

Polski Rejestr Statków

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF NAVAL SHIPS

PART V FIRE PROTECTION

2008



GDAŃSK

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF NAVAL SHIPS

prepared and edited by Polski Rejestr Statków, hereinafter referred to as PRS, consist of the following Parts:

- Part I – Classification Regulations
- Part II – Hull
- Part III – Hull Equipment
- Part IV – Stability and Subdivision
- Part V – Fire Protection
- Part VI – Machinery Installations and Refrigerating Plants
- Part VII – Machinery, Boilers and Pressure Vessels
- Part VIII – Electrical Installations and Control Systems
- Part X – Statutory Equipment.

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

Part V – Fire Protection – 2008 was approved by the PRS Board on 24 June 2008 and enters into force on 1 August 2008.

From the entry into force, the requirements of *Part V – Fire Protection – 2008* apply to:

- new naval ships, the building contract for which will be signed on or after 1 August 2008 – within the full scope,
- existing naval ships, in accordance with principles specified in *Part I – Classification Regulations*.

The requirements of *Part V – Fire Protection – 2008* are extended by the below-listed PRS Publications:

Publication No. 51/P – Procedural Requirements for Service Suppliers.

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PRS/AW, 04/2010

ISBN 978-83-7664-030-3

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1 GENERAL

1.1 Application

1.1.1 *Part V – Fire Protection* applies to the structural fire protection, fire-extinguishing systems, fire alarm systems, as well as to the arrangement of fire-fighting equipment in naval ships specified in paragraph 1.1.1, *Part I – Classification Regulations*.

1.1.2 The requirements of Chapters 1 to 7 are the basic requirements for all types of naval ships. Special purpose naval ships shall also comply with additional requirements set forth in Chapter 8.

1.2 Definitions

1.2.1 The definitions relating to the general terminology of the *Rules for the Classification and Construction of Naval Ships* (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.

1.2.2 For the purpose of *Part V*, the following abbreviations of ship spaces names have been introduced (definitions of the abbreviations are given in 1.2.3):

CCS	– Central Control Station
SCC	– Ship Control Centre
MFFS	– Main Fire-Fighting Station
HFFS	– Harbour Fire-Fighting Station
CS	– Combat Station
CIC	– Combat Information Centre
ASFCS	– Ammunition Store Fire Control Centre
DCS	– Damage Control Station
FS	– Fire Station
ASCS	– Auxiliary Ship Control Station
AFFS	– Auxiliary Fire-Fighting Station

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

- .1** Central Control Station (**CCS**) – an enclosed space which contains: a central control station of main engines and auxiliary machinery, controllable pitch propellers and thrusters, control devices, instrumentation, alarms giving warning of reaching the limits of the permissible assumed parameters, alarms announcing the activation of automatic protection devices and means of communication.
- .2** Continuous B Class ceilings or linings – those B Class ceilings or linings which terminate at A or B Class division.
- .3** Flammable liquids – liquids, liquid mixtures and suspended solids (e.g. paints, varnishes, etc.), which give off flammable vapours having a flash-point not exceeding 60 °C, determined in closed cup test.

- .4 Lower flammable limit – minimum concentration of flammable compound in air (or other oxidizing agent) below which the mixture will not ignite or above which a spontaneous propagation of flame may occur.
- .5 Smothering – filling the protected space with a medium not supporting combustion.
- .6 Surface extinction – cooling, wetting or restricting the access of oxidant to burning surfaces.
- .7 Main fire-resisting division – fire-resisting division forming the boundary of the main vertical zone.
- .8 Main vertical zones – those sections in naval ship into which the hull, superstructures and deckhouses are divided by A Class divisions; the length and width of these sections on any deck shall not exceed 40 m.
- .9 Main Fire-Fighting Station (**MFFS**) – a space or part thereof in which the following control and indicator functions are centralized:
 - fire detection and fire alarm systems;
 - sprinkler systems;
 - fire door indicator panels;
 - fire door closures;
 - watertight door indicator panels;
 - watertight door opening and closing;
 - shutting off ventilation fans;
 - general/fire alarms;
 - communication systems, including telephones and microphones to public address systems.

It is recommended that the main fire-fighting station (**MFFS**) should constitute part of the ship control centre (**SCC**) or be located in a space which has direct communication with the **SCC** and twenty-four hour watch. The main fire-fighting station shall have direct communication (wire or wireless) with central control station (**CCS**).
- .10 Upper flammable limit – maximum concentration of flammable agent in air (or other oxidizing agent) above which the mixture will not ignite.
- .11 Primary deck covering – the covering applied directly on the top of the deck plating, necessary to provide protection or the floor or floor covering adhesion to the deck plating, such as: primary coat, anticorrosive compound or adhesive.
- .12 Group of fires – definition of fire depending on the type of burning material. The fires are subdivided into the following groups:
 - Group A – fires of solid, mainly organic materials (e.g. wood, paper, textile materials, etc.) which, when burning, involve also the phenomenon of glowing;
 - Group B – fires of flammable liquids or melting materials;
 - Group C – fires of gaseous materials;
 - Group D – fires of light metals and light metal alloys (e.g. magnesium, sodium, aluminium, etc.).

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- .13 Fire-extinguishing systems** – active systems, intended to supply fire-extinguishing medium to the spaces protected, structurally fixed to the ship’s hull and activated from outside the protected spaces.
 - .14 Water screen system** – system which supplies water to vertical surfaces of bulkheads and exit trunks in order to protect them against the effects of fire. The system is also used for creating a narrow space filled with water droplets (water screen) in order to prevent the fire expansion. The system is activated manually from outside the protected spaces. Water screen system may also constitute an element of the ship’s wash down system as countermeasure against weapons of mass destruction.
 - .15 Foam fire-extinguishing system** – systems in which fire is suppressed by discharging foam over protected area or into a protected space. Depending on the expansion ratio, the following types of foam systems are distinguished:

 - low-expansion foam fire-extinguishing system – with foam expansion ratio not exceeding 20;
 - medium-expansion foam fire-extinguishing system – with foam expansion ratio greater than 20, but not exceeding 200;
 - high-expansion foam fire-extinguishing system – with foam expansion ratio exceeding 200.
 - .16 Sprinkler system** – fire-detecting and extinguishing system fitted with sprinkler sensors, activated by high temperature, starting automatically the supply of sprayed water by sprinklers in the area of the detected fire and actuating the alarm system. The system is intended for extinction of fires in accommodation spaces, service spaces or public spaces where people may be present.
 - .17 Water-spraying fire-extinguishing system** – manually or automatically controlled fire-extinguishing system where water is supplied by spraying nozzles installed in the protected space or in the region of the protected machinery. The system is intended for extinction of fires in cargo spaces, machinery spaces, store-rooms and locally for the protection of machinery or areas of high fire and/or explosion risk.
 - .18 Fire signalling systems** – systems intended for detecting the fire symptoms, i.e. smoke, temperature, flame or change in atmospheric conditions, as well as warning systems, which signal activation of the smothering system. Depending on the application, fire signalling systems are divided into:

 - fire detection and fire alarm system – a system designed for detecting the fire symptoms and transmitting, after automatic activation, the alarm signal to **MFFS**, **AFFS** and **CCS**. The manually operated call points are also the integral part of this system;
 - warning system – a system transmitting the warning signal to persons present in the protected space that the smothering system is on the point of being put into action and that they shall leave the space.

- .19 *FSS Code – International Code for Fire Safety Systems*, as adopted by IMO Resolution MSC.98(73) of 5 December 2000, with amendments.
- .20 *FTP Code – International Code for Application of Fire Test Procedures*, as adopted by IMO Resolution MSC.61(67) of 5 December 1996, with amendments.
- .21 Composite polymer (GRP laminate) – glass fibre reinforced plastic laminate.
- .22 Structural fire protection – all passive means of fire protection intended for:
 - preventing the fire hazard;
 - confining the expansion of fire and smoke on the ship;
 - ensuring safe evacuation of personnel from individual spaces and from the ship, as well as effective extinction of fire.
- .23 Helideck – a helicopter landing area located on the ship, including all structure, fire-fighting appliances and other equipment necessary for the safe parking and operation of the helicopters.
- .24 Expansion ratio – the ratio of the foam volume to the volume of solution from which the foam is produced.
- .25 Store-rooms – spaces such as:
 - rooms for explosives, intended for the storage of materials of explosive nature, such as: ammunition stores, warfare agents rooms, ammunition parks and rooms for pyrotechnic signalling means;
 - rooms for readily ignitable materials, intended for the storage of flammable solids and flammable liquids, such as: paint and flammable liquids rooms, compressed flammable gas rooms, garbage rooms, fuel filling and distribution spaces;
 - rooms for the storage of combustible materials, such as: boatswain’s stores, carpenter shops, ship’s archives and office rooms, mail rooms, rooms for Navy uniforms and protective clothing, laundries and drying rooms;
 - rooms for the storage of non-combustible materials, such as: spare parts rooms, stores of mechanical and electrical workshops outside the machinery spaces.
- .26 Dangerous materials (goods) – materials belonging to one of the following classes:
 - Class 1 – explosives (sub-classes 1.1, 1.2, 1.3, 1.4, 1.5 and 1.6);
 - Class 2 – gases: compressed, liquefied and dissolved under pressure (sub-classes: 2.1 – flammable gases, 2.2 – non-flammable and non-toxic gases, 2.3 – toxic flammable and non-flammable 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 – poisonous (toxic) substances;
- Class 6.2 – infectious substances;
- Class 7 – radioactive materials;
- Class 8 – caustic and corrosive substances;
- Class 9 – miscellaneous dangerous materials.

Note: For detailed definitions of dangerous goods, see *International Maritime Dangerous Goods (IMDG) Code*.

- .27** **Readily ignitable materials** – solid materials capable of forming explosive dust-and-air mixtures, as well as any combustible dry and fibrous materials, such as cotton, cotton wool, soot, etc.
- .28** **Non-combustible material** – a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to 750 °C. The material properties shall be determined by test in accordance with the *FTP Code*, Annex 1, Part 1. Any other material is a combustible material.
- .29** **Steel equivalent material** – any non-combustible material which, by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of applicable exposure to the standard fire test (e.g. aluminium alloy with appropriate insulation or composite material); the material shall be subjected to test according to IMO MSC/Circ.732.
- .30** **Low flame-spread (LFS) material** – material, the surface of which will adequately restrict the spread of flame. The material properties shall be determined by test in accordance with the *FTP Code*, Annex 1, Part 5.
- .31** **Bulkhead deck** – the uppermost deck to which the main watertight bulkheads, dividing the ship into compartments, are carried.
- .32** **Flame retardant deck finish materials** – primary deck coverings made of material which does not ignite easily and is not capable of producing excessive quantities of smoke and to give rise to toxic, as well as explosion hazards at elevated temperatures. The material properties shall be determined by test in accordance with the *FTP Code*, Annex 1, Part 6.
- .33** **Protected spaces** – spaces fitted with at least one fixed fire-extinguishing system or spaces fitted with fire detection and fire alarm system.
- .34** **Cargo spaces** – all spaces used for cargo, including dry cargo holds, cargo tanks (fuel oil, oils or water tanks), as well as spaces intended for the carriage of military vehicles.
- .35** **Accommodation spaces** – spaces such as crew and specialists cabins, public spaces, corridors, sanitary spaces, offices, first aid rooms, pantries containing no cooking appliances.
- .36** **Public spaces** – those portions of accommodation spaces which are used for halls, dining rooms, recreation rooms/lounges and similar permanently enclosed spaces.

- .37 Sanitary and similar spaces – toilets, washrooms, showers, bathrooms, cloakrooms, as well as spaces intended for deactivation and disinfection treatment.
- .38 Service spaces – spaces used for galleys, pantries containing cooking appliances, lockers, mail and specie rooms, store-rooms, workshops other than those forming part of the machinery spaces, as well as office service rooms, duty rooms, spaces in which combat stations are located, as well as spaces containing command and control systems (e.g. ship armament and positioning equipment).
- .39 Fire hazardous spaces – spaces containing combustible materials or which may provide a source of ignition.
- .40 Explosion hazardous spaces – spaces containing class 1, 2, 3, 4 and 5 dangerous materials.
- .41 Closed circuit equipment spaces – spaces or locations intended exclusively for electric equipment, accessible only to the authorized personnel.
- .42 Rooms containing furniture and furnishings of restricted fire risk – those rooms, whether cabins, public spaces, offices or other types of accommodation, in which:
 - case furniture, such as desks, wardrobes, cupboards, etc., is constructed entirely of approved non-combustible materials, except that a combustible veneer not exceeding 2 mm may be used on the working surface of such articles;
 - free-standing furniture, such as chairs, sofas, tables is constructed with frames of non-combustible materials;
 - draperies, curtains and other suspended textile materials have qualities of resistance to the ignition and propagation of flame, not inferior to those of wool of mass of 0.8 kg/m^2 , this being determined in accordance with the *FTP Code*, Annex 1, Part 7;
 - floor coverings have low flame-spread characteristics;
 - the exposed surfaces of walls, linings and ceilings have low flame-spread characteristics;
 - the upholstered furniture has satisfactory qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the *FTP Code*, Annex 1, Part 8;
 - the bedding components have qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the *FTP Code*, Annex 1, Part 9.
- .43 Special personnel – all persons who are not members of the crew, but are on board in connection with special tasks, e.g. scientific personnel, the personnel of laboratories, workmen, engineering and administrative staff, students and instructors or persons necessary during sea trials, etc.
- .44 Harbour fire-fighting station (**HFFS**) – a space or part thereof in which fire-extinguishing appliances listed in 1.2.3.1, used during the ship

stay in harbour, are located. It is recommended that the harbour fire-fighting station should be located in a space which is provided with twenty-four hour watch and which has communication with **CCS**.

- .45 Machinery spaces of category A** – spaces (including trunks to such spaces) which contain:
- internal combustion machinery used for main propulsion;
 - internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW;
 - oil-fired boilers or other oil-fired appliances, such as inert gas generators, incinerators, etc.
- .46 Machinery spaces** – all machinery spaces of category A and all other spaces containing propulsion machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air-conditioning machinery, and similar spaces and trunks to such spaces.
- .47 Adjacent compartments or spaces** – compartments or spaces which are separated from one another by a bulkhead, deck or other similar structure without openings or with openings having closures. Compartments and spaces separated from one another by structures having openings not fitted with means of closing or openings with closures which may be opened under normal service conditions shall be considered as one single space.
- .48 A Class divisions** – fire-resisting divisions formed by bulkheads, walls or decks which comply with the following criteria:
- they are made of steel or steel equivalent material;
 - they are suitably stiffened;
 - they are insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180 °C above the original temperature, within the time listed below:
 - Class A-60 – 60 min,
 - Class A-30 – 30 min,
 - Class A-15 – 15 min,
 - Class A-0 – 0 min;
 - they are so constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test;
 - the prototype wall or deck structure forming A Class division is subject to test in accordance with the *FTP Code*.
- .49 B Class divisions** – fire-retardant divisions formed by walls, decks, ceilings or linings which comply with the following criteria:
- they are constructed of approved non-combustible materials and all materials used in the construction and erection of these divisions are

non-combustible, with the exception that veneers made of LFS materials may be used;

- they have an insulation value such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 225 °C above the original temperature, within the time listed below:
 - Class B-15 – 15 min,
 - Class B-0 – 0 min;
- they are so constructed as to be capable of preventing the passage of flame to the end of the 30-minute standard fire test;
- the prototype structure forming B Class division is subject to test in accordance with the *FTP Code*.

.50 C Class divisions – divisions constructed of approved non-combustible materials. They need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise. Veneers made of LFS materials are permitted.

Adhesives used in the construction of C Class divisions are not required to be non-combustible; however, they shall have low flame-spread characteristics.

.51 Fire-fighting equipment – portable fire protection equipment, such as: fire hoses, water and foam nozzles, portable and mobile fire-extinguishers, portable foam applicator units, breathing apparatus and personal protection equipment intended for extinction of fire and rescue operations.

.52 Standard fire test – a test in which specimens of the relevant bulk-heads or decks are exposed in a test furnace to temperature corresponding approximately to the standard time–temperature curve. The test methods shall be in accordance with the *FTP Code*.

.53 Fire station (FS) – a space containing fire-extinguishing systems or fire-fighting equipment, or fire signalling system indicators serving the relevant parts of the ship (watertight compartment, main fire division, separate spaces, etc.)

.54 Foam concentrate – the foaming agent for mixing with the appropriate amounts of water to produce finished foam. Foam concentrates are divided into:

- alcohol resistant (AR) foam concentrate – foam concentrate used for extinguishing fires of water-miscible flammable liquids (polar liquids) and fires of other liquids, extinguished by typical foams;
- fluoroprotein (FP) foam concentrate – protein foam concentrate with a surface active fluorochemical additive that allows the foam to be spread quickly across the surface of the burning liquid;
- protein (P) foam concentrate – foam concentrate made mainly from natural hydrolyzed proteins;

- synthetic (S) foam concentrate – foam concentrate based upon synthetic surface activating liquids (generally detergents) with suitable stabilizing agents;
 - aqueous film forming foam (AFFF) concentrate – foam concentrate forming an aqueous film that floats on the surface of hydrocarbons under defined conditions and cutting off the combustion zone, thereby increasing the fire-extinguishing efficiency.
- .55** Flash-point – the minimum temperature in degrees Celsius at which a product will give off enough flammable vapours to be ignited, as determined by an approved flash-point apparatus (closed cup test).
- .56** Self-ignition temperature – the minimum temperature in degrees Celsius at which the self-heating properties of a material lead to ignition.
- .57** Crew of a ship – a group of persons controlling the ship and performing tasks in accordance with the purpose of the ship.
- .58** Auxiliary fire-fighting station (**AFFS**) – a space or part thereof in which fire-fighting appliances, listed in 1.2.3.1, are located. **AFFS** constitutes part of auxiliary ship control station (**ASCS**).

1.3 Scope of Survey

1.3.1 The general survey regulations for construction surveys and surveys of ships during service within the scope of fire protection are given in *Part I – Classification Regulations*.

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

1.3.3 A Class divisions, B Class divisions, non-metal materials used for the ship's structures, insulation materials, as well as the materials used for the internal finish of the ship's spaces, veneers, deck coverings, textile materials and the materials used for furniture manufacture shall have valid Certificate/Certificate of Conformity or Type Approval Certificate, issued by PRS or an authorized body.

1.3.4 Fire-extinguishing systems, fire detection and fire alarm system, as well as fire-fighting equipment shall have valid Certificate/Certificate of Conformity or Type Approval Certificate, issued by PRS or an authorized body within the scope of the requirements specified in particular Chapters of *Part V*.

1.3.5 PRS may give consent to a single acceptance of a structure, material or product to be installed on a given ship subject to tests and acceptance surveys being carried out in accordance with the previously agreed test programme and the issue of the relevant certificate.

1.4 Technical Documentation of Fire Protection

1.4.1 Technical Documentation

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

- .1 Plan of structural fire protection, made on the basis of the general arrangement plan of the ship, indicating the names of compartments and their fire hazards, covering:
 - the arrangement of fire-resisting and fire-retarding divisions, taking into account closures of openings in these divisions;
 - designation of means of escape from all spaces on the ship leading to survival craft;
 - the arrangement of control stations and fire stations;
- .2 Diagrams of fire-extinguishing systems, including the arrangement of piping and equipment;
- .3 Diagrams of fire detection and fire alarm systems, including the location of fire detectors and the arrangement of electrical circuits and equipment;
- .4 Calculations of fire-extinguishing systems;
- .5 Operation instructions of fire-extinguishing systems;
- .6 Plan of low-location lighting and designation of means of escape;
- .7 Fire doors arrangement and control plans;
- .8 The arrangement and control plans of fire dampers in ventilation ducts;
- .9 Tests programmes of fire-extinguishing systems;
- .10 Plans of ship equipment, covering:
 - list of fire-resisting divisions and the materials applied;
 - design of typical penetrations of pipings, cables and ventilation ducts, as well as bulkhead hose connectors (for connecting fire hoses) through fire-resisting divisions;
 - plan of the ship's spaces insulation;
 - plan of ceilings, walls and floor lining;
 - list of furniture, mattresses, suspended textile materials and the bedding components;
 - calculations of the total amount of combustible materials used in accommodation spaces, service spaces and control stations.

