

Dolski Rejestr Statków

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF HIGH-SPEED CRAFT

PART V FIRE PROTECTION

2014



GDAŃSK

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF HIGH SPEED CRAFT

developed and issued by Polski Rejestr Statków S.A., further referred to as PRS, consist of the following parts:

- Part I – Classification Regulations
- Part II – Hull
- Part III – Hull Equipment
- Part IV – Buoyancy, Stability and Subdivision
- Part V – Fire Protection
- Part VI – Machinery and Systems
- Part VII – Electrical Installations and Control Systems

With respect to materials and welding, the requirements specified in the *Rules for the Classification and Construction of Sea-Going Ships, Part IX –Materials and Welding*, apply.

Part V – Fire Protection – 2014 was approved by the PRS Board on 15 October 2014 and enters into force on 20 October 2014..

From the entry into force, the requirements of Part V apply in full to new craft..

For existing ships, the requirements of *Part V – Fire Protection* are applicable within the scope stated in *Part I – Classification Regulations* and as specified in Part SUPPLEMENT – RETROACTIVE REQUIREMENTS.

The requirements of *Part V – Fire Protection* are extended by the below-listed Publications:

- Publication No. 51/P – Procedural Requirements for Service Suppliers ,
- Publication No. 53/P – Plastic Pipes on Ships,
- Publication No. 89/P – Guidelines on Designing, Performance of Type Tests of Fixed Fire-extinguishing Systems used on Ships,
- Publication No. 29/I – Guidelines for Periodical Inspections of Fire-Extinguishing Systems and Appliances Used on Ships.

IMO resolutions and circulars referred to in *Part V – Fire Protection* – see the list of reference IMO documents at the end of the *Part*.

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1 GENERAL

1.1 Application

1.1.1 The requirements set forth in *Part V – Fire Protection* apply in full scope, in relation to the following high-speed craft:

- .1 cargo craft which do not proceed in the course of their voyage more than 8 h at 90% of maximum speed from a place of refuge when fully laden;
- .2 passenger craft which do not proceed in the course of their voyage more than 4 h at 90% of maximum speed from a place of refuge.

1.1.2 Departures from the requirements of this Part are permitted in relation to cargo craft of gross tonnage less than 500, which are not subject to *HSC Code*.

1.1.3 Unless specified otherwise, requirements of Chapters 1 to 5 are basic ones for all types of craft assigned main symbol of class constructed under PRS survey. The requirements of Chapter 6 complete the requirements for the given craft type assigned additional mark in the symbol of class, referred to in Chapter 3 of *Part I – Classification Regulations*.

1.2 Definitions

The definitions relating to the general terminology of the *Rules for the Classification and Construction of High-Speed Craft* (hereinafter referred to as the *Rules*) are given in *Part I – Classification Regulations*. Wherever, in *Part V*, definitions given in other Parts of the *Rules* are used, reference to these Parts is made.

For the purpose of *Part V*, the following definitions have been adopted:

.1 Flammable liquids – liquids, liquid mixtures and suspended solids (liquid fuels, paints, varnishes, etc.), which give off flammable vapours having a flash-point not exceeding 60 °C, determined in closed cup test.

.2 High-speed craft¹⁾ – a craft capable of maximum speed [m/s] equal to or exceeding:

$$3,7 \times \nabla^{0,1667}$$

where:

∇ = displacement corresponding to the design waterline [m³],

excluding the units the hull of which is fully supported above water surface in a non-displacement mode by the aerodynamical forces due to ground effect.

.3 Category A craft – any high-speed passenger craft,

.1 operating on a route where it has been demonstrated to the satisfaction of the flag and port States that there is a high probability that in the event of an evacuation at any point of the route, all passengers and crew can be rescued safely within the least of:

- the time to prevent persons in survival craft from exposure causing hypothermia in the worst intended conditions;
- the time appropriate with respect to environmental conditions and geographical features of the route, or
- 4 h; and

.2 carrying not more than 450 passengers.

.4 Category B craft – any high-speed passenger craft other than a category A craft, with machinery and safety systems arranged such that, in the event of any essential machinery and safety systems in any one compartment being disabled, the craft retains the capability to navigate safely. The damage scenarios considered in chapter 2 of *HSC Code* shall not be inferred in this respect.

.5 Passenger craft – a craft which carries more than twelve passengers.

.6 Ro-ro craft – a craft fitted with one or more ro-ro spaces.

¹⁾ referred to also as the *craft* or *ship*.

.7 Cargo craft – any high-speed craft other than a passenger craft, and which is capable of maintaining the main functions and safety systems of undamaged spaces after damage in any one compartment on board.

.8 FSS Code – the *International Fire Safety Systems Code*, as amended, as defined in Chapter II-2 of *SOLAS Convention*.

.9 FTP Code – the *International Code for Application of Fire Test Procedures*, as amended, as defined in chapter II-2 of the *SOLAS Convention*

.10 HSC Code – *International Code for High-Speed Craft, 2000*, as amended.

.11 IMDG Code – the *International Maritime Dangerous Goods Code*, as defined in Chapter VII of *SOLAS Convention*.

.12 SOLAS 74 Convention – the *International Convention for the Safety of Life at Sea, 1974*, as amended.

.13 Galleys – those enclosed spaces containing cooking facilities with exposed heating surfaces, or which have any cooking or heating appliances each having a power of more than 5 kW.

.14 Dangerous goods – cargoes which constitute additional fire hazard. Dangerous goods are divided into the below classes:

Class 1 – explosive materials;

Class 2.1 – flammable gases;

Class 2.– non-flammable, non-toxic gases;

Class 2.3 – toxic gases

Class 3 – flammable liquids;

Class 4.1 – flammable solids,

Class 4.2 – substances liable to spontaneous combustion;

Class 4.3 – substances which, in contact with water, emit flammable gases;

Class 5.1 – oxidizing substances;

Class 5.2 – organic peroxides;

Class 6.1 – toxic substances;

Class 6.2 – infectious substances;

Class 7 – radioactive materials;

Class 8 – corrosive substances;

Class 9 – miscellaneous dangerous substances and articles.

.15 Fire-restricting materials – those materials which have properties complying with the *Fire Test Procedures Code*.¹⁾

.16 Non-combustible material – 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 in accordance with the *Fire Test Procedures Code*.

.17 Steel or other equivalent material – any non-combustible material which, by its properties 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 or composite material with appropriate insulation).

.18 Assembly station – an area where passengers can be gathered in the event of an emergency, given instructions and prepared to abandon the craft, if necessary. The passenger spaces may serve as assembly stations if all passengers can be instructed there and prepared to abandon the craft.

.19 Open ro-ro spaces – those ro-ro spaces

.1 to which any passengers carried have access; and

.2 are open:

¹⁾ Refer to *Resolution MSC.40(64) – Standard for qualifying marine materials for high-speed craft as fire-restricting materials*, as well as amendments contained in *Resolution MSC.90(71)*.

- at both ends, or
 - have an opening at one end and are provided with permanent openings distributed in the side walls or a horizontal division bounding the space from below or above, having a total area of at least 10% of the total area of the space sides.
- .20 Weather deck** – a deck which is completely exposed to the weather from above and from at least two sides.
- .21 Operating compartment** – the enclosed area from which the navigation and control of the craft is exercised.
- .22 Cargo spaces** – all spaces other than special category spaces and ro-ro spaces used for cargo and trunks to such spaces. For the purposes of this Part, "cargo spaces" include ro-ro spaces, special category spaces and open deck spaces.
- .23 Special category spaces** – those enclosed ro-ro spaces 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 m.
- .24 Public spaces** – those spaces allocated for the passengers and including bars, refreshment kiosks, smoke rooms, main seating areas, lounges, dining rooms, recreation rooms, lobbies, lavatories and similar spaces, and may include sales shops.
- .25 Ro-ro spaces** – spaces not normally subdivided in any way and normally extending to either a substantial length or the entire length of the craft, 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 or rail tankers), trailers, containers, pallets, demountable tanks or in or on similar stowage units or other receptacles) can be loaded and unloaded, normally in a horizontal direction.
- .26 Service spaces** – those enclosed spaces used for pantries containing food warming equipment but no cooking facilities with exposed heating surfaces, lockers, sales shops, store-rooms and enclosed baggage rooms. Service spaces containing no cooking appliances may contain:
- .1 coffee automats, toasters, dish washers, microwave ovens, water boilers and similar appliances each of them with a maximum power of 5 kW; and
 - .2 electrically heated cooking plates and hot plates for keeping food warm, each of them with a maximum power of 2 kW and a surface temperature not above 150°C.
- .27 Crew accommodation** – those spaces allocated for the use of the crew, including cabins, sick bays, offices, lavatories, lounges and similar spaces.
- .28 Control stations** – those spaces in which the craft's radio or navigating equipment¹⁾, or the emergency source of power²⁾ and their switchboards are located, or where the fire recording or fire control equipment is centralized, or where other functions essential to the safe operation of the craft such as propulsion control, public address, stabilization systems, etc., are located.
- .29 Continuously manned control station** – a control station which is continuously manned by a responsible member of the crew while the craft is in normal service.
- .30 Machinery spaces** – spaces containing internal combustion engines either used for main propulsion or with an aggregate total power output of more than 110 kW, generators, oil fuel units, major electrical machinery and similar spaces and trunks to such spaces.
- .31 Auxiliary machinery spaces** – spaces containing internal combustion engines of a power output up to and including 110 kW, driving generators, sprinkler, drencher or fire pumps, bilge pumps, etc., oil filling stations, switchboards of aggregate capacity exceeding 800 kW, similar spaces and trunks to such spaces.

¹⁾ Navigating equipment includes, in particular, steering control and the compass, radar and direction-finding equipment.

²⁾ Accumulator batteries, regardless of their capacity:

- .1 used for power supply from black-out till start of emergency generator,
- .2 used as reserve source of energy to radiotelegraph installation,
- .3 used for start of emergency generator, and
- .4 in general, considered the emergency power source.

- .32 Auxiliary machinery spaces having little or no fire risk** – spaces such as refrigerating, stabilizing, ventilation and air conditioning machinery, switchboards of aggregate capacity 800 kW or less, similar spaces and trunks to such spaces.
- .33 Smoke-tight division** – means that a division made of non-combustible or fire-restricting materials is capable of preventing the passage of smoke.
- .34 Fire-resisting divisions** – divisions formed by bulkheads and decks which comply with the following:
- .1** are constructed of non-combustible or fire-restricting materials which by insulation or inherent fire-resisting properties satisfy the requirements of subparagraphs .2 to .6;
 - .2** are suitably stiffened;
 - .3** are so constructed as to be capable of preventing the passage of smoke and flame up to the end of the appropriate fire protection time during standard fire test;
 - .4** where required they shall maintain load-carrying capabilities up to the end of the appropriate fire protection time;
 - .5** they have thermal properties such that the average temperature on 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 during the appropriate fire protection time;
 - .6** a prototype of the wall, bulkhead or deck being the fire-resisting division have passed a test in accordance with the *Fire Test Procedures Code*¹⁾.
- .35 A standard fire test** – one in which specimens of the relevant bulkheads, decks or other constructions are exposed in a test furnace by a specified test method in accordance with the *Fire Test Procedures Code*.
- .36 Fire control station** – the enclosed area where means for starting/controlling fire-extinguishing systems are localized.
- .37 Refreshment kiosks** – spaces which are not enclosed, serving refreshments and containing food warming equipment having a total power of 5 kW or less and with an exposed heating surface temperature not above 150°C.
- .38 Flashpoint** – a flashpoint determined by a test using the closed-cup apparatus referenced in the *International Maritime Dangerous Goods (IMDG) Code*.
- .39 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*.
- .40 Oil fuel unit** – any equipment for the preparation and delivery of oil fuel, heated or not, to boilers and engines (including gas turbines) at a pressure of more than 0.18 MPa.

1.3 Scope of Survey

1.3.1 The general survey regulations for classification, construction surveys and surveys of craft within the scope of structural fire protection, fire-extinguishing systems, as well as fire detection and fire alarm systems are given in *Part I – Classification Regulations*.

1.3.2 The following are subject to survey during craft construction or alteration: fire protection structures, fire-extinguishing systems, fire detection and fire alarm systems, other fire protection systems and arrangements, the documentation of which is subject to consideration and approval, as well as appliances and systems which constitute fire risk.

1.3.3 With reference to the craft subject to *HSC Code*, flying the flag of the European Union member state, the below items of equipment/ appliances used in fire protection are covered with certification form conformity with *Council Directive 96/98/EC* of 20 December 1996 on marine equipment, as amended, also referred to as *MED Directive*:

- .1** fire-resisting divisions;
- .2** fire doors;

¹⁾ Refer to *Resolution MSC.45(65) – Test Procedures for Fire-Resisting Divisions of High Speed Craft*.

- .3 fire doors control systems items;
- .4 non-combustible materials;
- .5 materials restricting passage of fire (except furniture)
- .6 materials restricting passage of fire for furniture
- .7 primary deck coverings;
- .8 walls and ceilings surface materials and floor coverings with low flame-spread characteristics: decorative veneers, paint systems, floor coverings, as well as pipe insulation covers, adhesives used in fire-resisting structures and ventilation ducts combustible covers;
- .9 draperies, curtains and other suspended textiles and films;
- .10 upholstered furniture;
- .11 bedding components;
- .12 fire (ventilation) dampers;
- .13 penetrations through fire-resisting divisions of: electric cables, pipelines, ventilation ducts, trunks, etc.
- .14 materials other than steel, used in fuel and oil systems: pipes, joint, valves and flexible pipe assemblies;
- .15 sprinklers of sprinkler systems;
- .16 sprinklers of high-pressure equivalent sprinkler systems;
- .17 nozzles of high-pressure equivalent water-based sprinkler systems for use in ro-ro spaces and special category spaces;
- .18 nozzles of fire-extinguishing system for fat oil cooking appliance (automatic or manual);
- .19 items of equivalent fixed gas fire-extinguishing systems for the protection of machinery spaces and cargo pump rooms (fire-extinguishing agent, main valves and discharge nozzles);
- .20 aerosol fire-extinguishing systems for machinery spaces, equivalent to fixed gas fire-extinguishing systems;
- .21 fire hoses (standard) and fire hoses with reel;
- .22 dual-purpose type nozzles (spray and jet type);
- .23 portable and mobile fire-extinguishers and fire-extinguishing units;
- .24 portable fire-fighting equipment for lifeboats and rescue boats;
- .25 fire-fighter's outfit: protective clothing;
- .26 fire-fighter's outfit: boots;
- .27 fire-fighter's outfit: gloves;
- .28 fire-fighter's outfit: helmet;
- .29 fire-fighter's outfit: life-line;
- .30 self-contained compressed-air-operated breathing apparatus;
- .31 components of fixed fire detection and alarm systems (control and indicating devices, electrical and electronic installations, power supply equipment, fire detectors: smoke detectors, heat and flame detectors, manually operated call points as well as short circuit isolators, input/output devices, cables);
- .32 alarm devices of fire detection and alarm system.

Confirmation of compliance with the *MED Directive* requirements is Certificate of Conformity with *Directive MED*, issued by a notified body (the steering wheel mark on the Certificate).

1.3.4 With reference to the craft not subject to *HSC Code* and the craft operating under the flag of a state which is not a member to European Union, the items of fire-protection equipment/machinery referred to in 1.3.3, shall be of type approved by PRS (shall have PRS issued *Product Type Approval Certificate*).

In lieu of *Type Approval Certificate*, the above-mentioned equipment may have Certificate of Conformity with *MED Directive*.

1.3.5 The following structures, equipment/arrangements/materials used in fire protection, not covered by 1.3.3, shall be of the type approved by PRS:

- .1 carbon dioxide fire-extinguishing systems components: cylinders provided with valves and an activating device, distribution valves (with an activating device), non-return valves, flexible pipe assemblies, time-delay units, discharge nozzles;
- .2 nozzles for water spraying hand operated systems;
- .3 portable foam applicator units;

- .4 fire-extinguishing systems flexible assemblies;
- .5 foam concentrate used in portable foam applicator units;
- .6 sprinkler system;
- .7 equivalent high-pressure sprinkler system (water mist system);
- .8 water-spraying system for ro-ro and special category spaces;
- .9 equivalent high-pressure spraying water-based system for ro-ro and special category spaces;
- .10 equivalent gas fire-extinguishing system for machinery spaces and cargo pump-rooms;
- .11 fire detection and alarm system;
- .12 plastic pipes (piping components) used in fire-extinguishing systems.

1.3.6 PRS may give consent to a single acceptance of a structure, material, product or system, for which type approval is required, to be installed on a given craft, subject to tests and acceptance surveys being carried out in accordance with the previously agreed tests and acceptance programme and the issue of Inspection Certificate/ Certificate.

