

Chapter 7

FIRE SAFETY

PART A - GENERAL

7.1 General Requirements

7.1.1 The following basic principles underlay the provisions in this chapter and are embodied therein as appropriate, having regard to the category of craft and the potential fire hazard involved:

- .1 maintenance of the main functions and safety systems of the craft, including propulsion and control, fire detection, alarms and extinguishing capability of unaffected spaces, after fire in any one compartment on board;
- .2 division of the passenger accommodation area for category B craft, in such a way that the occupants of any compartment can escape to an alternative safe area or compartment in case of fire;
- .3 subdivision of the craft by fire resisting boundaries;
- .4 restricted use of combustible materials and materials generating smoke and toxic gases in a fire;
- .5 detection, containment and extinction of any fire in the space of origin;
- .6 protection of means of escape and access for fire fighting; and
- .7 immediate availability of fire-extinguishing appliances.

7.1.2 The requirements in this chapter are based in the following conditions:

- .1 Where a fire is detected, the crew immediately puts into action the fire-fighting procedures, informs the base port of the accident and prepares for the escape of passengers to alternative safe area or compartment, or, if necessary, for the evacuation of passengers.
- .2 The use of fuel with a flashpoint below 43°C is not recommended. However, fuel with a lower flashpoint, but not lower than 35°C, may be used in gas turbines only subject to compliance with the provisions specified in 7.5.1 to 7.5.6.
- .3 The repair and maintenance of the craft is carried out in accordance with the requirements given in chapters 18 and 19 of this Code.

- .4 Enclosed spaces such as cinemas, discotheques, and similar spaces are not permitted. Refreshment kiosks which do not contain cooking facilities with exposed heating surfaces may be permitted. Galleys, if fitted, should be in full compliance with chapter II-2 of the Convention.

Refreshment kiosks should be restricted as to installed cooking appliances in the same way as pantries which are qualified (in accordance with SOLAS Chapter II-2) as containing no cooking appliances.

- .5 Dangerous goods may be carried provided the relevant provisions of regulations II-2/53 and 54 of the Convention are complied with.
- .6 Passenger access to vehicle spaces is prohibited during the voyage except when accompanied by a crew member responsible for fire safety. Only authorised crew members should be permitted to enter cargo spaces at sea.

7.2 Definitions

7.2.1 "Fire-resisting divisions" are those divisions formed by bulkheads and decks which comply with the following:

- .1 They should be constructed of non-combustible or fire-restricting materials which by insulation or inherent fire-resisting properties satisfy the requirements of 7.2.1.2 to 7.2.1.6.
- .2 They should be suitably stiffened.
- .3 They should be so constructed as to be capable of preventing the passage of smoke and flame up to the end of the appropriate fire protection time.
- .4 Where required they should maintain load-carrying capabilities up to the end of the appropriate fire protection time.
- .5 They should have thermal properties such that the average temperature on the unexposed side will not rise more than 139°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 during the appropriate fire protection time.

For harmonisation with SOLAS Chapter II-2, 140 deg C average temperature rise may be accepted.

- .6 A test in accordance with the test procedures for a prototype bulkhead and deck should be required to ensure that it meets the above requirements.

7.2.1.6 *The appropriate test procedure and selection criteria are in MSC 45 (65).*

7.2.2 "Fire-restricting materials" are those materials which have properties complying with standards developed by the Organisation with respect to the following;

The appropriate test procedure and selection criteria can be found in ISO 9705 'Full Scale Room Fire Test' as applied by MSC 40 (64). See appendix ... , except in the case of small elements of construction which cannot be realistically tested in the full scale room test: such items, which include case furniture and seat frames, should be tested in accordance with ISO 5660 parts 1 and 2 and classified according to recommended criteria contained in FP 40/3/4. See appendix ... Materials tested to ISO 5660 parts 1 or 2 which do not satisfy all of the recommended criteria may be submitted to the responsible standards branch for consideration. It should be noted that the performance of fire restricting materials is related to their method of installation as well as their inherent material properties.

- .1 they should have low flame spread characteristics;
- .2 limit heat flux, due regard being paid to the risk of ignition of furniture in the compartment;
- .3 limited rate of heat release, due regard being paid to the risk of spread of fire to an adjacent compartment; and
- .4 gas and smoke should not be emitted in quantities that could be dangerous to the occupants of the craft.

7.2.3 "Local fire", the standards for compliance with 7.2.2.2 are to be developed by the Organisation as applicable to surface materials on bulkheads, wall, and ceiling linings including their supporting structure as considered necessary.

7.2.4 "Non-combustible material" is material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750°C, this being determined to the satisfaction of the Administration by an established test procedure. Any other material is a combustible material.

7.2.5 "A standard fire test" is one in which specimens of the relevant bulkheads, decks or other constructions are exposed in a test furnace by specified test method according to the standards developed by the Organisation.

A standard fire test means resolution A.754 (18) as applied by MSC 45 (65).

7.2.6 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).

7.2.7 "Low flame spread" means that the surface thus described will adequately restrict the spread of flame, this being determined by an established test procedure developed by the Organisation.

7.2.8 "Smoke-tight" or "capable of preventing the passage of smoke" means that a division made of non-combustible or fire-restricting materials is capable of preventing the passage of smoke.

7.3 Classification of space use

7.3.1 For the purposes of classification of space use in accordance with fire hazard risks, the following grouping should apply:

- .1 "Areas of major fire hazard" referred to in Tables 7.4-1 and 7.4-2 by A, include the following spaces:
 - Machinery spaces
 - Open vehicle spaces
 - Spaces containing dangerous goods.
 - Special category spaces
 - Storerooms containing flammable liquids
- .2 "Areas of moderate fire hazard" referred to in Tables 7.4-1 and 7.4-2 by B, include the following spaces:
 - Auxiliary machinery spaces, as defined in 1.4.3
 - Bond stores containing packaged beverages with alcohol content not exceeding 24% by volume
 - Crew accommodations
 - Service spaces

Where crew accommodation contains sleeping berths, the whole crew accommodation area, including any galleys or pantries for the use of crew, should comply with SOLAS Chapter II-2 requirements as if the vessel was not a high speed craft. This standard should also be applied to the boundaries between such crew accommodation and other parts of the ship.

Exceptions are areas where the high speed craft requirements are more onerous. Any areas where fire restricting materials are proposed will be specially considered by standards branch, as will cases where the number of sleeping berths is small in proportion to the extent of crew accommodation.

