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CHAPTER II - 2 A

Fire protection, fire detection and fire extinction

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CHAPTER II - 2 A

Fire protection, fire detection and fire extinction

Part A General

Regulation 1 Basic principles (R 2)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .1 The fire safety objectives of this chapter are to:
 - .1 prevent the occurrence of fire and explosion;
 - .2 reduce the risk to life caused by fire;
 - .3 reduce the risk of damage caused by fire to the ship, its cargo and the environment;
 - .4 contain, control and suppress fire and explosion in the compartment of origin; and
 - .5 provide adequate and readily accessible means of escape for passengers and crew.
- .2 In order to achieve the fire objectives set out in paragraph .1 the following basic principles underlie the regulations in this chapter and are embodied in the regulations as appropriate, having regard to the type of ships and the potential fire hazard involved:
 - .1 division of ship into main vertical zones by thermal and structural boundaries;
 - .2 separation of accommodation spaces from the remainder of the ship by thermal and structural boundaries;
 - .3 restricted use of combustible materials;
 - .4 detection of any fire in the zone of origin;
 - .5 containment and extinction of any fire in the space of origin;
 - .6 protection of means of escape or access for fire-fighting;
 - .7 ready availability of fire-extinguishing appliances;
 - .8 minimisation of possible ignition of flammable cargo vapour.
- .3 The fire safety objectives set out in paragraph 1 above shall be achieved by ensuring compliance with the prescriptive requirements specified in this chapter or by alternative design and arrangements which comply with Part F of the revised Chapter II-2 of SOLAS 1974, which applies to ships constructed on or after 1 January 2003. A ship shall be considered to meet the functional requirements set out in paragraph .2 and to achieve the fire safety objectives set out in paragraph .1 when either:
 - .1 the ship's designs and arrangements, as a whole, comply with the relevant prescriptive requirements in this chapter;

- .2 the ship's designs and arrangements, as a whole, have been reviewed and approved in accordance with Part F of the revised Chapter II-2 of SOLAS 1974, which applies to ships constructed on or after 1 January 2003; or
- .3 part(s) of the ship's designs and arrangements have been reviewed and approved in accordance with Part F of the revised SOLAS Chapter II-2 and the remaining parts of the ship comply with the relevant prescriptive requirements of this chapter.
- .4 All ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with at least the requirements previously applicable to these ships.

Repairs, alterations and modifications which substantially alter the dimensions of a ship or the passenger accommodation spaces, or substantially increase a ship's service life and outfitting related thereto shall meet the requirements for ships constructed on or after 1 January 2003 in so far as the Administration of the flag State deems reasonable and practicable.

EXISTING CLASS B SHIPS:

- .5 Notwithstanding the provisions of paragraph .4, class B ships carrying more than 36 passengers when undergoing repairs, alterations, modifications and outfitting related thereto shall comply with the following:
 - .1 all materials introduced to these ships shall comply with the requirements with regard to material applicable to new class B ships; and
 - .2 all repairs, alterations, modifications and outfitting related thereto involving the replacement of material of 50 tonnes or above, other than that required by regulation II-2/B/16, shall comply with the requirements applicable to new class B ships.

Regulation 2 Definitions (R 3)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .1 “**Non-combustible material**” is a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750 °C, this being determined by a fire test in accordance with the Fire Test Procedures Code. Any other material is a combustible material.
- .2 A “**standard fire test**” is one in which specimens of the relevant bulkheads or decks are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve. The specimen shall have an exposed surface of not less than 4.65 m² and height (or length of deck) of 2.44 metres, resembling as closely as possible the intended construction and including where appropriate at least one joint. The standard time-temperature curve is defined by a smooth curve drawn through the following internal furnace temperature points:

initial internal furnace temperature	20 °C
at the end of the first 5 minutes	576 °C
at the end of 10 minutes	679 °C

at the end of 15 minutes	738 °C
at the end of 30 minutes	841 °C
at the end of 60 minutes	945 °C

.2a FOR CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

A “**standard fire test**” is one in which the specimens of the relevant bulkheads and decks are exposed in a test furnace to temperatures corresponding approximately to the standard temperature curve. The test methods shall be in accordance with the Fire Test Procedures Code.

.3 “**A’ class divisions**” are those divisions formed by bulkheads and decks which comply with the following:

- .1 they shall be constructed of steel or other equivalent material;
- .2 they shall be suitably stiffened;
- .3 they shall be so constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test;
- .4 they shall be insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180 °C above the original temperature, within the time listed below:

class A-60	60 minutes
class A-30	30 minutes
class A-15	15 minutes
class A-0	0 minutes

- .5 The Administration of the flag State shall require a test of a prototype bulkhead or deck to ensure that it meets the above requirements for integrity and temperature rise in accordance with the IMO Resolution A.754(18).

For class B, C and D ships, constructed on or after 1 January 2003 IMO Resolution A.754(18) shall read Fire Test Procedures Code.

.4 “**B’ class divisions**” are those divisions formed by bulkheads, decks, ceilings or linings which comply with the following:

- .1 they shall be so constructed as to be capable of preventing the passage of flame to the end of the first half hour of the standard fire test;
- .2 they shall have an insulation value such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225 °C above the original temperature within the time listed below:

class B-15	15 min
class B-0	0 min

- .3 they shall be constructed of approved non-combustible materials and all materials entering into the construction and erection of ‘B’ class divisions shall be non-

combustible, with the exception that combustible veneers may be permitted provided they meet other requirements of this chapter;

- .4 the Administration of the flag State shall require a test of a prototype division to ensure that it meets the above requirements for integrity and temperature rise in accordance with IMO Resolution A.754(18).

For class B, C and D ships, constructed on or after 1 January 2003 IMO Resolution A.754(18) shall read Fire Test Procedures Code.

- .5 **“C’ class divisions”** are divisions constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise. Combustible veneers are permitted provided they meet other requirements of this chapter.
- .6 **“Continuous ‘B’ class ceilings or linings”** are those ‘B’ class ceilings or linings which terminate only at an ‘A’ or ‘B’ class division.
- .7 **“Steel or other equivalent material”**. Where the words ‘steel or other equivalent material’ occur, ‘equivalent material’ means any non-combustible material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable exposure to the standard fire test (e.g. aluminium alloy with appropriate insulation).
- .8 **“Low flame spread”** means that the surface thus described will adequately restrict the spread of flame, this being determined by a fire test according to IMO Resolution A.653(16), for bulkhead, ceiling and deck finish materials.
- .8a FOR CLASS B, C, AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:
“Low flame spread” means that the surface thus described will adequately restrict the spread of flame, this being determined in accordance with the Fire Test Procedures Code.
- .9 **“Main vertical zones”** are those sections into which the hull, superstructure, and deckhouses are divided by ‘A’ class divisions, the mean length and width of which on any deck does not in general exceed 40 metres.
- .10 **“Accommodation spaces”** are those spaces used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobbies rooms, barber shops, pantries containing no cooking appliances and similar spaces.
- .11 **“Public spaces”** are those portions of the accommodation which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.
- .12 **“Service spaces”** are those spaces used for galleys, pantries containing cooking appliances, lockers, mail and specie rooms, storerooms, workshops other than those forming part of the machinery spaces, and similar spaces and trunks to such spaces.
- .13 **“Cargo spaces”** are all spaces used for cargo (including cargo oil tanks) and trunks to such spaces.

- .13-1 “**Vehicle spaces**” are cargo spaces intended for the carriage of motor vehicles with fuel in their tanks for their own propulsion.
- .14 “**Ro-ro cargo spaces**” are spaces not normally subdivided in any way and extending to either a substantial length or the entire length of the ship in which motor vehicles with fuel in their tanks for their own propulsion and/or goods (packaged or in bulk, in or on rail or road cars, vehicles (including road and rail tankers), trailers, containers, pallets, dismountable tanks or in or on similar stowage units or other receptacles) can be loaded and unloaded normally in a horizontal direction.
- .15 “**Open ro-ro cargo spaces**” are ro-ro cargo spaces either open at both ends, or open at one end and provided with adequate natural ventilation effective over the entire length through permanent openings in the side plating or deckhead, or from above, and for ships constructed on or after 1 January 2003 having a total area of at least 10% of the total area of the space sides.
- .15-1 “**Open vehicle spaces**” are those vehicle spaces either open at both ends or have an opening at one end and are provided with adequate natural ventilation effective over their entire length through permanent openings distributed in the side plating or deckhead or from above, and for ships constructed on or after 1 January 2003 having a total area of at least 10% of the total area of the space sides.
- .16 “**Closed ro-ro cargo spaces**” are ro-ro cargo spaces which are neither open ro-ro cargo spaces nor weather decks.
- .16-1 “**Closed vehicle spaces**” are vehicle spaces which are neither open vehicle spaces nor weather decks.
- .17 “**Weather deck**” is a deck which is completely exposed to the weather from above and from at least two sides.
- .18 “**Special category spaces**” are those enclosed vehicle spaces above or below the bulkhead deck into and from which such vehicles can be driven and to which passengers have access. Special category spaces may be accommodated on more than one deck provided that the total overall clear height for vehicles does not exceed 10 metres.
- .19.1 “**Machinery spaces of category A**” are those spaces and trunks to such spaces which contain:
 - .1 internal combustion machinery used for main propulsion; or
 - .2 internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or
 - .3 any oil-fired boiler or oil fuel unit.
- .19.2 “**Machinery spaces**” are all machinery spaces of category A and all other spaces containing propelling 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.
- .20 “**Oil fuel unit**” is the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal

- combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0.18 N/mm^2 .
- .21 “**Control stations**” are those spaces in which the ship’s radio or main navigating equipment or the emergency source of power is located or where the fire recording or fire control equipment is centralised.
- .21-1 “**Central control station**” is a control station in which the following control and indicator functions are centralised:
- .1 fixed fire detection and alarm systems;
 - .2 automatic sprinklers, fire detection and alarm systems;
 - .3 fire door indicator panels;
 - .4 fire doors closures;
 - .5 watertight door indicator panels;
 - .6 watertight door closures;
 - .7 ventilation fans;
 - .8 general/fire alarms;
 - .9 communication systems including telephones; and
 - .10 microphones to public address systems.
- .21-2 “**Continuously manned central control station**” is a central control station which is continuously manned by a responsible member of the crew.
- .22 “**Rooms containing furniture and furnishings of restricted fire risk**” are, for the purpose of regulation II-2/B/2, those rooms containing furniture and furnishings of restricted fire risk (whether cabins, public spaces, offices and other types of accommodation) in which:
- .1 all case furniture such as desks, wardrobes, dressing tables, bureaux, dressers, is constructed entirely of approved non-combustible materials, except that a combustible veneer not exceeding 2 mm may be used on the working surface of such articles;
 - .2 all free-standing furniture such as chairs, sofas, tables, is constructed with frames of non-combustible materials;
 - .3 all draperies, curtains and other suspended textile materials have qualities of resistance to the propagation of flame not inferior to those of wool of mass 0.8 kg/m^2 , in accordance with IMO Resolution A.471(XII) and its amendments adopted by Resolution A.563(14).