1.3.7 Fire pumps, water-spraying and sprinkler systems supply pumps, are subject to acceptance and operation tests at the manufacturer's in the presence of PRS' Surveyor.

1.3.8 Containers and pressure vessels of gas fire-extinguishing systems, as well as CO₂ manifold are subject to acceptance and pressure tests at the manufacturer's in the presence of PRS' Surveyor.

1.3.9 During the ship service, fire-extinguishing systems and equipment used in fire protection, as well as appliances and equipment which constitute additional fire hazard are subject to periodical inspections and attestation in accordance with *Publication No. 29/P – Guidelines for Periodical Inspections of Fire-extinguishing Systems and Appliances Used on Ships*.

1.3.10 Inspections, maintenance and repair of fixed fire-extinguishing systems, fire-fighting equipment (fire-extinguishers and portable foam applicator units), breathing apparatus, low-location lighting systems, as well as laboratory tests of foam concentrates shall only be performed by service stations approved by PRS.

1.3.11 Service stations seeking PRS' approval shall fulfil the requirements specified in *Publication No. 51/P – Procedural Requirements for Service Suppliers*.

1.4 Technical Documentation of Fire Protection

1.4.1 Classification Documentation

Prior to the commencement of ship construction, the following technical documentation shall be submitted to the PRS Head Office for consideration and approval:

A. Structural Fire Protection:

- .1 plan of structural fire protection, indicating the names of compartments and their fire hazards, covering
 - the arrangement of fire divisions, taking into account closures of openings in these divisions;
 - structural particulars of the divisions;
 - designation of escape routes;
 - design of typical penetrations of pipings, cables and ventilation ducts through fire divisions;
- .2 fire doors arrangement and control plans;
- .3 plan of windows and sidescuttles;
- .4 plan of craft spaces insulation;
- .5 plan of deck covering;
- .6 plans of craft equipment, covering:
 - linings of walls and ceilings;
 - plan of floor lining;
 - list of upholstered furniture, suspended textile materials and the bedding components (required for passenger craft);

- .7 plan of maintenance and painting;
- .8 plan of ventilation and air-conditioning, including the arrangement of ventilation ducts, air inlets and outlets, as well as fire dampers plan;
- .9 plan of means of escape and escape time calculation;
- .10 evacuation procedure and analysis;
- .11 list of required certificates for materials/components/structures used in fire divisions.

B. Active Fire Protection:

- .1 plan of water fire main system, including calculation of fire pump capacities, hydraulic calculations of the required pressure at fire hydrants, the arrangement of fire pumps, pipelines and fire hydrants;
- .2 plan of sprinkler system, including the calculations of the necessary water supply, the required pressure at sprinklers, diagram of the system operation, including alarm signals, drawing of pressure tank, the arrangement of pumps, system components, pipings, control valves and sprinklers, with division into pipe sections plan, where such system is used;
- .3 plan of gas fire-extinguishing system, including the calculations of the required quantity of extinguishing medium, the diameters of pipes and nozzles, diagram of the system operation, including warning signalization, the arrangement of fire-extinguishing station, starting arrangements, the arrangement of pipes and nozzles, operation manual;
- .4 plan of water-spraying fire-extinguishing system for ro-ro cargo spaces and special category spaces, including the calculations of pumps capacities, hydraulic calculations of the required pressure at spraying nozzles, the arrangement of pumps, pipelines and nozzles, with division into pipe sections plan, where such system is used;
- .5 plan of ventilation system for ro-ro cargo spaces and special category spaces, including arrangement of fans and air inlets and outlets;
- .6 plan of fire detection and alarm system, including electric circuits diagrams, division into sections, the arrangement of control panel, indicating units, detectors and manually operated call points;
- .7 plan of engine room monitoring system, including the arrangement of cameras and monitors;
- .8 the arrangement plan of fire-fighting equipment, i.e. portable and mobile fire-extinguishers, portable foam applicator units, fire-fighter's outfit;
- .9 list of the required certificates for the applied components, appliances, systems and fire-fighting equipment.

Classification documentation shall contain material specifications, lists of appliances, components of systems, as well as the necessary information allowing to assess whether structures/appliances/systems comply with the requirements of this Part of the *Rules*.

With regard to the craft to be assigned additional mark in the symbol of class, additional documentation relating to structural fire protection or active fire protection may be required by PRS.

For the craft undergoing alteration, the above-mentioned documentation is subject to consideration and approval within the scope regarding alteration.

1.4.2 Fire Control Plan

1.4.2.1 The craft subject to *HSC Code*, as well as craft of above 150 gross tonnage shall be provided with *Fire Control Plan*, based on the general arrangement plan, indicating:

- .1 craft sections enclosed with fire divisions;
- .2 control stations;
- .3 access routes to particular craft spaces and decks;
- .4 craft spaces/areas protected by fire detection and fire alarm systems and showing the arrangement of manually operated call points and general alarm call points, fire indicating unit;
- .5 craft spaces/areas protected by fixed fire-extinguishing systems: gas, water spraying and sprinkler and showing the arrangement of system appliances such as: water supply pumps, fire-extinguishing medium storage tanks/cylinders, as well as shut-off section valves, water fire main systems isolating valves, fire hydrants, shore connections, as well as remote control positions for these systems

- .6 the arrangement of fire-fighting equipment: portable and mobile fire-extinguishers, portable foam applicator units, fire hoses with nozzles, water fog applicators, fire-fighter's outfit sets, fire axes, position of connection of international shore connection (if fitted);
- .7 the arrangement of closures of ventilation openings (inlet and outlet) of the spaces, the location of fire dampers in ventilation ducts, positions of remote shutting off ventilating fans, remote closures of ventilation openings of spaces, remote control of fire dampers in ventilation ducts, as well as fans serving each fire zone, together with a list of their identification numbers;
- .8 fuel and lubricating oil tanks, located outside the double bottom, the positions of remote control of the tanks shut-off valves and stopping oil fuel and lubricating oil pumps;
- .9 main and emergency fire pumps, positions of remote control of the main and emergency fire pumps, positions of remote control of fire pumps valves, positions of remote control of main and emergency bilge pumps;
- .10 emergency electrical source of power (generating set or accumulator battery), as well as emergency switchboard;
- .11 position of remote control of watertight doors, fire doors and machinery casing skylights;
- .12 the location of containers, in which *Fire Control Plan*, intended for the shoreside fire-fighting personnel, is stored;
- .13 assembly stations for passengers and crew (for passenger craft);
- .14 list and the arrangement of numbered openings (doors, manholes, ventilation inlets) which shall be closed before the release of fire-extinguishing medium into spaces protected by total flooding system.

Fire Control Plan shall show the craft profile with indicated deck levels, showing the arrangement of fire divisions and means of escape.

In specification table on the *Plan*, the number of the required fire-fighting equipment and other countable equipment used in fire protection shall be given.

1.4.2.2 The graphic symbols used in *Fire Control Plan* shall conform to the symbols given in Res. A.952(23); all the descriptions shall be in the official language of the Flag State. The descriptions in *Fire Control Plans* intended for the craft engaged on international voyages shall also be in English, French or Spanish languages.

1.4.2.3 *Fire Control Plan* shall be exhibited in the craft in the visible places – in lobbies, mess rooms, as well as on the navigation bridge and at control station.

1.4.2.4 Alternatively, the information included in *Fire Control Plan* may be presented in the form of a booklet, which shall be at all times available on board in an easily accessible position. One copy of the booklet shall be kept by each officer.

1.4.2.5 A duplicate of *Fire Control Plan*, intended for use by the shoreside fire-fighting personnel during the fire of the craft in a port, shall be permanently stored in a container located outside the deckhouse. The container shall be weathertight, painted red and marked in accordance with the guidelines, specified in MSC/Circ.451.

The location of each container with *Fire Control Plan* shall be indicated by a plate with the symbol used on *Fire Control Plan*.

1.4.2.6 *Fire Control Plan* shall be subject to updating and any changes to the *Plan* shall be entered, on a routine basis, by the officer responsible for fire protection.

1.4.2.7 *Fire Control Plan* shall be approved by the Flag State Maritime Administration or PRS, acting on behalf of the Flag State Maritime Administration

1.4.2.8 *Fire Control Plan* shall be marked with craft identification number which conforms to the IMO ship identification scheme adopted by IMO, in accordance with *SOLAS Convention*, reg. XI-1/3.

2 CONSTRUCTION AND FIRE PROTECTION OF THE CRAFT SPACES

2.1 Craft Construction

2.1.1 The hull, superstructure, structural bulkheads, decks, deckhouses and pillars shall be constructed of an approved non-combustible material having adequate structural properties. The use of other fire-restricting materials¹⁾, may be permitted provided the requirements of this Chapter are complied with and the materials are in compliance with the *FTP Code*.

2.1.2 Paragraph 2.1.1 does not apply to such structural items as air propellers, air ducts to propellers, transmission shafts, rudders and other control surfaces, struts, spares, flexible skirts, etc., which do not form basic structure of the craft.

2.2 Structural Fire Protection

2.2.1 Main Assumptions Concerning Structure

2.2.1.1 The below requirements apply to all craft irrespective of construction material. The structural fire protection times for separating bulkheads and decks shall be in accordance with tables 2.3-1 and 2.3-2, and the structural fire protection times are all based on providing protection during evacuation for a period of 60 min, as referred to in 2.9.1. If any other lesser structural fire protection time is determined for category A (passenger) craft and cargo craft by 2.9.1, then the times given below in 2.4.2 and 2.4.3 may be amended pro rata. In no case shall the structural fire protection time be less than 30 min.

2.2.1.2 In using tables 2.3-1 and 2.3-2, it shall 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 adjacent spaces, where there is doubt as to their classification for the purpose of this *Part* of the *Rules*, they shall be treated as spaces within the relevant category having the most stringent boundary requirement.

2.3 Classification of Spaces on the Craft

2.3.1 For the purposes of classification of compartments or spaces given in tables 2.3-1 and 2.3-2 in accordance with fire hazard risks, the following grouping shall apply:

- .1 Areas of major fire hazard**, referred to in tables by letter (A):
 - machinery spaces, defined in 1.2.30,
 - ro-ro spaces,
 - spaces containing dangerous goods,
 - special category spaces,
 - store-rooms containing flammable liquids,
 - galleys,
 - sales shops having a deck area of 50 m² or greater and containing flammable liquids for sale,
 - trunks in direct communication with the above spaces.
- .2 Areas of moderate fire hazard**, referred to in tables by letter (B):
 - auxiliary machinery spaces, as defined in 1.2.31,
 - bond stores containing packaged beverages with alcohol content not exceeding 24% by volume,
 - crew accommodation containing sleeping berths,
 - service spaces,
 - sales shops having a deck area of less than 50 m² containing a limited amount of flammable liquids for sale and where no dedicated store is provided separately,
 - sales shops having a deck area of 50 m² or greater not containing flammable liquids,
 - trunks in direct communication with the above spaces.

¹⁾ Refer to *Resolution MSC 40(64) on Standard for qualifying marine materials for high-speed craft as fire-restricting materials*, amended by *Resolution MSC 90(71)*, and interpretations given in MSC.1/Circ.1457.

- .3 Areas of minor fire hazard**, referred to in tables by letter (C):
 - auxiliary machinery spaces (of little or no fire risk), as defined in 1.2.32,
 - cargo spaces,
 - fuel tank compartments,
 - public spaces,
 - tanks, voids and areas of little or no fire risk,
 - refreshment kiosks,
 - sales shops other than those specified in 1 and 2,
 - corridors in passenger areas and stairway enclosures,
 - crew accommodation other than that mentioned in .2,
 - trunks in direct communication with the above spaces.
- .4 Control stations**, referred to in tables by letter (D), and defined in 1.2:
- .5 Evacuation stations and external escape routes**, referred to in tables by letter (E):
 - external stairs and open decks used for escape routes,
 - assembly 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 by letter (F):
 - open spaces locations other than evacuation stations and external escape routes and control stations.

2.3.2 In relation to the classification of spaces in 2.3.1, the following additional criteria shall be applied:

- .1** if a space is divided by partial bulkheads into two (or more) smaller areas such that they form enclosed spaces, then the enclosed spaces shall be surrounded by bulkheads and decks in accordance with tables 2.3-1 and 2.3-2, as applicable. However, if the separating bulkheads of such spaces are at least 30% open, then the spaces may be considered as the same space;
- .2** lockers/cabinets having a deck area of less than 2 m² may be accepted as part of the space they serve, provided they have open ventilation to the space and do not contain any material or equipment that could pose a fire risk;
- .3** where a space has the special characteristics of two or more space groups, the structural fire protection time of the divisions shall be the highest for the space group concerned. For example, the structural fire protection time of the divisions of emergency generator rooms shall be of the highest value for the space when the space is considered as being a control station (D) and a machinery space (A).

2.3.3 In approving structural fire protection details, the risk of heat transmission at intersections and terminal points of required thermal barriers shall be taken into account.

2.3.4 To prevent heat transmission at intersections and terminal points, the insulation of the deck or bulkhead shall be carried past the intersection or terminal point for a distance of at least 450 mm in the case of steel and aluminium structures (refer to IMO Resolution MSC.222(82), Fig. 7.3.4a) and 7.3.4b).

2.3.5 If a space is divided by a deck or bulkhead and the fire insulation required for each space is different, the insulation with the higher structural fire protection time should continue on the deck or bulkhead with the insulation of the lesser structural fire protection time for a distance of at least 450 mm.

2.3.6 In the event the lower part of the fire insulation has to be cut for drainage, the construction should be in accordance with the structural details shown in figure 7.3.6, from IMO Res. MSC.222(82).

Table 2.3-1
The structural fire protection times for separating bulkheads and decks on passenger craft

	(A)	(B)	(C)	(D)	(E)	(F)
Areas of major fire hazard (A)	60 ¹⁾²⁾ 60 ¹⁾²⁾	30 60 ¹⁾	³⁾ 60 ¹⁾⁸⁾	³⁾⁴⁾ 60 ¹⁾	³⁾ 60 ¹⁾	— 60 ¹⁾⁷⁾⁹⁾
Areas of moderate fire hazard (B)		30 ²⁾ 30 ²⁾	³⁾ 30 ⁸⁾	³⁾⁴⁾ 60	³⁾ 30	— ³⁾
Areas of minor fire hazard (C)			³⁾ ³⁾	³⁾⁴⁾ 30 ⁸⁾¹⁰⁾	³⁾ ³⁾	— ³⁾
Control stations (D)				³⁾⁴⁾ ³⁾⁴⁾	³⁾ ³⁾⁴⁾	— ³⁾
Evacuation stations and external escape routes (E)					³⁾ ³⁾	— ³⁾
Open spaces (F)						—

The figures on either side of the diagonal line represent the required structural fire protection time (in minutes) for the protection system effected by the use of insulation on the relevant side of the division. The numbers in brackets indicate the number of mandatory note.

Notes:

- ¹ The upper side of the decks located between spaces protected by fixed fire-extinguishing systems need not be insulated.
- ² Where adjacent spaces are in the same alphabetical category and a note 2 appears, a bulkhead between such spaces need not be fitted if deemed unnecessary by PRS. 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 through both spaces are in the same category.
- ³ No structural fire protection requirements; however, a smoke-tight division made of non-combustible or fire-restricting material is required.
- ⁴ Control stations which are also auxiliary machinery spaces shall be provided with 30 min. structural fire protection.

Table 2.3-2
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⁾ 60 ¹⁾²⁾	30 60 ¹⁾	³⁾ 60 ¹⁾⁸⁾	³⁾⁴⁾ 60 ¹⁾	³⁾ 60 ¹⁾	— 60 ¹⁾⁷⁾⁹⁾
Areas of moderate fire hazard (B)		²⁾⁶⁾ 2)6)	³⁾ 6)	³⁾⁴⁾ 60	³⁾ 6)	— ³⁾
Areas of minor fire hazard (C)			³⁾ ³⁾	³⁾⁴⁾ 30 ⁸⁾	³⁾ ³⁾	— ³⁾
Control stations (D)				³⁾⁴⁾ ³⁾⁴⁾	³⁾ ³⁾⁴⁾	— ³⁾
Evacuation stations and external escape routes (E)					³⁾ ³⁾	— ³⁾
Open spaces (F)						—

Notes to Tables 2.3-1 and 2.3-2 (cont.):

- ⁵ There are no special requirements for material or integrity of boundaries where only a dash appears in the table.
- ⁶ The fire protection time is 0 min 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.
- ⁷ Fire resisting divisions need not be provided with thermal insulation.
- ⁸ When steel construction is used, fire resisting divisions adjacent to void spaces need not be provided with thermal insulation.
- ⁹ The fire protection time may be reduced to 0 min for those parts of open ro-ro spaces which are not essential parts of the craft's main load bearing structure, where passengers have no access to them and the crew need not have access to them during any emergency.
- ¹⁰ On category A (passenger) craft, this value may be reduced to 0 min where the craft is provided with only a single public space (excluding lavatories) protected by a sprinkler system and adjacent to the operating compartment.