- .3 "Areas of minor fire hazard" referred to in Tables 7.4-1 and 7.4-2 by C, include the following:
- Auxiliary machinery spaces, as defined in 1.4.4
 - Cargo spaces
 - Fuel tank compartments
 - Public spaces
 - Tanks, voids and areas of little or no fire risk.
- .4 "Control stations" referred to in Tables 7.4-1 and 7.4-2 by D, as defined in 1.4.13

7.3.1.4 Control stations containing emergency power sources may also be classified major or moderate fire hazard areas, depending on installed power. Their boundaries should be constructed to satisfy the highest of the applicable fire protection times.

- .5 "Evacuation Stations and external escape routes" referred to in Tables 7.4-1 and 7.4-2 by E, include the following areas:
- External stairs and open decks used for escape routes
 - Muster stations, internal and external
 - Open deck spaces and enclosed promenades forming lifeboat and liferaft embarkation and lowering stations
 - The craft's side to the waterline in the lightest seagoing condition, superstructure and deckhouse sides situated below and adjacent to the liferaft's and evacuation slide's embarkation areas.
- .6 "Open Spaces" referred to in Tables 7.4-1 and 7.4-2 by F, include the following areas:
- Open spaces locations other than evacuation stations and external escape routes and control stations.

Table 7.4-1

Structural Fire Protection Times for Separating Bulkheads and Decks of Passenger Craft

	A	B	C	D	E	F
Areas of major fire hazard A	60 1,2	30 1	60 1,8	60 1	60 1	60 1,7
Areas of moderate fire hazard B		30 2	30 8	60 3,4	30 3	3
Areas of minor fire hazard C			30 8	30 3,4	3	3
Control stations D				3,4	3,4	3
Evacuation stations and escape routes E					3	3
Open spaces F						-

Table 7.4-2

Structural Fire Protection Times for Separating Bulkheads and Decks of Cargo Craft

	A	B	C	D	E	F
Areas of major fire hazard A	60 1,2	30 1	60 1,8	60 1	60 1	60 1,7
Areas of moderate fire hazard B		2,6	6	60 3,4	6	3
Areas of minor fire hazard C			30 8	30 3,4	3	3
Control stations D				3,4	3,4	3
Evacuation stations and escape routes E					3	3
Open spaces F						-

NOTES:

The figures on either side of the diagonal line represent the required structural fire protection time for the protection system on the relevant side of the division.

- 1 The upper side of the decks of Special Category Spaces need not be insulated.
- 2 Where adjacent spaces are in the same alphabetical category and a note 2 appears, a bulkhead or deck between such spaces need not be fitted if deemed unnecessary by the Administration. For example, a bulkhead need not be required between two store-rooms. A bulkhead, is however, required between a machinery space and a special category space even though both spaces are in the same category.
- 3 No structural fire protection requirements, however smoke-tight non-combustible or fire restricting material is required.
- 4 Control stations which are also auxiliary machinery spaces should be provided with 30 min structural fire protection.
- 5 There are no special requirements for material or integrity of boundaries where only a dash appears in the tables.
- 6 The fire protection time is 0 minute and the time for prevention of passage of smoke and flame is 30 min as determined by the first 30 min of the standard fire test.

It should be interpreted as meaning that the division should satisfy the requirements of a fire resisting division given in 7.2.1, except that 7.2.1.5 does not apply.

- 7 When steel construction is used, fire resisting divisions need not comply with 7.2.1.5.

Also, in the case of aluminium construction the 200 ° C core temperature rise limit can be substituted for the temperature rise specified in 7.2.1.5.

- 8 When steel construction is used, fire resisting divisions adjacent to void spaces need not comply with 7.2.1.5.

Also, in the case of aluminium construction the 200 ° C core temperature rise limit can be substituted for the temperature rise specified in 7.2.1.5.

7.4 Structural Fire Protection

7.4.1 Main Structure

7.4.1.1 The requirements below apply to all craft irrespective of construction material. The structural fire protection times for separating bulkheads and decks should be in accordance with Tables 7.4-1 and 7.4.-2, and the structural fire protection times are all based on providing protection for a period of 60 minutes as referred to in 4.8.1. If any other lesser structural fire protection time is determined for category A craft and cargo craft by 4.8.1, then the times given below in 7.4.2.2 and 7.4.2.3 may be amended pro-rata. In no case should the structural fire protection time be less than 30 min.

7.4.1.2 In using Tables 7.4-1 and 7.4-2, it should be noted that the title of each category is intended to be typical rather than restricted. For determining the appropriate fire integrity standards to be applied to boundaries between spaces, where there is doubt as to their classification for the purpose of this section, they should be treated as spaces within the relevant category having the most stringent boundary requirement.

7.4.1.3 The hull, superstructure, structural bulkheads, decks, deckhouses and pillars should be constructed of approved non-combustible materials having adequate structural properties. The use of other fire-restricting materials may be permitted provided the requirements of this chapter are complied with (including a test procedure, developed by the Organisation, for structural strength of composites at elevated temperatures).

Fire restricting materials which form such structural components must satisfy MSC 40 (64), and MSC 45 (65) for the appropriate fire protection time.

7.4.2 Fire-resisting divisions

7.4.2.1 Areas of major and moderate fire hazard should be enclosed by fire-resisting divisions complying with the requirements of 7.2.1 except where the omission of any such division would not affect the safety of the craft. These requirements need not apply to those parts of the structure in contact with water at the lightweight condition, but due regard should be given to the effect of temperature of hull in contact with water and heat transfer from any uninsulated structure in contact with water to insulated structure above the water.

In general, divisions separating spaces used for unrelated purposes should not be omitted (eg. a bond store within a vehicle deck). However the structural fire protection times of tables 7.4-1 and 7.4-2 do not imply a requirement to enclose areas of major fire hazard, such as vehicle decks, where adjacent to the external boundaries of the craft, and clear of evacuation stations and external escape routes, provided it is shown that fire safety is not impaired and the general requirement stated in paragraph 1.2.8 is satisfied. Similarly there is no implied requirement to separate spaces used for similar purposes,

such as machinery spaces, provided the general requirement of paragraph 1.4.11 is satisfied. For structure treated as in contact with water, lightweight condition in the displacement mode may be assumed, except in the case of amphibian craft which will not operate entirely over water. For non metallic structures, heat transfer capability must be demonstrated as sufficient to protect against the effects of fire.