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

1.4.2 Fire Control Plan

1.4.2.1 *Fire control plan*, approved by an authorized body and covering the following, shall be kept on board the ship:

- .1 vertical and horizontal fire divisions;
- .2 control stations and fire stations;

- .3 means of escape from all parts and spaces of the ship to lifeboats and survival craft embarkation areas;
- .4 spaces fitted with fire detection and fire alarm systems, as well as the arrangement of: fire detectors, manually operated call points and control panels;
- .5 spaces protected by fixed fire-extinguishing systems and the arrangement of: fire-extinguishing medium containers, fire pumps, water and foam monitors, shut-off valves, fire hydrants, shore connections, bulkhead hose connectors (for connecting fire hoses) and control devices;
- .6 the arrangement of fire-fighting equipment and emergency escape breathing devices;
- .7 position of remote shutting off the ventilation system and the location of: fire dampers in ventilation ducts and ventilation openings closures in spaces protected by gas systems;
- .8 fuel and lubricating oil tanks, located outside the double bottom and the arrangement of: remote control of shut-off valves and remote stopping oil fuel pumps;
- .9 spaces containing emergency sources of electric power and emergency switchboard room;
- .10 fire alarm call points and equipment;
- .11 internal communication telephones;
- .12 the location of containers, in which fire control plans, intended for the shoreside fire-fighting personnel, are stored.

The graphic symbols shall be in accordance with binding fire protection standards or military standards.

1.4.2.2 *Fire control plan* shall be exhibited in the ship in visible places – in corridors, mess room, as well as in **SCC**.

1.4.2.3 Additionally, the information included in the *Fire control plan* may be presented in the form of a booklet, which shall be placed in the duty room.

1.4.2.4 A duplicate of the *Fire control plan*, intended for use by the shoreside fire-fighting personnel (brigades), shall be permanently stored in a container at entrances, on the left and right side, outside the deckhouse. The container shall be weathertight, painted red and marked in accordance with fire protection requirements.

1.4.3 Maintenance and Fire Safety Operation Documentation

1.4.3.1 The ship shall be provided with the following documentation:

- .1 Fire protection systems and appliances maintenance plan;
- .2 Training manual;
- .3 Fire-fighting procedures.

1.4.3.2 Fire protection systems and appliances maintenance plan shall contain information on testing and inspections of fire-extinguishing systems, appliances and equipment, covering:

- .1 water fire-extinguishing systems, including fire pumps, fire hydrants, fire hoses and nozzles;
- .2 sprinkler systems;
- .3 other fixed fire-extinguishing systems;
- .4 fire detection and fire alarm systems;
- .5 ventilation systems, including fire and smoke dampers, fans and their controls;
- .6 emergency shut down of fuel supply and fuel discharge;
- .7 fire doors, including their controls;
- .8 general emergency alarm systems;
- .9 emergency escape breathing devices;
- .10 fire-extinguishers, including spare charges;
- .11 fire-fighter's outfit;
- .12 low-location lighting and public address systems.

Fire protection systems and appliances maintenance plan may be computer-based.

Fire protection systems and appliances maintenance plan shall take into account the requirements of particular fire-fighting appliances and equipment manufacturers regarding the scope of overhauls and maintenance, as well as the minimum intervals between the overhauls. Fire protection systems and appliances maintenance plan shall also take account of the requirements specified in IMO MSC/Circ. 850.

1.4.3.3 Training manual shall include instructions for fire emergency proceedings, as well as for conducting training and fire drills, within the following scope:

- .1 general fire safety practice and precautions related to the dangers resulting from the ship designation and combat tasks, electrical hazards, flammable liquids and similar common shipboard hazards;
- .2 general instructions for fire-fighting activities and fire-fighting procedures, including procedures for notification of a fire and use of manually operated call points;
- .3 fire-fighting procedures and the duties assigned to particular crew members;
- .4 division of crew members into parties responsible for fire extinction (SOR – Ship Organization and Regulations);
- .5 meaning of the ship's alarms;
- .6 operation and use of fire-extinguishing systems and appliances;
- .7 operation and use of fire doors;
- .8 operation and use of fire dampers and smoke dampers;
- .9 evacuation systems and equipment.

The training manual shall be provided in the main (**MF**FS) and auxiliary (**AF**FS) fire-fighting stations, as well as in appliances and equipment operator stations.

The training manual may be additionally prepared in the audio-visual form.

1.4.3.4 Fire fighting procedures shall contain a list of actions to be taken from the moment of fire detection until the fire extinction.

The procedures shall specify the duties and responsibilities of particular members of the crew.

List of procedures shall be provided in the main (**MF**FS) and auxiliary (**AF**FS) fire-fighting stations.

2 STRUCTURAL FIRE PROTECTION

2.1 General Construction Requirements

2.1.1 The hull, superstructures, structural bulkheads, decks and deckhouses shall be constructed of steel or steel equivalent material.

2.1.2 The external boundaries of hull and superstructures shall be of A Class standard.

2.1.3 The casings of machinery spaces of category A shall be of steel construction and shall be adequately insulated. Skylights in machinery casings shall be made of steel and shall not contain glass panels.

2.1.4 The ship's hull shall be divided by vertical divisions into main fire zones not exceeding 40 m in length.

2.1.5 The main vertical divisions above the bulkhead deck shall be in line with watertight subdivision bulkheads situated immediately below the bulkhead deck. Steps and recesses in the main vertical divisions to accommodate large spaces extending over the whole length of the main vertical zone may be permitted.

2.1.6 The main vertical divisions shall be A-60 Class divisions and shall extend from the outer plating of one side to the outer plating of the other side and from the ship's bottom to the outside deck of hull or superstructure.

2.1.7 The boundaries and decks of adjacent spaces within the main fire zones shall be A, B or C Class divisions in accordance with the requirements for division fire integrity specified in Tables 2.4.1-1 and 2.4.1-2.

2.1.8 The insulation of a deck or bulkhead, treated as fire divisions, shall be carried past the penetration, intersection or terminal point for a distance of at least 450 mm in the case of steel or aluminium structures. If a space is divided with a deck or bulkhead of A Class standard having insulation of different values, the insulation with the higher value shall continue on the deck or bulkhead with the insulation of the lesser value for a distance of at least 450 mm.

2.1.9 The floor plating of normal passageways in machinery spaces of category A shall be made of steel.

2.1.10 Class A and B Class divisions shall be subjected to fire test in accordance with the *FTP Code*, Annex 1, Part 3.

2.1.11 Light weight constructions (honeycomb type), made of steel or steel equivalent material may be used as non-load bearing internal A Class divisions in accommodation and service spaces, provided they have successfully passed the relevant standard fire test according to the *FTP Code*, Annex 1, Part 3. Such constructions cannot form part of the main fire division or be used as stairways enclosures.

2.2 Fire Resistance of Materials

2.2.1 Insulating materials shall be noncombustible, except in cargo spaces and refrigerated compartments of service spaces.

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

In spaces where petrol products may be present, the insulation surface shall be impenetrable for these products and their vapours.

2.2.2 All bulkheads, ceilings and their associated grounds shall be of non-combustible materials in the following spaces:

- .1 in accommodation spaces, service spaces and control stations – in ships where method IC, specified in 2.9.1.3, has been adopted; and
- .2 in corridors and stairway enclosures serving accommodation spaces, service spaces and control stations in ships where method IIC or IIIC, specified in 2.9.1.3, has been adopted.

2.2.3 Non-combustible bulkheads and ceilings fitted in accommodation and service spaces may be faced with combustible materials, such as facings, mouldings and decorations, provided that such spaces are bounded by non-combustible bulkheads and ceilings complying with the requirements of 2.2.4 to 2.2.8.

2.2.4 Combustible materials used on the surfaces of bulkheads and ceilings, specified in 2.2.3, shall have the heat of combustion Q not exceeding 45 MJ/m^2 of the area for the thickness used. This requirement is not applicable to the surfaces of furniture fixed to bulkheads.

Heat of combustion of material shall be determined from the following formula:

$$Q = Q_g \cdot q \cdot s, [\text{MJ/m}^2]$$

where:

Q – heat of combustion for the thickness used, $[\text{MJ/m}^2]$;

Q_g – material heat of combustion, determined according to ISO 1716: *Reaction to fire tests for building products – Determination of the heat combustion*, $[\text{MJ/kg}]$;

q – material density, $[\text{kg/m}^3]$;

s – material thickness, $[\text{m}]$.

2.2.5 Where, in accordance with 2.2.3, on the surfaces of bulkheads and ceilings combustible materials are used, the total volume of the materials shall be as follows:

- .1 the total volume of combustible facings, mouldings and decorations in accommodation and service spaces shall not exceed a volume equivalent to 2.5 mm veneer on the combined area of the bulkheads and ceilings linings. Furniture fixed to bulkheads or decks need not be included in the calculation of the total volume of combustible materials;

- .2 in the case of ships fitted with the sprinkler system complying with the requirements of sub-chapter 3.3, the above volume may include combustible materials used for erection of C Class divisions.

2.2.6 The materials used for the exposed surfaces:

- .1 in corridors and stairway enclosures;
- .2 of ceilings in accommodation spaces, service spaces and control stations;
- .3 in inaccessible spaces (lockers) in accommodation spaces, service spaces and control stations,

shall have low flame-spread-characteristics, confirmed by test in accordance with the *FTP Code*, Annex 1, Part 5.

2.2.7 Paints, varnishes and other finishes used on exposed interior surfaces within accommodation spaces, service spaces and control stations shall not be capable of producing excessive quantities of smoke and toxic substances, this being determined in accordance with the *FTP Code*, Annex 1, Part 2.

2.2.8 Primary deck coverings, if applied within accommodation spaces, service spaces and control stations shall be made of the material which will not give rise to smoke, toxic or explosive hazards at elevated temperatures, this being determined in accordance with the *FTP Code*.

2.2.9 In accommodation spaces, service spaces and control stations, the total mass of combustible materials (such as: cable insulation, plastic pipes, veneers, outfitting, as well as furniture, bedding components and electrical appliances) per unit area of the space shall not exceed the following values:

- 5 kg/m² – for corridors, stairways and control stations;
- 35 kg/m² – for accommodation spaces;
- 45 kg/m² – for service spaces surrounded by A Class divisions.

2.2.10 Waste receptacles shall be constructed of non-combustible materials, shall be capable of being closed and shall have no openings in the sides or bottom.

2.3 Classification of Ship Spaces according to Fire Risk (classification into categories)

To determine the fire integrity of bulkheads and decks separating adjacent spaces, the ship's spaces are divided into 14 categories:

- (1) **Control stations** – spaces containing:
 - (MFFS) and (AFFS) fire-fighting stations;
 - central control station (CCS) and combat information centre (CIC);
 - ship's radio and navigation equipment;
 - equipment for conducting and supporting the ship's combat operations;
 - emergency sources of power and lighting;
 - fire-extinguishing stations, fire detection and fire alarm system devices;

- control rooms for propulsion machinery, when located outside the machinery space.
- (2) **Corridors and lobbies** (which constitute escape routes).
- (3) **Accommodation spaces** – see 1.2, excluding corridors.
- (4) **Stairways** – interior stairways and lifts (except those wholly contained within the machinery spaces) and enclosures thereto. A stairway which is enclosed at one level only shall be regarded as part of the space from which it is not separated by a fire door.
- (5) **Service spaces (low fire risk)** – mess rooms, pantries containing no cooking appliances, lockers and store-rooms having areas less than 4 m², not having provisions for the storage of flammable liquids, drying rooms and laundries.
- (6) **Machinery spaces of category A and main galleys** – see 1.2.
- (7) **Other machinery spaces** – see 1.2, excluding machinery spaces of category A.
- (8) **Cargo spaces – cargo holds** – all spaces used for cargo (including oil fuel tanks) and trunkways and hatchways to such spaces.
- (9) **Service spaces (high fire risk)** – galleys, pantries containing cooking appliances, office service rooms, duty rooms, readily ignitable and flammable liquids rooms, lockers and store-rooms having areas of 4 m² or more, as well as workshops other than those forming part of the machinery spaces.
- (10) **Open decks** – open deck spaces, air spaces outside superstructures and deck-houses.
- (11) **Areas, on open deck, in weapon effect zone** – see 1.2, including cargo spaces intended for the carriage of military vehicles with fuel in their tanks for their own propulsion.
- (12) **Evacuation stations and external escape routes** – lifeboats and other survival craft embarkation areas and launching stations.
- (13) **Sanitary-hygienic spaces** – toilets, washrooms, bathrooms, cloak-rooms, etc.
- (14) **Tanks, void spaces and spaces with low or no fire risk** – tanks, cofferdams and other hull compartments.

2.4 Fire Integrity of Bulkheads and Decks

2.4.1 The minimum fire integrity of bulkheads and decks separating adjacent spaces shall be as prescribed in Tables 2.4.1-1 and 2.4.1-2.

2.4.2 The following requirements shall govern the application of the Tables:

- where only one value is given for fire integrity of a division between two spaces, this value shall be used for all cases;
- the dash means that there are no restrictions as far as material and fire integrity of a given division are concerned;
- where there exists doubt as to the classification of space to one of the below-given categories, it shall be treated as a space within the relevant category having most stringent boundary requirements.

Notes to Tables 2.4.1-1 and 2.4.1-2:

- a) No special requirements are imposed upon bulkheads in methods IIC and IIIC of fire protection.
- b) In the case of method IIIC, B-0 Class bulkheads shall be provided between spaces or groups of spaces of 50 m² and over in area.
- c) For the choice of division type – see 2.9.
- d) Where spaces are of the same numerical category, a bulkhead or deck of the rating shown in the Tables is only required when the adjacent spaces are for a different purpose, e.g. in category (9), a galley next to other galley does not require a bulkhead, but a galley next to a paint room requires A-0 Class bulkhead.
- e) For other machinery spaces – category (7) – of low fire risk, fire insulation need not be fitted.
- * Where an asterisk appears in the Tables, the division is required to be of steel or other equivalent material but is not required to be of A Class standard.

2.5 Means of Escape from Ship Spaces

2.5.1 The escape routes are routes for escape and also for access. The door locking arrangement shall be such that it does not obstruct these two objectives (escape and access) and that the doors in the way of escape routes can be opened from both sides.

The doors along the escape routes shall not, in general, open against the escape flow, except that:

- the cabin doors may open into the cabins in order to avoid injury to persons in a corridor when the door is opened;
- the doors in the vertical emergency escape trunks may open out of the trunk in order to permit the trunk to be used both for escape and for access.

2.5.2 Stairways and ladders shall be so arranged as to provide, from all accommodation spaces and spaces in which the crew is normally employed, other than machinery spaces, ready means of escape to the open deck and thence to the survival craft. In particular, the following requirements shall be complied with:

- .1** at all levels of accommodation there shall be provided at least two widely separated means of escape from each restricted space or group of spaces:
 - .1** below the lowest open deck, the main means of escape shall be a stairway and the second means of escape may be a trunk or a stairway;
 - .2** above the lowest open deck, the means of escape shall be stairways or doors leading to the open deck.
- .2** PRS may dispense with one of the means of escape, due regard being paid to the nature and location of spaces and to the number of persons who normally might be quartered or employed there. The below spaces may have one means of escape:
 - .1** spaces, which are entered only occasionally by crew members, the means of escape being independent of watertight doors;
 - .2** in the steering gear space, where the emergency steering position is located, if there is direct access to the open deck;
 - .3** radiotelegraph stations having direct access to the open deck;

- .3 no dead-end corridors having a length of more than 7 m shall be accepted;
- .4 stairways and corridors used as means of escape shall be not less than 700 mm in clear width and shall have a handrail on one side. Stairways and corridors with a clear width of 1800 mm and over shall have handrails on both sides. Clear width is the distance between the handrail and the bulkhead on the other side or between the handrails. The angle of inclination of stairways shall be, in general, 45°. In well-justified cases, the increase of the angle to 50° may be permitted; in machinery spaces and small spaces – to not more than 60°;
- .5 means of escape, including stairways and exits in way of accommodation and service spaces shall be marked with escape direction signs. These signs shall be made from photoluminescent material complying with fire protection requirements.

2.5.3 Two means of escape shall be provided from each machinery space of category A, one of the following requirements being complied with:

- .1 two sets of steel stairways or ladders shall be provided as widely separated as possible leading to doors in the upper part of the machinery space and from which access is provided to the open deck. One of these stairways or ladders shall be located within a protected enclosure having the fire integrity as required for stairways in 2.4.1, category (4), from the lower part of the machinery space to a safe position outside the space. This enclosure shall be provided with self-closing fire doors of the same fire integrity standard. The ladder or stairway shall be fixed in such a way that heat is not transferred into the enclosure through non-insulated fixing points. The protected enclosure shall have a free opening of at least 800 mm x 800 mm, the ladder being included. The enclosure shall be provided with emergency lighting.
- .2 one steel stairway or ladder shall be provided leading to a door in the upper part of machinery space and from which access is provided to the open deck and additionally, in the lower part of machinery space and in position well separated from the ladder or stairway referred to, a steel door capable of being operated from each side. The door shall provide access to a safe escape route from the lower part of the space to the open deck.

2.5.4 In ships below 1000 tonnes displacement, PRS may conditionally accept only one means of escape from machinery space of category A. In such case, the width and the arrangement of the upper part of the space will be specially considered.

In ships below 1000 tonnes displacement, fire shelters as a means of escape for machinery spaces of category A are not required.

2.5.5 In machinery spaces other than those of category A, PRS may reduce the requirements relating to the escape routes, having regard to the nature and location of the space, as well as the number of persons normally employed in that space.

2.5.6 Small machinery spaces, in which the maximum distance to the door is 5 m or which are entered only occasionally may be provided with only one escape exit.

2.6 Closures of Openings in Fire-Resisting Divisions and Fire-Resisting Divisions Penetrations

2.6.1 All openings in A and B Class fire-resisting divisions shall be provided with closing arrangements of fire integrity not lower than that of the division, in which they are fitted.

2.6.2 All inlets and outlets of ventilation, annular spaces around funnels, skylights and other openings leading to cargo spaces and machinery spaces shall have closing arrangements. These arrangements shall be so fitted as to be capable of being operated from outside of the spaces and from the open deck.

2.6.3 Pippings and ventilation ducts penetrating fire-resisting divisions shall comply with the requirements of sub-chapters 1.16.11.5 and 11.2, *Part VI – Machinery Installations and Refrigerating Plants*; cables penetrating fire-resisting divisions shall comply with the requirements given in sub-chapter 16.8.6, *Part VIII – Electrical Installations and Control Systems*.

2.7 Doors in Fire-Resisting Divisions

2.7.1 The fire integrity of doors shall be equivalent to that of the division in which they are fitted. Doors and door frames in A Class divisions shall be constructed of steel or steel equivalent material. Doors in B Class divisions shall be constructed of non-combustible material.

2.7.2 The construction of doors and door frames in A Class divisions, as well as the means of closure shall provide resistance to fire and to the passage of smoke and flame equivalent to that of the bulkhead in which the doors are fitted. Class A doors are subject to test in accordance with the *FTP Code*. Watertight doors need not be insulated fire doors.

2.7.3 Doors and door frames in B Class divisions, as well as the means of closure shall provide fire integrity equivalent to that of the bulkhead in which they are fitted; ventilation openings may be permitted in the lower portion of such door. Class B doors are subject to test in accordance with the *FTP Code*.

2.7.4 Fire doors in the main vertical fire divisions, galley boundaries and stairway enclosures, other than power-operated watertight doors and those which are normally locked, shall satisfy the following requirements:

- .1** the doors shall be self-closing and be capable of closing against an angle of inclination of up to 3.5° opposing closure;
- .2** the approximate time of closure for hinged fire doors shall be not more than 40 s and not less than 10 s from the beginning of their movement with the

ship in the upright position. The approximate uniform rate of closure for sliding fire doors shall be not more than 0.2 m/s and not less than 0.1 m/s with the ship in the upright position;

- .3 the doors, except those for emergency escape trunks, shall be capable of remote release from **CCS**, either simultaneously or in groups and shall be capable of release also individually from a position at both sides of the door. Release switches shall have an on-off function to prevent automatic resetting of the system;
- .4 hold-back hooks precluding the doors release from **CCS** are prohibited;
- .5 a door closed remotely from **CCS** 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;
- .6 indication shall be provided at the fire door indicator panel in **CCS** whether each of the remote-released doors is closed;
- .7 the release mechanism shall be so designed that the door will automatically close in the event of failure of the control system or central power supply;
- .8 local power accumulators for power-operated doors shall be provided in the immediate vicinity of the doors to enable the doors to be operated ten times (fully opened and closed) in the event of failure of the control system or central power supply using the local controls;
- .9 failure of the control system or central power supply at one door shall not impair the safe functioning of the other doors;
- .10 remote-released sliding or power-operated doors shall be equipped with an alarm that sounds for at least 5 s (but no more than 10 s) after the door is released from **CCS** and before the door begins to move and continues sounding until the door is completely closed;
- .11 a door designed to re-open upon contacting an object in its path shall re-open not more than 1 m from the point of contact;
- .12 where double-leaf doors are equipped with a latch necessary for their fire integrity, the latch shall be also controlled by the door control system;
- .13 doors giving direct access to cargo spaces for the carriage of military vehicles which are power-operated and automatically closed need not be equipped with the alarms and remote-release mechanisms required in .3 and .10;
- .14 the components of the local control system shall be accessible for maintenance and adjusting;
- .15 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 by test in accordance with the *FTP Code*. This system shall comply with the following requirements:
 - .1 the control system served by the power supply shall be able to operate the door at the temperature of at least 200° C for at least 60 min;
 - .2 the power supply for all other doors not subjected 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.

