by means of a separate secondary system, located completely within the cargo area.

However, a single circuit system may be accepted on the following conditions:

– system is so arranged that a positive pressure in the coil shall be at least 3 m water column above the static head of the cargo when circulating pump is not in operation,

– the thermal oil system expansion tank shall be fitted with high and low level alarms,

– means shall be provided in the thermal oil system expansion tank for detection of flammable cargo vapours. Portable equipment may be accepted.

– valves for the individual heating coils shall be provided with locking arrangement to ensure that the coils are under static pressure at all times.

.3 The thermal oil circulating pumps shall be arranged for emergency stopping from a position outside the space where they are situated.

.4 Vents from expansion tanks and thermal oil storage tanks of thermal oil heating plants shall be led to open deck.

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3.2 Exhaust-fired thermal oil heaters

.1 The heater shall be so designed and installed that all tubes may easily and readily be inspected for signs of corrosion and leakage.

.2 Visual inspection and tightness testing of the heater tubes to not less the the working pressure shall be carried out annually, and hydraulic testing shall be carried out bi-annually.

.3 The heater shall be fitted with temperature sensor(s) and an alarm for fire detection.

.4 A fixed fire extinguishing and cooling system shall be fitted. A drenching system providing copious amounts of water may be accepted. The exhaust ducting below the exhaust boiler shall be arranged for adequate collection and drainage, to prevent water flowing into the diesel engine. The drain shall be led to a suitable location.

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4. Fire detection system

For machinery spaces which are provided with a centralised or automatic control and monitoring system, a fire detection and alarm system is required complying with UR F32.

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5. Machinery space arrangement

5.1 Machinery space arrangement

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.2 (void)

.3 Where leakage of flammable liquids may occur during normal service or routine maintenance work, special arrangement shall be made to prevent these fluids from reaching other parts of the machinery where danger of ignition may arise.

.4 Materials used in machinery spaces shall not normally have properties increasing the fire potential of these rooms.

.5 Neither combustible nor oil-absorbing materials shall be used as flooring, bulkhead lining, ceiling or decks in the control room, machinery spaces, shaft tunnel or rooms where oil tanks are located. Where penetration of oil products is possible, the surface of the insulation shall be impervious to oil or oil vapours.

5.2 Segregation of fuel oil purifiers

.1 Fuel oil purifiers for heated fuel oil are subject to the following additional requirements.

.2 The fuel oil purifiers shall be placed in a separate room, enclosed by steel bulkheads extending from deck to deck and provided with self-closing steel doors.

.3 The room shall be provided with:

.1 independent mechanical ventilation or a ventilation arrangement which can be isolated from the machinery space ventilation
.2 fire detecting system
.3 fixed fire extinguishing installation.
- The extinguishing installation shall be capable of being activated from outside the room.

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-Closing of ventilation openings shall be effected from a position close to where the extinguishing system is activated.

-The extinguishing system shall be separate for the room, but may be a part of the main fire extinguishing system for the machinery space.

.4 Where the size and/or design of the engine room makes it impracticable to locate the fuel oil purifiers in a separate space, special consideration shall be given with regard to location, containment of possible leakages, and shielding and ventilation.

A local fixed fire extinguishing system shall be provided, capable of being activated automatically or activated manually from the machinery control position or from other suitable location. If automatic release is provided, additional manual release is to be arranged.

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F36 Deleted

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F37 UR F37 has been recategorised to be Recom 53.1 and deleted (May, 1998).

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F38 F38 has been re-categorised to be Recom. 53.2 and deleted (May 1998).

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F39 Measures to prevent explosions in cargo pump rooms on oil tankers

(1993)
(Rev. 1 1994)
(Rev 2 1997)
(Rev. 2/ Corr. 1 1998)
(Rev.3 July 1999)
(Rev.4 May 2001)

F 39 was deleted on 1 July 2002.

F40 Deleted 1997

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F41 Sea intakes for fire pump on ships with ICE Class
(1993)

1. On ships with ICE Class at least one of the fire pumps is to be connected to a sea chest which is provided with de-icing arrangements.

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F42 Fire testing of flexible pipes
(1995)

1. Flexible pipes with end attachments which are required to be of fire-resisting materials, shall be subject to a fire for 30 minutes at a temperature of 800^{o}C, while water at the maximum service pressure is circulated inside the pipe. The temperature of the water at the outlet shall not be less than 80^{o}C. No leak should be recorded during or after the test.

2. An alternative is to fire test the flexible pipe with flowing water at a pressure of at least 5 bar and subsequent pressure test to twice the design pressure.

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F43 Installation requirements for analysing units for continuous monitoring of flammable vapours

F43 (1997) (Rev.1 July 1999) (Rev. 2 June 2002)

This UR applies to gas analysing units of the sampling type located outside gas dangerous zones and fitted on board gas carriers or on board oil/chemical tankers.

Gas analysing units with non-explosion proof measuring equipment may be located in areas outside cargo areas, e.g. in cargo control room, navigation bridge or engine room when mounted on the forward bulkhead provided the following requirements are observed:

1. Sampling lines shall not run through gas safe spaces, except where permitted under 5.

2. The gas sampling pipes shall be equipped with flame arresters. Sample gas is to be led to the atmosphere with outlets arranged in a safe location.

3. Bulkhead penetrations of sample pipes between safe and dangerous areas shall be of approved type and have same fire integrity as the division penetrated. A manual isolating valve shall be fitted in each of the sampling lines at the bulkhead on the gas safe side.

4. The gas detection equipment including sample piping, sample pumps, solenoids, analysing units etc. shall be located in a reasonably gas tight enclosure (e.g. a fully enclosed steel cabinet with a gasketed door) which is to be monitored by its own sampling point. At gas concentrations above 30% LFL inside the enclosure the entire gas analysing unit is to be automatically shut down.

5. Where the enclosure cannot be arranged directly on the bulkhead, sample pipes shall be of steel or other equivalent material and without detachable connections, except for the connection points for isolating valves at the bulkhead and analysing units, and are to be routed on their shortest ways.

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F44 Fore peak ballast system on oil tankers

(June 2000)

The fore peak can be ballasted with the system serving ballast tanks within the cargo area, provided :

- The tank is considered as hazardous;
- The vent pipe openings are located on open deck 3 m away from sources of ignition;
- Means are provided, on the open deck, to allow measurement of flammable gas concentrations within the tank by a suitable portable instrument;
- The access to the fore peak and sounding arrangements are direct from open deck. In case the fore peak tank is separated by cofferdams from the cargo tanks, an access through a gas tight bolted manhole located in an enclosed space may be accepted. In that case, a warning sign is to be provided at the manhole stating that the tank may only be opened after it has been proven to be gas free or the electrical equipment which is not electrically safe in the enclosed space is isolated.

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