2.4 Fire-resisting Divisions

2.4.1 Areas of major and moderate fire hazard shall be enclosed by fire-resisting divisions complying with the requirements of 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 to a level at least 300 mm below waterline at the lightweight condition in the displacement mode, but due regard shall 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.

2.4.2 Fire-resisting bulkheads and decks shall be constructed to resist exposure to the standard fire test for a period of 30 min for areas of moderate fire hazard and 60 min for areas of major fire hazard, except as provided in 2.2.1.1.

2.4.3 Main load-carrying structures¹⁾ within areas of major and moderate fire hazard and structures supporting control stations shall be arranged to distribute load such that there will be no collapse of the construction of the deck and superstructure when it is exposed to fire for the appropriate fire protection time of the fire-resisting structure. The load-carrying structure shall also comply with the requirements of 2.4.4 and 2.4.5.

2.4.4 If the structures specified in 2.4.3 are made of aluminium alloy their installation shall be such that the temperature of the core does not rise more than 200°C above the ambient temperature in accordance with the fire protection times specified in 2.2.1.1 and 2.4.2, respectively.

2.4.5 If the structures specified in 2.4.3 are made of combustible material, their insulation shall be such that their temperatures will not rise to a level where deterioration of the construction will occur during the exposure to the standard fire test in accordance with the *FTP Code* to such an extent that the load-carrying capability, in accordance with the fire protection times specified in 2.2.1.1 and 2.4.2, respectively, will be impaired.

2.4.6 The construction of all doors, and door frames in fire-resisting divisions, with the means of securing them when closed, shall 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 steel doors need not be insulated. Also, where a fire-resisting division is penetrated by pipes, electrical cables etc., arrangements shall be made to ensure that the fire-resisting integrity of the division is not impaired, and necessary testing shall be carried out in accordance with the *FTP Code*. Where machinery shafts penetrate fire-resisting watertight divisions, arrangements shall be made to ensure that the required watertight and fire-resisting integrity of the division is not impaired.

2.4.7 Ventilation openings may be accepted in entrance doors to public toilets, provided they are positioned in the lower portion of the door, and fitted with closable grilles operable from outside the space and made of non-combustible or fire-restricting material.

¹⁾ Refer to Interpretations given in IMO MSC.1/Circ.1457.

2.5 Openings in Fire-resisting Divisions

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

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

2.5.3 Fire doors fitted in divisions bounding areas of major fire hazard and stairway enclosures shall satisfy the following requirements:

- .1** The doors shall be self-closing and be capable of closing with an angle of inclination of up to 3.5° opposing closure. The approximate time of closure for hinged fire doors shall be no more than 40 s and no less than 10 s from the beginning of their movement with the craft in the upright position. The approximate uniform rate of closure for sliding fire doors shall be of no more than 0.2 m/s and no less than 0.1 m/s with the craft in the upright position.
- .2** Remote released sliding or power-operated doors shall be equipped with an alarm that sounds at least 5 s but no more than 10 s after the door is released from the continuously manned control station and before the door begins to move and continues sounding until the door is completely closed. Doors designed to re-open upon contacting an object in their paths shall re-open no more than 1 m from the point of contact.
- .3** All doors shall be capable of remote, automatic release from a continuously manned central control station, either simultaneously or in groups, and shall be capable of release also individually from a position at both sides of the door. Indication shall be provided at the fire door indicator panel in the continuously manned control station whether each of the remote released doors is closed. The release mechanism shall be so designed that the door will automatically close in the event of disruption of the control system or main source of electrical power. Release switches shall have an on-off function to prevent automatic resetting of the system. Hold-back hooks not subject to continuously manned control station release shall be prohibited.
- .4** A door closed remotely from the continuously manned control station shall be capable of being re-opened at both sides of the door by local control. After such local opening, the door shall automatically close again.
- .5** Local power accumulators for power-operated doors shall be provided in the immediate vicinity of the doors and shall enable the doors to be operated at least ten times (fully opened and closed) using the local controls.
- .6** Disruption at one door of the control system or main source of electric power shall not impair the safe functioning of the other doors.
- .7** Double-leaf doors equipped with a latch necessary to their fire integrity shall have a latch that is automatically activated by the operation of the doors when released by the system.
- .8** 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.
- .9** The components of the local control system shall be accessible for maintenance and adjusting.
- .10** Power operated doors shall be provided with a control system of an approved type which shall be able to operate in case of fire, this being determined in accordance with the *FTP Code*. This system shall satisfy the following requirements:
 - .1** the control system shall be able to operate at a temperature of at least 200°C for at least 60 min, served by the power supply;
 - .2** the power supply for all other doors not subject to fire shall not be impaired; and
 - .3** at temperatures exceeding 200°C the control system shall be automatically isolated from the power supply and shall be capable of keeping the door closed up to at least 945°C.

2.5.4 The requirements for integrity of fire-resisting divisions of the outer boundaries facing open spaces of a craft shall not apply to glass partitions, windows and sidescuttles. Similarly, the requirements for integrity of fire-resisting divisions facing open spaces¹⁾ shall not apply to exterior doors in superstructures and deck-houses.

¹⁾ „Open space” is interpreted as excluding group (E) spaces (Evacuation stations and external escape routes), as specified in tables 2.3-1 and 2.3-2.

2.5.5 Doors in smoke-tight divisions shall be self-closing. Doors which are normally kept open shall close automatically or by remote control from a continuously manned control station.

2.6 Restricted Use of Combustible Materials

2.6.1 All separating divisions, ceilings or linings if they are not fire-resisting divisions, shall be of non-combustible or fire-restricting materials.

2.6.2 Where insulation is installed in areas in which it could come into contact with any flammable fluids or their vapours, its surface shall be impermeable to such flammable fluids or vapours. The fire insulation in such spaces may be covered by metal sheets (not perforated) or by vapour proof glass cloth accurately sealed at the joints.

2.6.3 Furniture and furnishings in public spaces and crew accommodation shall comply with the following standards:

- .1** all case furniture, such as desks, wardrobes, dressing tables, bureaux and dressers, 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 (*FTP Code*, Annex 1, sections 1 and 10);
- .2** all other furniture, such as chairs, sofas and tables, is constructed with frames of non-combustible or fire-restricting materials (*FTP Code*, Annex 1, sections 1 and 10);
- .3** all draperies, curtains and other suspended textile materials have qualities of resistance to the propagation of flame, this being determined in accordance with the *FTP Code* (Annex 1, section 7);
- .4** all upholstered furniture has qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the *FTP Code* (Annex 1, section 8);
- .5** all bedding components have qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the *FTP Code* (Annex 1, section 9); and
- .6** all deck finish materials comply with the *FTP Code* (Annex 1, sections 2 and 6).

2.6.4 With the reservation of 2.6.5, the following surfaces shall, as a minimum standard, be constructed of materials having low flame-spread characteristics:

- .1** exposed surfaces in corridors and stairway enclosures, and of bulkheads (including windows), wall and ceiling linings in all public spaces, crew accommodation, service spaces, control stations and internal assembly and evacuation stations;
- .2** surfaces in concealed or inaccessible spaces in corridors and stairway enclosures, public spaces, crew accommodation, service spaces, control stations and internal assembly and evacuation stations.

2.6.5 Paragraph 2.6.4 does not apply to partitions, windows and sidescuttles made of glass which are considered to be non-combustible and to comply with the requirements for low-flame spread surfaces or components and materials referred to in 2.6.3¹⁾.

2.6.6 Any thermal and acoustic insulation shall be of non-combustible or of fire-restricting material. Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of pipe fittings for cold service systems need not be non-combustible or fire restricting, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame spread characteristics

2.6.7 Exposed surfaces in corridors and stairway enclosures, and of bulkheads (including windows), wall and ceiling linings, in all public spaces, crew accommodation, service spaces, control stations and internal assembly and evacuation stations shall be constructed of materials which, when exposed to fire, are not capable of producing excessive quantities of smoke or toxic products, this being determined in accordance with the *FTP Code*.

2.6.8 Void compartments, where low-density combustible materials are used to provide buoyancy, shall be protected from adjacent fire hazard areas by fire-resisting divisions, in accordance with tables 2.3-1 and 2.3-2. Also, the space and closures to it shall be gastight but it shall be ventilated to atmosphere

¹⁾ Refer to paragraph 2.5.4 and *FTP Code*, Annex 2, paragraph 1 and 5.1.

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

2.6.10 The exhaust gas pipes shall be arranged so that the risk of fire is kept to a minimum. To this effect, the exhaust system shall be insulated and all 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, shall be constructed of non-combustible material or be shielded and insulated with non-combustible material to protect from high temperatures.

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

2.7 Requirements for Stairways

2.7.1 Internal stairways connecting only two decks need only be enclosed at one deck by means of divisions provided with self-closing doors having the structural fire protection time as required by tables 2.3-1 and 2.3-2 for divisions separating those areas which each stairway serves.

2.7.2 Open stairways may be fitted in a public space consisting of only two decks, provided they lie wholly within such public space and the following conditions are met:

- .1** all levels are used for the same purpose;
- .2** the area of the opening between the lower and upper part of the space is at least 10% of the deck area between the upper and lower part of the space;
- .3** the design is such that persons within the space should be generally aware, or could easily be made aware of, a developing fire or other hazardous situation located within that space;
- .4** sufficient means of escape are provided from both levels of the space directly leading to an adjacent safe area or compartment; and
- .5** the whole space is served by one section of the sprinkler system.

2.7.3 Personal lift trunks shall be so fitted as to prevent the passage of smoke from one deck to another and shall be provided with means of closing so as to permit the control of draught and smoke.

2.7.4 In public spaces, crew accommodation, service spaces, control stations, corridors and stairways, air spaces enclosed behind ceilings, panelling or linings shall be suitably divided by close-fitting draught stops not more than 14 m apart. Draught stops need not be provided on category A (passenger) craft provided with only a single public space, and on other craft in spaces with open ceilings (perforated ceilings) where the opening is 40% or more of the area, and the ceiling is arranged in such a way that a fire behind the ceiling can be easily seen and extinguished.

2.7.5 Public spaces connecting more than 2 decks may be considered as one space, provide that:

- the average length and width of the open space between lower and upper part falls within at least 25% of average length and width of the upper part of the whole space or at least on its respective area;
- sufficient evacuation routes from both levels of the space are provided, which lead directly to a safe adjacent zone or compartment;
- the whole space is served by one section of sprinkler system provided with one control valve.

2.8 Exits and Means of Escape

2.8.1 In order to ensure immediate assistance from the crew in an emergency situation, the crew accommodation, including any cabins, shall be located with due regard to easy, safe and quick access to the public spaces from inside the craft. For the same reason, easy, safe and quick access from the operating compartment to the public spaces shall be provided.

2.8.2 The design of the craft shall be such that all occupants may safely evacuate the craft into survival craft under all emergency conditions, by day or by night. The positions of all exits which may be used in an emergency, and of all life-saving appliances, the practicability of the evacuation procedure, and the evacuation time to evacuate all passengers and crew shall be demonstrated during acceptance tests of the craft.

2.8.3 Public spaces, evacuation routes, exits, lifejacket stowage, survival craft stowage and the embarkation stations shall be clearly and permanently marked and illuminated using the installation supplied from the main and emergency power source.

2.8.4 Each enclosed public space and similar permanently enclosed space allocated to passengers or crew shall be provided with at least two exits as widely separated as practical. All exit routes shall clearly indicate the directions to the evacuation station and safe areas. On category A (passenger) craft and cargo craft, at least one exit shall give access to the evacuation station serving the persons in the enclosed space considered, and all other exits shall give access to a position on the open deck from which access to an evacuation station is provided. On category B (passenger) craft, exits shall provide access to the alternative safe area required by 6.1.1.1. External routes may be accepted, provided that the requirements of 2.8.3 and 2.8.11 are complied with.

2.8.5 Subdivision of public spaces to provide refuge in case of fire may be required in compliance with 2.7.1 and 6.1.1.1.

2.8.6 Exit doors shall be capable of being readily operated from inside and outside the craft in daylight and in darkness. The means of operation shall be obvious, quick-operating and of adequate strength. Doors along escape routes should, wherever appropriate, open in the direction of escape flow from the space served.

2.8.7 The closing, latching and locking arrangements for exit doors shall be such that it is readily apparent to the crew member when the doors are closed and in a safe operational condition, either in direct view or by an indicator. The design of external doors shall be such as to minimize the possibility of jamming by ice or debris.

2.8.8 The craft shall have a sufficient number of exits which are suitable to facilitate the quick and unimpeded escape of persons wearing approved lifejackets in emergency conditions, such as collision damage or fire.

2.8.9 Sufficient space for a crew member shall be provided adjacent to exits for ensuring the rapid evacuation of passengers.

2.8.10 All exits, together with their means of opening, and additionally escape routes, shall be adequately marked for the guidance of passengers¹⁾. Appropriate markings, including the location of the *Fire Control Plan*, shall also be provided for the guidance of rescue personnel from outside the craft.

2.8.11 Footholds, ladders, etc., provided to give access from the inside to exits shall be of rigid construction and permanently fixed in position. Permanent handholds shall be provided whenever necessary to assist persons using exits, and shall be suitable for conditions when the craft has developed any possible angles of list or trim.

2.8.12 At least two unobstructed evacuation paths shall be available for the use of each person. Evacuation paths shall be disposed such that adequate evacuation facilities will be available in the event of any likely damage or emergency conditions, and evacuation paths shall have adequate lighting supplied from the main and emergency sources of power. Doors providing escape from a space shall, where possible, be situated at opposite ends of the space. Where the doors providing escape from a space are situated in the same end of the space, the distance between those doors shall be greater than the maximum length of the space.

2.8.13 The width of corridors, doorways and stairways which form part of the evacuation paths shall be not less than 900 mm for passenger craft and 700 mm for cargo craft. This width may be reduced to 600 mm for corridors, doorways and stairways serving spaces where persons are not normally employed. There shall be no protrusions in evacuation paths which could cause injury, ensnare clothing, damage lifejackets or restrict evacuation of disabled persons. The requirements of this paragraph do not apply to

¹⁾ Although the arrangement of a low-location lighting system is not required, markings, if installed, should be of photoluminescent or electroluminescent material.

aisles (a fore to aft passageway separating resting parts) or to areas between adjacent rows of seats. However, the width of such aisles and the seat pitch shall be such to allow the craft to comply with the provisions of 2.9 on evacuation time.

2.8.14 Special category spaces used for stowage of motor vehicles shall be provided with walkways having a width of at least 600 mm leading to a safe means of escape.

2.8.15 Adequate notices shall be provided to direct passengers to exits.

2.8.16 Provision shall be made on board for embarkation stations to be properly equipped for evacuation of passengers into life-saving appliances. Such provision shall include handholds, anti-skid treatment of the embarkation deck, and adequate space which is clear of cleats, bollards and similar fittings.

2.8.17 Main propulsion machinery spaces and ro-ro spaces shall be provided with two means of escape leading to a position outside the spaces from which a safe route to the evacuation stations is available. One means of escape from the main propulsion machinery spaces shall avoid direct access to any ro-ro space. Main propulsion machinery spaces having a length of less than 5 m and not being routinely entered or continuously manned may be provided with a single means of escape. At least one means of escape from a machinery space should consist of either a ladder leading to a door or hatch (not being a horizontal flush-hatch), or a door located in the lower part of that space and giving access to an adjacent compartment from which a safe means of escape is provided.

2.8.18 Spaces that are only entered occasionally by crew members may have only one means of escape. This sole means of escape should be independent of watertight doors.

2.9 Evacuation Time

2.9.1 The provisions for evacuation shall be designed such that the craft can be evacuated under controlled conditions in a time not longer than one third of the structural fire protection time (SFP) provided in 2.4 for areas of major fire hazard areas after subtracting a period of 7 min for initial detection and extinguishing action.

$$\text{Evacuation time} = \frac{(\text{SFP} - 7)}{3} \quad [\text{min}]$$

where:

SFP = structural fire protection time [min].

In determining the evacuation time, all means of escape are to be considered serviceable and they need not be dimensioned to take into account any additional number of persons that might be diverted from other means of escape if one or more of those other means of escape are lost or rendered unserviceable.

2.9.2 An evacuation procedure, including an evacuation analysis carried out taking into account the guidelines developed by IMO¹⁾, shall be developed for use in connection with the approval of fire structural protection plans and in planning the evacuation demonstration required in 2.9.3. The evacuation procedures shall include:

- .1** the emergency announcement made by the master;
- .2** contact with base port;
- .3** the donning of lifejackets;
- .4** manning of survival craft and emergency stations;
- .5** the shutting down of machinery and oil fuel supply lines;
- .6** the order to evacuate;
- .7** the deployment of survival craft and marine evacuation systems and rescue boats;
- .8** the bowing in of survival craft;

¹⁾ Refer to Guidelines for a simplified evacuation analysis of high-speed passenger craft (MSC/Circ.1166)..