2.7.5 Doors required to be self-closing shall not be fitted with hold-back hooks, which may be released locally only. However, hold-back arrangements fitted with remote release hooks capable of automatic release in the event of remote mechanism failure, may be used.

2.7.6 In corridor bulkheads, ventilation openings may be permitted only in and under the doors of cabins and public spaces. The openings shall be provided only in the lower half of the door and shall be fitted with grille made of non-combustible material. The total area of these openings shall not exceed 0.05 m².

Ventilation openings may be also permitted in B Class doors leading to toilets, offices, pantries, lockers and store-rooms.

2.7.7 Doors in all fire-resisting divisions (self-closing and automatically-closing doors included) shall be so arranged as to be capable of being opened manually from either side of the division by one person only.

2.7.8 In the lower corner of doors fitted in the main vertical zone bulkheads in escape routes, a self-closing hose port shall be provided; the fire integrity of the port material and construction shall be equivalent to that of the door in which it is fitted.

The port shall be a 150x150 mm clear opening with the door closed. It shall be inset into the lower edge of the door, opposite the door hinges or, in the case of sliding doors – nearest the opening.

In lieu of hose ports, bulkhead hose connectors – with isolating valves and couplings fitted on each side of the bulkhead – situated in the vicinity of the door, may be provided.

2.8 Windows and Portholes

2.8.1 All windows and portholes in fire-resisting divisions within accommodation spaces, service spaces and control stations shall be so arranged as to comply with the requirements for fire-resisting divisions, in which they are installed.

2.8.2 Windows and portholes in the ship shell plating, as well as in superstructures and deckhouses shall be of A Class standard and shall comply with the requirements of sub-chapter 7.2, *Part III – Hull Equipment*.

2.8.3 In external structures of machinery spaces (decks, divisions, bulkheads and trunks) glazed windows are not allowed. Glazed windows may be used, however, in enclosed machinery control stations located within machinery spaces.

2.9 Requirements for Ship Spaces Construction

2.9.1 Accommodation Spaces, Service Spaces and Control Stations

2.9.1.1 All bulkheads required to be B Class divisions shall extend from deck to deck and from shell to shell or other boundaries. Where continuous B Class ceilings or linings are fitted on both sides of the bulkhead, the bulkhead may terminate at such ceilings or linings.

2.9.1.2 Air spaces behind ceilings, panellings or linings in accommodation and service spaces, in control stations, corridors and stairways shall be divided by draught stops spaced not more than 14 m. Such draught stops shall be made of non-combustible materials.

In vertical direction, such air spaces, including those behind linings of stairway and trunks, shall be closed by draught stops at each deck.

To construct draught stops, the following methods may be applied:

- .1** the extension of B or C Class bulkhead, ceiling or lining;
- .2** steel sheet not less than 1 mm in thickness, stiffened, intermittently welded to the ship's structure and the top profile of the bulkhead or fastened mechanically to the ceilings or linings;
- .3** a non-combustible board, fastened mechanically to the ship's structure, bulkheads, ceilings or linings;
- .4** A Class mineral wool insulation, not less than 20 mm in thickness, faced on each side with expanded metal mesh, the mesh on one side being attached to the ship's structure, or expanded metal mesh being fitted on one side and non-combustible cloth (glass-cloth) on the other side of mineral wool insulation.

Where continuous ceilings are used, the draught stops shall be in line with the bulkheads.

Draught stops are not required in public spaces with open ceilings (perforated ceilings) with openings of 40% or more and arranged in such a way that a fire behind the ceiling can be seen and easily extinguished.

2.9.1.3 One of the following methods of fire protection shall be adopted in accommodation spaces, service spaces and control stations:

- **Method IC** – all internal divisional bulkheads shall be made as B or C Class divisions;
- **Method IIC** – all spaces in which fire might be expected to originate shall be fitted with sprinkler system complying with the requirements of sub-chapter 3.3, with no restriction on the type of internal divisional bulkheads;
- **Method IIIC** – all spaces in which fire might be expected to originate shall be fitted with fire detection and fire alarm system complying with the requirements of sub-chapter 4.1, with no restriction on the type of internal divisional bulkheads, except that in no case must the area of any accommodation space or

spaces bounded by an A or B Class division exceed 50 m². For public spaces this area may be increased to 75 m².

2.9.1.4 For a given method of fire protection, those divisions which are not required to be of A or B Class, shall be:

- for Method IC – at least C Class construction;
- for Method IIC – any, except in individual cases where C Class bulkheads are required in accordance with Table 2.4.1-1;
- for Method IIIC – any, provided that in no case must the area of any accommodation space or spaces bounded by an A or B Class division exceed 50 m² (except in individual cases where C Class bulkheads are required in accordance with Table 2.4.1-1). For public spaces this area may be increased to 75 m².

2.9.2 Stairways and Lifts within Accommodation Spaces

2.9.2.1 Stairways which penetrate only a single deck shall be protected at least at one level by B-0 Class division and self-closing doors. Lifts which penetrate only a single deck shall be surrounded by A-0 Class divisions with steel doors at both levels.

2.9.2.2 Stairs which penetrate more than a single deck shall have the form of a stairway. Stairways and lift trunks which penetrate more than a single deck shall be surrounded by at least A-0 Class divisions and be protected by steel self-closing doors at all levels.

2.9.2.3 In ships having accommodation for 12 persons or less, where there are at least 2 escape routes direct to the open deck at every deck, stairway enclosures and lift trunks may be of B-0 Class standard instead of A-0 Class standard.

2.9.2.4 All stairways shall be of steel frame structure, except where PRS sanctions the use of other equivalent material.

3 FIRE-EXTINGUISHING SYSTEMS

3.1 General Requirements

3.1.1 Application of Fire-Extinguishing Systems

3.1.1.1 Every naval ship exceeding 100 tonnes displacement, with the permanent crew of three persons or more, shall be fitted with the water fire main system.

3.1.1.2 In naval ships exceeding 300 tonnes displacement, spaces which constitute fire risk shall be fitted with fire-extinguishing systems and fire signalling systems in accordance with the requirements of Chapter 5.

3.1.1.3 In special purpose naval ships, fire or explosion hazard spaces shall be fitted with fire-extinguishing systems and fire signalling systems in accordance with the additional requirements specified in Chapter 8.

3.1.2 General Requirements for Fire-Extinguishing Systems

3.1.2.1 The requirements of Chapter 3 are applicable to all fire-extinguishing systems fitted on board naval ship. Where provision has been made in a naval ship for supplementary fire-extinguishing systems, not covered by the present Part of the *Rules*, such systems shall comply also with the requirements set out below, within the scope specially considered by PRS in each particular case.

Fire-extinguishing systems shall comply also with the general requirements given in sub-chapter 1.16, *Part VI – Machinery Installations and Refrigerating Plants*.

3.1.2.2 All 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*.

3.1.2.3 Fire-extinguishing medium storage vessels, compressed air, carbon dioxide and other gas cylinders used in fire-extinguishing systems shall comply with the requirements for pressure vessels and air receivers set out in Chapter 10, *Part VII – Machinery, Boilers and Pressure Vessels*.

3.1.2.4 The use of fire-extinguishing media, which, either by themselves or under expected conditions of use, emit toxic gases in such quantities as to endanger persons or the environment, is not permitted.

3.1.2.5 All openings in bulkheads and decks of spaces protected by gas fire-extinguishing system, which may admit air to or allow gas to escape from the protected space, shall be provided with closing appliances served from outside the space.

3.1.2.6 Where in a space, protected by gas fire-extinguishing system, the compressed air receivers are installed, the required quantity of the fire-extinguishing medium shall be calculated on the basis of the design volume of the protected space plus the free air equivalent capacity of the compressed air. Such additional quantity of the fire-extinguishing medium need not be provided if arrangements are made for the discharge of the air escaping via safety valves directly to the open air.

3.1.2.7 The piping for the distribution of fire-extinguishing medium shall be so arranged and discharge nozzles so positioned as to ensure an uniform distribution of the medium in the protected space.

3.1.2.8 At each entrance to and exit from the space protected by gas fire-extinguishing system (using CO₂ or other medium), the following notice shall be placed:

Space protected by.....gas fire-extinguishing system.

Leave this area immediately when thewarning signal is sounded.

Danger of suffocation.

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

The notice shall be made in red letters on a white background.

3.1.3 Fire-Extinguishing Stations

3.1.3.1 Where the fire-extinguishing medium is stored outside a protected space, it shall be stored in a separate room – fire-extinguishing station, which shall be situated outside the protected spaces, in a safe and readily accessible position.

Fire-extinguishing stations shall not be used for any other purpose than storage of fire-extinguishing media and operation of fire-extinguishing systems.

3.1.3.2 Fire-extinguishing station shall comply with the following requirements:

- .1** it shall be located on the open deck and have the entrance from this deck or immediately under the deck and have the entrance from the open deck – by a stairway or a fixed ladder. The entrance to the fire-extinguishing station shall be independent of the protected space;
- .2** it shall not be located forward of the collision bulkhead;
- .3** it shall be separated from adjacent spaces by gastight bulkheads and decks. All closing arrangements in these bulkheads and decks shall be gastight;
- .4** access doors shall open outwards;
- .5** the ventilation system shall comply with the requirements of sub-chapter 11.13, *Part VI – Machinery Installations and Refrigerating Plants*;
- .6** it shall be protected by heat insulation and shall be fitted with heating if it is essential for normal operation of the station that the temperature shall be maintained above the freezing point. In the carbon dioxide fire-extinguishing stations, the temperature shall not exceed +45 °C;

- .7 provision shall be made for monitoring the air temperature in the fire-extinguishing station from outside the station;
- .8 fire-extinguishing station shall be provided with telephone or other means of communication with **SCC**, **ASCS**, **MFFS**, **AFFS** and spaces to which fire-extinguishing medium is supplied;
- .9 fire-extinguishing station shall be permanently locked up. One set of keys for the lock shall be kept in a closed case with a glazed door, located near the entrance. Local fire-extinguishing stations need not be key locked; however, they shall be protected by sealing against being accidentally opened;
- .10 all valves and control arrangements in the fire-extinguishing station shall be provided with plates identifying them with the spaces controlled by particular valves or arrangements;
- .11 a plan of the fire-extinguishing system showing the controls and the spaces protected shall be displayed in a conspicuous position within the station. The plan shall contain also brief instructions for starting and operating the system, including the closing of ventilation system openings in the protected space. The plan and instructions shall be also displayed in the position of remote control of the system.

3.1.3.3 In naval ships below 300 tonnes displacement where the location of fire-extinguishing station outside the protected space is not feasible, as well as in naval ships where the volume of individual protected spaces does not exceed 100 m³, containers with fire-extinguishing medium may be located within a protected space on condition that such station is provided with remote control for immediate operation of the system from outside of the protected space.

3.1.4 Pipes and Fittings

3.1.4.1 Fire-extinguishing systems pipes shall comply with the following requirements:

- .1 the fire-extinguishing medium shall be supplied to each protected space through a separate distribution pipeline; the necessary pipes for conveying fire-extinguishing medium into protected spaces shall be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Suitable provision shall be made to prevent inadvertent admission of the medium to the space;
- .2 for a group of similar small-size spaces and similar designation (e.g. a group of store-rooms), a single distribution pipeline, with branches leading to each of these spaces is permitted. In such case, the branches shall be fitted with shut-off valves, remotely controlled from the fire-extinguishing station, as well as from MFFS or CCS – upon agreement with PRS;
- .3 it is not permitted to lay the pipes of gas fire-extinguishing systems through tanks containing oil fuel and lubricating oil, as well as through refrigerated spaces;

- .4 the pipes of gas fire-extinguishing systems may be led through accommodation and service spaces, provided that such pipes over their whole length within these spaces are of sufficient thickness, are all welded and after installation on board have been tested to a test pressure not lower than 5 MPa;
- .5 for each fire-extinguishing system means shall be provided to allow a check of the system operation during the ship service;
- .6 gaskets used in the pipe joints of fire-extinguishing systems shall be manufactured of materials resistant to the effect of the extinguishing medium, oil and sea water;
- .7 provision shall be made on the gas fire-extinguishing systems manifold for connection of compressed air with a pressure of 0.5-0.7 MPa for blowing the pipelines and checking the passage of the nozzles. A non-return shut-off valve shall be fitted on the pipeline supplying compressed air to the manifold.

3.1.4.2 Fire-extinguishing systems pipes shall be made of steel. Copper, copper-and-nickel or other alloys pipes may be used as equivalent to steel pipes. Steel pipes shall be galvanized both inside and outside.

3.1.4.3 Fittings, including sprinklers and spraying nozzles of fire-extinguishing systems shall be made of materials resistant to the corrosive effect of the extinguishing medium and sea water.

3.1.4.4 Pipes shall be fitted with bellows expansion joints or suitable bends shall be applied to avoid stresses due to thermal expansion.

3.1.5 Starting of Fire-Extinguishing System

3.1.5.1 Fire-extinguishing system shall be set into operation without any supplementary change-over in the fire-extinguishing station and shall operate quickly and efficiently under all service conditions, including those when the temperature is below zero centigrade.

Fire-extinguishing system starting arrangements shall be easily accessible and shall be so located as not to be cut off by a fire in a protected space.

The locations of starting arrangements shall be properly marked and lighted with electrical light supplied from the main and emergency source of power.

At each location there shall be clear instructions relating to the operation of the system having regard to the safety of crew.

3.1.5.2 Means shall be provided to preclude the possibility of spontaneous starting of a fire-extinguishing system and an accidental release of fire-extinguishing medium into the protected space under any service conditions, including the effect of such factors as pitching and rolling, shaking or vibrations.

3.1.5.3 Where necessary, the starting arrangements shall be protected against mechanical damage.

3.1.5.4 Arrangements for manual operation of gas fire-extinguishing systems shall be capable of being sealed in closed position.

3.1.5.5 Remote starting arrangements of gas fire-extinguishing system (by means of compressed air, nitrogen, carbon dioxide, etc.) shall have two receivers, one of them being a spare receiver.

3.1.5.6 Means shall be provided for automatically giving audible warning, complying with the requirements of sub-chapter 4.3, of the release of fire-extinguishing medium into a space in which personnel normally work or to which they have access.

3.1.5.7 Hand wheels and levers intended for control of remote system starting arrangements shall be properly connected to the valve stems or spindles so as to preclude their accidental disconnection.

3.1.5.8 Automatic release of fire-extinguishing medium shall not be permitted, except as permitted in respect of local automatically operated units fitted, in addition to and independent of any required fixed fire-extinguishing system, in machinery spaces above equipment constituting a high fire risk or in enclosed areas of high fire risk within machinery spaces.

3.2 Water Fire Main System

3.2.1 Number and Capacity of Fire Pumps

3.2.1.1 The number of the main fire pumps and the minimum pressure of water supplied simultaneously by all the pumps through any adjacent fire hydrants and the required nozzles at the discharge rate determined in 3.2.1.4 shall be in compliance with the values given in Table 3.2.1.1.

Table 3.2.1.1

Naval ships, displacement, D [t]	Number of pumps	Minimum pressure at fire hydrants, [MPa]
< 300	1	0.24
$300 \leq D < 3000$	2	0.28
≥ 3000	3	0.32

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

3.2.1.2 All self-propelled naval ships exceeding 300 tonnes displacement shall be additionally fitted with an emergency fire pump complying with the requirements of 3.2.4.

3.2.1.3 The emergency fire pump need not be fitted if the main fire pumps and the associated sources of power are located in two different compartments complying with the requirements of 3.2.2.

3.2.1.4 The total capacity of the main fire pumps (excluding the emergency fire pump), with a pressure not lower than that specified in Table 3.2.1.1, shall be not less than four-thirds of the required capacity of dewatering bilge system ejectors serving the largest watertight compartment, specified in paragraph 6.2.11, *Part VI – Machinery Installations and Refrigerating Plants*.

3.2.1.5 Each fire pump shall be capable of supplying at least two jets of water, with the largest nozzle outlets used in the ship.

3.2.1.6 In every ship which is required to be provided with more than one fire pump, each of the required fire pumps, other than the emergency pump, shall have a capacity not less than 80% of the total required capacity divided by the minimum number of the required fire pumps but in any case not less than 25 m³/h. These fire pumps shall be capable of supplying the fire main system under the required conditions.

3.2.1.7 Where other fire-extinguishing systems using water from fire pumps are provided in the ship, the capacity of such pumps shall be sufficient for the operation of the water fire main system with at least 50% of capacity determined in 3.2.1.4 and for simultaneous operation of one of the other systems which requires the largest quantity of water. In this case, the quantity of water available for the water fire main system shall be sufficient for delivering at least 2 jets of water through nozzles of the largest size used in the ship. The possible variation of fire hydrants capacity due to the pressure variation in the piping caused by the operation of other fire-extinguishing systems shall be also taken into account.

The quantity of water required for fire-extinguishing systems, other than the water fire main system, e.g. the ship flushing system, shall be determined according to the requirements for these systems.

3.2.1.8 In ships exceeding 1000 tonnes displacement, the water fire main system shall be permanently filled with water under pressure and shall be capable of immediately delivering water from each fire hydrant. One of the fire pumps shall be put automatically into action by the pressure drop in the system. A notice shall be placed at the sea inlet valve stating that the valve shall be kept permanently open during normal operation of the ship.

3.2.2 Arrangement of Fire Pumps

3.2.2.1 Where an emergency fire pump is not fitted, see 3.2.1.3, the main fire pumps, their sea valves and their sources of power shall be situated within two different compartments separated by at least A-0 Class divisions so arranged that a fire in one compartment will not render both fire pumps inoperable. Where the fire pumps are located in adjacent compartments, the bulkheads or decks separating the two compartments shall be of A-60 Class standard.

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

3.2.2.2 The main fire pumps shall be capable of supplying water to all water fire mains.

3.2.2.3 The fire pumps shall not be located forward of the bow collision bulkhead.

3.2.3 General Requirements for Fire Pumps

3.2.3.1 Fire pumps shall be independently driven.

In ships of 300 through 800 tonnes displacement, one of the required fire pumps may be driven from the main engine.

3.2.3.2 Fire pumps may be used for other shipboard services if the naval ship is provided with at least two independently driven fire pumps, one of which is all the time kept readily available.

3.2.3.3 Sanitary, ballast, bilge and other sea water pumps may be used as main fire pumps, provided that their capacity and pressure head comply with the requirements for fire pumps and that such pumps are not used as fuel and lubricating oil pumps.

In ships in which the above-mentioned pumps are installed in machinery spaces, it is additionally required for at least one pump to be capable of supplying sea water to the water fire main system. It is not, however, required to choose pumps with capacity and pressure characteristics other than that being optimal for the service intended just to make connection to the fire main possible, provided the required number and capacity of fire pumps are ensured.

3.2.3.4 Pumps and piping intended for fire-fighting purposes shall be neither used for the pumping of oil products and other flammable liquids, nor for serving tanks intended for alternate carriage of oil fuel and ballast.

3.2.3.5 Each fire pump shall be fitted with a pressure gauge on the delivery side. Pumps capable of developing, in the fire main, a pressure exceeding the permissible value shall be provided with safety valves set to operate at a pressure not higher than 10% in excess of the fire main working pressure, with an outlet to the pump suction pipe.

3.2.3.6 Fire pumps and their sea valves shall be located below the deepest waterline such as to ensure water suction under all trim, roll and heeling conditions, as well as during sailing close to sea bottom (sucking sludge and sand shall be precluded) and during sailing in brash ice in winter conditions. Fire pumps installed outside the machinery space shall have sea valves in each compartment in which they are situated. Each sea valve shall be provided with a durable plate stating that the valve shall be kept permanently open during normal operation of the ship.