7.4.2.2 Fire-resisting bulkheads and decks should be constructed to resist exposure to the standard fire test for a period of 30 minutes for areas of moderate fire hazard and 60 minutes for areas of major fire hazards except as provided in 7.4.1.1.

7.4.2.3 Main loading carrying structures within major and moderate fire hazard areas should be arranged to distribute load such that there will be no collapse of the construction of the hull and superstructure when it is exposed to fire for the appropriate fire protection time. The load carrying structure should also comply with the requirements of 7.4.2.4 and 7.4.2.5.

Notwithstanding that structures within areas of minor fire hazard are not included, for compatibility with the structural fire protection times of tables 7.4-1 and 7.4-2 such structure supporting control stations on cargo or passenger craft should be capable of supporting its loading after exposure to a standard fire test of 30 minutes duration.

7.4.2.4 If the structures specified in 7.4.2.3 are made of aluminium alloy their installation should be such that the temperature of the core does not rise more than 200°C above the ambient temperature in accordance with the time in 7.4.1.1 and 7.4.2.2.

7.4.2.5 If the structures specified in 7.4.2.3 are made of combustible material, their installation should be such that their temperatures will not rise to a level where deterioration of the construction will occur during the exposure to the composite standard fire test developed by the Organisation to such an extent that the load-carrying capability, in accordance with the times in 7.4.1.1 and 7.4.2.3, will be impaired.

7.4.2.5 Structures which satisfy MSC 45 (65) may be accepted as satisfying this requirement.

7.4.2.6 The construction of all doors, and door frames in fire-resisting divisions, with the means of securing them when closed, should provide resistance to fire as well as to the passage of smoke and flame equivalent to that of the bulkheads in which they are situated. Watertight doors of steel need not be insulated. Also, where a fire-resisting division is penetrated by pipes, ducts, controls, electrical cables or for other purposes, arrangements and necessary testing should be made to ensure that the fire-resisting integrity of the division is not impaired.

7.4.3 Restricted use of combustible materials

7.4.3.1 All separating divisions, ceilings or linings if not a fire resisting division, should be of non-combustible or fire restricting materials.

7.4.3.2 Where insulation is installed in areas in which it could come into contact with any flammable fluids or their vapours, its surface should be impermeable to such flammable fluids or vapours. The exposed surfaces of vapour barriers and adhesives used in conjunction with insulation materials should have low flame spread characteristics.

7.4.3.3 Furniture and furnishings in public spaces and crew accommodation should comply with the following standards;

- .1 all case furniture is constructed entirely of approved non-combustible or fire restricting materials, except that a combustible veneer with a calorific value not exceeding 45 MJ/m² may be used on the exposed surface of such articles;
- .2 all other furniture such as chairs, sofas, tables, is constructed with frames of non-combustible or fire restricting materials;
- .3 all draperies, curtains and other suspended textile materials have qualities of resistance to the propagation of flame in accordance with standards developed by the Organisation;

Apply IMO resolution A.471 (12) as amended by A.563 (14).

- .4 all upholstered furniture has qualities of resistance to the ignition and propagation of flame in accordance with standards developed by the Organisation;

Apply IMO resolution A.652 (16).

- .5 all bedding components comply with the standards developed by the Organisation; and

Apply IMO resolution A.688 (17).

- .6 all deck finish materials comply with the standards developed by the Organisation.

Primary deck coverings, where fitted in addition to surface deck finish materials, should satisfy resolution A 687 (17) as indicated in the footnote

7.4.3.4 The following surfaces should, as a minimum standard be constructed of materials having low flame-spread characteristics:

Low flame spread should be determined in accordance with IMO resolution A.653 (16). Exposed surfaces in corridors and stairway enclosures include deck finish materials. Surfaces of fire restricting materials, which have been satisfactorily tested as such with their surface decorative finish incorporated, need not be further tested to A 653 (16).

- .1 exposed surfaces in corridors and stairway enclosures, and of bulkheads, wall and ceiling linings in all accommodation and service spaces and control stations;
- .2 concealed or inaccessible spaces in accommodation, service spaces and control stations.

7.4.3.5 Any thermal and acoustic insulation material, if not in compliance with 7.2.1 or 7.2.2, should be of non-combustible material.

7.4.3.6 Materials used in the craft, when exposed to fire, should not emit smoke or toxic gases in quantities that could be dangerous to humans as determined in tests of a standard developed by the Organisation.

This paragraph applies to materials including the surface finishes specified in 7.4.3.4.1 and its interpretation. They should satisfy MSC 41 (64). Surfaces of fire restricting materials, which have been satisfactorily tested as such with their surface decorative finish incorporated, need not be further tested for smoke and toxic products of combustion.

7.4.3.7 Void compartments, where low density combustible materials are used to provide buoyancy, should be protected from adjacent fire hazard areas by fire-resisting divisions, in accordance with Tables 7.4-1 and 7.4-2. Also, the space and closures to it should be gastight but it should be ventilated to atmosphere.

7.4.3.8 In compartments where smoking is allowed, suitable non-combustible ash containers should be provided. In compartments where smoking is not allowed, adequate notices should be displayed.

7.4.3.9 The exhaust gas pipe should be arranged so that the risk of fire is kept to a minimum. To this effect, the exhaust system should be insulated and all the compartments and structures which are contiguous with the exhaust system, or those which may be affected by increased temperatures caused by waste gases in normal operation or in an emergency, should be constructed of non-combustible material or be shielded and insulated with non-combustible material to protect from high temperatures.

7.4.3.10 The design and arrangement of the exhaust manifolds or pipes should be such as to ensure the safe discharge of exhaust gases.

7.4.4 Arrangement

7.4.4.1 Internal stairways which serve more than two decks of accommodation should be enclosed at all levels with smoke-tight divisions of non-combustible or fire restricting materials, and where only two decks are served such enclosures should be provided on at least one level. Stairways may be fitted in the open in a public space, provided they lie wholly within such public space.

Notwithstanding this paragraph, where stairways abut areas of major or moderate fire hazard the enclosure should satisfy the structural fire protection times of tables 7.4-1 or 7.4-2.

7.4.4.2 Lift trunks should be so fitted as to prevent the passage of smoke and flame from one deck to another and should be provided with means of closing so as to permit the control of draught and smoke.