For class B, C and D ships, constructed on or after 1 January 2003 IMO Resolution A.471(XII) and its amendments adopted by Resolution A.563(14) shall read Fire Test Procedures Code;
 - .4 all floor coverings have qualities of resistance to the propagation of flame not inferior to those of an equivalent woollen material used for the same purpose.

For class B, C and D ships, constructed on or after 1 January 2003 this subparagraph shall read: all floor coverings have low flame spread characteristics;
 - .5 all exposed surfaces of bulkheads, linings and ceilings have low flame-spread characteristics;

- .6 all upholstered furniture has qualities of resistance to the ignition and propagation of flame in accordance with the Fire Test Procedures of Upholstered Furniture of IMO Resolution A.652(16).
For class B, C and D ships, constructed on or after 1 January 2003 IMO Resolution A.652(16) shall read Fire Test Procedures Code.
- .7 For class B, C and D ships, constructed on or after 1 January 2003:
All bedding components have qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the Fire Test Procedures Code.
- .23 **“Ro-ro passenger ship”** means a passenger ship with ro-ro cargo spaces or special category spaces as defined in this regulation.
- .24 **“Fire Test Procedures Code”** means the International Code for Application of Fire Test Procedures, as adopted by the Maritime Safety Committee of IMO by Resolution MSC.61(67), as may be amended by IMO, provided that such amendments are adopted, brought into force and take effect in accordance with the provisions of article VIII of the present SOLAS Convention concerning the amendment procedures applicable to the annex other than Chapter I thereof.
- .25 **“Fire Safety Systems Code”** means the International Code for Fire Safety Systems as adopted by the Maritime Safety Committee of IMO by Resolution MSC.98(73), as may be amended by IMO, provided that such amendments are adopted, brought into force and take effect in accordance with the provisions of article VIII of the present SOLAS Convention concerning the amendment procedures applicable to the annex other than Chapter I thereof.
- .26 **“Flashpoint”** is the temperature in degrees Celsius (closed cup test) at which a product will give off enough flammable vapour to be ignited, as determined by an approved flashpoint apparatus.
- .27 **“Prescriptive requirements”** mean the constructive characteristics, limiting dimensions or fire safety systems specified in this chapter.

Regulation 3 Fire pumps, fire mains, hydrants, hoses and nozzles (R 4)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .1.1 Every ship shall be provided with fire pumps, fire mains, hydrants, hoses and nozzles complying as applicable with the requirements of this regulation.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED BEFORE 1 JANUARY 2003:

- .1.2 Where more than one independent fire pump is required, isolating valves to separate the section of the fire main within the machinery space containing the main fire pump or pumps from the rest of the fire main shall be fitted in an easily accessible and tenable position outside this machinery space. The fire main shall be so arranged that when the isolating

valves are shut all the hydrants on the ship, except those in the machinery space referred above, can be supplied with water by a fire pump not located in this machinery space through pipes which do not enter this space. Exceptionally, short lengths of the emergency fire pump suction and discharge piping may penetrate the machinery space if it is impracticable to route it externally provided that the integrity of the fire main is maintained by the enclosure of the piping in a substantial steel casing.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .1.3 Isolating valves to separate the section of the fire main within the machinery space containing the main fire pump or pumps from the rest of the fire main shall be fitted in an easily accessible and tenable position outside the machinery spaces. The fire main shall be so arranged that when the isolating valves are shut all the hydrants on the ship, except those in the machinery space referred to above, can be supplied with water by another pump or an emergency fire pump. The emergency pump, its seawater inlet and suction and delivery pipes and isolating valves shall be located outside the machinery space. If this arrangement cannot be made, the sea-chest may be fitted in the machinery space if the valve is remotely controlled from a position in the same compartment as the emergency pump and the suction pipe is as short as practicable. Short lengths of suction or discharge piping may penetrate the machinery space, provided they are enclosed in a substantial steel casing or are insulated to A-60 standards. The pipes shall have substantial wall thickness, but in no case less than 11 mm and shall be welded except for the flanged connection to the sea inlet valve.

ALL NEW AND EXISTING CLASS B SHIPS AND NEW CLASS C AND D SHIPS OF 24 METRES IN LENGTH AND ABOVE:

- .2 Capacity of fire pumps**
- .1 The required fire pumps shall be capable of delivering for fire-fighting purposes a quantity of water, at the pressure specified in paragraph .4.2 not less than two thirds of the quantity required to be dealt with by the bilge pumps when employed for bilge pumping.
- .2 In every ship which is required by this regulation to be provided with more than one power fire pump, each of the required fire pumps shall have a capacity not less than 80% of the total required capacity divided by the minimum number of required fire pumps but in any case not less than 25 m³/h and each such pump shall in any event be capable of delivering at least the two required jets of water. These fire pumps shall be capable of supplying the fire main system under the required conditions.
- .3 In ships constructed on or after 1 January 2003 where more pumps than the minimum required pumps are installed such additional pumps shall have a capacity of at least 25 m³/h.
- .3 Arrangements of fire pumps, fire mains and ready availability of water supply**
- .1 Ships shall be provided with power driven fire pumps as follows:

- .1 ships certified to carry more than 500 passengers: at least three, one of which may be a main engine driven pump;
- .2 ships certified to carry up to 500 passengers or less: at least two, one of which may be a main engine driven pump.
- .2 Sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping oil and that if they are subject to occasional duty for the pumping of oil fuel, suitable changeover arrangements are fitted.
- .3 The arrangement of sea connections, fire pumps and their sources of power shall be such as to ensure that in ships certified to carry more than 250 passengers, in the event of a fire in any one compartment all the fire pumps will not be put out of action.

In new class B ships certified to carry up to 250 passengers or less, if a fire in any one compartment could put all the pumps out of action, the alternative means of providing water for fire-fighting purposes shall be an independently driven, power-operated emergency fire pump and with its source of power and sea connection located outside the machinery space. Such an independently driven emergency fire pump shall comply with the provisions of the Fire Safety Systems Code for ships constructed on or after 1 January 2003.

- .4 In new class B ships certified to carry more than 250 passengers, the arrangements for the ready availability of water supply shall be such that at least one effective jet of water is immediately available from any hydrant in an interior location and so as to ensure the continuation of the output of water by the automatic starting of a required fire pump.
- .5 In ships with a periodically unattended machinery space or when only one person is required on watch, there shall be immediate water delivery from the fire main system at a suitable pressure, either by remote starting of one of the main fire pumps with remote starting from the navigating bridge and fire control station, if any, or permanent pressurisation of the fire main system by one of the main fire pumps.
- .6 The delivery valve of each fire pump shall be fitted with a non-return valve.

.4 Diameter of and pressure in the fire mains

- .1 The diameter of the fire main and water service pipes shall be sufficient for the effective distribution of the maximum required discharge from two fire pumps operating simultaneously.
- .2 With two pumps simultaneously delivering through nozzles specified in paragraph .8 and sufficient hydrants to provide for the quantity of water specified in paragraph .4.1, the following minimum pressures shall be maintained at all hydrants:

Class B ships certified to carry:	NEW EXISTING
more than 500 passengers	0.4 N/mm ²
	0.3 N/mm ²
up to 500 passengers	0.3 N/mm ²
	0.2 N/mm ²

- .3 The maximum pressure at any hydrant shall not exceed that at which the effective control of a fire hose can be demonstrated.

.5 Number and position of hydrants

- .1 The number and position of hydrants shall be such that at least two jets of water not emanating from the same hydrant, one of which shall be from a single length of hose, may reach any part of the ship normally accessible to the passengers or crew while the ship is being navigated and any part of any cargo space when empty, any ro-ro cargo space or any special category space in which latter case the two jets shall reach any part of such space, each from a single length of hose. Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.
- .2 In the accommodation, service and machinery spaces the number and position of the hydrants shall be such that the requirements of paragraph .5.1 may be complied with when all watertight doors and all doors in main vertical zone bulkheads are closed.
- .3 Where access is provided to a machinery space at a low level from an adjacent shaft tunnel, two hydrants shall be provided external to, but near the entrance to that machinery space. Where such access is provided from other spaces, in one of those spaces two hydrants shall be provided near the entrance of the machinery space. Such provision need not be made where the tunnel or adjacent spaces are not part of the escape route.

.6 Pipes and hydrants

- .1 Materials readily rendered ineffective by heat shall not be used for fire mains and hydrants unless adequately protected. The pipes and hydrants shall be so placed that the fire hoses may be easily coupled to them. The arrangement of pipes and hydrants shall be such as to avoid the possibility of freezing. In ships where deck cargo may be carried, the positions of the hydrants shall be such that they are always readily accessible and the pipes shall be arranged as far as practicable to avoid risk of damage by such cargo.
- .2 A valve shall be fitted to serve each fire hose so that any fire hose may be removed while the fire pumps are at work.
- .3 On ships constructed on or after 1 January 2003 isolating valves shall be installed for all open deck fire main branches used for purposes other than fire-fighting.

.7 Fire hoses

- .1 Fire hoses shall be of non-perishable material, approved by the Administration of the flag State, and shall be

sufficient in length to project a jet of water to any of the spaces in which they may be required to be used. Each hose shall be provided with a nozzle and the necessary couplings. There shall be complete interchangeability of hose couplings and nozzles. Hoses specified in this chapter as 'fire hoses' shall together with any necessary fittings and tools, be kept ready for use in conspicuous positions near the water service hydrants or connections. Additionally, in interior locations in ships carrying more than 36 passengers fire hoses shall be permanently connected to the hydrants.

- .2 There shall be at least one fire hose for each of the hydrants required by paragraph .5. The length of a fire hose should be restricted to not more than 20 metres on deck and in superstructures and to 15 metres in machinery spaces and on smaller ships respectively to 15 metres and 10 metres.