3.2.3.7 Temperature in the spaces where all fire pumps, including the emergency fire pump, are placed shall be always higher than zero centigrade.

3.2.3.8 Provision shall be made for a remote starting of one of the fire pumps from the SCC and MFFS. Pressure gauge shall be fitted on the water fire main in the position where a remote starting arrangement is installed. The remote starting arrangement of the pumps need not be provided in the case of permanently pressurized water fire main system with automatic starting of the pump.

3.2.4 Emergency Fire Pump

3.2.4.1 The emergency fire pump, its sea valve, suction and delivery pipes and isolating valves shall be located outside the machinery space.

If this arrangement cannot be made, the sea valve may be fitted in the machinery space if the valve is remotely controlled from a position in the same compartment in which the emergency pump is located and the suction pipe is as short as practicable. Short lengths of suction and discharge piping may penetrate the machinery space, provided they are enclosed in a substantial steel casing or are insulated to A-60 Class standard. The pipes shall have substantial wall thickness, but in no case less than 11 mm and shall be welded, except for the flanged connection to the sea valve.

3.2.4.2 The emergency fire pump shall be a fixed independently driven pump, powered by diesel engine or electric motor supplied from an emergency source of power. The relevant electric cables shall not pass through the compartment containing the main fire pumps, the machinery spaces and other spaces of high fire risk. Where the ship arrangements are such that the cables have to pass through these spaces, the cables shall be of a fire-resistant type complying with the requirements of sub-chapter 16.1, *Part VIII – Electrical Installations and Control Systems* and shall be specially protected against mechanical damage, e.g. run in heavy gauge pipe.

Where a diesel engine driven emergency fire pump is fitted, its source of power and fuel supply shall be so arranged that they will not be readily affected by a fire in the compartment containing the main fire pumps.

3.2.4.3 The sea valve for the emergency fire pump shall be located below the deepest waterline and shall be so situated as to comply with the requirements set forth in 3.2.3.6.

Where necessary to ensure suction, the emergency fire pump shall be of self-priming type. The total suction head and the net positive suction head of the pump shall be such as to ensure the required pump capacity and the hydrants pressure under all conditions of list, trim, roll and pitch likely to be encountered in service.

It shall be demonstrated by calculations that the requirements, referred to above, are satisfied at:

- the deepest waterline, with account being taken of 22.5° roll and 10° pitch,
- a loading condition without cargo or ballast water, with 10% stores and fuel, roll and pitch not being taken into account.

Upon completion of the emergency fire pump installation, a performance test confirming the capacity required under 3.2.4.5 and 3.2.4.6 shall be carried out. As far as practicable, the test shall be carried out at the minimum ship draught at the suction position.

3.2.4.4 The boundaries of the space containing the emergency fire pump and its sources of power shall be constructed of steel and shall comply with the requirements for the fire integrity of bulkheads and decks specified in Tables 2.4.1-1 and 2.4.1-2 for control stations.

Where the space of the emergency fire pump is adjacent to the machinery space containing the main fire pumps, the bulkhead separating these spaces shall be of A-60 Class standard. The insulation shall extend at least 450 mm outside the area of the joint bulkheads and decks.

No direct access is permitted between the machinery space containing the main fire pumps and the space of the emergency fire pump and its sources of power. When this is impracticable, the access may be allowed through an air lock fitted with two doors. The doors fitted in the machinery space bulkhead shall be A-60 Class fire doors. The second doors shall be constructed of steel, be gastight and self-closing, without hold back arrangement.

Instead of an air lock, a watertight door may be fitted capable of being operated from a readily accessible space remote from the machinery space and the emergency pump space. In such case, a second means of access, e.g. through a manhole and ladder, to the space containing the emergency fire pump shall be provided.

3.2.4.5 Where the emergency fire pump is driven by a diesel engine, it shall be so arranged that an immediate start is possible under all prevailing temperature conditions. Where the emergency fire pump room is not heated, provision for electric heating of the engine cooling water or lubricating oil shall be made.

Diesel engines exceeding 15 kW shall be equipped with a starting device, e.g. a starting battery or an independent hydraulic system, or an independent starting air system having a capacity sufficient for at least six starts of the engine during 30 minutes and not less than 2 starts during the first 10 minutes. For diesel engines of 15 kW and less, manual means of starting are sufficient.

A service fuel tank of the volume sufficient to ensure at least 4-hours operation of the pump on full load shall be installed in the space containing the emergency

fire pump and its sources of power. In restricted service naval ships, the volume of fuel may be reduced to the volume sufficient to ensure 3-hours operation of the pump.

The fuel reserve sufficient to ensure an additional 18-hours operation of the pump shall be provided outside the machinery space.

The capacity of the emergency fire pump at a pressure in compliance with the requirements of Table 3.2.1.1 shall be sufficient to ensure simultaneous operation of two fire hose nozzles of the largest size adopted on the ship capable of producing jets of water of at least 12 m throw length. The emergency pump capacity cannot be less than 40% of the required capacity of fire pumps and in no case less than 25 m³/h.

3.2.4.6 Where the emergency fire pump is the main supply of water for any fixed fire-extinguishing system provided to protect the space where the main fire pumps are located, the capacity of the pump shall be additionally increased by the capacity required for this system.

3.2.4.7 Control post of the emergency fire pump shall be located in close vicinity to the pump, as well as in the place of the pump sea valve control if the valve is controlled from outside the emergency fire pump room.

3.2.4.8 The room containing the emergency fire pump and its sources of power shall be provided with lighting, supplied from the emergency source of electric power and shall be well ventilated. If mechanical ventilation has been provided, it shall be supplied from the emergency source of electric power.

The arrangements shall be such as to preclude the possibility of smoke from a machinery space fire entering or being drawn into that space.

3.2.4.9 The room containing the emergency fire pump and its sources of power shall have adequate space for maintenance work and inspections.

3.2.5 Pipings

3.2.5.1 The diameter of the pipes shall be sufficient for the effective distribution of the maximum required discharge from two fire pumps operating simultaneously.

In naval ships exceeding 500 tonnes displacement, the water fire main system shall be calculated for a working pressure not less than 1.0 MPa.

3.2.5.2 The pipelines and fire hydrants shall be so designed and arranged as to preclude their freezing in ships entering areas where low temperatures may exist. It applies, in particular, to continuously pressurized pipelines.

3.2.5.3 Each fire pump shall be provided with a shut-off valve on the suction side and a non-return shut-off valve on the delivery side.

3.2.5.4 In naval ships exceeding 500 tonnes displacement, the water fire main shall have one branch on either side led out to the open deck, terminated with an isolating valve and international shore connection, intended to provide a supply of water from shore to fire-extinguishing systems.

3.2.5.5 Any part of the water fire main system penetrating the bulkhead or deck bounding machinery space of category A, as well as each main fire division shall be fitted with an isolating valve, located outside the space or division in an easily accessible position.

The water fire main system shall be so designed as to allow water from the fire pump, installed in another space, or from emergency fire pump to reach all hydrants located outside the isolated space or division.

3.2.5.6 Materials readily rendered ineffective by heat caused by fire shall not be used for fire mains and hydrants unless adequately protected.

3.2.5.7 Fire mains pipelines shall be capable of being drained through drain plugs fitted in the lowest section of the system.

Each open deck fire main branch used for the purpose other than fire-fighting shall be fitted with an isolating valve. This valve shall be capable of being remotely controlled from the open deck.

3.2.5.8 In naval ships provided with at least two fire pumps, the water fire main system pipelines supplying fire hydrants located on open deck, in superstructures and deckhouses shall be led above the bulkhead deck and shall be arranged annularly. The pipelines shall be fitted with isolating valves so arranged that in the event of damage to a pipeline on one side it shall be possible to shut off this pipeline and supply the remaining pipelines from another fire pump.

3.2.5.9 Fire divisions in the way of escape routes shall be provided with bulkhead hose connectors – with an isolating valve and a coupling fitted on each side of the bulkhead – to enable fire hoses connection. The bulkhead hose connectors shall be fitted in an easily accessible position, in the vicinity of the door.

In lieu of bulkhead connectors, doors fitted with port holes complying with the requirements of 2.7.8 may be used.

3.2.6 Fire Hydrants

3.2.6.1 Each fire hydrant shall have a shut-off valve and a standard coupling complying with national/international standards. Fire hydrants fitted on open decks shall also have easily removable caps.

3.2.6.2 The hydrants shall be so situated that the fire hoses may be easily coupled to them.

The number and position of fire hydrants shall be such that at least two jets of water not emanating from the same hydrant, one of which shall be from a single

length of hose and the other from two interconnected hoses of the same length, may reach any part of the ship.

Fire hydrants shall be positioned near the accesses to the protected spaces.

3.2.6.3 Fire hydrants provided within large spaces, on open decks and in long corridors shall not be spaced more than 20 m apart.

In small spaces, where fire hoses cannot be promptly unrolled and operated, fire hydrants shall be located near the entrances to the spaces.

It is recommended that fire hydrants, installed on open decks and within superstructures, should be located near the entrances to the spaces, hatchways and trunks leading to the spaces.

3.2.6.3 Fire hydrants shall not be placed at the ends of blind corridors or in closed seldom visited spaces.

3.2.6.4 In naval ships where deck cargo may be carried, fire hydrants shall be so located or protected as to prevent their damage during the ship's operation.

3.2.6.6 In naval ships exceeding 500 tonnes displacement, machinery spaces of category A shall be provided with at least two fire hydrants located on either side of the ship. In naval ships below 500 tonnes displacement, machinery spaces of category A shall be provided with at least one fire hydrant.

3.2.6.5 In accommodation spaces, service spaces and machinery spaces, the number and position of fire hydrants shall be such that the requirements of 3.2.6.2 are complied with when all watertight doors are closed.

3.2.6.6 Fire hydrants shall be painted red.

3.2.6.9 Fire hydrants and the water fire main fittings shall be made of material resistant to corrosion in sea conditions.

3.2.7 Fire Hoses

3.2.7.1 Fire hoses shall be between 10 and 20 m in length, and the length of those intended for use in machinery spaces shall not exceed 15 m. Each fire hose shall be fitted with a nozzle and the necessary couplings. There shall be at least one fire hose for each hydrant. All fire hoses and nozzles on the ship shall have unified couplings ensuring complete interchangeability.

3.2.7.2 Fire hoses shall be made exclusively of material which is non-perishable in natural conditions of stowage.

3.2.7.3 The diameter of hoses and couplings shall correspond to the capacity of the fire hose nozzles.

3.2.7.4 Fire hoses and nozzles, together with any necessary fittings and tools, shall be kept ready for use in conspicuous positions near fire hydrants or connections. Fire hoses shall be stowed on reels or in baskets so as to be readily available for use. Lockers, painted red, shall be provided for the stowage of hoses outside the ship's spaces.

3.2.7.5 In accommodation and service spaces, the fire hoses shall be permanently connected to fire hydrants.

3.2.8 Fire Hose Nozzles

3.2.8.1 Standard nozzle sizes 12 mm, 16 mm or 19 mm or as near thereto as possible shall be used. Where other systems are used – such as fog fire-extinguishing system – different diameter nozzles may be permitted. Hose nozzles with an orifice diameter in excess of 19 mm are subject to special consideration of PRS in each particular case.

In accommodation and service spaces, hose nozzles with orifice diameter not exceeding 12 mm may be used.

The orifice diameter of the fire hose nozzles provided in the machinery spaces and on the open decks shall be such as to ensure the maximum discharge of water through two jets from the smallest fire pump at the pressure at each hydrant not less than that specified in Table 3.2.1.1. However, hose nozzles in excess of 19 mm need not be used.

3.2.8.2 All fire hose nozzles shall be of dual-purpose type, i.e. of spray/jet type incorporating a shutoff. It is recommended that 50% of the required number of fire hose nozzles should be “turbo” type, i.e. nozzles that form „water umbrella” protecting against heat radiation.

3.2.8.3 Fire pumps, fire hydrants, fire hose nozzles and fire hoses shall be of the type approved by PRS or an authorized body.

3.3 Sprinkler System

3.3.1 General Requirements

3.3.1.1 The sprinkler fire-extinguishing system shall be capable of immediate operation at all times and no action of the crew shall be necessary to set it in operation. The system pipings shall be always filled with fresh water, but small exposed sections may be of the dry type where, in the opinion of PRS, this is a necessary precaution. Sections of pipings, which may be subjected to freezing temperatures in service, shall be suitably protected, e.g. by the application of the so-called dry pipes or suitably insulated pipes. The system shall be kept charged at the necessary pressure and shall have provision for a continuous supply of water.

3.3.1.2 Sprinklers shall be grouped into separate sections; each section shall contain not more than 200 sprinklers.

3.3.1.3 The sprinkler system shall be automatically set in operation at the temperature in the protected space rising to the value given in 3.3.4.2.

3.3.1.4 The sprinkler system shall be fitted with sea water pump, section valves, a pressure tank and fresh water pump, pressure control, pipelines supplying water to spaces and the sprinklers. After operation of the sprinkler and the pressure drop in the system, the pressure control shall start the sea water pump which will immediately deliver water to the sprinklers.

3.3.1.5 Each section of sprinklers shall be provided with means for giving a visual and audible alarm signal whenever any sprinkler comes into operation. The alarm systems shall be such as to indicate any fault occurring in the sprinkler system.

Indicating units shall show in which section, served by the system, fire has occurred and shall be centralized on the navigation bridge. In addition, visible and audible alarms from the indicating unit shall be provided in a position that enable any information about occurrence of fire to be immediately received by the crew.

3.3.1.6 There shall be not less than two sources of power supply for the sea water pump and alarm system. If the pump is electrically driven, it shall be connected to the main source of electric power, which shall be capable of being supplied by at least two generators.

The power supply lines shall be so arranged as to avoid galleys, machinery spaces and other enclosed spaces of high fire risk, except in so far as it is necessary to reach the appropriate switchboards. One of the sources of power supply for the alarm system shall be an emergency source of electric power.

Where one of the sources of power for the sea water pump is an internal combustion engine, it shall, in addition to compliance with the requirements of 3.3.1.7, be so situated that a fire in any protected space will not affect the air supply to the engine.

3.3.1.7 The sea water pump and the pressure tank shall be located outside the protected spaces and shall be situated in a position reasonably remote from machinery spaces.

3.3.1.8 A list or plan shall be displayed at each indicating unit, referred to in 3.3.1.5, showing the spaces covered and their location in respect of each section of the system and the main vertical fire divisions. Suitable instructions for testing and maintenance of the system shall be available on board the ship.

3.3.1.9 The sprinkler system shall be of the type approved by PRS or an authorized body. The use of equivalent sprinkler systems, i.e. a high pressure water-mist sprinkler systems complying with the requirements of IMO Resolution A.800(19), may be permitted.

3.3.2 Sprinkler Sea Water Pump

3.3.2.1 An independent power sea water pump shall be provided for the purpose of maintaining continuous discharge of water from the sprinklers. The pump shall be brought into action automatically by the pressure drop in the system to minimum pressure set point before the standing fresh water charge in the pressure tank is completely exhausted.

Means shall be provided for testing the automatic operation of the pump on reduction of pressure in the system.

3.3.2.2 The pump and the piping system shall be capable of maintaining the necessary pressure at the level of the highest sprinkler to ensure a continuous output of water sufficient for the simultaneous coverage of a minimum area of 280 m² at the application rate specified in 3.3.4.1.

3.3.2.3 The pump shall have fitted on the delivery side a test valve with a short open-ended discharge pipe. The effective cross-sectional area of the valve and pipe shall be adequate to permit the release of the required pump output while maintaining the pressure in the system specified in 3.3.3.2.

3.3.2.4 The sea inlet to the pump shall be provided in the space containing the pump; the sea inlet shall be permanently open with the exception of the inspection or repair of the pump.

3.3.2.5 Provision shall be made to supply the sprinkler system from the water fire main system. The connection pipeline shall be fitted with a non-return shut-off valve that will prevent a backflow from the sprinkler system.

3.3.3 Pressure Tank

3.3.3.1 The pressure tank shall be fitted with:

- .1 fresh water supply pipeline;
- .2 automatic pressure maintaining device;
- .3 water level indicating device and alarms warning of the water level and pressure drop in the tank below the normal values, situated in a permanently manned position in the ship;
- .4 safety valve;
- .5 pressure gauge, connected by a stop valve or cock.

3.3.3.2 The quantity of fresh water in the pressure tank shall be equal to at least the quantity of sea water delivered by the sea water pump in one minute.

The tank capacity shall be equal to at least twice the above quantity of water.

Provision shall be made for maintaining such pressure in the tank that after the consumption of the whole quantity of fresh water, it will be not lower than the working pressure of the sprinklers plus hydrostatic pressure from the tank bottom to the highest sprinkler.

Arrangements for replenishing compressed air and fresh water in the pressure tank, as well as non-return valves precluding the ingress of sea water into the tank shall be provided.

3.3.3.3 The pressure tank shall comply with the requirements for pressure vessels, set out in Chapter 10, *Part VII – Machinery, Boilers and Pressure Vessels*.

3.3.4 Sprinklers

3.3.4.1 Sprinklers shall be placed in an overhead position and spaced in a suitable pattern to maintain an average application rate of not less than 5 l/min per one square metre of the space floor.

Sprinklers shall be placed as clear as possible of beams or other objects likely to obstruct the projections of water and in such positions that combustible materials in the space will be well sprayed.

3.3.4.2 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, where high ambient temperatures might be expected, the operating temperature may be increased by not more than 30 °C above the deckhead temperature.

3.3.4.3 The sprinklers shall be resistant to corrosion by marine atmosphere.

3.3.4.4 At least 6 spare sprinkler heads shall be provided for each section.

3.3.5 Section Valves

3.3.5.1 Section valves shall be fitted on the supply pipe of each section of the sprinkler system and shall ensure:

- .1** delivery of water when any of the sprinklers fitted in the section opens;
- .2** activation of the visual and audible alarm when any sprinkler fitted in the section opens;
- .3** the possibility of checking the operation of the system – through a special test valve, with a passage equivalent to that of the sprinkler. The test valve for each section shall be situated near the shut-off valve of that section.

3.3.5.2 Section valves shall be fitted in special metallic lockable enclosures or lockers outside the protected spaces.

Positions where section valves are fitted shall be easily accessible and provided with information plates.

3.3.5.3 A gauge indicating the pressure in the system shall be provided at each section valve and at MFSS.

3.3.6 Pippings

3.3.6.1 The suction pipes of sea water pump supplying the sprinkler system shall be fitted with filters to prevent the clogging of the system and sprinklers.

3.3.6.2 Provision shall be made in each section for blowing the pipes with compressed air and flushing them with fresh water.

3.3.6.3 The diameters of the sprinkler system pipes shall be such as to ensure the operation of the sprinklers at the water working pressure and the discharge rate specified in 3.3.4.1.

3.4 Water-Spraying Fire-Extinguishing System

3.4.1 General Requirements

3.4.1.1 The water-spraying fire-extinguishing system shall be fitted with the supply water pump, stop valves, distribution pipelines and spraying nozzles.

3.4.1.2 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. Where the system capacity is less than 50% of the fire pumps capacity specified in 3.2.1.4, a separate supply water pump need not be installed and the system may be supplied with water from the water fire main system. Where the system capacity exceeds 50% of the fire pumps capacity, an independent supply water pump shall be provided, with the capacity sufficient to cover the demand of the largest protected space.

3.4.1.3 The water discharge rate shall be taken as follows:

- 5 l/min per square metre – for open cargo spaces intended for the carriage of military vehicles;
- 24 l/min per shelf square metre – for shelves in explosives store-rooms and ammunition stores.

3.4.1.4 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.

3.4.1.5 The water-spraying fire-extinguishing system may be divided into sections. The section valves shall be operated from easily accessible positions outside the space to be protected so as not to be cut off by a fire in the protected space. The valves manifold shall be provided with a pressure gauge.

The section valves shall be numbered. At the section valves manifold, there shall be provided the water-spraying system operation instructions showing the division of the protected space into sections and the numbers of the section valves serving the given section.

3.4.1.6 The supply water pump shall be situated outside the protected space. Power supply cables shall not be led through protected spaces. In well-justified cases, fire-resistant, suitably insulated or protected cables may be used.

3.4.1.7 The supply water pump shall be started manually from a position close to section valves. Provision shall be made at that position for connecting, through non-return shut-off valve, the water-spraying system with the water fire main to enable the emergency supply of the system from the fire pumps.

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

3.4.1.9 The spraying nozzles shall be of full bore type with a diameter preventing them from being clogged by impurities in the water or corrosion of piping.