7.4.4.3 In accommodation and service spaces, control stations, corridors and stairways air spaces enclosed behind ceilings, panelling or linings should be suitably divided by close fitting draught stops not more than 14 m apart.

7.4.4.3 Draught stops should be of non combustibile or fire restricting material. Such materials which are heat sensitive should not be used except that draft stops need not withstand higher temperatures than the structure to which they are attached.

7.5 Fuel and other flammable fluid tanks and systems

7.5.1 Tanks containing fuel and other flammable fluids should be separated from passenger, crew, and baggage compartments by vapour-proof enclosures or cofferdams which are suitably ventilated and drained.

7.5.2 Fuel oil tanks should not be located in or contiguous to major fire hazard areas. However, flammable fluids of a flashpoint not less than 60°C may be located within such areas provided the tanks are made of steel or other equivalent material.

7.5.3 Every oil pipe, if damaged, would allow oil to escape from a storage, settling or daily service tank should be fitted with a cock or valve directly on the tank capable of being closed from a position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated.

7.5.4 Pipes, valves and couplings conveying flammable fluids should be of steel or such alternative material satisfactory to a standard, in respect of strength and fire integrity having regard to the service pressure and the spaces in which they are installed. Wherever practicable, the use of flexible pipes should be avoided.

7.5.5 Pipes, valves and couplings conveying flammable fluids should be arranged as far from hot surfaces or air intakes of engine installations, electrical appliances and other potential sources of ignition as is practicable and be

located or shielded so that the likelihood of fluid leakage coming into contact with such sources of ignition is kept to a minimum.

7.5.6 Fuel with a flash point below 35° should not be used. In every craft in which fuel with a flashpoint below 43°C is used, the arrangements for the storage, distribution and utilisation of the fuel should be such that, having regard to the hazard of fire and explosion which the use of such fuel may entail, the safety of the craft and of persons on board is preserved. The arrangements should comply, in addition to the requirements of 7.5.1 to 7.5.5, with the following provisions:

- .1 tanks for the storage of such fuel should be located outside any machinery space and at a distance of not less than 760 m inboard from the shell side and bottom plating, and from decks and bulkheads;
- .2 arrangements should be made to prevent overpressure in any fuel tanks or in any part of the oil fuel system, including the filling pipes. Any relief valves and air or overflow pipes should discharge to a position which, in the opinion of the Administration, is safe;
- .3 the spaces in which fuel tanks are located should be mechanically ventilated using exhaust fans providing not less than six air changes per hour. The fans should be such as to avoid the possibility of ignition of flammable gas air mixtures. Suitable wire mesh guards should be fitted over inlet and outlet ventilation openings. The outlets for such exhausts should be discharged to a position which in the opinion of the Administration is safe. 'No Smoking' signs should be posted at the entrance to such spaces;
- .4 earthed electrical distribution systems should not be used, with the exception of earthed intrinsically safe circuits;
- .5 suitable certified safe type electrical equipment should be used in all spaces where fuel leakage could occur including ventilation system. Only electrical equipment and fittings essential for operational purposes should be fitted in such spaces;
- .6 a fixed vapour detection system should be installed in each space through which fuel lines pass, with alarms provided at the continuously manned control station;
- .7 every fuel tanks should, where necessary, be provided with "savealls" or gutters which would catch any fuel which may leak from such tank;
- .8 safe and efficient means of ascertaining the amount of fuel contained in any tank should be provided. Sounding pipes should not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise. In particular, they should not terminate in passenger or crew spaces. The use of gauge glasses is prohibited. Other means of ascertaining the amount of fuel contained in any tank may be

permitted if such means do not require penetration below the top of the tank, and providing their failure or overfilling of the tank will not permit the release of fuel:

- .9 during bunkering operations no passenger should be on board the craft or in the vicinity of the bunkering station, and adequate 'No Smoking' and 'No Naked Lights' signs should be posted. Vessel to shore fuel connections should be of closed type and suitably grounded during bunkering operations;
- .10 the provision of fire detection and extinguishing systems in spaces where non-integral fuel tanks are located should be in accordance with paragraphs 7.7.1 to 7.7.4; and
- .11 refuelling of the craft should be done at the approved refuelling facilities, detailed in the route operational manual, at which the following fire appliances are provided:
 - .11.1 a suitable foam applicator system consisting of monitors and foam making branch pipes capable of delivering foam solution at a rate of not less than 500 litres per minute for not less than 10 minutes;
 - .11.2 dry powder extinguishers of total capacity not less than 50 kilograms; and
 - .11.3 carbon dioxide extinguishers of total capacity not less than 16 kilograms.

7.6 Ventilation

7.6.1 The main inlets and outlets of all ventilation systems should be capable of being closed from outside the spaces being ventilated. In addition such openings to areas of major fire hazard should be capable of being closed from a continuously manned control station.

7.6.2 All ventilation fans should be capable of being stopped from outside the spaces which they serve, and from outside the spaces in which they are installed. Ventilation fans serving major fire hazard areas should be capable of being operated from a continuously manned control station. The means provided for stopping the power ventilation to the machinery space should be separated from the means provided for stopping ventilation of other spaces.

7.6.3 Major fire hazard areas and main passenger spaces serving as muster stations should have separate ventilation systems and ventilation ducts. Ventilation ducts for major fire hazard areas should not pass through other spaces, and ducts for ventilation of other spaces should not pass through major fire hazard areas.

Separate ventilation systems means systems which have no connection to any other system. Where it is not possible to route ventilation ducts serving major fire hazard areas clear of other spaces, ducts of appropriate integrity and insulation value may be fitted within those other spaces.

7.6.4 Where, of necessity, a ventilation duct passes through a fire-resisting or smoke-tight division, a fail safe automatic closing fire damper should be fitted adjacent to the division. The duct between the division and the damper should be of steel or other equivalent material and insulated to the same standard as required for the fire resisting division.

Where a ventilation duct is permitted to pass through a fire resisting division, other than a smoke tight division fitted to satisfy paragraph 7.11.1, dampers may be omitted where the compensating provisions of SOLAS Chapter II-2 regulation 16.2.2 are adopted.

7.6.5 Where ventilation systems penetrate decks, the arrangements should be such that the effectiveness of the deck in resisting fire is not thereby impaired and precautions should be taken to reduce the likelihood of smoke and hot gases passing from one between deck space to another through the system.