.8 Nozzles

- .1.1 For the purposes of this chapter, standard nozzle sizes shall be 12 mm, 16 mm and 19 mm or as near thereto as possible. In cases where other systems are used — such as fog systems — different diameter nozzles may be permitted.
- .1.2 All nozzles shall be of an approved dual-purpose type (i.e. spray/jet type), and shall have a shutoff facility.
- .2 For accommodation and service spaces, a nozzle size greater than 12 mm need not be used;
- .3 For machinery spaces and exterior locations, the nozzle size shall be such as to obtain the maximum discharge possible from two jets at the pressure mentioned in paragraph .4 from the smallest pump, provided that a nozzle size greater than 19 mm need not be used.

NEW CLASS C AND D SHIPS OF LESS THAN 24 METRES IN LENGTH:

.9 Fire pumps, fire mains, hydrants, hoses, nozzles and ready availability of water supply

- .1 One independent fire pump is required, which shall be capable of delivering for fire-fighting purposes at least one jet of water from any fire hydrant, at the pressure specified below. The quantity of water so delivered is not to be less than two thirds of the quantity required to be dealt with by the bilge pumps when employed for bilge pumping. Such fire pump shall be capable, when discharging the maximum amount referred to above through fire hydrants with nozzles of 12 or 16 or 19 mm, of maintaining at any hydrant minimum pressures as required in class B ships.
- .2 Every ship carrying over 250 passengers shall be provided with an additional fire pump which shall be permanently connected to the fire main. Such pump shall be operated by power. Such pump and its source of power shall not be situated in the same compartment as the pump required by paragraph .9.1 and shall be provided with a permanent sea connection situated outside the machinery space. Such pump shall be capable of delivering at least one jet of water from any fire

- hydrants provided in the ship maintaining a pressure of at least 0.3 N/mm².
- .3 Sanitary, ballast, bilge or general service pumps may be accepted as fire pumps.
 - .4 Every ship shall be provided with a fire main having a diameter sufficient for the effective distribution of the maximum discharge given above. The number and position of the hydrants shall be such that at least one jet of water may reach any part of the ship using one single max. length of hose as given for class B ships in paragraph .7.2.
 - .5 Every ship shall be fitted with at least one fire hose for every hydrant fitted.
 - .6 In ships with a periodically unattended machinery space or when only one person is required on watch, there shall be immediate water delivery from the fire main system at a suitable pressure, either by remote starting of one of the main fire pumps with remote starting from the navigating bridge and fire control station, if any, or permanent pressurisation of the fire main system by one of the main fire pumps.
 - .7 The delivery valve of each fire pump shall be fitted with a non-return valve.

Regulation 4 Fixed fire-extinguishing systems (R 5 + 8 + 9 + 10)

.1 Fixed gas fire-extinguishing systems: General (R 5.1)

NEW CLASS B, C AND D SHIPS, CONSTRUCTED BEFORE 1 JANUARY 2003:

- .1 The necessary pipes for conveying fire-extinguishing medium into protected spaces shall be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Suitable provision shall be made to prevent inadvertent admission of the medium to any space.
- .2 The piping for the distribution of fire-extinguishing medium shall be arranged and discharge nozzles so positioned that a uniform distribution of medium is obtained.
- .3 Means shall be provided to close from outside the protected spaces all openings which may admit air to or allow gas to escape from the protected space.
- .4 Means shall be provided for automatically giving audible warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm shall operate for a suitable period before the medium is released.
- .5 The means of control of any fixed gas fire-extinguishing system shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system having regard to the safety of personnel.

- .6 Automatic release of fire-extinguishing medium shall not be permitted, except as permitted in respect of local automatically operated units fitted, in addition to and independent of any required fixed fire extinguishing system, in machinery spaces over equipment having a high fire risk or in enclosed areas of high fire risk within machinery spaces.
- .7 Where the quantity of extinguishing medium is required to protect more than one space, the quantity of medium available need not be more than the largest quantity required for any one space so protected.
- .8 Except as otherwise permitted, pressure containers required for the storage of fire-extinguishing medium, shall be located outside protected spaces in accordance with paragraph .1.11.
- .9 Means shall be provided for the crew to safely check the quantity of medium in the containers.
- .10 Containers for the storage of fire extinguishing medium and associated pressure components shall be designed to appropriate codes of practice having regard to their locations and maximum ambient temperatures expected in service.
- .11 When the fire-extinguishing medium is stored outside a protected space, it shall be stored in a room which shall be situated in a safe and readily accessible position and shall be effectively ventilated. Any entrance to such a storage room shall preferably be from the open deck and in any case shall be independent of the protected space.

Access doors shall open outwards, and bulkheads and decks including doors and other means of closing any opening therein, which form the boundaries between such rooms and adjoining enclosed spaces shall be gastight. For the purpose of application of the tables for fire integrity of bulkheads and decks in regulations II-2/B/2 or II-2/B/5, as applicable, such storage rooms shall be treated as control stations.
- .12 The use of a fire-extinguishing medium, which either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons or gives off gases which are harmful to the environment, in fire-extinguishing systems on board new ships and in such new installations on board existing ships, is not permitted.

NEW CLASS A, B, C AND D SHIPS AND EXISTING CLASS B SHIPS:

- .13 Fixed fire-extinguishing systems shall comply with the provisions of the Fire Safety Systems Code *as well as annex N 1 and N 2 to this chapter.*
- .14 Means shall be provided to close from outside the protected space all openings which may admit air to or allow gas escape from the protected space.
- .15 When the fire-extinguishing medium is stored outside a protected space, it shall be stored in a room which is located behind the forward collision bulkhead and is used for no other purposes. Any entrance to such a storage room shall preferably be from the open deck and shall be

independent of the protected space. If the storage place is located below deck, it shall be located no more than one deck below the open deck and shall be directly accessible by a stairway or ladder from the open deck.

Spaces which are located below deck or spaces where access from the open deck is not provided shall be fitted with a mechanical ventilation system designed to take exhaust air from the bottom of the space and shall be sized to provide at least 6 air changes per hour. Access doors shall open outwards and bulkheads and decks including doors and other means of closing any opening therein, which form boundaries between such rooms and adjacent enclosed spaces, shall be gastight. For the purpose of the application of tables .1, 4.2, 5.1 and 5.2 such storage rooms shall be treated as fire control stations.

- .16 Where the volume of free air contained in air receivers in any space is such that, if released in such space in the event of fire, such release of air within that space would seriously affect the efficiency of the fixed fire-extinguishing system, an additional quantity of fire-extinguishing medium shall be provided.
- .17 Suppliers of fixed fire-extinguishing installations shall provide a description of the installation, including a checklist for maintenance, in English and in the official language(s) of the flag State.
- .18 The quantity of the fire-extinguishing medium shall be checked at least once a year by either an expert authorised by the Administration, the supplier of the installation or a recognised organisation.
- .19 The periodic checking which is carried out by the ship's chief engineer or organised by the ship's management shall be entered in the ship's survey book stating the scope and the time of such checking.
- .20 Non-prescribed fire extinguishing equipment which is installed e.g. in store rooms shall, in its construction and dimensioning, comply with the provisions of this regulation for the type of installation in question.
- .21 All doors to spaces protected by CO₂/halon installation shall be marked 'This space is protected by a CO₂/halon installation and shall be evacuated when the alarm equipment comes into operation'.

.2 CO₂ systems (R 5.2)

- .1.1 For cargo spaces the quantity of CO₂ available shall, unless otherwise provided, be sufficient to give a minimum volume of free CO₂ equal to 30% of the gross volume of the largest machinery space so protected in the ship.

If there is a connection through ventilation ducts between two or more cargo spaces, these shall be considered one space. In ships used for the carriage of vehicles, the necessary quantity of CO₂ shall be calculated as 45% of the gross cubic content of the largest cargo space.

- .1.2 For machinery spaces the quantity of CO₂ carried shall be sufficient to give a minimum volume of free CO₂ equal to the larger of the following volumes, either:

- .1 40% of the gross volume of the largest machinery space so protected, the volume to exclude that part of the casing above the level at which the horizontal area of the casing is 40% or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or
 - .2 35% of the gross volume of the largest machinery space protected, including the casing; provided that if two or more machinery spaces are not entirely separated they shall be considered as forming one space.
 - .2 For the purpose of this paragraph the volume of free CO₂ shall be calculated at 0.56 m³/kg.
 - .3 The fixed piping system shall be such that 85% of the gas can be discharged into the space within 2 min. *90% of the required CO₂ quantity shall be discharged above the floor and the rest of it below the floor.*
 - .4 Release mechanism of CO₂:
 - .1 Two separate controls shall be provided for releasing CO₂ into a protected space and to ensure the activities of the alarm. One control shall be used to discharge the gas from its storage containers. A second control shall be used for opening the valve of the piping which conveys the gas into the protected space.
 - .2 The two controls shall be located inside a release box clearly identified for the particular space. If the box containing the controls is to be locked, a key to the box shall be in a break-glass type enclosure conspicuously located adjacent to the box.
 - .5 The Administration of the flag State shall ensure that the spaces in which the CO₂ batteries are located will be properly arranged as regards their access, ventilation and communication equipment. It shall take the necessary safety measures regarding the construction, installation, marking, filling and testing of CO₂ cylinders, pipes and fittings, and for the control and alarm equipment for such installation.
 - .6 CO₂ systems shall comply with the provisions of the Fire Safety Systems Code *and annex N 1.*
 - .7 The Administration shall ensure that the spaces in which the CO₂ batteries are located will be properly arranged as regards their access, ventilation and communication equipment. It shall take the necessary safety measures regarding the construction, installation, marking, filling and testing of CO₂ cylinders piping and fittings and for control and alarm equipment for such installation.
- .3 Fixed low-expansion foam fire-extinguishing systems in machinery spaces (R 8)**
- .1 Where in any machinery space a fixed low-expansion foam fire-extinguishing system is fitted in addition to the requirements of regulation 6, such system shall be capable of discharging through fixed discharge outlets in not more than five minutes a quantity of foam sufficient to cover to a depth of 150 mm the largest single area over which oil fuel is liable to spread. The system shall be capable of generating foam suitable for extinguishing oil

fires. Means shall be provided for effective distribution of the foam through a permanent system of piping and control valves or cocks to suitable discharge outlets and for the foam to be effectively directed by fixed sprayers on other main fire hazards in the protected space. The expansion ratio of the foam shall not exceed 12 to 1.

- .2 The means of control of any such systems shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .3 Fixed low-expansion foam fire-extinguishing systems in machinery spaces shall comply with the provisions of the Fire Safety Systems Code.