- .9 the supervision of passengers;
- .10 the orderly evacuation of passengers under supervision;
- .11 crew checking that all passengers have left the craft;
- .12 the evacuation of crew;
- .13 releasing the survival craft from the craft; and
- .14 the marshalling of survival craft by the rescue boat, where provided.

2.9.3 Achievement of the required evacuation time for passenger craft (as ascertained in accordance with 2.9.1) shall be verified by a practical demonstration conducted under controlled conditions in the presence of the PRS Surveyor, and shall be fully documented and verified for passenger craft by the Administration.

2.9.4 Evacuation demonstrations shall be carried out with due concern for the problems of mass movement or panic acceleration likely to arise in an emergency situation when rapid evacuation is necessary. The evacuation demonstrations shall be dry shod with the survival craft initially in their stowed positions and be conducted as follows:

- .1 the evacuation time on a category A craft shall be the time elapsed from the moment the first abandon craft announcement is given, with any passengers distributed in a normal voyage configuration, until the last person has embarked in a survival craft, and shall include the time for passengers and crew to don lifejackets;
- .2 the evacuation time on a category B (passenger) craft and cargo craft shall be the time elapsed from the moment the order to abandon the craft is given until the last person has embarked in a survival craft. Passengers and crew may be wearing lifejackets and prepared for evacuation, and they may be distributed among assembly stations;
- .3 for all craft the evacuation time shall include the time necessary to launch, inflate and secure the survival craft alongside ready for embarkation.

2.9.5 The evacuation time shall be verified by an evacuation demonstration which shall be performed using the survival craft and exits on one side, for which the evacuation analysis indicates the greatest evacuation time, with the passengers and crew allocated to them.

2.9.6 On craft where a one-side trial is impracticable, a partial evacuation trial may be considered using a route which the evacuation analysis shows to be the most critical.

2.9.7 The demonstration shall be carried out in controlled conditions in the following manner in compliance with the evacuation plan:

- .1 the demonstration shall commence with the craft afloat in harbour, in reasonably calm conditions, with all machinery and equipment operating in the normal seagoing condition;
- .2 all exits and doors inside the craft shall be in the same position as they are under normal seagoing condition;
- .3 safety belts, if required, shall be fastened;
- .4 the evacuation routes for all passengers and crew shall be such that no person need enter the water during the evacuation.

2.9.8 For passenger craft, a representative composition of persons with normal health, height and weight shall be used in the demonstration, and shall consist of different sexes and ages so far as it is practicable and reasonable.

2.9.9 The persons, other than the crew, selected for the demonstration, shall not have been specially drilled for such a demonstration.

2.9.10 Where the PRS Surveyor is satisfied that the evacuation time determined in accordance with 2.9.1 to 2.9.9 can thereby be accurately estimated, it may accept an evacuation demonstration in which persons are not required to descend through MES or equivalent means of evacuation, provided the time required to embark into the survival craft can be determined using:

- .1 data obtained from the type-approval tests of the evacuation equipment, increased by a factor based on the guidelines developed by IMO¹⁾; or
- .2 time extrapolated from trials using a limited number of participants.

2.9.11 An emergency evacuation demonstration shall be carried out for all new prototypes of high-speed craft and for other craft where evacuation arrangements differ substantially from those previously tested.

2.9.12 The specific evacuation procedure followed during the craft's initial demonstration on which certification is based shall be included in the craft operating manual together with the other evacuation procedures contained in 2.9.2. During the demonstration, video recordings shall be made, both inside and outside the craft, which shall form an integral part of the training manual required onboard the craft.

2.10 Fire Protection of Crew Accommodation, Service Spaces and Control Stations

2.10.1 Crew accommodation and service spaces considered areas of major and moderate fire hazard and other enclosed spaces not regularly occupied within public spaces, such as toilets, stairway enclosures, corridors, shall be provided with an approved fixed fire detection and alarm system, provided with smoke detectors and manually operated call points complying with the requirements of 4.1 to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations.

2.10.2 Manually operated call points shall be installed throughout the public spaces, crew accommodation, corridors and stairway enclosures, and where necessary control stations²⁾. 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 m from a manually operated call point. One manually operated call point shall be located at each exit from these spaces and from areas of major fire hazard.

2.10.3 Crew accommodation, service spaces and control stations shall be provided with portable fire extinguishers of appropriate type. At least five portable extinguishers shall be provided, and so positioned, as to be readily available for immediate use.

2.11 Fire Protection of Machinery Spaces

2.11.1 Machinery spaces considered areas of major and moderate fire hazard shall be provided with an approved fixed fire detection and alarm system, provided with smoke detectors and manually operated call points complying with the requirements of 4.1 to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations.

2.11.2 Main propulsion machinery room(s) shall in addition have detectors sensing medium other than smoke and be supervised by TV cameras monitored from the operating compartment.

2.11.3 Machinery spaces considered the areas of major fire hazard shall be protected by an approved fixed fire-extinguishing system operable from the control station or, if provided, from control position which is adequate for the fire hazard that may exist. The system shall comply with 3.3 and be capable of local manual control and remote control from the continuously manned control stations.

2.11.4 Fixed gas fire-extinguishing systems, not required in this subchapter, however mounted as additional onboard the craft, shall comply with the structural requirements given in Chapter 3, except that a second discharge necessary for fixed gas fire-extinguishing systems, is not required.

2.11.5 One extinguisher suitable for machinery space fires shall be positioned outside each machinery space entrance.

¹⁾ Refer to the *Guidelines for a simplified evacuation analysis of high-speed passenger craft* – MSC/Circ.1166, in particular paragraph 3.5.1 thereof.

²⁾ Control stations not normally occupied (e.g. emergency generator rooms) need not be provided with manually operated call points.

2.12 Fire Protection of Special Category Spaces and Ro-ro Spaces

2.12.1 Structural Fire Protection

2.12.1.1 The structural fire protection time of special category spaces and ro-ro spaces boundaries (walls and decks) shall be in accordance with tables 2.3-1 and 2.3-2, similar as for areas of major fire hazard.

2.12.1.2 The vehicle deck of a special category space or a ro-ro space, including an open ro-ro space, need only be insulated on the underside if required. Vehicle decks located totally within ro-ro spaces may be accepted without structural fire protection, provided these decks are not part of, or do not provide support to, the craft's main load-carrying structure and provided satisfactory measures are taken to ensure that the safety of the craft, including fire-fighting abilities, integrity of fire resisting divisions and means of evacuation, is not affected by a partial or total collapse of these internal decks.

2.12.1.3 Indicators shall be provided on the navigation bridge which shall indicate when any door leading to or from the special category space or ro-ro space is closed.

2.12.1.4 Fire doors in boundaries of special category spaces leading to spaces below the vehicle deck shall be arranged with coamings of a height of at least 100 mm.

2.12.2 Fixed Fire-extinguishing Systems

Each special category space and ro-ro space shall be fitted with an approved type fixed pressure water-spraying system for manual operation, complying with the requirements of 3.5.2, which shall protect all parts of any deck and vehicle platform in such space. Permitted is the use of any other fixed fire-extinguishing system that has been shown by full-scale test in conditions simulating a petrol fire in the space to be not less effective in controlling fires likely to occur in such a space.

2.12.3 Fire Detection and Patrols

2.12.3.1 A fixed fire detection and fire alarm system complying with the requirements of 4.1 and a television surveillance system shall be provided in special category spaces and ro-ro spaces. The fixed fire detection system shall be capable of rapidly detecting the onset of fire. The spacing and location of detectors shall be tested taking into account the effects of ventilation and other relevant factors.

2.12.3.2 Instead of the fixed fire detection and fire alarm system, maintenance of continuous fire patrol is allowed in these spaces.

2.12.3.3 Manually operated call points shall be provided as necessary throughout the special category spaces and ro-ro spaces and one of them shall be placed close to each exit from such spaces.

2.12.3.4 The fire detection and alarm system provided with smoke detection sections may be switched off temporarily with a timer during loading/unloading of vehicles to avoid "false" alarms. The switch-off time shall be adjusted to the time of vehicles loading/unloading. The fire detection panel shall indicate whether the detectors section is isolated or not. The manually operated call points, where fitted, shall not be capable of being switched off during vehicles loading/unloading.

2.12.4 Fire-fighting Equipment

There shall be provided in each special category space and ro-ro space:

- .1** at least three water fog applicators consisting of a metal L-shaped pipe, the long limb being approximately 2 m in length and capable of being fitted to a fire hose, and the short limb being approximately 250 mm in length and fitted with a fixed water fog nozzle or capable of being fitted with a water spray nozzle;
- .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 l of foam-concentrate and one spare tank. The nozzle shall be capable of producing effective foam

suitable for extinguishing an oil fire of at least 1.5 m³/min. At least two portable foam applicator units shall be available in the craft for use in such space; and

- .3 portable fire extinguishers, complying with requirements of 5.2, which shall 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. Fire extinguishers should be suitable for extinguishing A and B class fires¹⁾ and have a capacity of 12 kg dry powder or equivalent.

2.12.5 Ventilation System

The ventilation system shall comply with requirements of 3.7.3. of *Part VI – Machinery and Systems of HSC Rules*.

2.12.6 Drainage of Spaces

Drainage of spaces shall comply with the requirements of 3.8 of *Part VI – Machinery and Systems*.

2.12.7 Precautions against Ignition of Flammable Vapours or Liquids

2.12.7.1 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, shall be installed at least 450 mm above the deck or platform. Electrical equipment installed at more than 450 mm above the deck or platform shall be of a type so enclosed and protected by the enclosure of protection degree determined based on IMO accepted international standards²⁾. 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 safe type based on IMO accepted international standards³⁾.

2.12.7.2 The electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be certified "safe type"⁴⁾. The electrical equipment and wiring, if installed, shall be of a type approved for use in accordance with IMO accepted standards⁵⁾, and the outlets from any exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.

2.12.7.3 If pumping and drainage arrangements are provided, it shall be ensured that:

- .1 water contaminated with petrol or other flammable substances is not drained to machinery spaces or other spaces where sources of ignition may be present; and
- .2 electrical equipment fitted in tanks or other components of the drainage system shall be of a type suitable for use in explosive petrol/air mixtures.

2.12.8 Open Ro-ro Spaces

2.12.8.1 Open ro-ro spaces shall comply with the requirements set out in 2.12.1 (structural fire protection), 2.12.2 (fixed fire-extinguishing systems), 2.12.3 (fire detection and fire patrols), 2.12.4 (fire fighting equipment) and 2.12.6 (drainage of spaces).

2.12.8.2 For those parts of a ro-ro space which are completely open from above, the requirements set out in 2.12.2 (fixed fire-extinguishing systems), 2.12.3.1 (fire detection) and 2.12.6 (drainage of spaces) need not be complied with. However, a continuous fire patrol or a television surveillance system shall be maintained.

¹⁾ Refer to *Publication IEC 60529*.

²⁾ Refer to *Publication IEC 60529 – Degrees of protection provided by enclosures (IP Code)*, in particular, refer to the standards for an ingress protection of at least IP 55 or refer to the *Publication IEC 60079 series – Electrical apparatus for explosive gas atmospheres*, in particular, refer to the standards for protection by an apparatus for use in zone 2 areas.

³⁾ Refer to *Publication IEC 60079 – Electrical apparatus for explosive gas atmospheres*, in particular, refer to the standards for equipment and wiring to be suitable for use in zone 1 areas

⁴⁾ Refer to *Publication IEC 60092*

⁵⁾ Refer to *Publication IEC 60079 – Electrical apparatus for explosive gas atmospheres*, in particular, refer to the standards for equipment and wiring to be suitable for use in zone 1 areas

2.13 Fire Protection of Galleys

2.13.1 The structural fire protection time of galley boundaries (walls and decks) shall be in accordance with tables 2.3-1 and 2.3-2, similar as for areas of major fire hazard.

2.13.2 Galleys considered the areas of major fire hazard shall be protected by an approved fixed fire-detection and fire alarm systems, complying with the requirements of 4.1.

2.13.3 The galley doors shall be smoke-tight.

2.13.4 Each galley shall be provided with at least one portable CO₂ fire-extinguisher and, where deep fat cooking equipment is provided, one fire-extinguisher suitable for extinguishing fires of edible oil (group F fires).

2.13.5 Where deep-fat cooking equipment is installed, all such installations shall be fitted with:

- .1** an automatic or manual fixed fire-extinguishing system with fire-extinguishing agent suitable for extinguishing burning grease, tested to the ISO 15371:2009 Standard;
- .2** a primary and back up 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 to the deep-fat cooking equipment 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 labeled for ready use by the crew.

2.14 Fire Protection of Flammable Liquids Store Rooms

2.14.1 The store rooms shall be located outside the area of crew and passenger accommodation, shall be well ventilated and their doors shall open outwards.

2.14.2 The structural fire protection time of the boundaries (walls and decks) of flammable liquids store rooms shall be in accordance with tables 2.3-1 and 2.3-2, similar as for areas of major fire hazard.

2.14.3 Fire detector of the fire detection and alarm system shall be installed in the store room for flammable liquids.

2.14.4 The flammable liquids store rooms of floor area above 4 m² shall be equipped with a fixed gas fire-extinguishing system or other fire-extinguishing system ensuring equivalent protection, operated from outside of the store room.

2.14.5 A portable fire-extinguisher shall be located at the entrance to the store room.

3 FIXED FIRE-EXTINGUISHING SYSTEMS

3.1 General

3.1.1 Fire-extinguishing systems shall be so constructed as to be efficient and readily available for operation under all conditions specified in sub-chapter 1.6, *Part VI – Machinery Installations and Refrigerating Plants* of the *Rules for the Classification and Construction of Sea-Going Ships*, during normal operation of the craft.

3.1.2 Fire-extinguishing medium storage cylinders and pressure vessels used in fire-extinguishing systems shall fulfil the requirements of national/international standards applicable in shipbuilding.

3.1.3 In fire-extinguishing systems, metal/light metal alloy pipes of the minimum melting temperature appropriate for the given extinguishing system, shall be used. Steel pipes, except stainless steel pipes, shall be protected against corrosion; it is recommended that steel pipes should be hot-galvanized both inside and outside.

3.1.4 Plastic pipes are allowed for use in water fire main systems, led within spaces/areas of the craft if they were subjected to fire tests/examinations in accordance with *Publication No. 53/P* (Res. A.753(18) and Res. 313(88)), having due regard to their location, as specified in Table 4.1.3 of the said *Publication*.

3.1.5 Piping shall be secured to the craft's structure using engineering practices and solutions that account for both static and dynamic loads imposed by swaying pipe, the moving craft and moving fluid inside the pipe.

3.1.6 The means for fastening the systems pipings to the structure of the craft shall be suitable for use in the marine environment. Pipe hangers incorporating threaded fasteners shall provide a means for the fasteners to remain secure while subjected to vibration from the craft.

3.1.7 The means of connecting the fire-extinguishing system pipings to the structure of the craft and pipings connections shall take into account the long-term properties of the material and the interactions of all the materials used in the means of securing and connection with due regard to preventing corrosion by contact between dissimilar metals.

3.1.8 The fire-extinguishing systems shall also comply with general requirements contained in Chapter 3 of *Part VI – Machinery and Systems* of the *HSC Rules*.

3.2 Water Fire Main System

3.2.1 Each craft shall be equipped with water fire main system, consisting of fire pumps, water supply pipings, hydrant valves and fire hoses provided with nozzles. The water fire main system shall comply with the requirements of this subchapter.

3.2.2 At least two independently driven pumps shall be arranged on the craft, one to be treated as emergency fire pump. Each pump shall have at least two-thirds the capacity of a bilge pump but not less than 25 m³/h. Each fire pump shall be able to deliver sufficient quantity and pressure of water to simultaneously operate the hydrants as required by 3.2.9.

3.2.3 The arrangement of the pumps shall be such that in the event of a fire in any one compartment, all the fire pumps will not be put out of action.

3.2.4 Provision shall be made for a remote starting of one of the fire pumps from the fire control station, located outside the machinery space or from control station. In the pump remote starting position, a gauge indicating water pressure or another indicator (e.g. an electric lamp) shall be provided to indicate the pump operation.

3.2.5 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 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.

3.2.6 Isolating valves should be installed in the main so that fire main branches can be isolated when the main is used for purposes other than fire-fighting.

3.2.7 The spindles of manually operated valves shall be easily accessible and all valves shall be clearly marked.

3.2.8 Fire mains should be capable of being drained through the drain plugs fitted in the lowest section of the system.

3.2.9 Hydrants shall be 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.

3.2.10 Special category spaces hydrants shall 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.

3.2.11 One hydrant shall be located in the vicinity of and outside each entrance to a machinery space.

3.2.12 Each fire hose shall be of non-perishable material. Fire hoses shall have a length of:

- .1** at least 10 m;
- .2** not more than 15 m in machinery spaces;
- .3** not more than 20 m for other spaces and open decks.