7.6.6 All dampers fitted on fire resisting or smoke-tight divisions should also be capable of being manually closed from each accessible side of the division in which they are fitted, and remotely closed from the continuously manned control station.

7.7 Fire detection and extinguishing systems

7.7.1 Areas of major and moderate fire hazard and other enclosed spaces in the accommodation not regularly occupied, such as toilets, stairway enclosures and corridors should be provided with an approved automatic smoke detection system and manually operated call points to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations. Main propulsion machinery room(s) should in addition have detectors sensing other than smoke and be supervised by TV cameras monitored from the operating compartment. Manually operated call points should be installed throughout the accommodation spaces, service spaces and where necessary control stations. One manually operated call point should be located at each exit from these spaces and from areas of major fire hazard.

7.7.2 The fixed fire detection and fire alarm systems should comply with the following requirements.

7.7.2.1 General requirements

- .1 Any required fixed fire detection and fire alarm system with manually operated call points should be capable of immediate operation at all times.

- .2 Power supplies and electric circuits necessary for the operation of the system should be monitored for loss of power or fault conditions as appropriate. Occurrence of a fault condition should initiate a visual and audible fault signal at the control panel which should be distinct from a fire signal.
- .3 There should 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 should be an emergency source. The supply should be provided by separate feeders reserved solely for that purpose. Such feeders should run to an automatic change-over switch situated in or adjacent to the control panel for the fire detection system.
- .4 Detectors and manually operated call points should be grouped into sections. The activation of any detector or manually operated call point should initiate a visual and audible fire signal at the control panel and indicating units. If the signals have not received attention within two minutes an audible alarm should 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 should be located in the operating compartment or in the main fire control station.
- .6 Indicating units should, as a minimum, denote the section in which a detector or manually operated call point has operated. At least one unit should 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 craft is out of service. One indicating unit should be located in the operating compartment if the control panel is located in the space other than the operating compartment.
- .7 Clear information should 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 spaces, service spaces and control stations should 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 should be limited as determined by the Administration. In no case should more than fifty 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 In passenger craft, if there is no fire detection system capable of remotely and individually identifying each detector, a section of detectors should not serve spaces on both sides of the craft nor on more than one deck and neither should it be situated in more than one zone according to 7.11.1 except that the Administration, if it is satisfied that the protection of the craft against fire will not thereby be reduced, may permit such a section of detectors to serve both side of the craft and more than one deck. In passenger craft fitted with individually identifiable fire detectors, a section may serve spaces on both sides of the craft and on several decks.
- .10 A section of fire detectors which covers a control station, a service space or an accommodation space, should not include a machinery space of major fire hazard.
- .11 Detectors should 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 provided that they are no less sensitive than such detectors. Flame detectors should only be used in addition to smoke or heat detectors.
- .12 Suitable instructions and component spares for testing and maintenance should be provided.
- .13 The function of the detection system should be periodically tested 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 should 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 should 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 should be so arranged that:
 - .1 a loop cannot be damaged at more than one point by a fire;
 - .2 means are provided to ensure that any fault (e.g. power break; short circuit; earth) occurring in the loop should not render the whole loop ineffective;
 - .3 all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (electrical, electronic, informatic); and

- .4 the first initiated fire alarm should not prevent any other detector to initiate further fire alarms.

7.7.2.2 Insulation requirements

- .1 Manually operated call points should be installed throughout the accommodation spaces, service spaces and control stations. One manually operated call point should be located at each exit. Manually operated call points should be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 m from a manually operated call point.
- .2 Smoke detectors should be installed in all stairways, corridors and escape routes within accommodation spaces. Consideration should be given to the installation of special purpose smoke detectors within ventilation ducting.

As smoke detectors within ventilation trunking are prone to be unreliability, such provision should be regarded as a recommendation only.

- .3 Where a fixed fire detection and fire alarm system is required for the protection of spaces other than those specified in .2, at least one detector complying with 7.7.2.1.11 should be installed in each such space.
- .4 Detectors should be located for optimum performance. Positions mean beams and ventilation ducts or other positions where patterns of air flow could adversely affect performance and positions where impact or physical damage is likely should be avoided. In general, detectors which are located on the overhead should be a minimum distance of 0.5 m away from bulkheads.
- .5 The maximum spacing of detectors should 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	37m ²	9m ²	4.5m ²
Smoke	74m ²	11m ²	5.5m ²

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

- .6 Electrical wiring which forms parts of the system should be so arranged as to avoid machinery spaces of major fire

hazard, and other enclosed spaces of major fire hazard except where it is necessary to provide for fire detection or fire alarm in such spaces or to connect to the appropriate power supply.

7.7.2.3 Design requirements

- .1 The system and equipment should 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 required by paragraph 7.7.2.2. should be certified to operate before the smoke density exceeds 12.5 per cent obscuration per metre, but not until the smoke density exceeds 2 per cent obscuration per metre. Smoke detectors to be installed in other spaces should operate within sensitivity limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or over sensitivity.
- .3 Heat detectors should 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 should operate within temperature limits having regard to the avoidance to detector insensitivity or over sensitivity.
- .4 At the discretion of the Administration, 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.
- .5 Flame detectors corresponding to 7.7.2.1.11 should have a sensitivity sufficient to determine flame against an illuminated space background and a false signal identification system.

7.7.3 A fixed fire detection and fire alarm system for periodically unattended machinery spaces should comply with the following requirements:

- .1 The fire detection system should be so designed and the detectors so positioned as to detect rapidly the onset of fire in any part of those spaces and under any normal conditions of operation of the machinery and variations of ventilation as required by the possible range of ambient temperatures. Except in spaces of restricted height and where their use is specially appropriate, detection systems using only thermal detectors should not be permitted. The detection system should initiate audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, in sufficient places to ensure that the alarms are heard and observed on the navigating bridge and by a responsible engineer officer. When the operating compartment is unmanned the alarm should sound in a place where a responsible member of the crew is on duty.

- .2 After installation the system should be tested under varying conditions of engine operation and ventilation.

7.7.4 Areas of major fire hazard should be protected by an approved fixed extinguishing system operable from the control position which is adequate for the fire hazard that may exist. The system should be capable of local manual control and remote control from the continuously manned control stations.

7.7.5 In all craft where gas is used as the extinguishing medium, the quantity of gas should be sufficient to provide two independent discharges. The second discharge into the space should only be activated (released) manually from a position outside the space being protected. Where the space has a second fixed means of extinguishing installed, then the second discharge should not be required.