The spraying nozzles shall be of the type approved by PRS or an authorized body.

3.4.1.10 Piping shall be fitted with draining arrangements.

3.4.2 Water-Spraying Fire-Extinguishing System in Cargo Spaces Intended for the Carriage of Military Vehicles

3.4.2.1 The spraying nozzles shall be so arranged as to provide a full coverage with water of the protected space.

3.4.2.2 The water discharge rate shall be at least 3.5 l/min per square metre – for spaces with a deck height not exceeding 2.5 m and 5 l/min per square metre – for spaces with a deck height of 2.5 m or more.

3.4.2.3 The water pressure shall ensure an effective distribution of water in the protected space.

3.4.2.4 The system shall cover the full breadth of the deck and may be divided into sections ranging from side to side, provided that the length of the section is not less than 15 m.

3.4.2.5 The section valves shall be located in a space directly accessible from both the protected space and from outside the space. Adequate ventilation shall be provided in the space containing the section valves.

3.4.2.6 The system shall be water supplied by an independent sea water pump and shall be additionally connected to the water fire main system by a non-return shut-off valve.

3.4.2.7 The capacity of the pump shall ensure a simultaneous supply of water at the required pressure to all nozzles in at least two adjacent sections of the vehicle deck.

3.4.3 Water-Spraying Fire-Extinguishing System in Machinery Spaces

3.4.3.1 The system shall be fitted with the supply water pump, pressure maintaining arrangements, section valves, distribution pipelines and spraying nozzles.

3.4.3.2 The spraying nozzles shall be fitted above bilges, oil fuel tanks and other areas over which oil fuel is liable to spread, as well as above areas of specific fire hazards in machinery spaces.

3.4.3.3 The number and arrangement of spraying nozzles shall ensure an effective and uniform distribution of water in the protected space, with the water discharge rate not less than 5 l/min per square metre of the protected space floor.

The water discharge rate shall be increased to 20 l/min per square metre of the space in the area of the boiler front and roof, firing areas, oil fuel units and fuel purifiers, as well as to 10 l/min per square metre in areas of hot oil fuel pipes near exhausts or similar heated surfaces on main or auxiliary diesel engines.

3.4.3.4 The system may be divided into spraying nozzles sections covering particular regions of the machinery space and isolated by section valves.

3.4.3.5 The system shall be kept charged at the necessary pressure and the pump supplying water for the system shall be put automatically into action by a pressure drop in the system.

3.4.3.6 The pump shall be capable of simultaneously supplying, at the necessary pressure, all sections of the system in any one machinery space to be protected.

3.4.3.7 The pump shall be power supplied from the emergency generator or may be driven by an internal combustion engine. The engine for driving the pump shall be so situated that a fire in the protected space will not affect the air supply to the engine.

3.4.3.8 Pipings shall be fitted with suitable filters preventing the spraying nozzles from being clogged by impurities in sea water or corrosion of piping.

3.4.3.9 Provision shall be made for manual starting of the system.

3.4.3.10 The pump and its controls shall be installed outside the space to be protected. It shall not be possible for a fire in the space protected by the water-spraying fire-extinguishing system to put the system out of action.

3.4.3.11 The system shall be capable of being supplied by an emergency pump, which may be the pump of another water fire-extinguishing system. The system shall be permanently connected to sea valve and shall be capable of a continuous operation using sea water.

3.4.3.12 The system shall be available for immediate use and shall be capable of supplying water for at least 30 minutes.

3.4.3.13 Means shall be provided for checking the water pressure and flow rate during the system operation.

3.4.3.14 Activation of any section of water-spraying system shall give an alarm signal in the protected space and at MFFS. An alarm signal in MFFS shall indicate the activated section of the system.

3.4.3.15 The electrical components of the electrical power source for the system shall have a minimum rating of IP 54. The system shall be supplied by both main and emergency sources of electric power and shall be provided with an automatic change-over switch. The emergency source of power supply shall be situated outside the protected machinery space.

3.4.4 Water Screen System

3.4.4.1 The water screen system shall be provided for use in the following cases:

- .1 for creating “water wall” – in ships, where there is no possibility of installing A-60 Class divisions;
- .2 for drenching the external bulkheads of superstructures – in ships adapted for operation in oil spillage area;
- .3 for drenching the doors and hatches leading to machinery spaces and store-rooms for readily ignitable materials.

3.4.4.2 The water discharge rate of the water screen system shall be taken as follows:

- .1 70 l/min per linear metre of the bulkhead length as a full substitute of A-60 Class division;
- .2 30 l/min per linear metre of the bulkhead length for one side drenching of A-0 Class steel division or glazed door in B Class division.

3.4.4.3 The water screen system may be supplied from the water fire main system; for small water screens, as specified in 3.4.4.1.3, the system may be also supplied from sea water or fresh water pressure tank system.

3.4.4.4 Water screen means of control shall be located in easily accessible and safe positions.

3.4.5 Local Water-Spraying Fire-Extinguishing System for Machinery Spaces

3.4.5.1 Local water-spraying fire-extinguishing system shall deliver water onto the following high fire risk areas in machinery spaces:

- .1 the fire hazardous parts of the main and auxiliary internal combustion machinery;

- .2 boiler fronts at firing place;
- .3 the fire hazardous parts of incinerators;
- .4 purifiers for heated oil fuel;
- .5 oil fired equipment, such as thermal oil heaters.

3.4.5.2 Fresh water or sea water with or without additives mixed to enhance fire-extinguishing capability, e.g. foam concentrate may be used as the fire-extinguishing medium.

3.4.5.3 The water-spraying fire-extinguishing system shall ensure fire suppression without the necessity of the engines shut-down, personnel evacuation, shutting down mechanical ventilation and the sealing of the space.

3.4.5.4 Provision shall be made for manual starting of the system.

In ships with unattended machinery space, the system shall be activated automatically.

3.4.5.5 The activation of the fire-extinguishing system shall not result in loss of electric power or reduction of the manoeuvrability of the ship.

3.4.5.6 The system shall be capable of fire suppression with mechanical ventilation running and supplying air to the protected area, or a method of automatically shutting air supply fans upon activation of the system shall be provided.

3.4.5.7 The system shall be available for immediate use and shall be capable of continuously supplying water for at least 20 minutes.

3.4.5.8 The system shall consist of the supply water pump, pressure maintaining arrangements, valves, distribution pipelines and spraying nozzles. The pump and the pressure maintaining arrangements shall be located outside the protected space.

3.4.5.9 The local water-spraying system may be supplied from the main water-spraying system for the protection of machinery space, required in paragraph 5.2.1.3, provided that adequate quantity of water and pressure are available to operate both systems for the required period of time. The local system may form a section of the main water-spraying system on condition that all requirements of sub-chapter 3.4.3 and the present sub-chapter are complied with and the system is capable of being isolated from the main system.

3.4.5.10 The spraying nozzles shall be so located as to ensure an effective water discharge. The spacing between nozzles shall be determined on the basis of their characteristics and the manufacturer's recommendations. Nozzle positioning shall take into account obstructions, in the engine room, to the spray of the fire-fighting system.

3.4.5.11 The starting arrangements shall be located in easily accessible positions inside and outside the protected space. The starting arrangements located inside the space shall be so positioned as not to be cut off by a fire in the protected area.

3.4.5.12 The system operation instructions shall be displayed at each starting arrangement.

3.4.5.13 Means shall be provided for checking water pressure and flow rate during the system operation.

3.4.5.14 Activation of the local water-spraying fire-extinguishing system shall give visual and audible alarms, as well as indication of the activated zone. Signaling devices and indicators shall be provided in each protected space and at MFFS.

3.4.5.15 Spare parts for the system shall be provided as recommended by the manufacturer.

3.4.5.16 The electrical components of the electric power source in the protected spaces shall have a minimum rating of IP 54. Systems requiring an external power source need only be supplied by the ship's main power source.

3.4.5.17 Water-spraying fire-extinguishing system shall be of the type approved by PRS or an authorized body and shall comply with the requirements specified in IMO MSC/Circ. 913 and MSC/Circ.1082.

3.5 Foam Fire-Extinguishing System

3.5.1 General Requirements

3.5.1.1 Foam generating devices and foam concentrates for foam fire-extinguishing systems shall be of the type approved by PRS or an authorized body. Foam concentrates shall comply with the requirements of IMO circulars: MSC/Circ.582 – for low-expansion foam, MSC/Circ.798 – for medium-expansion foam and MSC/Circ.670 – for high-expansion foam.

3.5.1.2 Containers for the storage of foam concentrates shall be provided with arrangements for air venting, filling and draining, instruments indicating the liquid level and manholes for cleaning and inspection.

Where, according to the manufacturer's recommendations, the foam concentrate shall be stored in a container without the air access, air breathing valves shall be installed on the air venting pipes.

3.5.2 Low-Expansion Foam Fire-Extinguishing System in Machinery Spaces

3.5.2.1 Where in any machinery space, a low-expansion foam fire-extinguishing system is fitted, such system shall be capable of discharging in no more than 5 min a quantity of foam at a rate at least 5 l/min per square metre of the area over which oil fuel is liable to spread.

3.5.2.2 The foam fire-extinguishing station comprising a container for the storage of foam concentrate, foam concentrate inducer or foam concentrate metering pump and a cut-off valve shall be located in a safe position, outside the protected space.

3.5.2.3 The foam solution shall be distributed by pipings to discharge outlets which shall be located above devices and areas particularly exposed to fire hazard due to the spilled oil.

3.5.2.4 The system shall be manually controlled from the foam fire-extinguishing station and remotely controlled from MFFS.

3.5.3 High-Expansion Foam Fire-Extinguishing System

3.5.3.1 A fixed high-expansion foam system used in machinery spaces shall be capable of rapidly discharging through fixed discharge outlets a quantity of foam sufficient to fill the largest space to be protected at a rate of at least 1 m in depth per minute.

3.5.3.2 The quantity of foam concentrate available on naval ship shall be sufficient to produce a volume of foam equal to five times the volume of the largest space to be protected. The expansion ratio of the foam shall not exceed 1000 to 1.

3.5.3.3 The foam delivery ducts, air intakes of foam generators and the number of foam generators shall be so selected as to ensure an efficient generation and distribution of foam.

3.5.3.4 Foam generators shall be fitted in such way as to enable their tests to be carried out without the necessity of distributing foam to the protected space.

3.5.3.5 In spaces protected by high-expansion foam fire-extinguishing system, openings shall be provided in the upper part of such spaces, opposite to foam discharge places, to ensure a free outflow of air.

3.5.3.6 The foam generator, its sources of power supply, foam concentrate containers and means of controlling the system shall be readily accessible and simple to operate and shall be grouped in as few locations as possible at positions not likely to be cut off by a fire in the protected space.

3.5.3.7 The arrangement of the foam generator delivering ducts shall be such that a fire in the protected space will not affect the foam generating equipment.

3.5.3.8 If the foam generators are located adjacent to the protected spaces, the foam delivery ducts shall comply with the following requirements:

- .1** they shall be constructed of steel having a thickness of not less than 5 mm;
- .2** they shall be so installed as to allow at least 450 mm of separation between the foam generators and the protected space;

- .3 stainless steel dampers (single or multi-bladed) with a thickness of not less than 3 mm shall be installed at the openings in the boundary bulkheads or decks. The dampers shall be automatically operated (electrically, pneumatically or hydraulically) by means of remote control of the foam generator related to them.

3.5.4 Foam Fire-Extinguishing System for the Protection of Helideck

3.5.4.1 The foam fire-extinguishing system shall consist of a pump and foam concentrate pipes, sea water pipes, foam mixing unit and two foam fire-extinguishing stations for manual foam discharge to the helideck by fast attack hose line. The generated foam shall be a low-expansion foam with expansion ratio not exceeding 12 and capable of extinguishing helicopter fuel fire.

3.5.4.2 Foam concentrate shall be stored in a separate container of at least 400 l capacity. Additionally, provision shall be made for at least 200 l reserve foam concentrate stocks, stored in portable containers, mounted close to the main container. Foam concentrate shall be of the type approved by PRS or an authorized body and shall be suitable for use with sea water.

3.5.4.3 Foam fire-extinguishing stations shall be placed in safe locations so as not to be cut-off by helicopter casualty and fire. The distance between the foam fire-extinguishing stations shall be not less than one-half of the helideck width.

3.5.4.4 The foam fire-extinguishing station shall be fitted with a branch pipe and fire hydrant for permanent connection of a fire hose with manually controlled nozzle. The hose shall be rigid and stowed on a reel ensuring its easy unreeling. The length of the hose shall be such as to allow the foam discharged from manually controlled nozzle to reach any part of the helideck.

3.5.4.5 Foam monitor/monitors, where provided, shall be regarded as additional to the foam fire-extinguishing stations, referred to above. The foam monitors shall be so located as to allow foam to be delivered to any part of the helideck in all weather conditions in which helicopters can operate.

3.5.4.6 The foam fire-extinguishing system shall be capable of delivering foam at the discharge rate specified in the Table below, for at least 5 minutes:

Helideck category	Helicopter overall length, L [m]	Discharge rate of foam solution [l/min]
H1	$L < 15$	250
H2	$15 \leq L < 24$	500
H3	$24 \leq L < 35$	800

3.6 Carbon Dioxide Systems

3.6.1 General Requirements

3.6.1.1 Only high pressure carbon dioxide fire-extinguishing systems are permitted to be used. Carbon dioxide fire-extinguishing system shall consist of CO₂ cylinders battery, manifold, supplying pipelines and discharge nozzles.

3.6.1.2 CO₂ cylinders shall be located in a separate space – fire-extinguishing station. The requirements for CO₂ fire-extinguishing station are given in 3.1.3.

3.6.1.3 Spaces protected by carbon dioxide fire-extinguishing system shall be fitted with mechanical ventilation.

3.6.1.4 All doors and ventilation openings leading to protected spaces shall be capable of being closed from outside of the space.

3.6.1.5 In order to prevent an excessive pressure in a space protected by gas fire-extinguishing system due to the discharge of the fire-extinguishing medium, means shall be provided for the release of air from the upper part of the space. Fire-extinguishing system operation instructions shall clearly specify which valves should be closed last after admission of the medium.

3.6.1.6 CO₂ cylinders, fittings and nozzles shall be of the type approved by PRS or an authorized body.

3.6.2 Calculation of Carbon Dioxide Quantity and Pipe Diameters

3.6.2.1 The necessary quantity of carbon dioxide shall be calculated from the formula:

$$G = 1.79V\varphi, [\text{kg}]$$

where:

V – design volume of the largest space to be protected, [m³];

φ – filling factor, [kg/m³];

$\varphi = 0.3$ – for dry cargo holds and other spaces, except machinery spaces;

$\varphi = 0.35$ – for machinery spaces, the volume of which includes the volume of casings;

$\varphi = 0.4$ – for machinery spaces, the volume of which does not include the volume of casings above the level, at which the horizontal section area of the casing does not exceed 40% of the machinery space area, taken midway between the tank top and the lowest part of the casing.

Note:

For machinery spaces, such value of φ shall be taken at which G is the greatest. In naval ships below 800 tonnes displacement, upon PRS' agreement, the factors 0.35 and 0.4 may be reduced to 0.3 and 0.35, respectively.

3.6.2.2 Pipelines supplying carbon dioxide to the protected spaces shall ensure the supply of 85% of the design amount of carbon dioxide, from the cylinder, in a time not longer than:

- .1 2 minutes – to machinery spaces, emergency power unit spaces and to other spaces where oil fuel is used;
- .2 10 minutes – to spaces other than those specified in .1.

The time of CO₂ discharge to the protected spaces shall be checked by suitable calculations to be included in classification documentation of the carbon dioxide fire-extinguishing system.

3.6.2.3 The wall thickness of pipes shall be calculated according to sub-chapter 1.16.3, *Part VI – Machinery Installations and Refrigerating Plants* and shall not be less than the values specified in Table 1.16.3.1-1 of the said *Part*.

3.6.3 Requirements for Carbon Dioxide Cylinders

3.6.3.1 The number of cylinders for the storage of compressed carbon dioxide shall be chosen depending on the filling ratio (amount of carbon dioxide per 1 litre of the cylinder volume), which shall not exceed 0.675 kg/l – for the cylinder of the design pressure 12.5 MPa and 0.75 kg/l – for the cylinder of the design pressure 15 MPa and over.

While filling the cylinder, allowance not exceeding ± 0.5 kg (for 67 l standard cylinder) in relation to the design quantity is permitted. For cylinders of local fire-extinguishing stations, prescribed in 3.1.3.3 and 3.6.6, the cylinder filling ratio shall be reduced by 0.075 kg/l.

3.6.3.2 The cylinders in fire-extinguishing stations shall be placed vertically in rows on insulation pads which may be made of wood.

The cylinders shall be accessible for inspection and for checking the amount of carbon dioxide contained therein. Each cylinder shall be painted red and numbered.

3.6.3.3 The pipe connecting the cylinder with manifold, the so-called branch shall be made of metal tube loop. It is permitted to use pipes made of approved flexible materials.

Each branch in the collecting manifold shall be fitted with a non-return valve.

3.6.3.4 The manifold from the cylinders up to and including distribution valves shall be designed for a nominal working pressure of 10 MPa and shall be made of seamless steel pipes with certificate issued by an authorized body.

The manifold shall be fitted with a pressure gauge and a safety valve with outlet to the atmosphere. The safety valve opening pressure shall be 13 MPa and the flow area of the valve shall enable the discharge of excess CO₂ to the atmosphere without causing overpressure of the manifold.

A cock with a non-return valve shall be fitted on the manifold before distribution valves intended for hydraulic pressure tests of manifold and for blowing the pipes and CO₂ nozzles with compressed air.

3.6.3.5 Carbon dioxide fire-extinguishing station shall be fitted with an arrangement for measuring the amount of CO₂ in the cylinders.

3.6.3.6 Cylinders shall be fitted with safety valves or bursting disks, operating or bursting at a pressure rise in the cylinders to $1.3 p (\pm 0.1 \%)$, where p means the cylinder design pressure.

3.6.3.7 Where the cylinder storage space is located below the open deck, the carbon dioxide from the cylinder safety valves shall be discharged to the atmosphere by a special pipe having an audible signalling device.

3.6.3.8 The cylinder valves opening device shall be of a lever type and shall ensure full opening of the valve by turning the lever by not more than 90°. The device shall permit the valves to be opened individually or in groups.

3.6.3.9 The cylinder valves shall be fitted with siphon pipes cut diagonally at the distance of 5 mm from the cylinder bottom. Inside diameters of these pipes and the pipes connecting the cylinder valves with manifold shall be not less than 10 mm.

3.6.4 Starting Arrangements

3.6.4.1 Carbon dioxide system shall be capable of remote start from outside of the protected space, as well as of manual start – in the event of emergency – from fire-extinguishing station.

3.6.4.2 Remote controls of the carbon dioxide system for the protection of machinery spaces and emergency generator space shall be fitted in MFSS and in a place above the bulkhead deck, located in the vicinity of the entrance to the protected space.

3.6.4.3 Starting arrangements in the fire-extinguishing station shall ensure a simultaneous opening of all cylinder valves provided for the protected space.

3.6.4.4 Starting arrangement shall automatically switch off mechanical ventilation serving the protected space.

3.6.4.5 Starting arrangements of carbon dioxide fire-extinguishing systems used in spaces, in which persons may normally be present, shall comply with the following requirements:

- .1** they shall have two independent controls of carbon dioxide discharge to the protected space. One of these controls shall ensure opening of the carbon dioxide cylinder valves, whereas the other one shall open the valve on the pipeline supplying carbon dioxide to the protected space;
- .2** both controls shall be located inside a control cabinet which shall be clearly marked indicating the space, for the protection of which it is intended. If the cabinet is locked, then the key shall be placed in a glazed box near the cabinet;

- .3 the opening of the cabinet shall activate, in the protected space, a warning signal complying with the requirements of sub-chapter 4.2;
- .4 starting arrangement shall be provided with a time-delay device, interlocked with warning signalization, to ensure that the release of carbon dioxide into the space will be delayed by the time necessary to evacuate the space, but not less than 20 s.

3.6.5 Distribution Pipelines and Nozzles

3.6.5.1 Distribution pipelines runs from fire-extinguishing station to the protected spaces shall be as short as practicable.

3.6.5.2 Carbon dioxide shall be discharged into protected spaces through nozzles to be located in the upper part of the protected space. The nozzles shall be also directed to the drip-trays of tanks and oil fuel arrangements.