.4 Fixed high-expansion foam fire-extinguishing systems in machinery spaces (R 9)

- .1 Any required fixed high-expansion foam system in machinery spaces shall be capable of rapidly discharging through fixed discharge outlets a quantity of foam sufficient to fill the greatest space to be protected at a rate of at least 1 metre in depth per minute. The quantity of foam-forming liquid available shall be sufficient to produce a volume of foam equal to five times the volume of the largest space to be protected. The expansion ratio of the foam shall not exceed 1,000 to 1.
- .2 Supply ducts for delivering foam, air intakes to the foam generator and the number of foam-producing units shall be such as will provide effective foam production and distribution.
- .3 The arrangement of the foam generator delivery ducting shall be such that a fire in the protected space will not affect the foam generating equipment.
- .4 The foam generator, its sources of power supply, foam forming liquid and means of controlling the system shall be readily accessible and simple to operate and shall be grouped in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .5 Fixed low expansion foam fire-extinguishing systems in machinery spaces shall comply with the provisions of the Fire Safety Systems Code.

.5 Fixed pressure water-spraying fire-extinguishing systems in machinery spaces (R 10)

NEW CLASS B, C AND D SHIPS CONSTRUCTED BEFORE 1 JANUARY 2003 AND EXISTING B CLASS SHIPS:

- .1 Any required fixed pressure water-spraying fire-extinguishing system in machinery spaces shall be provided with spraying nozzles of an approved type.
- .2 The number and arrangement of the nozzles shall be such as to ensure an effective average distribution of water of at least 5 litres/m² per minute in the spaces to be protected. Increased application rates may be considered

if necessary for particular hazardous areas. Nozzles shall be fitted above bilges, tank tops and other areas over which oil fuel is liable to spread and also above other specific fire hazards in the machinery spaces.

- .3 The system may be divided into sections, the distribution valves of which shall be operated from easily accessible positions outside the spaces to be protected and will not be readily cut off by a fire in the protected space.
- .4 The system shall be kept charged at the necessary pressure and the pump supplying the water for the system shall be put automatically into action by a pressure drop in the system.
- .5 The pump shall be capable of simultaneously supplying at the necessary pressure all sections of the system in any one compartment to be protected. The pump and its controls shall be installed outside the space or spaces to be protected. It shall not be possible for a fire in the space or spaces protected by the water-spraying system to put the system out of action.
- .6 Precautions shall be taken to prevent the nozzles from becoming clogged by impurities in the water or corrosion of piping, nozzles, valves and pump.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .7 The pump may be driven by an independent internal combustion machinery but, if it is dependent upon power being supplied from the emergency generator fitted in compliance with the provisions of Part D of Chapter II-1, that generator shall be so arranged as to start automatically in case of main power failure so that power for the pump required by paragraph .5 is immediately available. When the pump is driven by independent internal combustion machinery it shall be so situated that a fire in the protected space will not affect the air supply to the machinery.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .8 Fixed pressure water-spraying fire-extinguishing systems in machinery spaces shall comply with the provisions of the Fire Safety Systems Code.

Regulation 5 Portable fire extinguishers (R 6)

NEW CLASS B, C AND D SHIPS, CONSTRUCTED BEFORE 1 JANUARY 2003 AND EXISTING CLASS B SHIPS:

- .1 All fire extinguishers shall be of approved types and designs.
- .2 The capacity of required portable fluid extinguishers shall be not more than 13.5 litre and not less than 9 litres. Other extinguishers shall be at least as portable as the 13.5 litre fluid extinguisher and shall have a fire extinguishing capability at least equivalent to that of a 9 litre fluid extinguisher.
- .3 Spare charges shall be carried for 50% of the total of each type of extinguisher on board. Another extinguisher of the same type is a spare charge for an extinguisher which cannot be readily recharged on board.

- .4 In general, portable CO₂ fire extinguishers shall not be located in accommodation spaces. Where such extinguishers are provided in radio rooms, at switchboards and other similar positions, the volume of any space containing one or more extinguishers shall be such as to limit the concentration of vapour that can occur due to discharge to not more than 5% of the net volume of the space for the purpose of this regulation. The volume of CO₂ shall be calculated at 0.56 m³/kg.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .5 Portable fire extinguishers shall comply with the provisions of the Fire Safety Systems Code *and shall be inspected in accordance with the provisions of annex N(3) to this chapter.*
- .6 CO₂ fire extinguishers shall not be placed in accommodation spaces. In control stations and other spaces containing electrical or electronic equipment or appliances necessary for the safety of the ship, fire extinguishers shall be provided whose extinguishing media are neither electrically conductive nor harmful to the equipment and appliances.
- .7 Fire extinguishers shall be situated ready for use at easily visible places, which can be reached quickly and easily at any time in the event of a fire and in such a way that their serviceability is not impaired by the weather, vibration or other external factors. Portable fire extinguishers shall be provided with devices which indicate whether they have been used.
- .8 Spare charges shall be provided for 100% of the first 10 extinguishers and 50% of the remaining fire extinguishers capable of being recharged on board.
- .9 For the extinguishers which cannot be recharged on board, additional portable fire extinguishers of the same quantity, type, capacity and number as determined in paragraph .13 below shall be provided in lieu of spare charges.

NEW CLASS B, C AND EXISTING CLASS B SHIPS:

- .10 Fire extinguishers containing an extinguishing medium which either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons or gives off gases which are harmful to the environment shall not be permitted.
- .11 The fire extinguishers shall be suitable for extinguishing fires which are possible in the vicinity of the fire extinguisher location.
- .12 One of the portable fire extinguishers intended for use in any space shall be located near the entrance of that space.
- .13 The minimum number of fire extinguishers shall be as follows:
- .1 in accommodation and service spaces:
the fire extinguishers shall be so located that no point in the space is more than 10 metres walking distance from an extinguisher;
 - .2 an extinguisher suitable for use in high voltage areas shall be located in the proximity of any electric panel or subpanel having a power of 20 kW or more;

- .3 in galleys the extinguishers shall be so located that no point in the space is more than 10 metres walking distance from an extinguisher;
- .4 an extinguisher shall be located in the proximity of paint lockers and store rooms containing readily flammable products;
- .5 at least one extinguisher shall be located on the navigating bridge and in each control station.
- .14 Portable fire extinguishers provided for use in accommodation or service spaces shall so far as practicable have a uniform method of operation.
- .15 Periodic inspection of fire extinguishers:
the Administration of the flag State shall ensure that portable fire extinguishers shall be periodically inspected, function-tested and pressure-tested. *The fire-extinguishers shall be inspected in accordance with annex N (3).*

Regulation 6 Fire-extinguishing arrangements in machinery spaces (R 7)

Machinery spaces of category A shall be provided with:

IN NEW CLASS B, C AND D SHIPS OF 24 METRES IN LENGTH AND OVER:

- .1 any one of the following fixed fire-extinguishing systems:
 - .1 a gas system complying with the relevant provisions of paragraphs .1 and .2 of regulation 4, or an equivalent water-based system as an alternative arrangement for halon systems, complying with the provisions of MSC/Circ.668 of 30 December 1994 and MSC/Circ.728 of 26 June 1996, taking into consideration the date of construction of the ship;
 - .2 a high-expansion foam system complying with the relevant provisions of paragraph .4 of regulation 4, taking into consideration the date of construction of the ship;
 - .3 a pressure water-spraying system complying with the relevant provisions of paragraph .5 of regulation 4, taking into consideration the date of construction of the ship.
- .2 at least one set of portable air-foam equipment consisting of an air-foam nozzle of an inductor type capable of being connected to the fire main by a fire hose, together with a portable tank containing at least 20 litres of foam-making liquid and one spare tank. The nozzle shall be capable of producing effective foam suitable for extinguishing an oil fire, at a rate of at least 1.5 m³ per min.
- .3 In each such space, approved foam-type fire extinguishers, each of at least 45 litres capacity, or equivalent, sufficient in number to enable foam or its equivalent to be directed on to any part of the fuel and lubricating oil pressure systems, gearing and other fire hazards. In addition, there shall be provided a sufficient number of portable foam extinguishers or equivalent which shall be so located that no point in the space is more than 10 metres walking distance from an extinguisher and that there are at least two such extinguishers in each such space.

IN NEW CLASS B, C AND D SHIPS OF LESS THAN 24 METRES IN LENGTH AND EXISTING CLASS B SHIPS:

- .4 one of the fixed fire-extinguishing systems specified in paragraph .1 above, and in addition in any space containing internal combustion engines, or oil fuel settling tanks or oil-fuel units, one foam fire-extinguisher of at least 45 litres capacity or one CO₂ extinguisher of at least 16 kg capacity shall be provided;
- .5 one portable fire extinguisher suitable for extinguishing oil fires for each 736 kW or part thereof of such machinery; provided that not less than two nor more than six such extinguishers shall be required in any such space.

The use of low expansion foam fixed system in lieu of some of the six portable fire extinguishers required by this regulation is permitted.

IN NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS CARRYING MORE THAN 36 PASSENGERS:

- .6 Each machinery space shall be provided with at least two suitable water fog applicators, consisting of a metal L-shaped pipe, the long limb being about two metres in length capable of being fitted to a fire hose and the short limb being about 250 mm in length fitted with a fixed water fog nozzle or capable of being fitted with a water spray nozzle.

IN NEW CLASS B, C AND D SHIPS AND EXISTING CLASS B SHIPS:

- .7 When heated oil is used as heating medium, it may be additionally required that boiler rooms are equipped with permanently installed or portable equipment for local systems for jet spraying of water under pressure or the spreading of foam above and below the floor for fire-extinguishing purposes.

.8 IN NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003, WITH A LENGTH OF 24 METRES AND ABOVE:

- .1 Machinery spaces of category A above 500 m³ in volume shall, in addition to the fixed fire-extinguishing system required in this regulation, be protected by an approved type of fixed water-based or equivalent local application fire-fighting system, complying with the IMO guidelines contained in MSC/Circ.913.

In the cases of periodically unattended machinery spaces, the fire-fighting system shall have both automatic and manual release capabilities. In the case of continuously manned machinery spaces the fire-fighting system is only required to have a manual release capability.