7.7.6.1 The fixed fire-extinguishing systems should comply with the following requirements:

- .1 The use of a fire-extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use will adversely affect the earth's ozone layer and/or gives off toxic gases in such quantities as to endanger persons should not be permitted.
- .2 The necessary pipes for conveying fire-extinguishing medium into protected spaces should be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Non-return valves should be installed in discharge lines between cylinders and manifolds. Suitable provision should be made to prevent inadvertent admission of the medium to any space.
- .3 The piping for the distribution of fire-extinguishing medium should be arranged and discharge nozzles so positioned that a uniform distribution of medium is obtained.
- .4 Means should be provided to close all openings which may admit air to or allow gas to escape from a protected space.
- .5 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, the Administration should require the provision of an additional quantity of fire-extinguishing medium.
- .6 Means should 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 should operate for a suitable period before the medium is released.

The audible alarm should be supplemented by a visual alarm in manned high ambient noise spaces.

- .7 The means of control of any fixed gas fire-extinguishing system should be readily accessible and simple to operate and should 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 should be clear instructions relating to the operation of the system having regard to the safety of personnel.
- .8 Automatic release of fire-extinguishing medium should not be permitted.
- .9 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.
- .10 Pressure containers required for the storage of fire-extinguishing medium should be located outside protected spaces in accordance with 7.7.6.1.13.
- .11 Means should be provided for the crew to safely check the quantity of medium in the containers.
- .12 Containers for the storage of fire-extinguishing medium and associated pressure components should be designed to pressure codes of practice to the satisfaction of the Administration having regard to their locations and maximum ambient temperatures expected in service.
- .13 When the fire-extinguishing medium is stored outside a protected space, it should be stored in a room which should be situated in a safe and readily accessible position and should be effectively ventilated. Any entrance to such a storage room should preferably be from the open deck and in any case should be independent of the protected space. Access doors should be 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 should be gas tight. Such storage rooms should be treated as control rooms.
- .14 Spare parts for the system should be stored on board or at a base port.

7.7.6.2 Carbon dioxide systems

- .1 For cargo spaces the quantity of carbon dioxide available should, unless otherwise provided, be sufficient to give a minimum volume of free gas equal to 30 per cent of the gross volume of the largest cargo space so protected in the craft.
- .2 For machinery spaces the quantity of carbon dioxide carried should be sufficient to give a minimum volume of free gas equal to the larger of the following volumes, either:
 - .2.1 40 per cent 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 per cent or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or
 - .2.2 35 per cent of the gross volume of the largest machinery space protected, including the casing;

provided that the above-mentioned percentages may be reduced to 35 per cent and 30 per cent respectively for cargo craft of less than 2,000 tons gross tonnage; provided also that if two or more machinery spaces are not entirely separate they should be considered as forming one space.

- .3 For the purpose of this paragraph the volume of free carbon dioxide should be calculated at 0.56 m³/kg.
- .4 For machinery spaces the fixed piping system should be such that 85 per cent of the gas can be discharged into the space within 2 minutes.
- .5 Two separate controls should be provided for releasing carbon dioxide into a protected space and to ensure the activation of the alarm. One control should be used to discharge the gas from its storage containers. A second control should be used for opening the valve of the piping which conveys the gas into the protected spaces.
- .6 The two controls should 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 should be in a break-glass type enclosure conspicuously located adjacent to the box.

7.7.7 Control stations, accommodation spaces, service spaces should be provided with portable fire extinguisher of appropriate types. At least five portable extinguishers should be provided, and so positioned, as to be readily available for immediate use. In addition at least one extinguisher suitable for

machinery space fires should be positioned outside each machinery space entrance.

7.7.8 Fire pumps, and appropriate associated equipment, or alternative effective fire-extinguishing systems should be fitted as follows:

- .1 At least two independently driven pumps should be arranged. Each pump should have at least two-thirds the capacity of a bilge pump as determined by 10.3.5 and 10.3.6 but not less than 25 m³/h. Each fire pump should be able to deliver sufficient quantity and pressure of water to simultaneously operate the hydrants as required by .4.
- .2 The arrangement of the pumps should be such that in the event of a fire in any one compartment all the fire pumps will not be put out of action.
- .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 should be fitted in an easily accessible and tenable position outside the machinery spaces. The fire main should be so arranged that when the isolating valves are shut all the hydrants on the craft, except those in the machinery space referred to above, can be supplied with water by a fire pump not located in this machinery space through pipes which do not enter this space.
- .4 Hydrants should be so arranged so that any location on the craft can be reached by the water jets from two fire hoses from two different hydrants, one of the jets being from a single length of hose. Special category spaces hydrants should be located so that any location within the space can be reached by two water jets from two different hydrants, each jet being supplied from a single length of hose.
- .5 Each fire hose should be of non-perishable material and have a maximum length approved by the Administration. Fire hoses, together with any necessary fittings and tools, should be kept ready for use in conspicuous positions near the hydrants. All fire hoses in interior locations should be connected to the hydrants at all times. One fire hose should be provided for each hydrant as required by 7.7.8.4.
- .6 Each fire hose should be provided with a nozzle of an approved dual purpose type (i.e. spray/jet type) incorporating a shut off.

7.8 Protection of special category spaces

7.8.1 Structural protection

These paragraphs should apply also to open vehicle spaces and the boundaries of open vehicle spaces which are adjacent to other enclosed spaces: see 7.3.1.1 which classifies such spaces as of major hazard.

- .1 Boundaries of special category spaces should be insulated in accordance with Tables 7.4-1 and 7.4-2. The standing deck of a special category space need only be insulated on the underside if required.

Proposals to omit insulation from the underside of decks within special category or open vehicle spaces, or from the outer boundaries of such spaces should be submitted to standards branch for consideration.

- .2 Indicators should be provided on the navigating bridge which should indicate when any door leading to or from the special category space is closed.

These paragraphs should apply also to open vehicle spaces and the boundaries of open vehicle spaces which are adjacent to other enclosed spaces: see 7.3.1.1 which classifies such spaces as of major hazard.

7.8.2 Fixed fire-extinguishing system

Each special category space should be fitted with an approved fixed pressure water-spraying system for manual operation which should protect all parts of any deck and vehicle platform in such space, provided that the Administration may permit the use of any other fixed fire-extinguishing system that has been shown by full-scale test in conditions simulating a flowing petrol fire in a special category space to be not less effective in controlling fires likely to occur in such a space.