3.2.13 Fire hoses, together with any necessary fittings and tools for their connecting, shall be kept ready for use in hose boxes in conspicuous positions near the hydrants. All fire hoses in interior locations shall be permanently connected to the hydrants.

3.2.14 One length of fire hose shall be provided for each fire hydrant.

3.2.15 Each fire hose shall be provided with a nozzle of an approved dual purpose type (i.e. spray/jet type) incorporating a water shutoff.

3.2.16 Standard nozzle sizes 12 mm, 16 mm or 19 mm or as near thereto as possible shall be used on the craft. Where other fire-extinguishing systems are used – such as fog fire-extinguishing systems – different diameter nozzles may be permitted.

3.3 Fixed Gas Fire-extinguishing Systems

3.3.1 General

3.3.1.1 Clean extinguishing agents, i.e. chemical compositions from the group of halogen derivatives of hydrocarbons (e.g. FM-200, FE-36, etc.), inert gases (CO₂, nitrogen, argon, etc.) or their mixtures, shall be used as fire-extinguishing agents in fixed gas fire-extinguishing systems. Halon 1211, 1301 and 2402 and perfluorocarbons may not be used as fire-extinguishing agents in these systems.

3.3.1.2 The use of a fire-extinguishing medium which, either by itself or under expected conditions of use will give off toxic gases in such quantities as to endanger persons or environment shall not be permitted.

3.3.1.3 Where the gas 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, provided the spaces are separate. Two spaces can be considered as separated spaces where separating divisions comply with tables 2.3-1 and 2.3-2, as appropriate, or the divisions are gas-tight, made of steel or steel equivalent material.

3.3.1.4 In all craft where gas is used as the extinguishing medium, the quantity of gas shall be sufficient to provide two independent discharges, that means double amount of extinguishing medium, designated for extinguishing the largest protected space, shall be taken in calculations. In case of inefficient fire-extinguishing action in the space, the second discharge into the space shall only be activated manually from a fire control station outside the space being protected. Where the space has a local fire suppression water-based system installed, to protect fuel oil, lubricating oil and hydraulic oil pipings located near exhaust manifolds, turbo chargers or similar heated surfaces on main and auxiliary internal combustion engines, a double amount of fire-extinguishing medium need not be taken.

3.3.1.5 The necessary pipes for conveying gas 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. Pipelines may pass through crew and passenger accommodation spaces, provided they are of substantial thickness and that their tightness is verified with a pressure test, after their installation, at a pressure head not less than 5 N/mm². Pipelines passing through accommodation areas shall only be joined by welding and shall not be fitted with drains or other openings within such spaces. Pipelines shall not pass through refrigerated spaces. Non-return valves shall be installed in discharge lines between cylinders and manifolds.

3.3.1.6 Suitable provision shall be made in the system to prevent inadvertent admission of the medium to any protected space.

3.3.1.7 The piping for the distribution of gas fire-extinguishing medium shall be arranged and discharge nozzles so positioned that a uniform distribution of medium is obtained in the protected space.

3.3.1.8 All openings in boundaries and decks of spaces protected by a fixed gas fire-extinguishing system, which may admit air to or allow extinguishing gas to escape from the space shall be capable of being closed from outside of the protected space.

3.3.1.9 Where air receivers (e.g. diesel engine starting air receivers) are installed in a protected space, the volume of the receivers converted to free air volume shall be added to the gross volume of the space when calculating the necessary quantity of the fire-extinguishing medium. The volume of free air in receivers need not be considered, provided a discharge pipe connected to a safety valve is fitted and leads directly to the open air.

3.3.1.10 Means shall be provided for automatically giving audible and visible warning of the release of fire-extinguishing medium into any gas fire-extinguishing system protected space in which personnel normally work or to which they have access¹⁾. The pre-discharge alarm should be automatically activated, e.g. by a micro-switch which will activate alarm after opening of the release cabinet door/control panel. The alarm shall operate for a period suitable for evacuation of personnel from the space, before the medium is released, but not less than 20 s.

3.3.1.11 The cabinets/control panels 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 procedures before system activation.

3.3.1.12 The fixed gas fire-extinguishing system shall be controlled manually by means of directional valves located on pipings conveying the fire-extinguishing medium. Automatic release of the medium to the space is not allowed.

3.3.1.13 Pressure containers required for the storage of fire-extinguishing medium shall be located outside protected spaces in specially designed fire-extinguishing stations complying with the requirements specified in 3.3.1.15. Pressure containers may be located inside the space to be protected for systems using media safe for persons present in the space.

3.3.1.14 Means shall be provided for the crew to safely check the quantity of medium in the containers, when it is not necessary to move the containers completely from their fixing position²⁾.

3.3.1.15 Containers/cylinders for the storage of fire-extinguishing medium and associated pressure components shall be designed having regard to their locations and maximum ambient temperatures expected in service. It is assumed that the maximum ambient temperature is 55°C.

3.3.1.16 Fire-extinguishing station for the storage of fire-extinguishing medium cylinders shall be located outside protected spaces, in a safe and easily accessible place. The boundaries and decks separating fire-extinguishing station from adjacent spaces shall ensure that the fire protection times are in accordance with the values in tables 2.3-1 and 2.3-2, providing integrity similar to control stations. Additionally, the fire-extinguishing station shall comply with the following:

- .1** it shall not be used for any other purposes than the storage of fire-extinguishing medium and fire-extinguishing system operation;

¹⁾ The alarm signal shall differ from other alarm signals and shall be in accordance with the *Code of Alarms and Indicators – Resolution A.1021(26)*.

²⁾ This may be achieved for instance by providing hanging bars above each bottle row for a weighing device or by using suitable surface indicators. Surface indicators containing radioactive material should be of an approved type.

- .2 it shall be located on the open deck and have direct access from the open deck. If it is located below the deck, then shall be located no more than one deck below the open deck and have direct access by means of stairs or a ladder from the open deck;
- .3 it shall be provided with an efficient ventilation. Where the station is located below the open deck or where the access from the open deck is not provided it shall be fitted with mechanical ventilation system designed with the exhaust duct from the bottom part of the space and air intake duct in the top part and to provide at least 6 air changes per hour, and
- .4 access doors shall open outwards and the bulkheads and decks separating the station from adjacent spaces, including doors and closings of other openings, shall be gastight.

3.3.1.17 Spare parts for the system in accordance with manufacturer's instructions, shall be stored on board or at a base port.

3.3.1.18 If the release of a fire extinguishing medium may produce significant over or under pressure in the protected space, appropriate air relief valves shall be fitted to limit the induced pressures to acceptable limits to avoid structural damage of the craft.

3.3.1.19 In piping sections, where isolating valve introduce sections of closed piping, such sections shall be fitted with a pressure relief valve, the outlet of the valve being led to the atmosphere.

3.3.1.20 All discharge piping¹⁾, fittings and nozzles in the protected spaces shall be constructed of materials having a melting temperature which exceeds 925 °C.

3.3.1.21 Pipes distributing fire-extinguishing medium into protected spaces shall be fitted with a stub-pipe for connecting to compressed air used for the piping passage test.

3.3.1.22 At each entrance/manhole to the space protected by gas fire-extinguishing system, a warning plate, bearing the following inscription, shall be placed:

**SPACE PROTECTED BY GAS-FIRE-EXTINGUISHING SYSTEM
LEAVE THIS AREA IMMEDIATELY WHEN THE WARNING SIGNAL IS SOUNDED.
DANGER OF SUFFOCATION**

In place of dots, the name of the fire-extinguishing medium (e.g. CO₂) and the description of the warning signal shall be given.

3.3.2 Carbon Dioxide Systems

The carbon dioxide fire-extinguishing system, in addition to general requirements shall comply with the following:

- .1 For cargo spaces, the quantity of carbon dioxide available shall be sufficient to give a minimum volume of free gas equal to 30% of the gross volume of the largest cargo space so protected in the craft.
- .2 For machinery spaces, the quantity of carbon dioxide carried shall be sufficient to give a minimum volume of free gas equal to the larger of the following volumes, either:
 - .2.1 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
 - .2.2 35% of the gross volume of the largest machinery space protected, including the casing
The above-mentioned percentages may be reduced to 35% and 30% respectively for cargo craft of less than 2,000 gross tonnage; provided also that if two or more machinery spaces are not entirely separate they shall be considered as forming one space.
- .3 For the purpose of this paragraph the volume of free carbon dioxide shall be calculated at 0.56 m³/kg.
- .4 For machinery spaces, the fixed piping system shall be such that 85% of the gas can be discharged into the space within 2 min.

¹⁾ Gaskets used in pipings connections in protected spaces need not be made of materials of melting point higher than 925°C

- .5 Control devices of carbon dioxide fire-extinguishing system intended for the protection of machinery spaces and other spaces in which the crew normally work and to which they have access shall fulfil the following requirements:
 - .5.1 Two separate controls shall be provided for releasing carbon dioxide into a protected space and to ensure the activation of the alarm. One control shall be used for opening the valve of the piping which conveys the gas into the protected spaces; The second control shall be used to discharge the gas from its storage containers.
 - .5.2 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.

3.3.3 Equivalent Fixed Gas Fire-extinguishing Systems

Equivalent fixed gas fire-extinguishing systems for machinery spaces, other than carbon dioxide systems, in addition to general requirements shall comply with applicable requirements specified in PRS *Publication 89/P – Guidelines on Designing, Performance of Type Tests of Fixed Fire-extinguishing Systems used on Ships*¹⁾.

3.4 Sprinkler System

3.4.1 General

3.4.1.1 Sprinkler systems are intended for use exclusively in accommodation spaces.

3.4.1.2 The below types of sprinkler systems may be used on high-speed craft:

- .1 manual sprinkler systems, where admission of water is controlled by manually actuated valves or by breaking of a glass element in actuating station;
- .2 automatic sprinkler systems, employing automatic sprinklers attached to „wet” pipings containing water under pressure or „dry” pipings containing air or nitrogen under pressure, where water outlet from sprinklers is opened by fire heat.
- .3 combination sprinkler systems employing both manual and automatic actuation and having nozzles fitted with fusible elements.
- .4 equivalent sprinkler systems – high-pressure (water mist), which may be of type as specified in subparagraphs from .1 to .3. The high-pressure equivalent sprinkler system shall comply with the applicable requirements given in *Publication No. 89/P – Guidelines on Designing, Performance of Type Tests of Fixed Fire-extinguishing Systems used on Ships*²⁾.

3.4.1.3 Each protected zone served by a manual sprinkler system shall have two switches or break glass stations widely separated, with one switch for each protected zone located in the operating compartment or other continuously manned control station. Switches and break glass stations shall be suitably protected from unauthorized use, and activation shall be alarmed in the operating compartment or the continuously manned control station.

The second switch or break glass station shall be placed in a place easily accessible for the crew, however, protected from inadvertent use by passengers.

3.4.1.4 For combination system, pipings may be empty or filled with compressed air. Each protected area shall be fitted with manually actuated break glass stations. Water shall fill the system and appropriate valves and pumps shall automatically operate upon actuation of a manual station or supplemental detection system. Additionally, a manually actuated switch shall be located in the operating compartment.

¹⁾ The Publication takes into account the requirements for equivalent gas fire-extinguishing systems, contained in: IMO Circulars: MSC/Circ.848, MSC.1/Circ.1267, MSC/Circ.1165, MSC.1/Circ.1237, MSC.1/Circ.1269 and MSC.1/Circ.1386.

²⁾ The Publication takes into account the requirements for equivalent sprinkler systems contained in Resolutions: IMO: A.800(19) and MSC.265(84).

3.4.1.5 The sprinkler system shall be capable of immediate operation at all times and no additional action of the crew shall be necessary to set it in operation the sprinkler system

3.4.2 Supply (Sea) Water Sprinkler Pump and System Calculations

3.4.2.1 Each supply pump shall be capable of being started manually from the operating compartment and from the place close to the pump. An electric power fault alarm for the pump shall be provided in the operating compartment.

3.4.2.2 The sea water supply pump shall be of self-priming type or the arrangement for automatic priming the pump or priming arrangement operated from operating compartment acting under all pump operating conditions, shall be provided.

3.4.2.3 The following operating parameters shall be indicated in the operating compartment:

- .1 sprinkler system pressure normal (for constantly pressurized systems only);
- .2 sprinkler system operating (pump running);
- .3 sprinkler system failure (loss of pressure).

3.4.2.4 A gauge shall be provided in the operating compartment to indicate sprinkler main pressure.

3.4.2.5 Pumps, pipings and other system supply components shall be sized and arranged so as to be capable of maintaining within one minute of system activation a minimum flow corresponding to the simultaneous operation of sprinklers in the following hydraulically most demanding design areas not less than:

- .1 for manual systems with open nozzles, two horizontally adjacent sprinkler sections – 280 m³;
- .2 for manual system with fusible element nozzles – 280 m³;
- .3 for “wet” pipe systems – 150 m³; and
- .4 for “dry” pipe and combination systems – 200 m³.

3.4.2.6 For all types of systems, the design area can be reduced to the maximum size of the largest space within fire resisting divisions (30 min or greater) on a single deck area.

3.4.2.7 For systems other than equivalent systems (for water mist), referred to in 3.4.1.1.4, the water discharge rate shall be not less than 5 l/m²/min.

3.4.2.8 In automatic systems, sprinkler pumps shall start upon loss of system pressure.

3.4.2.9 Sprinkler pumps shall not be located in any space protected by the sprinkler system it serves.

3.4.2.10 There shall be at least two sources of power supply for the sea water pump and automatic fire alarm and detection system. If the pump is electrically driven, there shall be a main generator and emergency source of power. One supply for the pump shall be taken from the main switchboard, and one from emergency switchboard, by separate feeders reserved solely for that purpose. Alternatively, a dedicated diesel driven pump may be provided as an emergency source of power.

3.4.2.11 The feeders shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of major fire hazard 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 supply is available therefrom, and be so designed that upon failure of that supply it would automatically change over to the supply from the emergency switchboard. The switches on the main switchboard and the emergency switchboard shall be clearly labeled and normally kept closed. No other switches shall be permitted in the feeders concerned.

3.4.2.12 Where one of the sources of power for the pump is an internal combustion engine, it shall not be located in the space protected by the sprinkler system served by the pump and shall be so situated that a fire in any protected space would not affect the air supply to the engine.

3.4.2.13 The sprinkler system shall have connection from the ship's main by way of a lockable screw-down non-return valve at the connection which would prevent a backflow from the sprinkler system to the fire main.

3.4.2.14 Category A (passenger) craft having a “wet” pipe sprinkler system may have a hydro-pneumatic tank in lieu of an emergency source of power for the sprinkler pump.

3.4.3 Sprinklers

3.4.3.1 For systems other than equivalent sprinkler systems, referred to in 3.4.1.1.4, sprinklers shall be fast response ones, in accordance with requirements of ISO 6182/1 Standard.

3.4.3.2 For constantly pressurized systems, six spare sprinklers of each type shall be stored onboard the craft.

3.4.3.3 In accommodation and service spaces, the sprinklers shall come into operation within the temperature range from 68 °C ÷ 79 °C, except that in locations such as drying rooms and galleys, the operating temperature may be increased, however, by not more than 30°C above the normal deckhead temperature.

3.4.4 Control Valves

3.4.4.1 A manual system shall become operational through the opening of not more than one shut-off valve on the discharge side of the pump. This valve shall be referred to as the control valve and shall be located outside the space being protected.

3.4.4.2 Control valves shall be readily accessible by crew members and operable without special tools or keys.

3.4.4.3 Control valves shall be fitted with remote actuators that are controlled from the operating compartment or manual break glass stations, if fitted. Control valves shall have local manual emergency controls.

3.4.4.4 Control valves shall be capable of being manually opened within 45 s with a torque not exceeding 45 Nm under full flow conditions.

3.4.4.5 Means shall be provided to secure all other valves, e.g. section valves, in the open or „ready” position.

3.4.4.6 All valves shall be labelled indicating their function and normal position. Control valves shall also indicate the areas served.

3.4.4.7 All valves shall be provided with means to indicate whether they are open or closed.

3.4.5 System Pipings

3.4.5.1 Materials used for pipings shall be of steel or plastics, as follows:

- .1** Where located above a 15 minute-rated fire resisting ceiling and comprising either a “dry” or combination pipe system associated with a fire detection system, or a “wet” pipe system:
 - .1.1** materials complying with requirements of Level 3 under resolution A.753(18) on *Guidelines for the Application of Plastic Pipes on Ships*, as amended by MSC.313(88), or
 - .1.2** metals other than steel, having properties of good conduction of heat, such as aluminium or copper;
- .2** Other “dry” pipe systems and systems not continuously filled with water: materials complying with the requirements of Level 2 of resolution A.753(18).