- .2 Fixed local application fire-fighting systems are to protect areas such as the following without the necessity of engine shutdown, personnel evacuation or sealing of spaces:
 - .1 the fire hazard portions of internal combustion machinery used for the ship's main propulsion and power generation,
 - .2 boiler fronts,
 - .3 the fire hazard portions of incinerators and

- .4 purifiers for heated fuel oil.
- .3 Activation of any local application system shall give a visual and distinct audible alarm in the protected space and at continuously manned stations. The alarm shall indicate the specific system activated. The system alarm requirements described within this paragraph are in addition to and not a substitute for the detection and fire alarm systems required elsewhere in this chapter.

IN NEW CLASS B, C AND D, CONSTRUCTED BEFORE 1 JANUARY 2003 AND EXISTING CLASS B SHIPS OF 24 METRES IN LENGTH AND ABOVE AND ALL SHIPS CERTIFIED TO CARRY MORE THAN 400 PASSENGERS:

- .9 Fixed local application fire-fighting systems shall be fitted in accordance with paragraph .8 of this regulation not later than 1 October 2005.

Regulation 7 Special arrangements in machinery spaces (R 11)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .1 The number of skylights, doors, ventilators, openings in funnels to permit exhaust ventilation and other openings to machinery spaces shall be reduced to a minimum consistent with the needs of ventilation and the proper and safe working of the ship.
- .2 Skylights shall be of steel and shall not contain glass panels. Suitable arrangements shall be made to permit the release of smoke in the event of fire, from the space to be protected.

NEW CLASS B, C AND D SHIPS:

- .3 Doors other than power-operated watertight doors, shall be so arranged that positive closure is assured in case of fire in the space, by power-operated closing arrangements or by the provision of self-closing doors capable of closing against an inclination of 3.5° opposing closure and having a fail-safe hold-back facility, provided with a remotely operated release device.

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .4 Windows shall not be fitted in machinery space boundaries. This does not preclude the use of glass in control rooms within the machinery spaces.
- .5 Means of control shall be provided for:
 - .1 opening and closure of skylights, closure of openings in funnels which normally allow exhaust ventilation, and closure of ventilator dampers;
 - .2 permitting the release of smoke;
 - .3 closing power-operated doors or actuating release mechanism on doors other than power-operated watertight doors;
 - .4 stopping ventilating fans; and
 - .5 stopping forced and induced draught fans, oil fuel transfer pumps, oil fuel unit pumps and other similar fuel pumps. Other similar fuel pumps means for ships constructed on or after 1 January 2003 lubricating oil service pumps, thermal oil circulating pumps and oil

separators. However paragraph .6 of this regulation need not apply to oily water separators.

- .6 The controls required in paragraph .5 and regulation II-2/A/10.2.5 shall be located outside the space concerned, where they will not be cut off in the event of fire in the space they serve. Such controls and the controls for any required fire-extinguishing system shall be situated at one control position or grouped in as few positions as possible. Such positions shall have a safe access from the open deck.
- .7 When access to any machinery space of category A is provided at a low level from an adjacent shaft tunnel, there shall be provided in the shaft tunnel, near the watertight door, a light steel fire-screen door operable from each side.

Regulation 8 Automatic sprinkler, fire detection and fire alarm systems (R 12)

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003, AND EXISTING CLASS B SHIPS:

- .1 Any required automatic sprinkler, fire detection and fire alarm system shall be capable of immediate operation at all times and no action by the crew shall be necessary to set it in operation. It shall be of the wet pipe type but small exposed sections may be of the dry pipe type where this is a necessary precaution. Any parts of the system which may be subjected to freezing temperatures in service shall be suitably protected against freezing. It shall be kept charged at the necessary pressure and shall have provision for a continuous supply of water as required in this regulation.
- .2 Each section of sprinklers shall include means for giving a visual and audible alarm signal automatically at one or more indicating units whenever any sprinkler comes into operation. Such units shall indicate in which section served by the system fire has occurred and shall be centralised on the navigation bridge and in addition, visible and audible alarms from the unit shall be placed in a position other than on the navigating bridge so as to ensure that the indication of fire is immediately received by the crew. The alarm system shall be such as to indicate if any fault occurs in the system.
- .3 Sprinklers shall be grouped into separate sections, each of which shall contain not more than 200 sprinklers. Any section of sprinklers shall not serve more than two decks and shall not be situated in more than one main vertical zone, unless it can be demonstrated that arrangements with a section of sprinklers serving more than two decks or situated in more than one main vertical zone will not reduce the protection of the ship against fire.
- .4 Each section of sprinklers shall be capable of being isolated by one stop valve only. The stop valve in each section shall be readily accessible and its location shall be clearly and permanently indicated. Means shall be provided to prevent the operation of the stop valves by any unauthorised person.
- .5 A gauge indicating the pressure in the system shall be provided at each section stop valve and at a central station.

- .6 The sprinklers shall be resistant to corrosion by marine atmosphere. In accommodation and service spaces the sprinklers shall come into operation within the temperature range from 68 to 79° C, except that in locations such as drying rooms, where high ambient temperatures might be expected, the operating temperature may be increased by not more than 30°C above the maximum deckhead temperature.
- .7 A list or plan shall be displayed at each indicating unit showing the spaces covered and the location of the zone in respect of each section. Suitable instructions for testing and maintenance shall be available.
- .8 Sprinklers shall be placed in an overhead position and spaced in a suitable pattern to maintain an average application rate of not less than 5 litres/m² per minute over the nominal area covered by the sprinklers. Sprinklers shall be placed as clear as possible of beams or other objects likely to obstruct the projections of water and in such positions that combustible material in the space will be well sprayed.
- .9 A pressure tank having a volume equal to at least twice that of the charge of water specified in this paragraph shall be provided. The tank shall contain a standing charge of fresh water, equivalent to the amount of water which would be discharged in one minute by the pump referred to in paragraph .12, and the arrangements shall provide for maintaining an air pressure in the tank such as to ensure that where the standing charge of fresh water in the tank has been used the pressure will be not less than the working pressure of the sprinkler, plus the pressure exerted by a head of water measured from the bottom of the tank to the highest sprinkler in the system. Suitable means of replenishing the air under pressure and of replenishing the fresh water charge in the tank shall be provided. A glass gauge shall be provided to indicate the correct level of the water in the tank.
- .10 Means shall be provided to prevent the passage of seawater into the tank. The pressure tank shall be fitted with an efficient relief valve and a pressure gauge. Stop valves or cocks shall be provided at each of the gauge connections.
- .11 An independent power pump shall be provided solely for the purpose of continuing automatically the discharge of water from the sprinklers. The pump shall be brought into action automatically by the pressure drop in the system before the standing fresh water charge in the pressure tank is completely exhausted.
- .12 The pump and the piping system shall be capable of maintaining the necessary pressure at the level of the highest sprinkler to ensure a continuous output of water sufficient for the simultaneous coverage of a minimum area of 280 m² at the application rate specified in paragraph .8. For new class C and D ships of less than 40 metres in length with a total protected area of less than 280 m², the Administration may specify the appropriate area for sizing of pumps and alternative supply components.
- .13 The pump shall have fitted on the delivery side a test valve with a short open-ended discharge pipe. The effective area through the valve and the pipe shall be adequate to permit the release of the required pump output while maintaining the pressure in the system specified in paragraph .9.

- .14 The sea inlet to the pump shall wherever possible be in the space containing the pump and shall be so arranged that when the ship is afloat it will not be necessary to shut off the supply of seawater to the pump for any purpose other than the inspection or repair of the pump.
- .15 The sprinkler pump and tank shall be situated in a position reasonably remote from any machinery space and shall not be situated in any space required to be protected by the sprinkler system.
- .16 There shall be not less than two sources of power supply for the seawater pump and automatic alarm and detection system. Where the sources of power for the pump are electrical, these shall be a main generator and an emergency source of power. One supply for the pump shall be taken from the main switchboard, and one from the emergency switchboard by separate feeders reserved solely for that purpose. The feeders shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk except in so far as it is necessary to reach the appropriate switchboards, and shall be run to an automatic changeover switch situated near the sprinkler pump. This switch shall permit the supply of power from the main switchboard so long as a supply is available therefrom, and to be so designed that upon failure of that supply it will automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard shall be clearly labelled and normally kept closed. No other switch shall be permitted in the feeders concerned. One of the sources of power supply for the alarm and detection system shall be an emergency source. Where one of the sources of power for the pump is an internal combustion engine it shall, in addition to complying with the provisions of paragraph .15, be so situated that a fire in any protected space will not affect the air supply to the machinery.
- .17 The sprinkler system shall have a connection from the ship's fire main by way of a lockable screw-down nonreturn valve at the connection which will prevent a backflow from the sprinkler system to the fire main.
- .18 A test valve shall be provided for testing the automatic alarm for each section of sprinklers by a discharge of water equivalent to the operation of one sprinkler. The test valve for each section shall be situated near the stop valve for that section.
- .19 Means shall be provided for testing the automatic operation of the pump on reduction of pressure in the system.
- .20 Switches shall be provided at one of the indicating positions referred to in paragraph .2 which will enable the alarm and the indicators for each section of sprinklers to be tested.
- .21 At least 6 spare sprinkler heads shall be provided for each section.
- NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:
- .22 The automatic sprinkler, fire detection and fire alarm systems shall be of an approved type, complying with the provisions of the Fire Safety System Code.
- .23 For new C and D class ships of less than 40 metres in length and with a total protected area of less than 280 m² the

Administration may specify the appropriate area for sizing of pumps and alternative components.

Regulation 9 Fixed fire detection and fire alarm systems (R 13)

NEW CLASS B, C AND D SHIPS, CONSTRUCTED BEFORE 1 JANUARY 2003 AND EXISTING CLASS B SHIPS:

.1 General

- .1 Any required fixed fire detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times.
- .2 Power supplies and electric circuits necessary for the operation of the system shall be monitored for loss of power or fault conditions as appropriate. Occurrence of a fault condition shall initiate a visual and audible fault signal at the control panel which shall be distinct from a fire signal.
- .3 There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fire detection and fire alarm system, one of which shall be an emergency source. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic changeover switch situated in or adjacent to the control panel for the fire detection system.
- .4 Detectors and manually operated call points shall be grouped into sections. The activation of any detector or manually operated call point shall initiate a visual and audible fire signal at the control panel and indicating units. If the signals have not received attention within 2 minutes an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces. This alarm sounder system need not be an integral part of the detection system.
- .5 The control panel shall be located on the navigating bridge or in the main fire control station.
- .6 Indicating units shall, as a minimum, denote the section in which a detector or manually operated call point has operated. At least one unit shall be so located that it is easily accessible to responsible members of the crew at all times, when at sea or in port, except when the ship is out of service. One indicating unit shall be located on the navigating bridge if the control panel is located in the main fire control station.
- .7 Clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.
- .8 Where the fire detection system does not include means of remotely identifying each detector individually, no section covering more than one deck within accommodation, service and control stations shall normally be permitted except a section which covers an enclosed stairway. In order to avoid delay in identifying the source of fire, the number of enclosed spaces included in each section shall be limited as determined by

the Administration of the flag State. In no case shall more than 50 enclosed spaces be permitted in any section. If the detection system is fitted with remotely and individually identifiable fire detectors, the sections may cover several decks and serve any number of enclosed spaces.