7.8.3 Patrols and detection

7.8.3.1 A continuous fire patrol should be maintained in special category spaces unless a fixed fire detection and alarm system, complying with the requirements of 7.7.2, and a television surveillance system are provided. The fixed fire detection system should be capable of rapidly detecting the onset of fire. The spacing and location of detectors should be tested taking into account the effects of ventilation and other relevant factors.

7.8.3.2 Manually operated call points should be provided as necessary throughout the special category spaces and one should be placed close to each exit from such spaces.

7.8.4 Fire-extinguishing equipment

7.8.4.1 There should be provided in each special category space:

- .1 at least three water fog applicators;
- .2 one portable foam applicator unit 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 20

litres of foam-making liquid and one spare tank. The nozzle should be capable of producing effective foam suitable for extinguishing an oil fire of at least 1.5 m³/minute. At least two portable foam applicator units should be available in the craft for use in such space; and

- .3 portable fire extinguishers should be located so that no point in the space is more than approximately 15 m walking distance from an extinguisher, provided that at least one portable extinguisher is located at each access to such space.

7.8.5 Ventilation system

7.8.5.1 There should be provided an effective power ventilation system for the special category spaces sufficient to give at least 10 air changes per hour while navigating and 20 air changes per hour at the quayside during vehicle loading and unloading operations. The system for such spaces should be entirely separated from other ventilation systems and should be operating at all times when vehicles are in such spaces. Ventilation ducts serving special category spaces capable of being effectively sealed should be separated for each such space. The system should be capable of being controlled from a position outside such spaces.

7.8.5.2 The ventilation should be such as to prevent air stratification and the formation of air pockets.

7.8.5.3 Means should be provided to indicate on the operating compartment any loss or reduction of the required ventilating capacity.

7.8.5.4 Arrangements should be provided to permit a rapid shutdown and effective closure of the ventilation system in case of fire, taking into account the weather and sea conditions.

7.8.5.5 Ventilation ducts, including dampers should be made of steel or other equivalent material.

This paragraph need not be applied to trunking at the terminal ends of a ventilation system under the conditions specified in SOLAS Chapter II-2 regulation 16.1, or to trunking of a system serving only a single space, within that space.

7.8.6 Scuppers, bilge pumping and drainage

7.8.6.1 In view of the serious loss of stability which could arise due to large quantities of water accumulating on the deck or decks consequent on the operation of the fixed pressure water-spraying system, scuppers should be fitted so as to ensure that such water is rapidly discharged directly overboard. Alternatively, pumping and drainage facility are to be provided additional to the requirements of chapter 10.

If not discharging overboard, scuppers from spaces for the carriage of motor vehicles with fuel in their tanks for their own propulsion should not be led to machinery or other spaces where sources of ignition may be present. Electrical equipment fitted in tanks or other components of such drainage systems, should be suitable for use in explosive petrol/air mixtures.

7.8.7 Precautions against ignition of flammable vapours

7.8.7.1 On any deck or platform, if fitted, on which vehicles are carried and on which explosive vapours might be expected to accumulate, except platforms with openings of sufficient size permitting penetration of petrol gases downwards, equipment which may constitute a source of ignition of flammable vapours and, in particular, electrical equipment and wiring, should be installed at least 450 mm above the deck or platform. Electrical equipment installed at more than 450 mm above the deck or platform should be of a type so enclosed and protected as to prevent the escape of sparks. However, if the installation of electrical equipment and wiring at less than 450 mm above the deck or platform is necessary for the safe operation of the craft, such electrical equipment and wiring may be installed provided that it is of a type approved for use in an explosive petrol and air mixture.

7.8.7.2 Electrical equipment and wiring, if installed in an exhaust ventilation duct, should be of a type approved for use in explosive petrol and air mixtures and the outlet from any exhaust duct should be sited in a safe position, having regard to other possible sources of ignition.

7.9 Miscellaneous

7.9.1 There should be permanently exhibited, for the guidance of the master and officers of the craft, fire Control Plans showing clearly for each deck the following positions: the control stations, the sections of the craft which are enclosed by fire resisting divisions together with particulars of the fire alarms, fire detection systems, the sprinkler installations, the fixed and portable fire-extinguishing appliances, the means of access to the various compartments and decks in the craft, the ventilating system including particulars of the master fan controls, the positions of dampers and identification numbers of the ventilating fans serving each section of the craft, the location of the international shore connection, if fitted, and the position of all means of control referred to in 7.5.3, 7.6.2, 7.7.1 and 7.7.5. The text of such plans should be in the official language of the flag state. However, if the language is neither English nor French, a translation into one of those languages should be indicated.

7.9.2 A duplicate set of fire control plans or a booklet containing such plans should be permanently stored in a prominently marked weathertight enclosure outside the deckhouse for the assistance of shore side fire-fighting personnel.

7.9.3 Openings in fire resisting divisions

7.9.3.1 Except for the hatches between cargo, special category, store, and baggage spaces and between such spaces and the weather decks, all openings should be provided with permanently attached means of closing which should be at least as effective for resisting fires as the divisions in which they are fitted.

7.9.3.2 It should be possible for each door to be opened and closed from each side of the bulkhead by one person only.

7.9.3.3 Fire doors bounding major fire hazard area and stairway enclosures should satisfy the following requirements:

These requirements should also be applied to doors in smoke tight divisions fitted in compliance with 7.11.1.

- .1 The doors should be self-closing and be capable of closing with an angle of inclination of up to 3.5° opposing closure, and should have an approximately uniform rate of closure of no more than 40 s and no less than 10 s with the craft in the upright position.

Hinged doors should close within 10 -40 seconds from release, and sliding doors should close at between 0.1 and 0.2 metres/second.

- .2 Remote-controlled sliding or power-operated doors should be equipped with an alarm that sounds at least 5 s but no more than 10 s before the door begins to move and continue sounding until the door is completely closed. Doors designed to re-open upon contacting an object in their paths should re-open sufficient to allow a clear passage of at least 0.75 m, but no more than 1 m.

Doors designed to reopen on contacting an object in their path should reopen no more than 1 metre from the point of contact.