3.4.5.2 Flow friction loss calculations shall utilize the Hazen-Williams formula. Calculation of flows in carbon steel piping, including galvanized piping, shall be based on C = 100. Calculations for flows in „wet” pipe sprinkler systems employing carbon steel pipings shall be based on C = 120. For all systems, flow calculations for corrosion resistant piping such as copper, copper alloys, stainless steel and plastic piping shall be based on C = 150.

3.4.6 Test Pipings

Test pipings shall be provided in each section to periodically allow a full flow test. The pipings shall discharge the section's design flow overboard. Test pipings may also serve as system drain pipings. For „wet” pipe systems, the discharge pipings need not exceed 50 mm in diameter. All systems shall also have a test arrangement at the farthest point in each section to allow a test flow equal to that from a single sprinkler. **Hydropneumatic Tanks**

3.4.7.1 Sprinkler systems shall have a hydropneumatic pressure tank with a minimum capacity of 200 l and shall be fitted with a supplementary supply from a reliable potable or fresh water source that will enable filling the tank.

For manually operated sprinkler systems, the tank is not required. The tank may be omitted where the system is kept charged with fresh water by a small topping pump taking suction from the potable or fresh water supply. Topping pump operation shall be automatic. The pump shall be fitted with a sensor to actuate a fault alarm in the operating compartment in the event of loss of pressure to the topping pump suction. The connection of the topping pump to the potable water shall be equipped with a reduced pressure back flow preventer.

3.4.7.3 Hydropneumatic tanks shall be fitted with means of audio and visual indicating in the operating compartment low water level and low air pressure conditions. When the hydropneumatic tank level drops to a predetermined level, the sprinkler pump shall automatically start.

3.4.7.4 A means shall be provided to automatically prevent sea water from entering the hydropneumatic tank.

3.4.7.5 A hydropneumatic tank in the potable water system may serve as the hydropneumatic tank for the sprinkler system, provided that the potable water demand cannot deplete the water level or air pressure below the minimum levels required for sprinkler system operation.

3.4.8 Compressed Air in „Dry” Pipe and Combination Systems and Hydropneumatic Tanks

3.4.8.1 “Dry” pipe systems shall be arranged such that water will discharge from the farthest sprinkler within 60 s of actuation of the sprinkler.

3.4.8.2 Compressed air may be taken from a dedicated compressor or other reliable source.

3.4.8.3 Non-return valve shall be provided to prevent water from entering the air supply system.

3.4.8.4 Air pressure shall be automatically maintained to account for normal pressure fluctuations and air supply shall be arranged to prevent significant quantities entering the system when the sprinklers activate.

3.4.8.5 An alarm shall be provided on the bridge to indicate low air pressure in a “dry” pipe system.

3.4.9 System Drainage

3.4.9.1 All sprinkler systems shall be arranged to be capable of being drained.

3.4.9.2 All sprinklers except those in “wet” pipe systems shall be of “dry” pendent type to prevent the accumulation of debris, corrosion and seawater.

3.4.9.3 Those lengths of pipe that cannot be made self draining shall be constructed of materials that do not exhibit corrosion during long-term exposure to sea water. Sprinklers in this area shall not be made of brass or other materials subject to corrosion or dezincification.

3.4.9.4 All portions of systems subject to freezing shall be self draining or filled with an anti-freeze solution.

3.4.10 Electric Control Systems

3.4.10.1 Sprinkler system control, fire detection and alarm/indication systems shall be electrically separate from all non-fire protection systems. All portions of systems subject to freezing shall be self draining or filled with an anti-freeze solution.

3.4.10.2 A ground fall or open circuit on any one conductor of the sprinkler detection and control system shall cause a fault indication at the operating compartment without impairing the operation of the system. This requirement does not apply to conductors delivering power to sprinkler pump motor(s).

3.4.10.3 The control system of sprinkler system shall be supplied from main and emergency source of power.

3.5 Water-Spraying Fire-Extinguishing Systems

3.5.1 General

3.5.1.1 The water-spraying fire-extinguishing system shall consist of supply water pump/pump units, distribution pipelines which may be divided into sections with section valves and spraying nozzles.

3.5.1.2 The capacity and the pressure head of the supply water pump shall be determined on the basis of the required water discharge rate, taking into account the characteristics and number of spraying nozzles installed in the largest protected space.

3.5.1.3 The spraying nozzles shall be so arranged as to provide uniform distribution of dispersed water in the protected space.

3.5.1.4 The system shall be fitted with filters preventing the nozzles from becoming clogged by impurities in sea water or pipe corrosion chips.

3.5.1.5 Pipelines shall be capable of being drained by means of drain plugs fitted in the lowest places.

3.5.1.6 In each of the protected spaces, an adequate draining system shall be provided to enable suitable overboard discharge of water by means of gravitational force or bilge pump.

3.5.2 Water-Spraying Fire-Extinguishing System for Ro-Ro Spaces and Special Category Spaces

3.5.2.1 The pumps/pump units shall be capable of maintaining:

- .1** half the total required application rate with any one pump unit out of function, for category A passenger craft; and
- .2** the total required application rate with any one pump unit out of function, for category B passenger craft

3.5.2.2 The system shall be divided into sections. Each section shall be capable of being isolated by one section control valve. The section control valves shall be located outside the protected spaces, in a compartment readily accessible without entering the protected spaces and which will not be cut off by a fire in the protected spaces. It should be possible to manually open and close the section control valves either directly on the valve or via a control valve system routed outside of the protected spaces.

3.5.2.3 Section control valves shall be indicated by plates bearing the number of each section, in accordance with numbering shown on installation plans and in operating manuals

3.5.2.4 The section valves manifold shall be fitted with a pressure gauge.

3.5.2.5 The supply water pump/pump units shall be capable of being brought into operation by remote (manual) control from the position at which the section valves are situated.

3.5.2.6 Instructions for maintenance and operation of the installation shall be placed in the room where the section valves are located.

3.5.2.7 The water-spraying fire-extinguishing systems for ro-ro spaces and special category spaces, in addition to general requirements, shall also comply with applicable requirements of *Publication 89/P – Guidelines on Designing, Performance of Type Tests of Fixed Fire-extinguishing Systems used on Ships*¹⁾.

3.6 Pressure Tests of Fire-Extinguishing Systems

The scope of workshop tests and the tests on completion of pipelines installation on board, as well as test pressure values for fire-extinguishing systems shall be determined in accordance with Table 3.6.1.

Table 3.6.1
Scope of pressure tests and test pressure values for fire-extinguishing systems

Item	Systems to be tested	Test pressure	
		In workshop	Onboard craft
1	Water fire-extinguishing systems : .1 pipes of water fire main systems; .2 pipes of water-spraying systems and sprinkler systems;	– –	1.25 <i>p</i> 1.25 <i>p</i>
2	Carbon dioxide fire-extinguishing system: .1 pipes from CO ₂ cylinders to distribution valves (manifold), .2 pipes from distribution valves to the protected spaces and pipes from safety valves passing through accommodation and service spaces; .3 remote control pilot lines pipes from pilot cylinders to distribution valves/cylinder valves .4 pipes passing through spaces other than accommodation spaces and service spaces and pipes in the protected space.	1.5 <i>p</i> – 1.3 <i>p</i> –	19 MPa 5 MPa 1.3 <i>p</i> (nitrogen test) 1 MPa
3	Cylinders, storage tanks and containers : .1 pressurized (including cylinders without valves) .2 cylinders with valves fitted.	1.5 <i>p</i> 1.25 <i>p</i> (air test)	– –
4	Fittings – pressure and strength tests	1.5 <i>p</i> (but at least 0.2 MPa)	–

Notes to table 3.6.1:

- 1) The value *p* in the table means the maximum working pressure in the system. For carbon dioxide system, *p* is equal to the design pressure in the cylinder.
- 2) Complete fittings shall be subjected to hydraulic test with a pressure of at least 1.25 *p*.
- 3) The systems shall be tested in assembly on board ship, upon completion of all installation work..

4 FIRE SIGNALLING SYSTEMS

4.1 Fire Detection and Fire Alarm System

4.1.1 General

4.1.1.1 Any required fixed fire detection and fire alarm system shall consist of fire detectors, manually operated call points and the control panel/indicating unit. The system shall be capable of immediate operation at all times.

4.1.1.2 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.

4.1.1.3 There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fixed fire-detection and fire alarm system, one of which shall be an emergency source.

¹⁾ In the *Publication*, requirements for water spraying systems and equivalent high-pressure water-based spraying systems for ro-ro spaces and special category spaces, contained in IMO MSC.1/Circ. 1430, have been taken into account.

The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in or adjacent to the control panel for the fire-detection system.

4.1.1.4 Detectors and manually operated call points shall be grouped into sections each consisting of a group of detectors and manually operated call points, as displayed on the indicating unit required for this position. 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 (alarm repeaters). If the signals are not acknowledged within two minutes, an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces. There shall be no time delay for the audible alarms in crew accommodation areas when all the control stations are unattended. The alarm sounder system need not be an integral part of the detection system.

4.1.1.5 The control panel shall be located in the operating compartment or in the main fire control station.

4.1.1.6 Indicating units (alarm repeaters) 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 craft is out of service. One indicating unit shall be located in the operating compartment if the control panel is located in the space other than the operating compartment.

4.1.1.7 Clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.

4.1.1.8 Where the fire-detection system does not include means of remotely identifying each detector individually, no section covering more than one deck within public spaces, crew accommodation, service spaces 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 to the minimum. In no case shall more than 50 enclosed spaces be permitted in any section. If the detection and alarm system is fitted with remotely and individually identifiable fire detectors, the sections may cover several decks and serve any number of enclosed spaces.

4.1.1.9 In passenger craft, if there is no fire-detection and alarm system capable of remotely and individually identifying each detector, a section of detectors shall not serve spaces on both sides of the craft nor on more than one deck and neither shall it be situated in more than one zone according to 6.1.1.1. In passenger craft fitted with individually identifiable fire detectors, a section may serve spaces on both sides of the craft and on several decks. Notwithstanding previous provisions of the paragraph, the solution may be adopted that the same section of detectors may serve spaces on more than one deck if such spaces are located in the fore or aft end of the craft or they are so arranged that they constitute common spaces on different decks (e.g. fan rooms, galleys, public spaces, etc).

4.1.1.10 A section of fire detectors which covers an operating compartment, a service space or a public space, shall not include a machinery space of major fire hazard. For fire detection systems with remotely and individually identifiable fire detectors, the requirement set out in this section is considered met when a loop covering accommodation spaces, service spaces, and operating compartments (electric circuit connecting fire detectors of different sections in a sequence and connected (input – output) to an indicating unit), does not include machinery spaces of a major fire hazard.

4.1.1.11 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 approved by PRS, provided that they are no less sensitive than the above detectors. Flame detectors shall only be used in addition to smoke or heat detectors.

4.1.1.12 The craft shall be provided with suitable instructions and appropriate fire detectors testing equipment producing hot air at the appropriate temperature, or smoke or aerosol particles having the appropriate range of density or particle size, or applying other phenomena associated with incipient fires to which the detector is designed to respond. Spare parts/detectors, in accordance with the system manufacturer's instructions, shall be provided.

4.1.1.13 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.

4.1.1.14 The fire-detection and alarm system shall not be used for any other purpose, except that the control station may be used to activate one or more below functions:

- .1 paging system;
- .2 stopping fans;
- .3 closing fire doors;
- .4 closing fire and smoke dampers; and
- .5 operating sprinkler system.

4.1.1.15 Fire-detection and alarm systems with a zone address identification capability shall be so arranged that:

- .1 a loop¹⁾ cannot be damaged at more than one point by a fire and should not pass through a space twice. Where this is not practical (e.g. for large public spaces), the part of the loop which by necessity passes through the space for a second time shall be installed at the maximum possible distance from the other parts of the loop;
- .2 means are provided to ensure that any fault (e.g. power break; short circuit; earth) occurring in the loop shall not render the whole loop ineffective;
- .3 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 shall not prevent any other detector to initiate further fire alarms.

4.1.1.16 The fire detection and alarm system shall also comply with the applicable general requirements for electrical systems, specified in Chapter 1 of *Part VII – Electrical and Control Systems*.

4.1.2 Installation requirements

4.1.2.1 Where a fixed fire-detection and fire alarm system is required for the protection of spaces other than stairways, corridors and escape routes, at least one detector complying with 4.1.1.11 shall be installed in each such space.

4.1.2.2 Detectors shall be located for optimum performance. Positions near 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 shall be avoided. Detectors which are located on the overhead shall be a minimum distance of 0.5 m away from bulkheads, except for corridors, lockers and stairways.

4.1.2.3 The arrangement of detectors shall be in accordance with the below Table:

Detector type	Maximum floor area per detector [m ²]	Maximum distance apart between centres [m]	Maximum distance from bulkheads [m]
Heat	37	9	4.5
Smoke	74	11	5.5

Other spacings based upon test data which demonstrate the characteristics of the detectors are permitted.

4.1.2.4 Electrical wiring which forms parts of the system shall 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.

¹⁾ Loop: electrical circuit linking detectors of various sections in a sequence and connected (input and output) to the indicating unit(s).

4.1.3 Design Requirements

4.1.3.1 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 the craft.

4.1.3.2 Smoke detectors 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 specified in standards having regard to the avoidance of detector insensitivity or oversensitivity.

4.1.3.3 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 having regard to the avoidance to detector insensitivity or over-sensitivity.

4.1.3.4 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.

4.1.3.5 Flame detectors corresponding to 4.1.1.11 shall have a sensitivity sufficient to detect flame against an illuminated space background and a false signal identification system.

4.1.4 Fire Detection and Alarm Systems for Periodically Unattended Machinery Spaces

4.1.4.1 The fire-detection system shall 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 shall not be permitted. The detection and alarm system shall 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 shall sound in a place where a responsible member of the crew is on duty.

4.1.4.2 After installation, the system shall be tested under varying conditions of engine operation and ventilation.

5 FIRE-FIGHTING EQUIPMENT

5.1 General

5.1.1 The fire-fighting equipment shall be located in easily accessible places on the craft, preferably at the entrance to the space and shall be properly labeled using symbols applied in fire protection onboard craft.

5.1.2 The fire fighting equipment shall be kept in good working condition and be available for immediate use at all times. It shall be used exclusively for fire fighting..

5.1.3 The equipment shall be type approved by PRS or the Flag Administration of the craft.

5.1.4 Fire fighting equipment protecting against the effect of fire, such as fire blankets, protective clothing and gloves shall be supplied by the manufacturer with asbestos free declaration taking account of Appendix 8 to the *2011 Guidelines for the Development of the Inventory of Hazardous Materials* (Resolution MEPC.197(62)).

5.2 Portable and Mobile Fire-Extinguishers

5.2.1 Portable fire-extinguishers used onboard the craft shall comply with the requirements of PN-EN 3-7 Standard and shall be of type and design appropriate for use in marine environment¹⁾.

¹⁾ Refer to *Improved guidelines for marine portable fire extinguishers* – Res. A.951(23).

5.2.2 Each portable powder or carbon dioxide extinguisher shall have a capacity of at least 5kg, and each foam extinguisher a capacity of at least 9 litres. The total mass of portable fire extinguisher shall not exceed 20 kg.

5.2.3 In operating compartments and other spaces containing electrical or electronic equipment or appliances necessary for the safety of the craft, portable fire extinguishers shall be provided with extinguishing media which are neither electrically conductive nor harmful to the equipment and appliances.

5.2.4 Portable fire extinguishers with CO₂ as the extinguishing agent may be used only for extinguishing fires in galleys and electrical installations. Considering hazard for health of persons present in the space, the content of these fire extinguishers shall be no more than 1 kg per 15 m³ of the room in which they are made available for use.

5.2.5 Portable fire-extinguishers shall be provided with devices or lead-sealed safety pin to indicate whether they have been used.

5.2.6 Portable fire extinguishers shall be subject to periodical inspection at least every year. Appropriate label placed on the extinguisher confirms the inspection. The inspections may be carried out by service stations approved by PRS or by Flag Administration.

5.2.7 The fire-extinguishers shall be installed and distributed on the craft so that, in the event of a fire starting at any point and at any time, a fire extinguisher can be reached immediately.

In addition, the fire extinguisher should be located such that their serviceability is not impaired by the weather, vibration or other external factors.

5.2.8 In the craft operating in winter conditions, the fire-extinguishers shall be located in heated spaces, to preclude their freezing.

5.3 Fire-Fighter's Outfit

5.3.1 All craft other than category A passenger craft shall carry at least two firefighter's outfits complying with the requirements of 5.3.6.