- .9 If there is no fire detection system capable of remotely and individually identifying each detector, a section of detectors shall not serve spaces on both sides of the ship nor on more than one deck and neither shall it be situated in more than one main vertical zone except that the Administration of the flag State, if it is satisfied that the protection of the ship against fire will not thereby be reduced, may permit such a section of detectors to serve both sides of the ship and more than one deck. In ships fitted with individually identifiable fire detectors, a section may serve spaces on both sides of the ship and on several decks but may not be situated in more than one main vertical zone.
- .10 A section of fire detectors which covers a control station, a service space or an accommodation space shall not include a machinery space.
- .11 Detectors shall be operated by heat, smoke or other products of combustion, flame or any combination of these factors. Detectors operated by other factors indicative of incipient fires may be considered by the Administration of the flag State provided that they are not less sensitive than such detectors. Flame detectors shall only be used in addition to smoke or heat detectors.
- .12 Suitable instructions and component spares for testing and maintenance shall be provided.
- .13 The function of the detection system shall be periodically tested to the satisfaction of the Administration of the flag State by means of equipment producing hot air at the appropriate temperature, or smoke or aerosol particles having the appropriate range of density or particle size, or other phenomena associated with incipient fires to which the detector is designed to respond.

All detectors shall be of a type such that they can be tested for correct operation and restored to normal surveillance without the renewal of any component.

- .14 The fire detection system shall not be used for any other purpose, except that closing of fire doors and similar functions may be permitted at the control panel.
- .15 Fire detection systems with a zone address identification capability shall be so arranged that:
 - a loop cannot be damaged at more than one point by a fire;
 - means are provided to ensure that any fault (e.g. power break, short circuit, earth) occurring in the loop will not render the whole loop ineffective,
 - all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (electrical, electronic, informatic),
 - the first initiated fire alarm will not prevent any other detector to initiate further fire alarms.

.2 Installation requirements

- .1 Manually operated call points shall be installed throughout the accommodation spaces, service spaces and control stations. One manually operated call point shall be located at each exit. Manually operated call points shall be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 metres from a manually operated call point.
- .2 Smoke detectors shall be installed in all stairways, corridors and escape routes within accommodation spaces.
- .3 Where a fixed fire detection and fire alarm is required for the protection of spaces other than those specified in paragraph .2.2 above, at least one detector complying with paragraph .1.11 shall be installed in each such space.
- .4 Detectors shall be located for optimum performance. Positions near beams and ventilation ducts or other positions where patterns of airflow could adversely affect performance and positions where impact or physical damage is likely shall be avoided. In general, detectors which are located on the overhead shall be a minimum distance of 0.5 metres away from bulkheads.
- .5 The maximum spacing of detectors shall be in accordance with the table below:

Type of detector	Maximum floor area per detector	Maximum distance apart between centres Maximum distance away from bulkheads
Heat	37 m ²	9 m
	74m ²	4.5 m
Smoke		11 m
		5.5 m

The Administration of the flag State may require or permit other spacings based upon test data which demonstrate the characteristics of the detectors.

- .6 Electrical wiring which forms part of the system shall be so arranged as to avoid galleys, machinery spaces, and other enclosed spaces of high fire risk except where it is necessary to provide for fire detection or fire alarm in such spaces or to connect to the appropriate power supply.

.3 Design requirements

- .1 The system and equipment shall be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships.
- .2 Smoke detectors to be installed in stairways, corridors and escape routes within accommodation spaces as required by paragraph .2.2 shall be certified to operate before the smoke density exceeds 12.5% obscuration per metre, but not until the smoke density exceeds 2% obscuration per metre.

Smoke detectors to be installed in other spaces shall operate within sensitivity limits to the satisfaction of the Administration of the flag State having regard to the avoidance of detector insensitivity or oversensitivity.

- .3 Heat detectors shall be certified to operate before the temperature exceeds 78°C but not until the temperature exceeds 54°C, when the temperature is raised to those limits at a rate less than 1°C per minute. At higher rates of temperature rise, the heat detector shall operate within temperature limits to the satisfaction of the Administration of the flag State having regard to the avoidance of detector insensitivity or oversensitivity.
- .4 The permissible temperature of operation of heat detectors may be increased to 30°C above the maximum deckhead temperature in drying rooms and similar spaces of a normal high ambient temperature.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- 4.1 The fixed fire detection and fire alarm systems shall be of an approved type, complying with the provisions of the Fire Safety Systems Code.
- 4.2 Manually operated call points complying with the Fire Safety Systems Code shall be installed throughout the accommodation spaces, service spaces and control stations. One manually operated call point shall be located at each exit. Manually operated call points shall be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 metres from a manually operated call point.

NEW CLASS A, B, C AND D SHIPS:

- .5 In addition to the above provisions, the Administration of the flag State shall ensure that safety provisions on the installations regarding their independence from other installations or systems, the corrosion resistance of their components, the electrical power supply to their control system, and the availability of instructions for their operation and maintenance shall be complied with.

Regulation 10 Arrangements for oil fuel, lubricating oil and other flammable oils (R 15)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

.1 Limitations in the use of oil as fuel

The following limitations shall apply to the use of oil as fuel:

- .1 Except as otherwise permitted by this paragraph, no oil fuel with a flashpoint of less than 60°C shall be used.
- .2 In emergency generators, oil fuel with a flashpoint of not less than 43°C may be used.
- .3 Subject to such additional precautions as it may consider necessary and on condition that the ambient temperature of the space in which such oil fuel is stored or used shall not be allowed to rise to within 10°C below the flashpoint of the oil fuel, the Administration of the flag State may permit the general use of oil fuel having a flashpoint of less than 60°C but not less than 43°C.

For ships constructed on or after 1 January 2003 oil fuel having a flashpoint of less than 60°C but not less than 43°C may be permitted subject to the following:

- .1 fuel oil tanks except those arranged in double bottom compartments shall be located outside of machinery spaces of category A;
- .2 provisions for the measurement of oil temperature are provided on the suction pipe of the fuel pump;
- .3 stop valves and/or cocks are provided on the inlet side and outlet side of the oil fuel strainers and;
- .4 pipe joints of welded construction or of circular cone type or spherical type union joint are applied as much as possible.

The flashpoint of oils shall be determined by an approved closed cup method.

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

.2 Oil fuel arrangements

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

- .1.1 As far as practicable, parts of the oil fuel system containing heated oil under pressure exceeding 0.18 N/mm² shall 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 shall be adequately illuminated.
- .1.2 By heated oil is meant oil the temperature of which after heating is higher than 60°C or higher than the current flashpoint of the oil, if this is lower than 60°C.
- .2 The ventilation of machinery spaces shall be sufficient under all normal conditions to prevent accumulation of oil vapour.
- .3 As far as practicable, oil fuel tanks shall be part of the ship's structure and shall be located outside machinery spaces. Where oil fuel tanks, other than double bottom tanks, are necessarily located adjacent to or within machinery spaces, at least one of their vertical sides shall be contiguous to the machinery space boundaries, and shall preferably have a common boundary with the double bottom tanks, and the area of the tank boundary common with the machinery spaces shall be kept to a minimum. Where such tanks are situated within the boundaries of machinery spaces they shall not contain oil fuel having a flashpoint of less than 60°C. The use of freestanding oil fuel tanks shall be avoided and shall be prohibited in machinery spaces.
- .4 No oil fuel tank shall be situated where spillage or leakage therefrom can constitute a hazard by falling on heated surfaces. Precautions shall be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces.
- .5 Every oil fuel pipe, which, if damaged, would allow oil to escape from a storage, settling or daily service tank, having a capacity of 500 litres or above, 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 additional valve is fitted in the machinery space it shall be operated from a position outside this space.

In ships constructed on or after 1 January 2003 the controls for remote operation of the valve for the emergency generator fuel tank shall be in a separate location from the controls for remote operation of other valves located in machinery spaces.

- .6 Safe and efficient means of ascertaining the amount of oil fuel contained in any oil fuel tank shall be provided.

NEW CLASS B, C AND D SHIPS:

- .1 Sounding pipes 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, sounding pipes shall not terminate in machinery spaces. However, where the Administration of the flag State considers that these latter requirements are impracticable, it may permit termination of sounding pipes in machinery spaces on condition that all the following requirements are met:
 - .1.1 in addition, an oil-level gauge is provided meeting the requirements of subparagraph .2.6.2;
 - .1.2 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 the sounding pipes from coming into contact with a source of ignition;
 - .1.3 the termination of sounding pipes are fitted with self-closing blanking devices and with a small diameter self-closing control cock located below the blanking device for the purpose of ascertaining before the blanking device is opened that oil fuel is not present. Provision shall be made as to ensure that any spillage of oil fuel through the control cock involves no ignition hazard.

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .2 Other means of ascertaining the amount of oil fuel contained in any oil fuel tank may be permitted if such means, like the means provided in subparagraph .2.6.1.1, do not require penetration below the top of the tank, and providing their failure or overfilling of the tanks will not permit release of fuel.
- .3 Means prescribed in subparagraph .2.6.2 shall be maintained in the proper condition to ensure their continued accurate functioning in service.

- .7 Provision shall be made to prevent overpressure in any oil tank or in any part of the oil fuel system, including the filling pipes served by pumps on board. Any relief valves and air or overflow pipes shall discharge to a position where there is no risk of fire or explosion from the emergence of oils and vapour and shall not lead into crew spaces, passenger spaces nor into special category spaces, closed ro-ro spaces, machinery spaces or similar spaces, situated in ships constructed on or after 1 January 2003.
- .8 Oil fuel pipes and their valves and fittings shall be of steel or other approved material, except that restricted use of flexible pipes may be permitted. Such flexible pipes and end attachments shall be of approved fire-resisting materials of adequate strength.