- .3 All doors should be capable of remote and automatic release from a continuously manned central control station, either simultaneously or in groups, and also individually from a position at both sides of the door. Indication should be provided at the fire control panel in the continuously manned control station whether each of the remote-controlled doors is closed. The release mechanism should be so designed that the door will automatically close in the event of disruption of the control system or central power supply. Release switches should have an on-off function to

prevent automatic resetting of the system. Hold-back hooks not subject to control station release should be prohibited.

- .4 Local power accumulators for power-operated doors should be provided in the immediate vicinity of the doors to enable the doors to be operated at least ten times (fully opened and closed) using the local controls.

Powered doors should be provided with local control and, in order to ensure continued operation after disruption of power supply, energy accumulators are also required. The last such powered operation before depletion of stored energy should be the closing of the door. Disabling the power supply of any one door should not impair the safe functioning of other doors.

- .5 Double-leaf doors equipped with a latch necessary to their fire integrity should have a latch that is automatically activated by the operation of the doors when released by the system.
- .6 Doors giving direct access to special category spaces which are power-operated and automatically closed need not be equipped with alarms and remote-release mechanisms required in .2 and .3.

7.9.3.4 The requirements for integrity of fire resisting divisions of the outer boundaries facing open spaces of a craft should not apply to glass partitions, windows and side scuttles. Similarly, the requirements for integrity of fire resisting divisions facing open spaces should not apply to exterior doors in superstructures and deckhouses.

Open spaces, for the purpose of this requirement do not include evacuation stations and external escape routes: see 7.3.1.6.

7.10 Fireman's outfits

7.10.1 All craft other than Category A passenger craft should carry at least two fireman's outfits complying with the requirements of 7.10.3.

7.10.1.1 In addition, there should be provided in Category B passenger craft for every 80 m, or part thereof, of the aggregate of the length of all passenger spaces and service spaces on the deck which carries such spaces or, if there is more than one such deck, on the deck which has the largest aggregate of such length, two fireman's outfits and two sets of personal equipment, each comprising the items stipulated in 7.10.3.1.1, to 7.10.3.1.3;

7.10.1.2 In Category B passenger craft for each pair of breathing apparatus there should be provided one water fog applicator which should be stored adjacent to such apparatus.

7.10.1.3 The Administration may require additional sets of personal equipment and breathing apparatus, having due regard to the size and type of the craft.

7.10.2 The fireman's outfits or sets of personal equipment should be so stored as to be easily accessible and ready for use and, where more than one fireman's outfit or more than one set of personal equipment is carried, they should be stored in widely separated positions. In passenger craft, at least two fireman's outfits and one set of personal equipment should be available at any one control station.

7.10.3 A fireman's outfit should consist of:

- .1 Personal equipment comprising:
 - .1.1 protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam or gases. The outer surface should be water-resistant;
 - .1.2 boots and gloves of rubbers or other electrically non-conductive material;
 - .1.3 a rigid helmet providing effective protection against impact;
 - .1.4 an electric safety lamp (hand lantern) of an approved type with a minimum burning period of three hours;
 - .1.5 an axe.
- .2 A breathing apparatus of an approved type which may be either:
 - .1 a smoke helmet or smoke mast which should be provided with a suitable air pump and a length of air hose sufficient to reach from the open deck, well clear of hatch or doorway, to any part of the holds or machinery spaces. If, in order to comply with this subparagraph, an air hose exceeding 36 m in length would be necessary, a self-contained breathing apparatus should be substituted or provided in addition as determined by the Administration; or
 - .2 a self-contained compressed air operated breathing apparatus, the volume of air contained in the cylinders of which should be at least 1,200 litres, or other self-contained breathing apparatus which should be capable of functioning for at least 30 minutes. A number of spare charges, suitable for use with the apparatus provided, should be available on board.
- .3 For each breathing apparatus a fire proof lifeline of sufficient length and strength should 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.

PART B REQUIREMENTS FOR PASSENGER CRAFT

7.11 Arrangement

7.11.1 For category B craft the public spaces should be divided into zones according to the following:

- .1 The craft should be divided into at least two zones. The mean length of each zone should not exceed 40 m.
- .2 For the occupants of each zone there should be an alternative safe area to which it is possible to escape in case of fire. The alternative safe area should be separated from other passenger zones by smoke-tight divisions of non-combustible materials or fire restricting materials extending from deck to deck. The alternative safe area can be another passenger zone provided the additional number of passengers may be accommodated in an emergency.

The area can be sized based on one seat per person and/or 0.35 m² per person clear of seats.

- .3 The alternative safe area should, as far as practicable, be located adjacent to the passenger zone it is intended to serve. There should be at least two exits from each passenger zone, located as far away from each other as possible, leading to the alternative safe area. Escape routes should be provided to enable all passengers and crew to be safely evacuated from the alternative safe area.

7.11.2 Category A craft need not be divided into zones.

7.11.3 Control station, life-saving appliance stowage positions, escape routes and places of embarkation into survival craft should not, as far as practicable, be located adjacent to any major or moderate fire hazard areas.

7.12 Ventilation

The ventilation fans of each zone in the accommodation spaces should also be capable of being independently controlled from a continuously manned control station.

In addition to the control requirements of this paragraph, accommodation ventilation systems should not serve spaces in more than one zone.

7.13 Fixed sprinkler system

7.13.1 Public spaces and service spaces, storage rooms other than those containing flammable liquids, and similar spaces should be protected by a fixed sprinkler system meeting a standard developed by the Organisation. Manually

operated sprinkler systems should be divided into sections of appropriate size and the valves for each section, start of sprinkler pump(s) and alarms should be operable from two spaces separated as widely as possible, one of which should be a continuously manned control station. In category B craft, no section of the system should serve more than one of the zones required in 7.11.

Sprinkler systems complying with SOLAS II-2 regulation 12, IMO resolution A.800 (18) or resolution MSC 44 (65) are acceptable.

7.13.2 Plans of the system should be displayed at each operating station. Suitable arrangements should be made for the drainage of water discharged when the system is activated.

PART C REQUIREMENTS FOR CARGO CRAFT

7.14 Control Stations

Control stations, life-saving appliances stowage positions, escape routes and places of embarkation into survival craft should be located adjacent to crew accommodation areas.

7.15 Cargo spaces

Cargo spaces, except open deck areas or refrigerated holds, should be provided with an approved automatic smoke detection system complying with 7.7.2 to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations and should be protected by an approved fixed quick acting fire-extinguishing system complying with 7.7.6.1 operable from the control station.