5.3.2 In addition, there shall 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 firefighter's outfits and two sets of personal equipment, each comprising protective clothing, firefighter's boots, gloves and a helmet.

5.3.3 In category B passenger craft, for each pair of breathing apparatus there shall be provided one water fog applicator, complying with requirements of 2.12.4, which shall be stored adjacent to such apparatus.

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

5.3.5 The firefighter's outfits or sets of personal equipment shall be stored in permanent and clearly marked positions so as to be easily accessible and ready for use and, where more than one firefighter's outfit or more than one set of personal equipment is carried, they shall be stored in widely separated positions.

5.3.6 Fire-fighter's outfit shall consist of the following:

.1 personal equipment, comprising:

.1.1 light type protective clothing made of material¹⁾ protecting the skin from the heat, radiating from the fire and from burns and scalding by flame or steam. The outer surface of the protective clothing shall be water-resistant;

¹⁾ Refer to *ISO 6942 – Protective clothing - Protection against heat and fire - evaluation of materials and material assemblies when exposed to source of radiant heat*

- .1.2 fire fighter's gloves;
 - .1.3 fire fighter's boots;
 - .1.4 fire-fighter's helmet;
 - .1.5 electric safety lamp of approved type of an explosion-proof type, with a minimum burning period of 3 h.;
 - .1.6 fireman's belt with snap fastener and fireman's axe in a sheath. The handle of the axe shall be provided with high-voltage insulation.
- .2 breathing apparatus, of an approved type, which shall be a self-contained compressed-air-operated breathing apparatus, the volume of air in the cylinders being at least 1200 l or other self-contained breathing apparatus capable of functioning for at least 30 min. Two spare charge shall be provided for each required breathing apparatus.
 - .3 for each breathing apparatus, a fireproof lifeline at least 30 m in length shall be provided. The lifeline shall be subjected to a strength test by static load of 3.5 kN for 5 min. The lifeline shall be capable of being attached by means of snaphook to the harness of the apparatus or to a separate belt in order to prevent the breathing apparatus from becoming detached when the lifeline is operated.

6 ADDITIONAL REQUIREMENTS

6.1 Passenger Craft – mark: PASSENGER CATEGORY A, PASSENGER CATEGORY B

6.1.1 Division into Fire Zones

6.1.1.1 For category B passenger craft, the public spaces shall be divided into zones according to the following:

- .1 The craft shall be divided into at least two zones. The mean length of each zone shall not exceed 40 m.
- .2 For the occupants of each zone there shall be an alternative safe area to which it is possible to escape in case of fire. The alternative safe area shall 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. Alternative safe areas shall be dimensioned on the basis of one person per seat and 0.35 m² per person of the net remaining area, based on the maximum number of persons they are called to accommodate in an emergency
- .3 The alternative safe area shall, as far as practicable, be located adjacent to the passenger zone it is intended to serve. There shall 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 shall be provided to enable all passengers and crew to be safely evacuated from the alternative safe area within the structural fire protection time for areas of major fire hazard.

6.1.1.2 Category A craft need not be divided into zones.

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

6.1.2 Ventilation of Spaces

Each safe zone in the public spaces shall be served by a ventilation system independent of the ventilation system of any other zone. The ventilation fans of each zone in the public spaces shall also be capable of being independently controlled from a continuously manned control station.

6.1.3 Fixed Sprinkler System

6.1.3.1 Public spaces and service spaces, crew accommodation areas where sleeping berths are provided, storage rooms other than those containing flammable liquids, and similar spaces shall be protected by a fixed sprinkler system complying with requirements of 3,4¹⁾. A stairway open at one deck shall be considered part

¹⁾ Refer to the *Standards for fixed sprinkler systems for high-speed craft*, adopted by IMO by resolution MSC.44(65), as may be amended.

of the space to which it is open, and consequently, shall be protected by a sprinkler system intended for the space. Manually operated sprinkler systems shall be divided into sections of appropriate size and the valves for each section, start of sprinkler pump(s) and alarms shall be capable of being operated from two spaces separated as widely as possible, one of which shall be a continuously manned control station. In category B craft, no section of the system shall serve more than one of the zones required in 6.1.1.

6.1.3.2 Service manual of the system shall be displayed at each fire control station, referred to in 6.1.3.1. Suitable arrangements shall be made for the drainage of water discharged when the system is activated.

6.1.3.3 Category A craft need not be provided with the sprinkler system complying with the requirements of 6.1.3.1 and 6.1.3.2, providing that:

- smoking is not permitted onboard the craft;
- sales shops, galleys, service spaces, ro-ro spaces and cargo spaces are not fitted in the craft;
- the voyage duration at 90% of maximum speed from departure port to destination when fully loaded does not exceed 2 h.

6.2 Cargo Craft

6.2.1 Control Stations

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

6.2.2 Cargo Spaces

Cargo spaces, except open deck areas or refrigerated holds, shall be provided with an approved fire detection and alarm system, provided with smoke detectors, complying with 4.1, to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations and shall be protected by an approved fixed gas fire-extinguishing system, complying with 3.3 operable from the control station.

6.2.3 Fixed Sprinkler System

6.2.3.1 Crew accommodation where sleeping berths are provided, having a total deck area greater than 50 m² (including corridors serving such accommodation), shall be protected by a fixed sprinkler system complying with requirements of 3.4.

6.2.3.2 Service manual of the system shall be displayed at each fire control station, intended for the system operation. Suitable arrangements shall be made for the drainage of water discharged when the system is activated.

6.3 Craft for the Carriage of Dangerous Goods

6.3.1 General

6.3.1.1 In addition to complying with the requirements of 6.2.2 for cargo craft and with the requirements of 2.12 for both passenger and cargo craft as appropriate, craft types and cargo spaces referred to in 6.3.1.2 intended for the carriage of dangerous goods shall comply with the requirements of this paragraph, as appropriate, except when carrying dangerous goods in limited quantities¹⁾, unless such requirements have already been met by compliance with the requirements elsewhere in this subchapter. The types of craft and modes of carriage of dangerous goods are referred to in 6.3.1.2 and in table 6.3.1-1, where the numbers appearing in 6.3.1.2 are referred to in the top line.

Cargo craft of less than 500 gross tonnage constructed on or after 1 July 2002 shall comply with this paragraph, but the Administration of the State whose flag the craft is entitled to fly may, in consultation with the base port State, reduce the requirements and such reduced requirements shall be recorded in the document of compliance referred to in 6.3.1.4.

Craft constructed on or after 1 July 2002 but before 1 January 2011, with cargo spaces intended for the carriage of packaged dangerous goods, shall comply with 6.3.1.3, except when carrying dangerous

¹⁾ Refer to *IMDG Code*, Chapter 3.4.

goods specified as classes 6.2 and 7 and dangerous goods in limited quantities¹⁾ and excepted quantities²⁾, in accordance with tables 6.3.1-1 and 6.3.1-3, not later than the date of the first renewal survey on or after 1 January 2011.

6.3.1.2 Application of tables 6.3.1-1 i 6.3.1-2 for the type of craft and cargo space

For the given craft or cargo space, defined as below, respective column of tables 6.3.1-1 and 6.3.1-2, shall be applied.

- .1 craft and cargo spaces not specifically designed for the carriage of freight containers but intended for the carriage of dangerous goods in packaged form including goods in freight containers and portable tanks;
- .2 purpose-built container craft and cargo spaces intended for the carriage of dangerous goods in freight containers and portable tanks. In this context, a purpose built container space is a cargo space fitted with cell guides for stowage and securing of containers.
- .3 ro-ro craft and ro-ro spaces, including special category spaces, intended for the carriage of dangerous goods;
- .4 craft and cargo spaces intended for the carriage of solid dangerous goods in bulk.

6.3.1.3 Detailed Requirements

Unless otherwise specified, the following requirements shall govern the application of tables 6.3.1-1, 6.3.1-2 and 6.3.1-3 to both "on deck" and "under deck" stowage of dangerous goods. The numbers of the following sub-sections are indicated in the first column of the above-mentioned tables. For the purpose of this section, "on deck" shall be taken to mean spaces on the weather deck.

Table 6.3.1-1

Application of the requirements of 6.3.1.3 to different modes of carriage of dangerous goods in craft and cargo spaces

Wherever "x" appears in the table it means that this requirement is applicable to all classes of dangerous goods as given in the appropriate line of table 6.3.1-3, except as indicated by the notes.

Section 6.3.1.2 Section 6.3.1.3	Weather decks (.1 to .4 inclusive)	.1	.2	.3		.4
		Craft and cargo holds not specifically designed	Container cargo spaces	Closed ro-ro spaces	Open ro-ro spaces	Solid dangerous goods in bulk (including cargo of group B of SSBC Code)
6.3.1.3.1.1	X	X	X	X	X	For application of requirements to different classes of dangerous goods, see Table 6.3.1-2.
6.3.1.3.1.2	X	X	X	X	X	
6.3.1.3.1.3	–	X	X	X	X	
6.3.1.3.1.4	–	X	X	X	X	
6.3.1.3.2	–	X	X	X	X	
6.3.1.3.3	–	X	X	X	–	
6.3.1.3.4.1	–	X	X ¹⁾	X	–	
6.3.1.3.4.2	–	X	X ¹⁾	X	–	
6.3.1.3.5	–	X	X	X	–	
6.3.1.3.6.1	X	X	X	X	X	
6.3.1.3.6.2	X	X	X	X	X	
6.3.1.3.7	X	X	–	–	X	
6.3.1.3.8.1	–	X	X	X	–	
6.3.1.3.8.2	–	–	–	X ²⁾	X	
6.3.1.3.9	–	–	–	X	X	
6.3.1.3.10	X	–	–	X	X	

¹⁾ Refer to *IMDG Code*, Chapter 3.4

²⁾ Refer to *IMDG Code*, Chapter 3.5

Notes:

- ¹ For classes 4 and 5.1, not applicable to closed freight containers.
 For classes 2, 3, 6.1 and 8 when carried in closed freight containers, the number of air changes may be reduced to not less than two per hour. For classes 4 and 5.1 (liquids) carried in closed freight containers, the number of air changes may be reduced to not less than two per hour. For the purpose of this requirement, a portable tank is considered a closed freight container.
- ² Applies only to ro-ro spaces, not capable of being sealed.

**Table 6.3.1-2
 Application of the requirements of 6.3.1.3 to different classes of dangerous goods for craft and cargo spaces carrying solid dangerous goods in bulk**

Section \ Class	4.1	4.2	4.3 ³	5.1	6.1	8	9
6.3.1.3.1.1	X	X	–	X	–	–	X
6.3.1.3.1.2	X	X	–	X	–	–	X
6.3.1.3.2	X	X ⁴	X	X ⁵	–	–	X ⁵
6.3.1.3.4.1	–	X ⁴	X	–	–	–	–
6.3.1.3.4.2	X ⁶	X ^{4,7}	X ⁷	X ^{4,6}	–	–	X ^{4,6}
6.3.1.3.4.4	X	X	X	X	X	X	X
6.3.1.3.6	X	X	X	X	X	X	X

Notes:

- ³ The hazards of substances in this class which may be carried in bulk are such that special consideration must be given to the construction and equipment of the craft involved in addition to meeting the requirements enumerated in this Table..
- ⁴ Only applicable to Seedcake containing solvent extractions, to Ammonium nitrate and to Ammonium nitrate fertilizers.
- ⁵ Only applicable to Ammonium nitrate and to Ammonium nitrate fertilizers. However, a degree of protection in accordance with standards contained in the International Electrotechnical Commission *Publication 60079 - Electrical Apparatus for Explosive Gas Atmospheres*, is sufficient.
- ⁶ Only suitable wire mesh guards are required.
- ⁷ For seedcake containing residues of solvent extraction and cargoes of *BC Code* Class 4.3, two separate fans shall be permanently fitted unless portable type fans have been adapted for being securely fitted (e.g., fixed) prior to loading and during the voyage. The ventilation system shall comply with the provisions of 6.3.1.3.4.1 and 6.3.1.3.4.1. Ventilation shall be such that any escaping gases cannot reach public spaces or crew accommodation on or under deck.

Table 6.3.1-3
Application of the requirements of 6.3.1.3 to different classes of dangerous goods carried in packaged form

Section \ Class	Class																							
	1.1-1.6 ⁹	1.4S	2.1	2.2	2.3 flammable ⁷	2.3 non-flammable	3 FP ¹² < 23°C	3 23°C ≤ FP ¹⁵ ≤ 60°C	4.1.	4.2	4.3 liquids ¹⁸	4.3 solids	5.1 ¹⁰	5.2 ¹³	6.1 liquids FP ¹² < 23°C	6.1 liquids FP ¹⁵ ≥ 23°C ≤ 60°C	6.1 liquids	6.1 solids	8 liquids FP ¹² < 23°C	8 liquids FP ¹⁵ ≥ 23°C ≤ 60°C	8 liquids	8 solids	9	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
6.3.1.3.1.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
6.3.1.3.1.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	-	
6.3.1.3.1.3	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6.3.1.3.1.4	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6.3.1.3.2	X	-	X	-	X	-	X	-	-	-	X ¹⁵	-	-	-	X	-	-	-	X	-	-	-	X ¹⁴	
6.3.1.3.3	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-	
6.3.1.3.4.1	-	-	X	-	-	X	X	-	X ⁸	X ⁸	X	X	X ⁸	-	X	X	-	X ⁸	X	X	-	-	X ⁸	
6.3.1.3.4.2	-	-	X	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	X	X	-	-	X ¹⁴	
6.3.1.3.5	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	X	X	-	X	X ¹⁶	X ¹⁶	-	-	
6.3.1.3.6	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
6.3.1.3.7	-	-	-	-	-	-	X	X	X	X	X	X	X	-	X	X	-	-	X	X	-	-	-	
6.3.1.3.8	X ⁹	X	X	X	X	X	X	X	X	X	X	X	X ¹⁰	X	X	X	X	X	X	X	X	X	X	
6.3.1.3.9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
6.3.1.3.10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Notes:

- ⁸ When mechanically-ventilated spaces are required by the *IMDG Code*.
- ⁹ Stow 3 m horizontally away from the machinery space boundaries in all cases.
- ¹⁰ Refer to the *IMDG Code*.
- ¹¹ As appropriate for the goods to be carried.
- ¹² FP means flashpoint.
- ¹³ Under the provisions of the *IMDG Code*, stowage of class 5.2 dangerous goods under deck or in enclosed ro-ro spaces is prohibited.
- ¹⁴ Only applicable to dangerous goods evolving flammable vapour listed in the *IMDG Code*.
- ¹⁵ Only applicable to dangerous goods having a flashpoint less than 23°C listed in the *IMDG Code*.
- ¹⁶ Only applicable to dangerous goods having a subsidiary risk class 6.1.
- ¹⁷ Under the provisions of the *IMDG Code*, stowage of class 2.3 having subsidiary risk class 2.1 under deck or in enclosed ro-ro spaces is prohibited.
- ¹⁸ Under the provisions of the *IMDG Code*, stowage of class 4.3 liquids having a flashpoint less than 23°C under deck or in enclosed ro-ro spaces is prohibited.

6.3.1.3.1 Water Supplies

6.3.1.3.1.1 Arrangements shall be made to ensure immediate availability of water supply from the fire main at the required pressure either by permanent pressurization and automatic start of fire pump or by remote starting arrangements for the fire pumps placed in control station.

6.3.1.3.1.2 The quantity of water delivered shall be sufficient for simultaneous supplying four nozzles of a size and at a pressure as specified in 3.2, capable of being delivered on any part of the cargo space when empty. This requirements shall be met by the total capacity of the main fire pump(s) not including the capacity of the emergency fire pump, if fitted. This amount of water may be applied by equivalent means to the satisfaction of PRS.

6.3.1.3.1.3 Means of effectively cooling the designated under deck cargo space with water at not less than 5 l/min/m² of the horizontal area of cargo spaces, either by a fixed arrangement of spraying nozzles, or flooding the space with water, shall be provided. Fire hoses with nozzles, connected to hydrants, may be used for this purpose in small cargo spaces and in small areas of larger cargo-spaces after agreeing it with PRS. In any event, the drainage and pumping arrangements shall comply with the requirements of 2.12.6 and be such as to prevent the build-up of free surfaces. If this is not possible, the adverse effect upon stability of the added weight and free surface of water shall be taken into account.

6.3.1.3.1.4 Provision to flood a designated under deck cargo space with suitable specified media may be substituted for cooling by means of water spraying or flooding¹⁾.

6.3.1.3.1.5 The requirements of 6.3.1.3.1.1 to 6.3.1.3.1.4 concerning water supply, may be fulfilled by a water spray system complying with requirements of 3.5, provided that the amount of water required for fire-fighting purposes in the largest cargo space allows simultaneous use of the water spray system plus four jets of water from hose nozzles, of size and at required pressure, in accordance with 3.2.