NEW CLASS B, C AND D SHIPS:

- .9 All external high pressure fuel delivery lines between the high pressure fuel pumps and fuel injectors shall be protected with a jacketed piping system capable of containing fuel from a high pressure line failure. A jacketed pipe incorporates an outer pipe into which the high-pressure fuel pipe is placed forming a permanent assembly. The jacketed piping system shall include a means for collection of leakages and arrangements shall be provided for an alarm to be given of a fuel line failure.
- .10 All surfaces with temperatures above 220°C which may be impinged as a result of a fuel system failure shall be properly insulated.
- .11 Oil fuel lines shall 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 shall be kept to a minimum.

NEW CLASS B, C AND D SHIPS, CONSTRUCTED ON OR AFTER 1 JANUARY 2003:

- .12 Oil fuel lines shall not be located immediately above or near units of high temperature including boilers, steam pipelines, exhaust manifolds, silencers or other equipment required to be insulated. As far as practicable, oil fuel lines shall be arranged far apart from hot surfaces, electrical installations or other sources of ignition and shall be screened or otherwise suitably protected to avoid oil spray or oil leakage onto the sources of ignition. The number of joints in such piping systems shall be kept to a minimum.
- .13 Components of a diesel engine fuel system shall be designed considering the maximum peak pressure which will be experienced in service, including any high pressure pulses which are generated and transmitted back into fuel supply and spill lines by the action of fuel injection pumps. Connections within the fuel supply and spill lines shall be constructed having regard to their ability to prevent pressurised oil fuel leaks while in service and after maintenance.
- .14 In multi-engine installations which are supplied from the same fuel source, means of isolating the fuel supply and spill piping to individual engines, shall be provided. The means of isolation shall not affect the operation of the

other engines and shall be operable from a position not rendered inaccessible by a fire on any of the engines

- .15 Where the Administration permit the conveying of oil and combustible liquids through accommodation and service spaces, the pipes conveying oil or combustible liquids shall be of a material approved by the Administration having regard of the fire risk.
- .16 EXISTING CLASS B SHIPS shall comply with the requirements of paragraphs .2.9 to .2.11 not later than 1 July 2003, except that a suitable enclosure of engines having an output of 375 kW or less having fuel injection pumps serving more than one injector may be used as an alternative to the jacketed piping system in paragraph .2.9.

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

.3 Lubricating oil arrangements

The arrangements for the storage, distribution and utilisation of oil used in pressure lubrication systems shall be such as to ensure the safety of the ship and persons on board, and such arrangements in machinery spaces shall at least comply with the provisions of paragraphs .2.1, .2.4, .2.5, .2.6, .2.7, .2.8, .2.10 and .2.11, except that:

- .1 this does not preclude the use of sight-flow glasses in lubricating systems provided that they are shown by test to have a suitable degree of fire resistance. If sight-flow glasses are used, the pipe shall be provided with valves in both ends. The valve at the lower end of the pipe shall be of a self-closing type;
- .2 sounding pipes may be authorised in machinery spaces; the requirements of paragraphs .2.6.1.1 and .2.6.1.3 need not be applied on condition that the sounding pipes are fitted with appropriate means of closure.

For ships constructed on or after 1 January 2003 the provisions of paragraph 10.2.5 shall also apply to lubricating oil tanks except those having a capacity less than 500 litres, storage tanks on which valves are closed during the normal operation of the ship or where it is determined that the unintended operation of a quick closing valve on the lubricating oil tank would endanger the safe operation of the main propulsion and essential auxiliary machinery.

.4 Arrangements for other flammable oils

The arrangements for the storage, distribution and utilisation of other flammable oils employed under pressure in power transmission systems, control and activating systems and heating systems shall be such as to ensure the safety of the ship and persons on board. In locations where means of ignition are present, such arrangements shall at least comply with the provisions of paragraphs .2.4, .2.6, .2.10 and .2.11 and with the provisions of paragraphs .2.7 and .2.8 in respect of strength and construction.

.5 Periodically unattended machinery spaces

In addition to the requirements of provisions 1 to 4, the oil fuel and lubricating oil systems shall comply with the following:

- .1 where daily service oil fuel tanks are filled automatically, or by remote control, means shall be provided to prevent

overflow spillages. Other equipment which treats flammable liquids automatically, e.g. oil fuel purifiers, which, whenever practicable, shall be installed in a special space reserved for purifiers and their heaters, shall have arrangements to prevent overflow spillages;

- .2 where daily service oil fuel tanks or settling tanks are fitted with heating arrangements, a high temperature alarm shall be provided if the flashpoint of the oil fuel can be exceeded.

.6 Prohibition of carriage of flammable oils in forepeak tanks

Fuel oil, lubrication oil and other flammable oils shall not be carried in forepeak tanks.

Regulation 11 Firefighter's outfit (R 17)

- .1 A firefighter's outfit shall consist of:

NEW CLASS B, C AND D AND EXISTING CLASS A AND B SHIPS:

- .1 Personal equipment comprising:
 - .1 protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam. The outer surface shall be water-resistant;
 - .2 boots and gloves of rubber or other electrically non-conducting material;
 - .3 a rigid helmet providing effective protection against impact;
 - .4 an electric safety lamp (hand lantern) of an approved type with a minimum burning period of three hours;
 - .5 a firefighter's axe.
- .2 A breathing apparatus of an approved type consisting of a self-contained compressed-air-operated breathing apparatus (SCBA), the volume of air contained in the cylinders of which shall be at least 1,200 litres, or other self-contained breathing apparatus which shall be capable of functioning for at least 30 minutes. Every SCBA shall be provided with fully charged spare cylinders having a spare storage capacity of at least 2,400 litres of free air except that:
 - (i) if the ship is carrying five or more SCBA, the total spare storage capacity of free air need not to exceed 9,600 litres; or
 - (ii) if the ship is equipped with means for recharging the air cylinders with full pressure with air, free from contamination, the spare storage capacity of the fully charged spare cylinders of each SCBA shall be at least 1,200 litres of free air, and the total spare storage capacity of free air provided in the ship shall not be required to exceed 4,800 litres of free air.

All air cylinders for SCBA's shall be interchangeable.

- .2 For each breathing apparatus a fireproof lifeline of sufficient length and strength shall be provided capable of being attached by means of a snaphook to the harness of the apparatus or to a

separate belt in order to prevent the breathing apparatus becoming detached when the lifeline is operated.

- .3 New class B and existing class B ships of 24 metres in length and above and all class C and D ships of 40 metres in length and above shall carry at least two firefighter's outfits.
- .1 In ships of 60 metres in length and above, in addition there shall be provided, if the aggregate of the lengths of all passenger spaces and service spaces on the deck which carries such spaces is more than 80 metres, or, if there is more than one such deck, on the deck which has the largest aggregate of such lengths, two firefighter's outfits and two sets of personal equipment for every 80 metres, or part thereof, of such aggregate of lengths.
- In ships carrying more than 36 passengers, two additional firefighter's outfits shall be provided for each main vertical zone, except for stairway enclosures which constitute individual main vertical zones and for main vertical zones of limited length in the fore and aft end of a ship which do not include, machinery spaces or main galleys.
- .2 In ships of 40 metres in length and above but less than 60 metres two firefighter's outfits have to be provided.
- .3 In new class B and existing class B ships of 24 metres in length and above but less than 40 metres, also two firefighter's outfits have to be provided, but with only one spare aircharge for self-contained breathing apparatus.
- .4 In new and existing class B ships of less than 24 metres length and in new class C and D ships no firefighter's outfit has to be provided.
- .5 The firefighter's outfits or sets of personal equipment shall be so stored as to be easily accessible and ready for use and, where more than one fire-fighter's outfit or more than one set of personal equipment is carried, they shall be stored in widely separated positions. At least one firefighter's outfit and one set of personal equipment shall be available at any one such position.

Regulation 12 Miscellaneous items (R 18)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .1 Where class 'A' divisions are penetrated for the passage of electric cables, pipes, trunks, ducts etc., or for girders, beams or other structural members, arrangements shall be made to ensure that the fire resistance is not impaired in so far as is reasonable and practicable.

For ships, which are constructed on or after 1 January 2003, where 'A' class divisions are penetrated, such penetrations shall be tested in accordance with the Fire Test Procedures Code, to ensure that the fire resistance of the divisions is not impaired.

In the case of ventilation ducts regulations II-2/B/9.2.2b and II-2/B/9.3 apply.

However, where a pipe penetration is made of steel or equivalent material having a thickness of 3 mm or greater and

a length of not less than 900 mm (preferably 450 mm on each side of the division) and no openings, testing is not required.

Such penetrations shall be suitably insulated by extension of the insulation at the same level of the division.

- .2 Where class 'B' divisions are penetrated for the passage of electric cables, pipes, trunks, ducts etc., or for the fitting of ventilation terminals, lighting fixtures and similar devices, arrangements shall be made to ensure that the fire resistance is not impaired in so far as is reasonable and practicable. In ships, which are constructed on or after 1 January 2003 for such penetrations arrangements shall be made to ensure that the fire resistance of the divisions is not impaired.

Pipes other than steel or copper that penetrate 'B' class divisions shall be protected by either:

- .1 a fire tested penetration device, suitable for the fire resistance of the division pierced and the type of the pipe used; or
- .2 a steel sleeve, having a thickness of not less than 1.8 mm and a length of not less than 900 mm for pipe diameters of 150 mm or more and not less than 600 mm for pipe diameters of less than 150 mm (preferably equally divided to each side of the division).

The pipe shall be connected to the ends of the sleeve by flanges or couplings or the clearance between the sleeve and the pipe shall not exceed 2.5 mm or any clearance between pipe and sleeve shall be made tight by means of non-combustible or other suitable material.

- .3 Pipes penetrating 'A' or 'B' class divisions shall be of approved materials having regard to the temperature such divisions are required to withstand.

In ships, constructed on or after 1 January 2003, no-insulated metallic pipes penetrating 'A' or 'B' class divisions shall be of materials having a melting temperature which exceeds 950°C for 'A-0' and 850°C for 'B-0' class divisions.

- .4 In accommodation spaces, service spaces or control stations, pipes intended to convey oil or other flammable liquids shall be of a suitable material and construction having regard to the fire risk.
- .5 Materials readily rendered ineffective by heat shall not be used for over board scuppers, sanitary discharges, and other outlets which are close to the waterline and where the failure of the material in the event of fire would give rise to danger of flooding.
- .6 Electric radiators, if used, shall be fixed in position and so constructed as to reduce fire risks to a minimum. No such radiators shall be fitted with an element so exposed that clothing, curtains, or other similar materials can be scorched or set on fire by heat from the element.
- .7 All waste receptacles shall be constructed of non-combustible materials with no openings in the sides or bottom.
- .8 In spaces where penetration of oil products is possible, the surface of insulation shall be impervious to oil or oil vapours.