3.6.5.3 Where the floor plates in machinery spaces of category A are placed higher than one metre above the tank top, a number of nozzles (about 15% or a in suitable proportion to the volume) shall be fitted in the upper part of that space, below the floor.

3.6.6 Local Carbon Dioxide Fire-Extinguishing Stations

3.6.6.1 In well-grounded cases, local CO₂ fire-extinguishing stations may be located in spaces where the crew is normally employed. The maximum number of CO₂ cylinders in the station shall be such that CO₂ concentration in the room after its release does not exceed 5% of the gross volume, i.e. concentration safe for the persons in the room.

A greater number of CO₂ cylinders is permitted, provided that carbon dioxide from CO₂ cylinder safety valves is discharged to the atmosphere by a special pipe fitted with an audible signalling device and that it cannot penetrate to the space after being used (i.e. cylinders for extinguishing combustion engine silencers fire).

3.6.6.2 A local carbon dioxide fire-extinguishing station for extinction of fire in exhaust duct from the galley range shall consist of a cylinder, supplying pipeline and discharge nozzles, fitted in the duct. The necessary quantity of carbon dioxide shall be calculated from the formula:

$$G = 1.79 \cdot V \cdot \varphi \cdot z, \text{ [kg]}$$

where:

V – volume of space above galley range, plus volume of ventilation duct, [m³];

φ – filling factor equal to 0.4, [kg/m³];

z – coefficient of losses, resulting from the open space protection;

$z = 2\div 3$, depending on the galley range.

Carbon dioxide may be stored in one or more cylinders in a cabinet inside the galley space.

3.7 Other Gas Fire-Extinguishing Systems

3.7.1 Extinguishing systems being capable of maintaining the atmosphere with the oxygen content not exceeding 14% by volume may be employed as gas fire-extinguishing systems.

3.7.2 Inert gases, such as nitrogen, argon or any mixture of them, as well as gaseous fire-extinguishing media permitted for use in fire protection and treated as halon substitutes may be used as fire extinguishing medium.

3.7.3 In the case of fire-extinguishing systems used for the protection of spaces in which the crew is normally employed, the maximum concentration of extinguishing medium, after its release into the space, cannot be greater than its LOAEL (Lowest Observed Adverse Effects Level), calculated on the net volume of the protected space.

3.7.4 The filling time of the protected space shall be taken not longer than that for carbon dioxide systems specified in 3.6.2.2.

3.7.5 The extinguishing medium shall be stored in receivers, which may be kept within the protected space or outside the space, in fire-extinguishing station complying with the requirements of 3.1.3.2.

3.7.6 Steam fire-extinguishing system may be used on naval ships, in restricted areas, as an addition to the required fire-extinguishing systems, subject to PRS' consent in each particular case. In such cases, the boiler for supplying steam shall have an evaporation of at least 1.0 kg per hour for each 0.75 m³ of the gross volume of the largest protected space.

3.7.7 Gas fire-extinguishing systems shall be of the type approved by PRS or an authorized body. The basis for approval of gas fire-extinguishing systems intended for the protection of machinery spaces of category A is IMO MSC/Circ.848.

3.8 Dry Powder Fire-Extinguishing System

3.8.1 General Requirements

3.8.1.1 In dry powder systems, the extinguishing powder approved by PRS or an authorized body shall be used.

3.8.1.2 Nitrogen shall be used as the powder carrier. Other type of inert gas may be used upon agreement with PRS.

3.8.1.3 The system shall consist of:

- .1** fire-extinguishing stations, where powder containers, gas (powder carrier) pressure vessels and distribution manifolds are stored;

- .2 fire stations, where starting cylinders, fire hose nozzles or powder monitors are stored;
- .3 pipings and fittings for the activation of the system and for the powder supply to fire stations.

3.8.1.4 Remote activation of the system from any one of the fire stations, referred to in 3.8.1.3.2, shall be ensured.

The system shall be ready to operate not later than 30 s from the opening of starting cylinder at the most remote, from the fire-extinguishing station, fire station.

3.8.2 Quantity of the Powder and Gas (Powder Carrier) Number and Capacity of Fire-Hose Nozzles and Monitors

3.8.2.1 In each container stored in the fire-extinguishing station, there shall be a design quantity of powder adequate for a continuous operation during at least 45 s of all fire hose nozzles and monitors connected to one station, at their rated capacity.

3.8.2.2 The capacity of each fire hose nozzle shall be not less than 3.5 kg/s and the distance of powder coverage not less than 8 m. When determining the maximum distance of coverage of a fire hose nozzle, the length of the hose shall be taken into account.

3.8.2.3 The capacity of each monitor shall be not less than 10 kg/s; 10, 30 and 40 m shall be taken as the maximum distances of powder discharge for the monitors of 10, 25 and 45 kg/s capacity.

3.8.2.4 The quantity of powder for the protection of emergency sets compartments, store-rooms of readily ignitable materials, store-rooms of flammable gases, etc. shall be such as to ensure a continuous operation of the system during at least 10 s at the discharge rate of 0.1 kg/m^3 per one second.

3.8.2.5 The quantity of gas (powder carrier) shall be sufficient for a single discharge of the total quantity of powder in the container.

3.8.3 Fire-Extinguishing Stations of Dry Powder System

If two or more fire stations are connected to the fire-extinguishing station, each of them shall be supplied from the powder manifold by an independent pipe fitted with an isolating valve.

The fire-extinguishing station arrangements shall enable the operation of both the individual fire stations and all the stations simultaneously.

3.8.4 Fire Stations

3.8.4.1 Fire stations shall be located in easily accessible positions.

3.8.4.2 Each fire station shall be provided with the following:

- fire hose nozzle;
 - rigid, non-kinkable hose up to 25 m in length;
 - cylinders for remote activation of the system;
- or alternatively:
- monitor;
 - cylinders for remote activation of the system.

3.8.4.3 The fire station equipment, except for the monitor, shall be stored in a watertight box or locker.

3.8.4.4 The fire hose nozzle shall be equipped with a device for the opening and closing the passage.

3.8.4.5 The passage area of the fire hose nozzle shall be equal to the hose passage area or less, but not more than by 50%.

3.8.4.6 Starting cylinders shall be fitted with pressure gauges.

3.8.4.7 The system activation instructions shall be available at each fire station.

3.8.5 Containers, Pipings and Fittings

3.8.5.1 Powder container shall be provided with a scarfed pipe with its end being at a distance of about 100 mm from the container bottom.

3.8.5.2 Arrangement for the supply of gas to the lower part of the container shall be provided with a device preventing the powder from penetrating into the gas piping.

3.8.5.3 The powder filling ratio shall be taken not greater than 0.95.

3.8.5.4 The pipings and fittings of the system shall not have contractions or sudden increase of the passage area.

3.8.5.5 The cross-sectional area of the manifold in the fire-extinguishing station shall be not less than the sum and not greater than the double sum of the sectional areas of pipings connected to the manifold through which the powder may be simultaneously supplied.

3.8.5.6 The distributing manifold of the system in the fire-extinguishing station shall be provided with means for blowing-through the pipes after the use of the system.

3.8.5.7 The bending radius of the powder system pipings shall be not less than $10d$, where d is the outer diameter of the pipe.

3.8.5.8 To spaces, set down in 3.8.2.4, the powder shall be delivered by means of spray nozzles, the design, number and arrangement of which shall ensure an uniform powder coverage throughout the space. The pressure at the most remote spray nozzle shall be equal to at least the minimum pressure sufficient for effective powder coverage.

3.9 Special Fire-Extinguishing Systems

For the protection of specific spaces, the use of special fire-extinguishing systems is permitted. Such systems are subject to PRS' consideration in each particular case.

3.10 Pressure Tests of Fire-Extinguishing Systems

3.10.1 The scope of tests and test pressure values for fire-extinguishing systems at workshop tests and upon completion of pipelines installation on board naval ships shall be taken from Table 3.10.

3.10.2 The system flexible coupling which according to the *Rules* requirements shall be fire-proof shall be subjected to fire test. During the test, the coupling shall be subjected to a temperature of 800 °C during 30 min, the pipeline being filled with water at a maximum, for the given system, working pressure. Water temperature at the outlet cannot be lower than 80 °C. No leakages are permitted.

Alternatively, fire test may be carried out at a pressure lower than the working pressure, but not lower than 0.5 MPa. In such case, the coupling after the test completion shall be subjected to a pressure equal to twice the working pressure.

3.10.3 Fire hydrants are subject to fire test, which shall be conducted in two stages:

- dry test – the valve shall be put into a furnace and tested for 10 minutes at a temperature of 250 °C;
- test under water working pressure – the valve connected to the water supply piping shall be put into a furnace and tested for 30 minutes at a temperature of 540 °C.

The fire test is considered satisfactory if after conducting the two stages of the test, the fire hydrant operates properly.

Table 3.10
Scope of tests and test pressure values for fire-extinguishing systems

Item	Systems and components to be tested	Hydraulic test pressure	
		In workshop	On board naval ship
1	2	3	4
1	Water and foam fire-extinguishing systems (see also sub-chapter 1.5.4, <i>Part VI—Machinery Installations and Refrigerating Plants</i>):		
	.1 pipes of water fire main systems,	–	1.25 <i>p</i>
	.2 pipes of water-spraying systems,	–	1.25 <i>p</i>
	.3 pipes of sprinkler systems.	–	1.25 <i>p</i>

1	2	3	4
2	Pipes of dry powder systems	1.5 <i>p</i>	1.25 <i>p</i> (air test)
3	Carbon dioxide fire-extinguishing system: .1 pipes from cylinders to distribution valves, distributing pipes passing through the spaces (see 3.1.4.1); .2 pipes from distribution valves to protected spaces, pipes of protective devices; .3 pipes in the protected space.	1.5 <i>p</i> – –	10 MPa 5 MPa 0.5 MPa
4	Pipes of other gas fire-extinguishing systems	–	1.25 <i>p</i> (air test)
5	Compressed air pipes	1.5 <i>p</i>	1.25 <i>p</i> (air test)
6	Cylinders, storage tanks and containers: .1 pressurized (cylinders without valves), .2 non-pressurized, .3 cylinders with valves fitted.	1.5 <i>p</i> by filling up to the top of air vent pipe 1.25 <i>p</i> (air test)	– (air test, together with the whole system) –
7	Fittings – pressure and strength tests	1.5 <i>p</i> (but at least 0.2 MPa)	–

Notes to Table 3.10:

- 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*. Carbon dioxide cylinders valves shall be tested for tightness to maximum breaking pressure of the bursting disk – according to 3.6.2.6.
- 3) The systems shall be tested in assembly on board naval ship, upon completion of all installation work.
- 4) Pipes of water fire main systems in naval ships exceeding 500 tonnes displacement shall be tested for tightness to a pressure of at least 1.0 MPa.

4 FIRE SIGNALLING SYSTEMS

4.1 Fire Detection and Fire Alarm System

4.1.1 General Requirements

4.1.1.1 Any fire detection and fire alarm system shall be fitted with fire detectors, manually operated call points and control panel. The system shall be capable of immediate operation at all times.

4.1.1.2 Fire detectors shall be operated by heat, smoke or other factors indicative of incipient fires.

4.1.1.3 Fire detection and fire alarm system shall be divided into sections of detectors covering particular areas of the ship's spaces.

4.1.1.4 Where the fire detection and alarm system does not include means for remotely identifying each detector individually, no section covering more than one deck within accommodation spaces, service spaces and control stations is normally permitted, except a section which covers an enclosed stairway. In order to avoid delay in identifying the source of fire, the number of the enclosed spaces included in each section shall be limited to minimum and is subject to PRS' consideration. In no case shall more than 50 enclosed spaces be permitted in any section.

If the system is fitted with remotely and individually identifiable fire detectors, the section may cover several decks and serve any number of enclosed spaces.

4.1.1.5 A section of fire detectors which covers control stations, accommodation spaces or service spaces cannot include fire detectors in machinery spaces of category A.

In the case of fire detection and fire alarm system with remotely and individually identifiable fire detectors, a loop covering sections of fire detectors in control stations, accommodation spaces or service spaces shall not include section of fire detectors in machinery spaces of category A.

4.1.1.6 Upon installation on board the ship, the function of the fire detection and fire alarm system shall be tested by means of equipment producing hot air of the appropriate temperature, smoke or aerosol particles having the appropriate range of density or particle size, or other phenomena associated with incipient fires to which the detector is designed to respond, in accordance with the test programme approved by PRS.

4.1.1.7 Fire detection and fire alarm system shall also comply with the requirements of sub-chapter 7.4, *Part VIII – Electrical Installations and Control Systems*.

4.1.1.8 After installation on board the ship, the system is subject to final acceptance test to ensure that safety provisions regarding the system independence of

other installations or systems, corrosion resistance of its components, the electric power supply to its control system and the availability of instructions for the system operation and maintenance are complied with.

4.1.2 Application of Fire Detection and Fire Alarm System

4.1.2.1 The system is intended for naval ships exceeding 300 tonnes displacement.

4.1.2.2 The system shall protect the following ship spaces:

- .1 accommodation and service spaces, together with corridors, stairways and escape routes;
- .2 rooms for readily ignitable materials and welding workshops;
- .3 control stations;
- .4 spaces intended for the carriage of dangerous cargoes;
- .5 enclosed spaces intended for the carriage of military vehicles.

4.1.3 Arrangement of Fire Detectors and Manually Operated Call Points

4.1.3.1 Fire detectors shall be so located as to ensure their optimum performance. Positions near beams and ventilation ducts or other positions where patterns of air flow could adversely affect the detectors performance and positions where impact or physical damage is likely shall be avoided. Detectors which are located overhead shall be at least 0.5 m away from bulkheads.

Distances of less than 0.5 m from bulkheads may be acceptable in corridors, lockers and stairways.

4.1.3.2 Manually operated call points shall be installed throughout the accommodations spaces, service spaces and control stations. One manually operated call point shall be located at each exit. Manually operated call points shall be readily accessible in the corridors of each deck and shall be so arranged that no part of the corridor is more than 20 m from a manually operated call point.

4.1.3.3 Smoke detectors shall be installed in all stairways, corridors and escape routes within accommodation spaces. It is recommended that smoke detectors should be installed within ventilation ducts, in which smoke, the indicative of fire, may appear.

4.1.3.4 Where fire detection and fire alarm system is installed in spaces other than stairways, corridors and escape routes, at least one fire detector shall be installed in each such space.

4.1.3.5 The arrangement of fire detectors shall be in accordance with the below requirements:

Item	Type of detector	Maximum floor area per detector, [m ²]	Maximum distance between detector centres, [m]	Maximum distance away from bulkheads, [m]
1	Heat	20	5	2.5
2	Smoke	40	6	3.0

Fire detector spacings greater than those given in the above Table may be permitted on the basis of the documented examinations and tests carried out by fire detection and alarm system manufacturer.

4.2 Warning Signalization of the Release of Fire-Extinguishing Medium

4.2.1 In spaces protected by gas fire-extinguishing systems, specified in sub-chapters 3.6 and 3.7, in which persons may normally be present, means shall be provided for automatically giving visual and audible warning of the release of fire-extinguishing medium into the spaces. This applies, in particular, to such spaces as machinery spaces, spaces intended for the carriage of combat equipment, as well as other spaces to which access is facilitated by doors or hatchways. Small spaces, such as small compressor rooms, paint lockers, etc. with local operation of fire-extinguishing system need not be provided with warning signalization system if the walking distance to the door does not exceed 10 m.

4.2.2 Warning signalization shall be different from other alarm signals and shall be audible at the highest noise level in the protected space and in adjacent spaces if evacuation from the adjacent spaces is performed through the protected space.

4.2.3 Warning signalization shall be activated automatically by fire-extinguishing system starting arrangements. The signalization shall operate for a suitable period before the release of fire-extinguishing medium to allow evacuation of the space.

4.2.4 Warning signalization shall also comply with the requirements of sub-chapter 7.5, *Part VIII – Electrical Installations and Control Systems*.

5 FIRE PROTECTION OF NAVAL SHIP SPACES

5.1 Accommodation Spaces, Service Spaces and Control Stations

5.1.1 All accommodation spaces, service spaces and control stations shall be provided with the sprinkler system complying with the requirements of sub-chapter 3.3. In addition, fire detection and fire alarm system, with fire detectors complying with the requirements of sub-chapter 4.1 shall be fitted in all corridors, stairways and escape routes.

5.1.2 In accommodation spaces, service spaces and control stations in which internal divisional bulkheads are B or C Class divisions, the sprinkler system need not be used.

5.1.3 In accommodation spaces, service spaces and control stations in which the space bounded by A and B Class division does not exceed 50 m², instead of the sprinkler system, fire detection and fire alarm system complying with the requirements of sub-chapter 4.1 can be used.

5.1.4 In spaces which afford no substantial fire risk, such as void spaces, sanitary spaces, etc., the sprinkler system and fire detection and fire alarm system need not be installed.

5.1.5 Accommodation spaces shall be provided with fire-fighting equipment and emergency escape breathing devices, located in accordance with Table 7.6. Emergency escape breathing devices shall be located in easily accessible places on escape routes.

5.2 Machinery Spaces

5.2.1 In ships exceeding 300 tonnes displacement, machinery spaces of category A shall be provided with one of the following fire-extinguishing systems:

- .1** a gas system complying with the requirements of sub-chapter 3.6 or 3.7;
- .2** a high-expansion foam fire-extinguishing system complying with the requirements of sub-chapter 3.5.3;
- .3** a water-spraying fire-extinguishing system for machinery spaces complying with the requirements of sub-chapter 3.4.3.

In ships below 300 tonnes displacement, unattended machinery spaces of category A shall also be provided with one of the above-mentioned fire-extinguishing systems.

As an alternative, the following fire-extinguishing systems complying with the requirements of IMO circulars can be used: gas fire-extinguishing system – MSC/Circ. 848, high pressure water mist fire-extinguishing system – MSC/Circ. 668 and MSC/Circ. 728 and aerosol fire-extinguishing system – MSC/Circ. 1007.

5.2.2 Fuel oil purifiers room shall be provided with fire detection and fire alarm system, complying with the requirements of sub-chapter 4.1, and a fixed fire-extinguishing system capable of being activated from outside the room. The system shall operate independently of the machinery space fire-extinguishing system, but may constitute its part.

Closing of ventilation openings in fuel oil purifiers room shall be effected from a position close to the place from which fire-extinguishing system is activated.

In the engine room, in which fuel oil purifiers are not located in a separate space, a local fire-extinguishing system shall be provided, capable of being activated automatically or activated manually from the machinery control position or from other suitable location. If automatic release is provided, additional manual release shall be also arranged.

If a local water-spraying fire-extinguishing system, complying with the requirements of 3.4.5 is applied for fuel oil purifiers, no other fire-extinguishing system is required.

5.2.3 In ships exceeding 2000 tonnes displacement, machinery spaces of category A above 500 m³ in volume shall be provided with a local water-spraying fire-extinguishing system complying with the requirements of 3.4.5.

5.2.4 For main and auxiliary internal combustion engines silencers, exhaust gas boilers, exhaust gas pipes of steam boilers and incinerators, as well as gas turbine system regenerators, a local gas fire-extinguishing system, independent of the machinery space fire-extinguishing system, shall be provided.

5.2.5 Means of control shall be provided for:

- .1 opening and closure of skylights, closure of openings in funnels which normally allow exhaust ventilation and closure of ventilator dampers;
- .2 stopping ventilating fans of machinery space ventilating system;
- .3 stopping forced and induced draught fans, oil fuel transfer pumps, oil fuel unit pumps, lubricating oil service pumps, thermal oil circulating pumps and oil separators;
- .4 closing oil fuel pipes valves for storage, settling and daily service tanks situated in machinery space above the double bottom.

5.2.6 Means of control, required in 5.2.5, shall be located outside the machinery space where they will not be cut off in the event of fire in the spaces they serve.

5.2.7 Each machinery space shall be provided with fire-fighting equipment in accordance with Table 7.6.

5.3 Cargo Spaces

5.3.1 In ships exceeding 500 tonnes displacement, cargo spaces intended for the carriage of dry cargoes, which do not constitute the ship's spares, shall be provided with one of the following fixed fire-extinguishing systems:

- .1 a gas system complying with the requirements of sub-chapter 3.6 or 3.7;
- .2 a water-spraying fire-extinguishing system complying with the requirements of sub-chapter 3.4, with the water discharge rate not less than 5 l/min per square metre of the cargo hold.