6.3.1.3.1.6 Each craft carrying dangerous goods shall be provided with three fire hoses and nozzles complying with 3.2.6 and 3.2.7.

6.3.1.3.2 Sources of Ignition

Electrical equipment and wiring shall not be fitted in enclosed cargo spaces or on vehicle decks, unless it is essential for operational purposes. However, if electrical equipment is fitted in such spaces, it shall be of a certified safe type for use in the dangerous environments to which it may be exposed²⁾, unless it is possible to completely isolate the electrical system (e.g. by removal of links in the system, other than fuses). Cable penetrations of the decks and bulkheads shall be sealed against the passage of

¹⁾ A high expansion foam system, complying with MSC.1/Circ.1384, is acceptable except if cargoes react dangerously with water (see the *IMDG Code*).

²⁾ Refer to *Publication IEC 92-506 – Electrical installations in ships Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk* and *Publication IEC 79 - Electrical apparatus for explosive gas atmospheres*

gas or vapour. Through runs of cables and cables within the cargo spaces shall be protected against mechanical damage. Any other equipment which may constitute a source of ignition of flammable vapour shall not be permitted.

6.3.1.3.3 Fire detection and alarm system

Enclosed cargo spaces shall be provided with an approved automatic fire detection and alarm system provided with smoke detectors, complying with 4.1 or with such a fire detection system which gives equivalent protection.

6.3.1.3.4 Ventilation

6.3.1.3.4.1 Adequate power ventilation shall be provided in enclosed cargo spaces. The arrangement shall be such as to provide for at least six air changes per hour in the cargo space based on an empty space and for removal of vapours from the upper or lower parts of the space, as appropriate.

6.3.1.3.4.2 The fans shall be such as to avoid the possibility of ignition of flammable gas air mixtures. Exhaust fans shall be of non-sparking type. Suitable wire mesh guards of a size of 13mm x 13mm shall be fitted over inlet and outlet ventilation openings to prevent foreign objects from entering into the fan casing.

6.3.1.3.4.3 If adjacent spaces are not separated from cargo spaces by gastight bulkheads or decks, ventilation requirements shall apply to the adjacent spaces as for the cargo space itself.

6.3.1.3.4.4 Natural ventilation shall be provided in enclosed spaces intended for the carriage of solid dangerous goods in bulk, where there is no provision for mechanical ventilation.

6.3.1.3.4.5 For container open-deck craft, power ventilation is required only for the lower part of the cargo hold for which purpose-built ducting is required. The ventilation rate shall be at least two air changes per hour based on the empty hold volume below the weather deck.

6.3.1.3.5 Bilge System

Where it is intended to carry flammable or toxic liquids in enclosed spaces, the bilge pumping shall be so designed as to protect against inadvertent pumping of such liquids through machinery spaces piping or pumps. Where large quantities of such liquids are carried, additional means of draining those spaces shall be provided, as follows:

- .1** if the bilge drainage system for cargo spaces is additional to the system served by pumps in the machinery space, the capacity of the system shall be not less than 10 m³/h per cargo space served. If the additional system is a common system, the capacity need not exceed 25 m³/h. The additional bilge system need not be arranged with redundancy. Whenever flammable or toxic liquids are carried, the bilge line shall be isolated from the machinery space either by fitting a blank flange or by a closed lockable isolating valve;
- .2** if bilge drainage of cargo spaces is arranged by gravity drainage, the drainage shall be either lead directly overboard or to a closed drain tank located outside the machinery spaces. The tank shall be provided with vent pipe to a safe location on the open deck;
- .3** enclosed spaces outside machinery spaces containing bilge pumps serving cargo spaces intended for the carriage of flammable or toxic liquids shall be fitted with separate mechanical ventilation giving at least six air changes per hour. Electrical equipment in the space shall be of certified safe type¹⁾. If the space has access from another enclosed space, the door shall be self-closing; and
- .4** drainage from a cargo space into bilge wells in a lower space is only permitted if that space satisfies the same requirements as the cargo space above.

¹⁾ Refer to *Publication IEC 92-506 – Electrical installations in ships Part 506: Special features – Ships carrying specific dangerous goods and materials hazardous only in bulk* and *Publication IEC 79 - Electrical apparatus for explosive gas atmospheres*.

6.3.1.3.6 Personnel Protection

6.3.1.3.6.1 The craft shall be provided with four sets of chemical protective clothing, in addition to the required fire-fighter's outfits. The chemical protective clothing shall cover all skin so that no part of the body is unprotected. The chemical protective clothing shall be selected taking account of the hazards related to the carried cargoes (chemicals) and IMO-developed standards for the particular classes of cargo and physical condition.

6.3.1.3.6.2 The craft shall be provided with at least two additional self-contained breathing apparatus in accordance with the requirements specified in 5.3.6.2. For each of the breathing apparatus, two complete sets of air bottles shall be provided, in addition to the spare bottles required for fireman's outfit.

6.3.1.3.7 Portable Fire-Extinguishers

The cargo spaces shall be provided with portable fire-extinguishers with a total capacity of at least 12 kg of dry powder or equivalent (e.g. two 6 kg dry powder extinguishers), located at the entrance to these spaces. These extinguishers shall be in addition to any portable fire-extinguishers required by this *Part* of the *Rules*.

6.3.1.3.8 Fixed Fire-Extinguishing System

6.3.1.3.8.1 Cargo spaces, except for open decks, shall be provided with an approved type fixed gas fire extinguishing system complying with the provisions of 3.3. For solid mass dangerous cargoes carried in bulk for which the fixed fire-extinguishing system is ineffective, other fire extinguishing system which gives equivalent protection for the cargo carried shall be provided. It may be water spraying system of a water delivery rate at least 5 l/min per m² of cargo space floor area.

Delivery of 4 jets of water may be accepted as sufficient for the protection of cargo for which the gas fire-extinguishing system is inefficient.

For the list of solid mass dangerous cargoes carried in bulk for which the gas fire-extinguishing system is inefficient, and for which other fire-extinguishing system, providing equivalent protection, shall be applied – refer to Annex to MSC.1/Circ.1395, Table 2.

6.3.1.3.8.2 Each open ro-ro space having a deck above it and each ro-ro space not capable of being sealed shall be fitted with an approved fixed pressure water-spraying system¹⁾ for manual operation which shall protect all parts of any deck and vehicle platform in such space. The use of any other fixed fire-extinguishing system may be permitted that has been shown by full-scale test, during simulation of burning petrol in the space, to be no less effective in fire-fighting for the space. In any event the drainage and pumping arrangements shall comply with the requirements of 2.12.6 and shall be such as to prevent the build-up of free water surfaces. If this is not possible, the adverse effect upon stability of the added weight and free surface of water shall be taken into account and calculations shall be submitted to confirm that the craft after flooding the cargo space complies with stability and subdivision requirements.

6.3.1.3.9 Separation Between Ro-ro Spaces and Open Ro-ro Spaces

A separation shall be provided between a ro-ro space and an adjacent open ro-ro space. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces. Alternatively, such separation need not be provided if both spaces fully comply with the requirements for ro-ro spaces in this *Part* of the *Rules*.

6.3.1.3.10 Separation Between Ro-ro Spaces and Weather Decks

A separation shall be provided between a ro-ro space and the adjacent weather deck. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces. Alternatively, a separation need not be provided if the ro-ro space fully complies with the requirements

¹⁾ Refer to MSC.1/Circ.1430 – Revised Guidelines for the design and approval of fixed water-based fire-fighting systems for ro-ro spaces and special category spaces.

for ro-ro spaces in this *Part* of the *Rules*. However, a separation is always required when dangerous goods carried shall be loaded on the weather deck only.

6.3.1.4 Document of Compliance

An appropriate document¹⁾ as evidence of compliance of craft construction and equipment with the requirements of this *Part* and *HSSC Code* shall be placed onboard

6.4 Ro-Ro Craft – Mark RO-RO

Fire protection of ro-ro spaces and special category spaces shall comply with the requirements of 2.12.

6.5 Vessels Designed to Transport Offshore Support Personnel – Mark CREW BOAT

6.5.1 Water Fire Mains

6.5.2 All craft shall be provided with minimum one main fire pump, whose capacity shall be at least 25 m³/h, ensuring pressure at hydrants of a minimum 0.27 MPa with any two hydrants in simultaneous operation.

6.5.3 Craft with an overall length of more than 40 m, or where the main fire pump is installed in a machinery space not protected by a fixed gas fire extinguishing system, shall be fitted with an emergency fire pump with minimum capacity of 15 m³/h.

6.5.4 Fixed Sprinkler System

The sprinkler system in crew and passenger accommodation spaces, irrespective of their size, is not required.

6.5.5 Fire Protection of Machinery Spaces

6.5.5.1 Main propulsion machinery rooms need not be fitted with TV camera.

6.5.5.2 For fixed gas fire-extinguishing systems in machinery spaces, remote control from the control station is not required provided local manual control is in a safe and readily available position.

6.5.5.3 The quantity of gas required for one discharge is accepted as being sufficient where gas is used as the extinguishing medium in the fixed gas fire-extinguishing system.

6.5.6 Fire Protection of Galleys

Fixed fire-extinguishing systems for deep fat cooking equipment and galley ducts are not required.

6.5.7 Fireman's Outfit

The fireman's outfit is not required.

6.6 Craft with Unattended Machinery Space

6.6.1 Water Fire Main System

On all craft adapted for unattended operation of 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 fire pumps from the operating compartment, or permanent pressurisation of the fire main system by one of the main fire pumps.

6.6.2 Fixed Fire Detection and Alarm System in Machinery Spaces

6.6.2.1 The fire-detection system shall 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

¹⁾ Refer to *Document of compliance with the special requirements for ships carrying dangerous goods under the provisions of regulation II-2/19 of the 1974 SOLAS Convention, as amended, and of paragraph 7.17 of the 2000 HSC Code, as amended.*

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 shall not be permitted. The detection system shall initiate audible and visual alarms distinct 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 shall sound in a place where a responsible member of the crew is on duty.

6.6.2.2 After installation, the system shall be tested under varying conditions of engine operation and ventilation.

6.7 Craft with Ice Class – Mark (L4), Lm1 and Lm2

6.7.1 General

Components of the fire-fighting systems and other fire protection equipment which may be exposed to negative temperatures and freezing which could interfere with the proper functioning of that component, shall be adequately protected.

6.7.2 Escape Routes

Any stairways, ladders and external platforms installed on escape routes leading from accommodation and service spaces to assembly stations and to life-saving equipment, exposed to negative temperatures shall be so arranged or protected that they can be safely used in icing or snow cover conditions.

6.7.3 Water Fire Extinguishing Systems

6.7.3.1 At least one of the water fire main system pumps and each pump serving other water fire-extinguishing systems, required in the present *Part* of the *Rules*, shall be connected to a bottom/side sea chest, fulfilling the requirements for ice chest, as given in 22.2.11 of *Part VI – Machinery Installations and Refrigerating Plants* of the *Rules for the Classification and Construction of Sea-going Ships*.

6.7.3.2 Fire pumps shall be installed in heated compartments and in any event shall be adequately protected from freezing for minimum temperature for the intended voyage.

6.7.3.3 Hydrants positioned on open decks shall be installed in boxes to protect them against being flooded when operated and freezing. Each hydrant shall be equipped with an efficient two-handed valve handle.

6.7.4 Fixed Gas Fire-Extinguishing Systems

6.7.4.1 The fixed gas fire-extinguishing systems shall be so designed or positioned that their operation efficiency is not impaired by ice or snow accumulation or low temperature.

6.7.4.2 Closing arrangements for openings of the spaces protected by gas fire-extinguishing systems which may be subjected to low temperatures and freezing shall be protected adequately.

6.7.4.3 Precautions shall be taken to prevent fire-extinguishing medium pipings, isolating valves and nozzles of any fire-extinguishing system located in spaces to be subject to negative temperatures from becoming clogged by ice build up or freezing.

6.7.4.4 Open air external terminals of relief valves and safety valves of the fire-extinguishing medium piping and tanks shall be adequately protected from becoming clogged due to freezing or snow accumulation.

6.7.5 Fire-Fighting Equipment

Foam fire-extinguishers shall not be located in any positions that are exposed to freezing temperatures.

SUPPLEMENT – RETROACTIVE REQUIREMENTS

1 APPLICATION

1.1 The requirements specified in the present *Supplement* apply to existing craft, irrespective of their construction date.

1.2 Compliance with the applicable retroactive requirements is confirmed by PRS' Surveyor in the report on the nearest ship survey, to be carried out after the requirements compliance date.

2 REQUIREMENTS

2.1 Halon Fire-Extinguishing Systems, Halon Extinguishers

2.1.1 In accordance with *Regulation (EC) No. 1005/2009 of the European Parliament and of the Council, of 16 September 2009 on substances that deplete the ozone layer*, on existing craft flying the flag of the European Union Member State, fixed halon fire-extinguishing systems containing such halons as: 1211, 1301 and 2402, considered as controlled substances listed in Annex I (group III) to this *Regulation*, are prohibited. Also portable fire-extinguishers containing the above-mentioned halons are prohibited onboard.

2.1.2 If an existing craft carries a halon system, such a system shall be dismantled and halon shall be recovered in order to be destroyed, recycled or reclaimed by a service station approved by the Flag State Administration for conformity with the environmental protection rules. The dismantled halon system shall be replaced by gas fire-extinguishing system, complying with the requirements specified in sub-chapter 3.3 of this *Part* of the *Rules*. Portable fire-extinguishers containing the above-mentioned halons shall be replaced by other approved fire-extinguishers, complying with 1.3 of this *Part V* of the *Rules*.

2.1.3 Documentation of a new fire-extinguishing system is subject to approval by the PRS Head Office. After installation on board, the system shall be accepted and tested under PRS Surveyor's supervision.

List of IMO documents referred to in Part V of the Rules

IMO Assembly Resolutions

1. A.753(18): Guidelines for the Application of Plastic Pipes on Ships, as amended by MSC.313(88).
2. A.800(19): Revised guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS regulation II-2/12
3. A.952(23): Graphical Symbols for Shipboard Fire Control Plans.
4. MSC.40(64): Standard for qualifying marine materials for high-speed craft as fire-restricting materials.
5. MSC.44(65): Standards for fixed sprinkler systems for high-speed craft.
6. MSC.45(65): Test procedures for fire resisting divisions of high-speed craft.
7. MSC.90(71): Amendments to the standard for qualifying marine materials for high-speed craft as fire-restricting materials (resolution MSC.40(64)).
8. MSC.97(73): International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code).
9. MSC.222(82) – Adoption of amendments to The International Code of Safety for High-Speed Craft, 2000.
10. MSC.265(84): Amendments to the revised guidelines for approval of sprinkler systems equivalent to that referred to in SOLAS Regulation II-2/12 (Resolution A.800(19)).
11. MSC.271(85) – Adoption of Amendments to the International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code).
12. MSC.313(88) – Amendments to the Guidelines for the Application of Plastic Pipes on Ships (Res. A.753(18)).

MSC Circulars

1. MSC/Circ.848: Revised guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms.
2. MSC/Circ.911: Interpretations of fire protection-related provisions of the HSC Code.
3. MSC/Circ.911/Add.1: Addendum to the Interpretations of fire protection-related provisions of the HSC Code.
4. MSC/Circ.912: Interpretations of standards for fixed sprinkler systems for high-speed craft (Resolution MSC.44(65)).
5. MSC/Circ.1102: Interpretations of the 2000 HSC Code and SOLAS Chapter X.
6. MSC/Circ.1165: Revised guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms.
7. MSC.1/Circ.1166: Guidelines for a simplified evacuation analysis for high-speed passenger craft (This circular supersedes MSC/Circ.1001).
8. MSC.1/Circ.1237: Amendments to the revised guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC/Circ.1165).
9. MSC.1/Circ.1266: Carriage of dangerous goods. Document of compliance with the special requirements for ships carrying dangerous goods under the provisions of regulation II-2/19 of the 1974 SOLAS Convention, as amended, and of paragraph 7.17 of the 2000 HSC Code, as amended.
10. MSC.1/Circ.1267: Amendments to the revised guidelines for the approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms (MSC/Circ.848).
11. MSC.1/Circ.1269: Amendments to the revised guidelines for the approval of equivalent water-based fire-extinguishing systems for machinery spaces and cargo pump-rooms (MSC.1/Circ.1165).
12. MSC.1/Circ.1395: List of solid bulk cargoes for which a fixed gas fire-extinguishing system may be exempted or for which a fixed gas fire-extinguishing system is ineffective.
13. MSC.1/Circ.1430: Revised guidelines for the design and approval of fixed water-based fire-extinguishing systems for ro-ro spaces and special category spaces.
14. MSC.1/Circ.1457: Unified Interpretations of the 2000 HSC Code, as amended by resolutions MSC.175(79) and MSC.222(82).