NEW CLASS A, B, C AND D SHIPS: In spaces in which there is a risk of oils splashing or oil vapour, e.g. in machinery spaces of category A, the surface of the insulating material

shall be impermeable by oil and oil vapour. Where there is covering by non-perforated steel plate or other non-combustible materials (not aluminium) which is the ultimate physical surface, this covering may be joined by seaming, riveting, etc.

- .9 Paint lockers and flammable liquid lockers shall be protected by an approved fire-extinguishing arrangement, enabling the crew to extinguish a fire without entering the space.

In ships, which are constructed on or after 1 January 2003:

- .1 Paint lockers shall be protected by:
- .1 a CO₂ system, designed to give a minimum volume of free gas equal to 40% of the gross volume of the protected space;
 - .2 a dry powder system, designed for at least 0.5 kg powder/m³;
 - .3 a waterspraying or sprinkler system, designed for 5 litres/m² min. Water spraying systems may be connected to the fire main of the ship; or
 - .4 a system providing equivalent protection, as determined by the Administration.

In any case the system shall be operable from outside the protected space.

- .2 Flammable liquid lockers shall be protected by an appropriate fire extinguishing arrangement approved by the Administration.
- .3 For lockers of a deck area of less than 4 m², which do not give access to accommodation spaces, a CO₂ portable extinguisher sized to provide a minimum volume of free gas equal to 40% of the gross volume of the space may be accepted in lieu of a fixed system.

A discharge port shall be arranged in the locker to allow the discharge of the extinguisher without having to enter into the protected space. The required portable fire extinguisher shall be stowed adjacent to the port. Alternatively a port or hose connection may be provided to facilitate the use of fire main water.

NEW CLASS A, B, C AND D SHIPS AND EXISTING CLASS B SHIPS:

- .10 Deep-fat friers, boiling and roasting apparatus:

When deep-fat friers, boiling and roasting apparatus are installed and used in spaces outside the main galley, the Administration of the flag State shall impose additional safety measures with regard to the specific fire hazards associated with the use of this type of equipment.

In ships, which are constructed on or after 1 January 2003, deep-fat cooking equipment shall be fitted with the following:

- .1 an automatic or manual extinguishing system tested to an international standard in accordance with Publication ISO 15371:2000 on fire-extinguishing systems for protection of galley deep-fat cooking equipment;
- .2 a primary and backup thermostat with an alarm to alert the operator in the event of failure of either thermostat;

- .3 arrangements for automatically shutting off the electrical power upon activation of the extinguishing system;
- .4 an alarm for indicating operation of the extinguishing system in the galley where the equipment is installed; and
- .5 controls for manual operation of the extinguishing system, which are clearly labelled for ready use of the crew.

In ships, which are constructed before 1 January 2003, new installations for deep-fat cooking equipment shall comply with the requirements of this paragraph.

NEW CLASS A, B, C AND D SHIPS:

- .11 Heat bridges:

In the implementation of fire proofing measures, steps shall be undertaken by the Administration of the flag State to prevent heat transfer through heat bridges, e.g. between decks and bulkheads.

In ships, which are constructed on or after 1 January 2003, the insulation of a deck or bulkhead shall be carried past the penetration, intersection or terminal point for a distance of at least 450 mm in the case of steel and aluminium structures. If a space is divided with a deck or a bulkhead of 'A' class standard having insulation of different values, the insulation with the higher value shall continue on the deck or bulkhead with the insulation of the lesser value for a distance of at least 450 mm.

NEW CLASS A, B, C AND D SHIPS AND EXISTING CLASS B SHIPS:

- .12 Pressurised gas containers:

All portable containers for gases which are compressed, liquefied or broken down under pressure, which may feed a possible fire, shall immediately after use be put in a suitable place above the bulkhead deck, from which there is direct access to open deck.

Regulation 13 Fire control plans and fire drills (R 20)

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

- .1 In all ships general arrangement plans shall be permanently exhibited for the guidance of the ship's officers, showing clearly for each deck the control stations, the various fire sections enclosed by 'A' class divisions, the sections enclosed by 'B' class divisions together with particulars of the fire detection and fire alarm systems, the sprinkler installation, the fire-extinguishing appliances, means of access to different compartments, decks, etc. and the ventilating system including particulars of the fan control positions, the position of dampers and identification numbers of the ventilating fans serving each section. Alternatively the aforementioned details may be set out in a booklet, a copy of which shall be supplied to each officer, and one copy shall at all times be available on board in an accessible position. Plans and booklets shall be kept up to date, any alterations being recorded thereon as soon as practicable. Description in such plans and booklets shall be in the official language of the flag State. If the language is neither English nor French, a translation into one of these

languages shall be included. In the case the ship is engaged on domestic voyages in another Member State, a translation into the official language of that host State, if this language is neither English nor French, shall be included.

For new class B, C and D ships, constructed on or after 1 January 2003 the information to be provided with the required fire control plans and booklets and the graphical symbols to be used for the fire control plans shall be in accordance with the IMO Resolutions A.756(18) and A.654(16).

- .2 In all ships with a length of 24 metres and over a duplicate set of fire control plans or a booklet containing such plans shall be permanently stored in a prominently marked weather tight enclosure outside the deckhouse for the assistance of shore side fire-fighting personnel.

Regulation 14 Operational readiness and maintenance

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

.1 General requirements

At all times while the ship is in service, the fire protection systems and fire-fighting systems and appliances shall be maintained ready for use.

A ship is not in service when:

- .1 it is in for repairs or lay-up (either at anchor or at port) or in dry-dock;
- .2 it is declared not in service by the owner or the owner's representative; and
- .3 if there are no passengers on board.

The following fire protection systems shall be kept in good order so as to ensure their required performance if a fire occurs:

1.1 Operational readiness

- .1 structural fire protection including fire resisting divisions and protection of openings and penetrations in these divisions;
- .2 fire detection and fire alarm systems; and
- .3 means of escape systems and appliances.

Fire-fighting systems and appliances shall be kept in good working order and readily available for immediate use. Portable extinguishers which have been discharged shall be immediately recharged or replaced with an equivalent unit.

1.2 Maintenance, testing and inspections

Maintenance, testing and inspections shall be carried out based on the guidelines developed by IMO and in a manner having due regard to ensuring the reliability of fire-fighting systems and appliances.

A maintenance plan shall be kept on board the ship and shall be available for inspection, whenever required by the Administration.

The maintenance plan shall include at least the following fire protection systems and fire-fighting systems and appliances, where installed:

- .1 fire mains, fire pumps and hydrants including hoses and nozzles;
- .2 fixed fire detection and fire alarm systems;
- .3 fixed fire-extinguishing systems and other fire-extinguishing appliances;
- .4 automatic sprinkler, fire detection and fire alarm systems;
- .5 ventilation systems including fire and smoke dampers, fans and their controls;
- .6 emergency shut down of fuel supply;
- .7 fire doors including their controls;
- .8 general emergency alarm systems;
- .9 emergency escape breathing devices;
- .10 portable fire extinguishers including spare charges; and
- .11 firefighter's outfits.

The maintenance programme may be computer-based.

.2 Additional requirements

For new class B, C and D ships, constructed on or after 1 January 2003, carrying more than 36 passengers a maintenance plan for low-location lighting and public address systems shall be developed in addition to the maintenance plan mentioned under paragraph 1.2.

Regulation 15 Instructions, on-board training and drills

NEW CLASS B, C AND D AND EXISTING CLASS B SHIPS:

.1 Instructions, duties and organisation

- .1 Crew members shall receive instructions on fire safety on-board the ship.
- .2 Crew members shall receive instructions on their assigned duties.
- .3 Parties responsible for fire extinguishing shall be organised. These parties shall have the capability to complete their duties at all times while the ship is in service.

.2 On-board training and drills

- .1 Crew members shall be trained to be familiar with the arrangements of the ship as well as the location and operation of any fire-fighting systems and appliances that they may be called upon to use.
- .2 Training in the use of the emergency escape breathing devices shall be considered as a part of on-board training.
- .3 Performance of crew members assigned fire-fighting duties shall be periodically evaluated by conducting on-board training and drills to identify areas in need of improvement, to ensure competency in fire-fighting skills is maintained and to ensure the operational readiness of the fire-fighting organisation.
- .4 On-board training in the use of the ship's fire-extinguishing systems and appliances shall be planned

and conducted in accordance with provisions of regulation III/19.4.1.

- .5 Fire drills shall be conducted and recorded in accordance with the provisions of regulations III/19.3 and III/19.5.

3. Training manuals

A training manual shall be provided in each crew mess room and recreation room or in each crew cabin. The training manual shall be written in the working language of the ship. The training manual, which may comprise several volumes, shall contain the instructions and the information required in paragraph 2.3.4 in easily understood terms and illustrated wherever possible. Any part of such information may be provided in the form of audio-visual aides in lieu of the manual. The training manual shall explain the following in detail:

- .1 general fire safety practice and precautions related to the dangers of smoking, electrical hazards, flammable liquids and similar common shipboard hazards;
- .2 general instructions on fire-fighting activities and fire-fighting procedures including procedures for notification of a fire and use of manually operated call points;
- .3 meanings of ship's alarms;
- .4 operation and use of fire-fighting systems and appliances;
- .5 operation and use of fire doors;
- .6 operation and use of fire and smoke dampers; and
- .7 escape systems and appliances.

4. Fire control plans

Fire control plans have to comply with the requirements of regulation II-2/A-13.

Regulation 16 Operations

- .1 To provide information and instruction for proper ship and cargo handling operations in relation to fire safety, operational booklets shall be provided on board.
- .2 The required fire operational booklet shall contain the necessary information and instructions for the safe operation of the ship and cargo handling operations in relation to fire safety. The booklet shall include information concerning the crew's responsibilities for the general fire safety of the ship while loading and discharging cargo and while underway. The necessary precautions in connection with the handling of general cargoes shall have been explained. For ships carrying dangerous goods and combustible cargoes in bulk the fire safety booklet shall provide reference to the pertinent fire-fighting and emergency cargo handling instructions contained in the Code of Safe Practice for Solid Bulk Cargoes, the International Bulk Chemical Code, the International Gas Carrier Code and the International Dangerous Goods Code, whichever is relevant.