5.3.2 Naval ships below 500 tonnes displacement are subject to special consideration of PRS.

5.4 Cargo Areas on Open Deck

5.4.1 Cargo areas intended for the carriage of containers loaded with special supply for naval ship, creating fire or explosion hazard, shall be located far away from accommodation spaces and combat equipment.

5.4.2 If open cargo space for containers has a roof, it shall be fitted with water-foam spraying nozzles supplied from foam fire-extinguishing system or water fire main system. The water or foam discharge rate shall be not less than 5 l/min per square metre of the deck.

5.4.3 A container carrying materials that are particularly dangerous for the naval ship survivability shall be so located and secured as to allow emergency drop of the container overboard.

5.4.4 The post for container emergency drop overboard shall be operated by one person from a safe place located close to the container.

5.5 Galleys

5.5.1 Bulkheads and decks of galleys and bakeries shall be constructed of steel or shall be made from steel equivalent materials.

5.5.2 The deck in galleys and bakeries shall be lined with ceramic tiles or other equivalent non-combustible material.

5.5.3 From each galley serving more than 50 persons, at least two exits shall be provided; one of these exits may be an emergency escape through a window or hatch.

5.5.4 The equipment of a galley shall be made of non-combustible materials.

5.5.5 Exhaust ducts from galley range and bakery shall not pass through spaces which constitute fire risk. Such ducts passing through these spaces shall be covered with non-combustible insulation material of such thickness that the temperature rise on the external surface of the insulation will not exceed 60°.

5.5.6 Exhaust ducts from galley ranges passing through accommodation spaces or spaces containing combustible materials shall be constructed of A Class divisions and shall comply with the applicable requirements for ventilation ducts,

set forth in sub-chapter 11.2, *Part VI – Machinery Installations and Refrigerating Plants*. Additionally, the exhaust duct shall be fitted with:

- .1 a grease trap readily removable for cleaning;
- .2 a fire damper located in the lower end of the duct. The fire damper shall be made of steel and shall be capable of stopping the air draught. It is recommended that a fire damper should be also provided in the upper end of the duct;
- .3 fixed means for extinguishing fire within the duct. If carbon dioxide system is fitted, it shall comply with the requirements of paragraph 3.6.6.2;
- .4 suitably located hatches with covers for inspection and cleaning.

Arrangements, operable from within the galley, for shutting off the exhaust fans shall be provided.

5.5.7 Deep-fat cooking/frying equipment shall be fitted with the following:

- .1 an automatic or manual fire-extinguishing system, approved by PRS or an authorized body on the basis of tests carried out in accordance with ISO 15371:2000;
- .2 a primary and backup thermostat with an alarm to alert the operator in the event of failure of either thermostat;
- .3 arrangements for automatically shutting off the electrical power upon activation of the fire-extinguishing system;
- .4 an alarm for indicating operation of the fire-extinguishing system in the galley where the equipment is installed; and
- .5 manual operation switch of the fire-extinguishing system, clearly labelled.

5.5.8 Galley and bakery equipment shall be electric power supplied; in special cases, subject to PRS' consent, heating steam or liquid fuel equipment may be used.

5.6 Waste Storage and Handling Spaces

5.6.1 Waste storage and handling spaces shall be fitted with water-spraying fire-extinguishing system complying with the requirements of sub-chapter 3.4 or sprinkler system complying with the requirements of sub-chapter 3.3. The water-spraying system may be supplied by water fire main system or fresh water hydrofore system.

5.6.2 Incinerator spaces situated outside machinery spaces shall be provided with fire detection and fire alarm system complying with the requirements of sub-chapter 4.1, as well as with one of the fire-extinguishing systems required for protection of machinery spaces of category A, specified in paragraph 5.2.1.

5.7 Welding Shops and Cylinder Stowage Spaces

5.7.1 Welding shops in naval ships shall comply with the following requirements:

- .1 they shall not be situated in the forward part of the ship's hull, in machinery spaces and at a distance less than 5 m from the spaces that constitute fire or explosion risk;
- .2 they shall have exits to the open deck and shall be separated from the adjacent spaces by A-60 Class divisions or by A-0 Class divisions in cases where the spaces do not constitute fire risk;
- .3 the entrance doors shall be locked and shall be so designed as to be capable of being sealed in closed position;
- .4 they shall be provided with an independent mechanical ventilation ensuring at least 20 air changes per hour.

5.7.2 Spaces intended for the stowage of oxygen and acetylene cylinders shall comply with the following requirements:

- .1 natural ventilation in the spaces shall be provided;
- .2 means shall be provided to enable stowage of oxygen and acetylene cylinders in vertical position; cylinder racks shall be provided with clamps or other arrangements ensuring proper fastening and quick removal of the cylinders;
- .3 spaces intended for the stowage of cylinders shall be arranged at a distance not less than 4 m from accommodation spaces, service spaces and control stations, as well as from the spaces containing readily ignitable materials and fuel, or in which equipment essential for the naval ship's survivability and fighting capability has been installed;
- .4 spaces intended for the stowage of acetylene cylinders shall be independent of the oxygen cylinder spaces, and shall be provided with access directly from the open deck with notices warning against fire or explosion hazard, placed on the door;
- .5 spaces intended for the stowage of oxygen and acetylene cylinders shall be separated from the adjacent spaces by A-60 Class divisions; doors to these spaces shall be locked and shall be so designed as to be capable of being sealed in closed position.

5.8 Store-Rooms for Readily Ignitable Materials

5.8.1 Store-rooms for readily ignitable materials shall be located outside the area of accommodation spaces and service spaces and far from the spaces containing ship armament. Exits from the store-rooms shall lead to the open deck directly or via corridor, stairway or a hatch specially designed for this purpose. In naval ships below 300 tonnes displacement, the store-rooms may be located within the area of accommodation spaces and service spaces, but they shall not be adjacent thereto.

5.8.2 Flammable liquids of a flash-point below 43 °C shall be stored inside ventilated store-rooms in metallic receivers; each of such receivers shall be fitted with:

- .1 self-closing tap valve;
- .2 closed-type measuring device;
- .3 device for filling the receiver from outside the store-room;

- .4 air pipe, led outside the store-room and complying with the requirements of sub-chapter 9.1, *Part VI – Machinery Installations and Refrigerating Plants*;
- .5 drip tray.

The quantities of any flammable liquids not exceeding 35 dm³ may be stored in metallic canisters with tight closure.

Where the total volume of the receivers exceeds 250 dm³ (but does not exceed 2500 dm³), the store-room used for their storage shall be fitted with an independent mechanical ventilation ensuring the removal of air from the lower parts of the space at the rate not less than 20 changes per hour.

The supply ventilation may be of natural type.

Switching on the fans shall be combined with the arrangement opening the access door to the store-room. The whole equipment inside the store-room shall be of explosion-proof type, according to sub-chapter 2.8, *Part VIII – Electrical Installations and Control Systems*.

Where the quantity of flammable liquids exceeds 2500 dm³, the receivers for their storage shall comply with the requirements of sub-chapter 6.1.

5.8.3 In naval ships below 300 tonnes displacement, where the arrangement of a special space for flammable liquids of a flash-point below 43° C is not practicable, the liquids can be stored in appropriately ventilated cabinets or boxes. Such cabinets or boxes shall not be adjacent to accommodation spaces and service spaces and their doors shall open outside.

Inside the cabinets or boxes, the liquids shall be stored in metallic canisters with tight closures and their total volume shall not exceed 50 dm³.

5.8.4 Store-rooms for flammable liquids shall be provided with fire-extinguishing arrangement enabling the crew to extinguish a fire without entering the space.

The store-rooms of deck area of 4 m² and more shall be equipped with one of the following fixed fire-extinguishing systems:

- .1 carbon dioxide system, designed for 40% of the gross volume of the space;
- .2 dry-powder system, designed for at least 0.5 kg powder/m³;
- .3 water-spraying system, with the water discharge rate not less than 5 l/min per square metre of the deck area.

The water-spraying system may be connected to the water fire main system of the ship.

System other than those mentioned above may be accepted upon agreement with PRS.

For store-rooms of deck area less than 4 m², which do not give access to accommodation spaces, carbon dioxide extinguisher, which can be discharged through a port in the boundary of the store-rooms, may be provided. The extinguisher shall be stored in the vicinity of the port.

In lieu of the extinguisher, a port or hose connection enabling the direct water supply from the water fire main system may be provided.

5.9 Store-Rooms for Explosives

5.9.1 The store-rooms of the following type may be provided:

- .1** built-in store-rooms – spaces which constitute part of the ship's hull structure;
- .2** portable self-contained store-rooms – spaces which do not constitute part of the ship's hull structure, of the volume of 3 m³ or more;
- .3** portable boxes for the storage of explosives – boxes which do not constitute part of the ship's hull structure, of the volume less than 3 m³.

5.9.2 Built-in store-rooms shall be situated in the forward or after part of the ship's hull and shall be separated from the propeller shaft, propeller and rudder by at least one watertight compartment. Store-rooms shall not be located below accommodation spaces, control stations and fuel storage spaces, neither be adjacent thereto.

5.9.3 Built-in store-rooms shall not be adjacent to machinery spaces of category A, boiler rooms, galley and other fire hazardous spaces. If, however, such location cannot be avoided, a cofferdam of at least 0.6 m in width, separating these spaces, shall be provided. The cofferdam shall be fitted with ventilation and shall be empty. One of the walls enclosing the cofferdam shall be A-15 Class division. Where the cofferdam is adjacent to machinery space of category A, the wall enclosing the cofferdam shall be A-30 Class division.

5.9.4 Access to store-rooms built in the ship's hull shall be provided from the open deck through a watertight or gastight door. In no case shall the access to store-rooms be provided through spaces referred to in paragraphs 5.8.2 and 5.8.3.

5.9.5 Self-contained store-rooms and boxes for explosives shall be located on the open deck in places protected against the direct action of the sea waves. Protection against the action of the warm air and dangerous steam coming from the galley and explosive gases from the pump-room, etc., shall be provided. Attention shall be paid also to a possible effect of radio waves on certain explosives.

5.9.6 Boxes for the storage of explosives shall be located on the open deck at a distance of at least 0.1 m from the deck or any superstructure, in places affording an easy disposal of the content of the boxes overboard.

5.9.7 Bulkheads and decks forming store-rooms for explosives shall be watertight and constructed of steel. They shall be A-15 Class divisions. Insulation preventing water condensation shall be provided.

5.9.8 The pipelines of fresh water, sea water and bilge systems, as well as the pipelines of the systems installed in the store-rooms may be run through store-rooms for explosives.

The pipelines of other systems may be run through store-rooms for explosives, provided they are encased in a watertight duct.

5.9.9 The doors and covers of store-rooms must be provided with means enabling them to be locked.

5.9.10 Store-rooms shall be fitted with shelves. The construction and the capacity of the shelves shall be such as to ensure the safe stowage of the entire store of explosives in containers of the approved type and to preclude the latter from shifting or falling in case of roll.

The upper shelf shall not be located higher than 1.8 m above the floor. The shelves shall have holes to facilitate the flow of water from the upper to the lower shelves during the operation of the water-spraying system.

5.9.11 The floor of store-rooms shall be covered with permanent, antislip material precluding spark formation, such as floor-mats or two layers of linoleum.

5.9.12 The free volume of the store-room, when loaded, shall be at least 70% of the entire store-room space and the cubic capacity of the store-room shall be not less than one cubic metre per each 100 kg of explosives or 1000 detonating fuses.

5.9.13 Store-rooms built in the ship's hull shall be provided with natural or mechanical ventilation which would ensure the temperature inside store-rooms not exceeding 38 °C. Openings of this ventilation shall be provided with flame arresters.

5.9.14 Portable store-rooms shall be provided with an effective natural ventilation, the inlet and outlet openings of the ventilation being fitted with flame arresters.

5.9.15 Store-rooms for explosives shall be fitted with automatic temperature alarms whose detectors will operate at temperatures rising above 40 °C. An appropriate signal indicator shall be provided on the navigation bridge and in the ship's fire officer cabin.

5.9.16 Built-in and portable store-rooms for explosives shall be fitted with water-spraying system complying with the requirements of sub-chapter 3.4. Control devices shall be clearly marked.

5.9.17 Scuppers shall be fitted in the store-room decks. The scupper pipes shall be fitted with valves which shall be kept permanently closed under normal service conditions. The valves shall be controlled from outside the store-room.

5.9.18 Portable store-rooms shall be fitted with plates stating the weight of the empty store-room and the weight of the store-room loaded to a maximum.

5.9.19 Boxes for the stowage of explosives shall be watertight and constructed of metal. The thickness of the walls and cover of the boxes shall be not less than 3 mm. Surfaces exposed to a direct solar radiation shall be provided with protective screens.

5.9.20 Store-rooms for explosives shall be provided with the following conspicuous inscriptions:

- .1 Store-room for explosives;
- .2 Do not approach with open fire;
- .3 Keep the door closed;
- .4 Do not enter with open fire;
- .5 Do not lift (applies to portable store-rooms).

5.9.21 Boxes for the stowage of explosives shall be provided with the following conspicuous inscriptions:

- .1 Box for the stowage of explosives;
- .2 Do not approach with open fire;
- .3 Keep the box closed.

5.9.22 The electrical equipment of store-rooms for explosives shall comply with the requirements of sub-chapter 2.8, *Part VIII – Electrical Installations and Control Systems*.

5.9.23 Special rooms shall be provided for the stowage of fuses.

5.9.24 Special rooms shall be provided for charging and other preparatory operations for using explosives. The charging rooms shall be situated on the open deck, shall be bounded by A Class divisions and be well removed from accommodation spaces, service spaces and control stations.

The bulkheads, decks and the equipment of these special rooms shall be lined with materials precluding spark formation.

5.10 Ammunition Stores

5.10.1 Each ammunition store shall be provided with water-spraying system, complying with the requirements of sub-chapter 3.4 and supplied with sea water. In addition, the water-spraying system shall comply with the following requirements:

- .1 the system shall be capable of spraying separately the ammunition store walls and the horizontal area of the store shelves/floor;
- .2 the water discharge rate shall be at least 30 l/min per linear length of the wall. The pipeline for spraying the store walls shall cover the whole perimeter of the room; where the ammunition store is totally located under the waterline, spraying only the walls adjacent to other ship spaces is permitted;
- .3 horizontal areas of the store shelves/floor (where water is supplied directly on ammunition) shall be sprayed with fresh water. The water discharge rate shall be at least 24 l/min per square metre of the shelf/floor. Fresh water shall be supplied from the pressure tank and the standing fresh water charge in the pressure tank shall ensure water spraying, at the required discharge rate, for at least 5 min; in the case of small ammunition stores – for at least 3 min. The system shall be capable of being supplied with sea water after the standing fresh water charge has been used;

- .4** if ammunition is stowed in an automatic ammunition store, in separate groups (pallets, containers, etc.) and the ammunition may be automatically picked up from any group, provision shall be made for division of the water-spraying system into sections serving each group;
- .5** the water-spraying system pipings, up to section valves, shall be permanently filled with water. The required water pressure – from 0.5 MPa to 1 MPa – shall be maintained by the pressure tank. The standing water charge in the pressure tank shall ensure water spraying, at the required discharge rate, for 30 s – 60 s. After this time, the system shall be supplied from the water fire main system or by other independent water pump. A separate pressure tank for each ammunition store shall be provided;
- .6** opening time of the section valves (the system starting time) shall be from 0.3 s to 0.5 s. The use, in the system, of section valves actuated by explosive cartridges is permitted.

5.10.2 All ammunition stores shall be fitted with temperature rise control system using sensors which should respond to the temperature rise above 30, 50 and 70 °C ($\pm 5\%$). The system shall be located in the control station. The number of sensors shall be from 2 to 8, depending on the ammunition store dimensions.

5.10.3 The temperature rise above 30 °C shall automatically activate ventilation system ensuring the cooling of the ammunition store.

5.10.4 The temperature rise above 50 °C shall automatically activate the section of the water-spraying system designated for drenching the ammunition store walls.

5.10.5 The temperature rise above 70 °C shall automatically activate the section of the water-spraying system designated for drenching the horizontal areas of the ammunition store.

5.10.6 Provision shall be made for “flooding” ammunition stores, i.e. filling the stores with water to such a level as to cover the ammunition contained therein. The ammunition store flooding time cannot exceed 30 min. Water-spraying system may be used for this purpose.

5.10.7 Where flooding the ammunition store with the use of water-spraying system exceeds 30 min, a separate flooding system shall be provided.

5.10.8 Where ammunition stores are located below the ship waterline, the stores may be flooded by gravitation, through sea-inlet valves located near the store or may be flooded with water supplied by a separate pipe from the sea chests main.

5.10.9 Ammunition stores located above the ship waterline shall be flooded from an independent system supplied by an ejector or sea water pump.

5.10.10 Provision shall be made for draining the ammunition stores. The ammunition stores located above the ship waterline may be drained by separate pipes, fitted with cut-off valves and led directly overboard. The ammunition stores located below the ship waterline shall be drained by drainage system served by bilge pump, through separate pipes fitted with a cut-off valve. The cut-off valves shall be provided with information plates stating that the valves shall be kept always closed during the ship's normal operation.

5.10.11 The capacity of the drainage system shall be such that the water level rise, in the ammunition store, during the water-spraying system operation, will not be higher than 10 cm.

5.10.12 The ammunition store flooding and drainage system shall be manually controlled.

5.10.13 Pipes and fittings used for draining the ammunition stores shall be made of metals resistant to corrosion or from steel suitably protected against corrosion.

5.10.14 The manual control posts of fire-extinguishing systems, as well as of the ammunition store flooding and drainage systems shall be located in two positions outside the ammunition store, one of which shall be located one deck further up the ammunition store. The manual control of the valve for the system spraying the ammunition store walls may be performed from one position, located close to the ammunition store.

5.10.15 The location of manual control posts of fire-extinguishing systems shall take into account fire risk analysis and the layout of access routes to ammunition stores.

5.10.16 The manual control posts of fire-extinguishing systems, as well as of the ammunition store flooding and drainage systems shall not be located in closed spaces. These posts shall be easily visible and accessible, appropriately marked and shall be lighted from the emergency source of electric power.

5.11 Ammunition Stores for Rocket-Driven Missiles

5.11.1 Ammunition stores for rocket-driven missiles shall be fitted with water-spraying system, complying with the requirements of sub-chapter 3.4 and a gas fire-extinguishing system complying with the requirements of sub-chapter 3.6 or 3.7. The gas fire-extinguishing system shall additionally comply with the following requirements:

- .1** the time of extinguishing medium discharge into the ammunition store shall not exceed 10 s;
- .2** where the design of decompression airlocks does not ensure cutting off the air flow into the ammunition store, provision shall be made for a separate discharge of extinguishing medium into the decompression airlocks area to prevent the air flow into the ammunition store;

- .3 the required fire extinguishing concentration of the medium in the ammunition store shall be maintained for at least 5 min;
- .4 each ammunition store shall be provided with its own fire-extinguishing station located outside the store;
- .5 to enable the use of fire-extinguishing system twice, two fire-extinguishing medium tanks shall be provided, one of which shall be regarded as a reserve tank.

5.11.2 The temperature rise above 70 °C shall automatically activate the water-spraying system. The gas fire-extinguishing system shall be capable of manual control in the event of fire.

5.11.3 Ammunition stores for rocket-driven missiles shall be additionally fitted with pressure sensors responding to the pressure rise above 8 kPa (± 1 kPa). At least two pressure sensors shall be provided in the ammunition store.

5.11.4 The pressure rise in the ammunition store above 8 kPa shall automatically open the decompression airlocks hatches and shall operate fire-extinguishing system, with the nozzles directed into the clear opening of the airlocks.

5.11.5 Ammunition stores for rocket-driven missiles with rocket thrust exceeding 7000 N shall be additionally provided with:

- .1 a system spraying the rocket engine jet nozzles. The number of spraying nozzles shall correspond to the number of the rocket engine jet nozzles. The spraying nozzles shall be supplied with sea water; the water pressure at the spraying nozzle outlet shall be 4÷5 times greater than the dynamic and static pressures of the rocket engine exhaust gases. Water from the spraying nozzle shall be directed into the centre of the rocket engine jet nozzle;
- .2 a mechanical movable sensor of the rocket engine operation. Under the effect of rocket thrust, the sensor shall activate water supply to the nozzle spraying the engine and shall operate the external system spraying the ammunition in the ammunition store or spraying only this group of ammunition in which the engine has operated.

6 REQUIREMENTS FOR SYSTEMS AND EQUIPMENT WHICH CONSTITUTE FIRE RISK IN NAVAL SHIP

6.1 Tanks and Distributing Stations for Fuel of Flash-Point less than 43 °C

6.1.1 Tanks intended for fuel of a flash-point less than 43 °C shall comply with the following requirements:

- .1** they shall be built into the ship's hull near – to the extent practicable – its fore and aft portion and far from accommodation spaces, service spaces and the armament spaces;
- .2** they shall be surrounded from all sides and corners, excluding the side, with cofferdams which, in normal service conditions, shall be filled with water or inert gas;
- .3** each fuel tank shall be fitted with the following pipings: filling pipes, fuel discharge pipes, sounding and air pipes. The lower end of filling pipe shall be situated not more than 300 mm and the lower end of sounding pipe not more than 30 mm above the tank bottom. The tanks pipings shall comply with the requirements of sub-chapter 1.16, *Part VI – Machinery Installations and Refrigerating Plants*. The level of liquid in the tank shall be measured using closed type level meters or remote tank level measurement system;
- .4** air pipes of the tank shall be raised at least 2.5 m above the open deck. The outlets of these pipes shall be at the distance of at least 9 m from openings in superstructures and deckhouses and shall be fitted with flame arresters;
- .5** all fuel tank pipes: filling pipes, air pipes, overflow pipes and sounding pipes shall be led from the tanks to oil fuel stations inside a separate gastight trunk of dimensions enabling access at the whole length of the trunk. The trunk walls shall be made as A-60 Class divisions or, if the trunk shall be filled with inert gas – as A-0 Class divisions. In all cases, the supply and exhaust ventilation of the trunk shall be ensured. The outlets of ventilation pipes shall be fitted with flame arresters;
- .6** all fuel pipelines, machinery, fittings and instruments associated with fuel storage and transport shall be reliably grounded to the ship's hull structure in order to avoid formation of electrostatic charges.

6.1.2 Distributing stations for fuel of a flash-point below 43 °C shall comply with the following requirements:

- .1** they shall be located on the open deck as far as possible from accommodation and service spaces, as well as the armament spaces;
- .2** they shall be enclosed with A-60 Class fire divisions. The doors may be A Class doors, made of steel without insulation. The station shall be bounded with gastight bulkheads and decks;
- .3** deck linings shall preclude the possibility of sparking;
- .4** door closing arrangements shall preclude the possibility of sparking;

- .5 a measuring instrument recording the amount of distributed fuel and flexible hose terminated with self-closing valve shall be installed in the fuel distribution system;
- .6 containers used for the fuel distribution shall be made of material precluding spark formation.

6.1.3 Distributing station shall be fitted with drip trays for collecting and draining the spilled oil to a suitable drain tank.

6.2 Heating the Ship Spaces

6.2.1 Electric or steam heating appliances may be used for heating the naval ship spaces. The electric space heaters shall comply with the requirements of Chapter 15, *Part VIII – Electrical Installations and Control Systems*.

6.2.2 All ship space heaters shall be so constructed and positioned as to preclude the possibility of ignition of space furnishing and combustible materials present inside the space.

6.2.3 Ship space heaters shall be placed at least 50 mm from the sides and the space walls. The sections of sides or the space walls lined with combustible material located in close vicinity of the heaters shall be covered by non-combustible thermal insulation. Where such insulation is not provided, the heaters shall be installed at a distance not less than 150 mm from the lining made of combustible material.

7 PORTABLE FIRE-FIGHTING EQUIPMENT

7.1 General Requirements

7.1.1 Fire-fighting equipment shall be located in easily accessible and visible places on the ship and shall be suitably marked in accordance with fire protection requirements or military standards. The symbols shall be made of photoluminescent material.

Fire-fighting equipment shall be reliably mounted to walls /linings/ decks and shall be ready for immediate use.

7.1.2 Fire-fighting equipment shall be kept in good working condition and available for immediate use at all times whether at sea or in port and shall be used exclusively for fire fighting, rescue operations and training purposes.

7.1.3 Fire hoses and nozzles shall be provided with standard size couplings, adjusted to a quick attachment. The material for the fire-fighting equipment, as well as for the attachment couplings shall be resistant to corrosion by marine atmosphere.

7.1.4 Spare fire-fighting equipment shall be stored in the fire-fighting equipment room or in another place designated exclusively for this purpose. It is recommended that there should be two fire-fighting equipment rooms on the naval ship, one of which shall be located within superstructure. Each fire-fighting equipment room shall be clearly and durably marked.

7.1.5 Suitable stands for overhauling and maintenance of stored equipment and spares, as well as the means for keeping them ready for immediate use shall be provided in fire-fighting equipment room.

7.1.6 Fire-fighting equipment and fire-fighter's outfit shall be of the type approved by PRS or an authorized body.

7.1.7 A set consisting of crowbar and fire axe shall be located inside accommodation spaces area, near exits.

7.1.8 Fire protection warning plates with inscriptions: DANGER and NO SMOKING shall be provided on board. The plates of dimensions not less than 840 × 600 mm shall be white with 20 mm red borders. The letters shall be black and at least 120 mm in height.

7.2 Portable and Mobile Fire-Extinguishers

7.2.1 Powder and carbon dioxide fire extinguishers shall have a capacity of at least 5 kg; foam fire extinguisher – a capacity of at least 9 litres. The total mass of portable fire extinguisher cannot exceed 20 kg.

7.2.2 Fire extinguishers with fire-extinguishing capability equivalent to that of 9 l foam fire extinguisher may be considered equivalent to those specified in 7.2.1.

7.2.3 Portable fire-extinguishers shall be suitable for extinguishing fires which are possible in the vicinity of the fire-extinguisher location (having regard to fire size and the type of burning material).

Fire-extinguishers containing an extinguishing medium which either by itself or under expected conditions of use gives off toxic gases in such quantities as to endanger persons or gives off gases which are harmful to the environment shall not be permitted.

7.2.4 In naval ships exceeding 500 tonnes displacement, fire extinguishers of the same type, capable of being recharged on board, shall be provided with spare charges as follows: 100% for the first 10 extinguishers and 50% for the remaining extinguishers. Not more than 60 total spare charges are required. Instructions for recharging fire extinguishers shall be carried on board.

For fire extinguishers which cannot be recharged on board, additional portable fire extinguishers of the same quantity, type, capacity and number, as determined above, shall be provided in lieu of spare charges.

7.2.5 Every 12 months, fire extinguishers and fire-extinguishing units shall be subjected to periodical overhauls, which shall be carried out by fire-fighting equipment maintenance and repair shop approved by PRS or an authorized body.

7.2.6 Portable fire-extinguishers shall be situated ready for use in easily visible places, which can be reached quickly and easily at any time in the event of a fire and in such a way that their serviceability is not impaired by the weather, vibration or other external factors.

One of the portable fire-extinguishers intended for use in the given space shall be located near the entrance to that space.

7.2.7 It is permitted to fit a group of spaces of the total surface area not exceeding 50 m² with one portable fire-extinguisher stowed in the corridor, provided that entrances to these spaces are from this corridor only.

7.2.8 In accommodation and service spaces, in machinery spaces of category A and in galleys, the minimum number of portable fire-extinguishers and their location shall be such that no point in the space is more than 10 m walking distance from an extinguisher.

7.2.9 Portable fire-extinguishers shall not be stowed at a distance less than 1 m from a presumable source of fire.

7.2.10 Each fire-extinguisher shall be fitted with a device or a cotter pin and a seal, the breaking of which shall indicate that the extinguisher has been used and is, or may be, discharged.

7.2.11 Carbon dioxide portable fire-extinguishers shall not be placed in accommodation spaces.

7.2.12 In control stations and in other spaces in which electrical or electronic equipment or appliances necessary for the safety of the ship are fitted, portable fire-extinguishers shall be provided with fire-extinguishing media which are neither electrically conductive nor harmful to the equipment and appliances.

7.2.13 Mobile fire-extinguisher is a wheeled extinguisher with at least 20 kg extinguishing media capacity, provided with an actuating device containing propellant gas which allows immediate and independent fire-extinguishing operation.

In ships below 500 tonnes displacement, mobile fire-extinguishers, subject to PRS' consent, may be used as an alternative fire arrangement for fire-extinguishing equipment required in particular chapters of the present Part of the *Rules*.

7.3 Portable Foam Applicator Unit

A portable foam applicator unit shall consist of a foam nozzle, fire hose, inline inducer with a small diameter hose, two portable containers containing at least 20 l of foam concentrate. The nozzle shall be capable of producing low-expansion foam suitable for extinguishing Group B fires. The discharge rate of the nozzle shall be at least 1.5 m³/min.

7.4 Fire-Fighter's Outfit

7.4.1 A fire-fighter's outfit shall consist of:

- .1** personal equipment comprising:
 - protective clothing or protective suit made of material protecting the skin from the heat radiating from the fire and from burns and scalding by steam. The outer surface of the clothing shall be water-resistant;
 - fireman's gloves;
 - fireman's helmet;
 - wireless communication equipment;
 - an electric safety lamp with a minimum burning period of 3 h;
 - fireman's belt with snap fastener and fireman's axe sheath. The handle of the axe shall be provided with high-voltage insulation;
 - immobility indicator;
 - a non-combustible balaclava with an opening for the breathing apparatus face mask;
- .2** a breathing apparatus with a mask, 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 with a mask capable of functioning for at least 30 min. For each breathing apparatus, provision shall be made for such number of spare charges as is necessary for at least 2 hours fire fighting. Only one spare charge for each breathing apparatus is permitted, provided that an independent high-pressure compressor for

recharging the breathing apparatus air cylinders is available on board. The air cylinders and the breathing apparatus shall be of the same type to make all components of the breathing apparatus fully interchangeable;

- .3** additional equipment, comprising:
- electrically non-conductive gloves;
 - electrically non-conductive boots;
 - cutters with electrically non-conductive handles allowing to cut the largest diameter power cables, installed on board.

7.4.2 For each breathing apparatus, a fireproof lifeline about 30 m in length and sufficient strength shall be provided 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. The lifeline shall be subjected to a strength test by statical load of 3.5 kN for 5 min.

7.4.3 The breathing apparatus shall be subjected to periodical overhauls every 12 months, the intervals between the overhauls being, however, not shorter than specified in operating instructions. The overhauls shall be carried out by fire-fighting equipment maintenance and repair shops approved by PRS or an authorized body.

7.5 Emergency Escape Breathing Devices

7.5.1 An emergency escape breathing device shall be only used for escape from a compartment that has a hazardous atmosphere, dangerous to life and health. The emergency escape breathing device shall not be used for fighting fires and entering oxygen deficient tanks.

7.5.2 The emergency escape breathing device shall include a full face piece or a hood and oxygen or air cylinder.

7.5.3 A full face piece shall completely cover the face and form a seal around the eyes, nose and mouth.

7.5.4 The hood shall completely cover the head, neck and may cover portions of the shoulders.

7.5.5 The hood and a full face piece shall be made of flame-resistant materials and include a clear window for viewing.

7.5.6 The emergency escape breathing device shall have a service duration of at least 10 min.

7.5.7 An inactivated emergency escape breathing device shall be capable of being carried hands-free.

7.5.8 The emergency escape breathing device shall comply with the requirements of IMO MSC/Circ. 849 and shall be of the type approved by PRS or an authorized body.

7.6 Arrangement of Fire-Fighting Equipment in Naval Ship

The number and arrangement of fire-fighting equipment in naval ship spaces are specified in Table 7.6.

Table 7.6
Arrangement of fire-fighting equipment in ship spaces

Item	Equipment	Number and arrangement
1	2	3
1	Fire hoses complete with fittings: 1. for the water fire main system 2. for the foam fire-extinguishing system	a) equal to the number of the ship's fire hydrants; b) for ships carrying means of transport with fuel in their tanks, additionally 3 pcs; c) on helideck, additionally 2 pcs. a) equal to the number of the ship's fire hydrants intended for supplying foam. Water hoses, mentioned in 1.1, may be included in this number, provided that their diameter is adequate for foam supply.
2	Fire hose nozzles: 1. water dual-purpose type 2. water fog applicators with extensions	– equal to the number of the ship's fire hydrants. a) for ships exceeding 2000 tonnes displacement: – in each machinery space of category A – 3 pcs; – for each 2 breathing apparatus – 1 pc; b) in each cargo space intended for the carriage of military vehicles – 3 pcs.
3	Portable foam applicator unit complying with the requirements of sub-chapter 4.2	a) in boiler space – 1 set; b) in machinery space of category A – 1 set; c) in cargo spaces intended for the carriage of military vehicles – 1 set, but not less than 2 sets for a ship.
4	Mobile fire-extinguishers for extinguishing B and C groups of fires: – 135 or 45 l foam extinguisher, – 50 or 25 kg dry powder extinguisher – 45 or 26 kg carbon dioxide extinguisher	a) in each oil fired boiler room: – one 135 l foam extinguisher or one 50 kg dry powder extinguisher; b) in machinery space of category A: – one 45 l foam extinguisher or one 25 kg dry powder extinguisher. The extinguisher is not required where the machinery space is fitted with a local carbon dioxide extinguishing system with a hose and nozzle; c) in space with main electric propulsion motors: one 50 kg dry powder extinguisher or one 45 kg carbon dioxide extinguisher;

1	2	3
		<p>d) in machinery spaces with turbines or steam engines, of the total output power exceeding 375 kW:</p> <ul style="list-style-type: none"> – one 45 l foam extinguisher or one 25 kg dry powder extinguisher. <p>The extinguisher is not required where the machinery space is fitted with one of fixed fire-extinguishing systems.</p>
5	<p>Fire extinguishers for extinction of A, B and C groups of fires:</p> <ul style="list-style-type: none"> – 9 or 13.5 l fluid fire extinguishers – 4.5 or 6 kg dry powder fire extinguishers 	<p>a) control stations and fire posts:</p> <ul style="list-style-type: none"> – one ABC fire extinguisher in each space or in a group of spaces of the total surface area not exceeding 50 m², with exits to a common corridor; – one BC fire extinguisher in the space of emergency power generating unit; – one BC fire extinguisher in the space of emergency fire pump driven by internal combustion engine; <p>b) machinery spaces with internal combustion engines or gas turbines:</p> <ul style="list-style-type: none"> – one BC fire extinguisher at each level of engine room at port and starboard side, but not more than six extinguishers, two fluid fire extinguishers being required at the floor level; – one BC fire extinguisher in each space where oil fuel separation is carried out; <p>c) machinery spaces with turbines of the total output power exceeding 375 kW:</p> <ul style="list-style-type: none"> – two fire extinguishers in each engine room; <p>d) boiler rooms or incinerating plant spaces:</p> <ul style="list-style-type: none"> – two BC fire extinguishers per each space and additionally two BC fire extinguishers per each furnace or burner in the boiler room, but not more than four extinguishers; – one BC fire extinguisher per each incinerating plant space; <p>e) store-rooms of readily ignitable materials and workshops:</p> <ul style="list-style-type: none"> – one ABC fire extinguisher per each workshop or store-room space (the extinguishers may be kept in corridor close to the space entrance); – one BC fire extinguisher near door in each store-room of flammable liquids; <p>f) steering gear space:</p> <ul style="list-style-type: none"> – one BC fire extinguisher; <p>g) accommodation and service spaces:</p> <ul style="list-style-type: none"> – one ABC fire extinguisher per each 20 m of corridor length in the area of accommodation and service spaces; – one ABC fire extinguisher per each 100 m² of public spaces;

1	2	3
		<ul style="list-style-type: none"> - one ABC fire extinguisher in each service space of area exceeding 30 m²; - one ABC fire extinguisher in each galley or bakery; - one ABC fire extinguisher in each lobby; <p>h) cargo spaces intended for the carriage of military vehicles:</p> <ul style="list-style-type: none"> - ABC fire extinguishers at each side spaced by 20 m from each other.
6	5 kg BC carbon dioxide fire extinguishers, intended for extinction of fire in equipment under voltage	<p>a) machinery spaces with main internal combustion engines:</p> <ul style="list-style-type: none"> - one fire extinguisher for engine rooms with engines of the total output less than 750 kW; - two fire extinguishers for engine rooms with engines of the total output of 750 kW and over; <p>b) machinery spaces with main propulsion electric motors:</p> <ul style="list-style-type: none"> - two fire extinguishers per each motor; <p>c) machinery spaces with auxiliary power generating sets:</p> <ul style="list-style-type: none"> - one fire extinguisher at each free standing unit or per each two units installed side-by-side; <p>d) centre of machinery control:</p> <ul style="list-style-type: none"> - two fire extinguishers per each compartment; <p>e) machinery spaces with electric motors:</p> <ul style="list-style-type: none"> - one fire extinguisher for spaces of floor space less than 30 m²; - two fire extinguishers for spaces of floor space exceeding 30 m²; <p>f) switchboard space in the area of accommodation spaces:</p> <ul style="list-style-type: none"> - one fire extinguisher in the adjacent corridor; <p>g) refrigerating plant spaces, spaces of air-conditioning units and fans where electric equipment is installed:</p> <ul style="list-style-type: none"> - one fire extinguisher for spaces of floor space less than 30 m²; <p>h) steering gear and thruster spaces:</p> <ul style="list-style-type: none"> - one fire extinguisher in each space; <p>i) radio stations and chartrooms:</p> <ul style="list-style-type: none"> - one fire extinguisher in each space or in corridor near the entrance; <p>j) gyrocompass space:</p> <ul style="list-style-type: none"> - one fire extinguisher in space; <p>k) sick-bay, telephone exchange:</p> <ul style="list-style-type: none"> - one fire extinguisher in space; <p>l) galley and bakery space:</p> <ul style="list-style-type: none"> - one fire extinguisher in each space; <p>m) in the vicinity of switchboards:</p> <ul style="list-style-type: none"> - one fire extinguisher per each switchboard of 20 kW or more.

1	2	3
7	Fire-fighter's outfit complying with the requirements of 4.3	a) each ship: – at least 3 sets but not less than 1 set for each member of the party responsible for fire extinction, with the exception of additional equipment.
8	Fire blanket	a) radio stations and chartrooms: – 1 pc; b) machinery spaces with engines of the total output: – less than 400 kW – 1 pc; – 401 ÷ 800 kW – 2 pcs; – more than 800 kW – 3 pcs; c) a separate boiler-room – 1 pc.
9	Crowbar and fire axe	1 set – at each exit from accommodation spaces deck.
10	Portable international shore connection for the supply of water to the water fire main system	1 pc – required for all ships engaged on international voyages.
11	Portable exhaust fan	1 set – for CO ₂ removal from a space protected by fixed carbon dioxide system.
12	Exhaust gas analyser	1 instrument – for ships intended for the carriage of military vehicles.
13	Gas detector	For ships fitted with fixed carbon dioxide fire-extinguishing systems: 1 gas detector; 10 tube-type carbon dioxide detectors.
14	Fire protection information board	2 boards per ship.
15	Protective clothing resistant to chemical attack	For ships carrying dangerous goods: 4 sets.
16	Foam concentrate for a spare container of portable foam applicator unit	60 litres per each portable foam applicator unit.
17	Emergency escape breathing device complying with the requirements of sub-chapter 4.5	a) all ships-accommodation spaces: – 2 pcs located along escape routes; – 1 pc – a spare device stored in fire-fighting equipment room. For ships exceeding 500 tonnes displacement – 1 pc for each member of the crew. b) all ships – machinery spaces: – 2 pcs located along escape routes; – additionally 1 pc in each separate space within machinery space, such as CCS, workshop, etc. c) in the case of disposable emergency breathing devices, additionally 2 training devices.
18	Explosion metre and oxygen metre	1pc per each party responsible for fire extinction

1	2	3
19	Bulkhead thermometer	2 pcs per each party responsible for fire extinction
20	Standpipe	1 pc per ship
21	Thermovision camera	1 pc per ship exceeding 500 tonnes displacement
22	A set of hydraulic rescue tools	1 set per rescue ship and the ship with helideck

7.7 Spare Parts and Tools

7.7.1 General Requirements

7.7.1.1 The spares and tools for fixed fire-extinguishing systems shall be kept in fire-extinguishing stations, on racks provided for this purpose or in fire-fighting equipment rooms.

7.7.1.2 In spaces where fire-extinguishing systems pumps, compressors and motors are installed, a place for keeping the spares and tools intended for maintenance of the systems shall be provided.

7.7.1.3 All spare parts shall be properly marked.

7.7.2 Number of Spares and Tools

Spare parts for fixed fire-extinguishing systems and tools for assembly shall be stored on board. The recommended number of spares and tools is given in Table 7.7.2; recommendations of the systems components manufacturers shall be also taken into account.

Table 7.7.2
Recommended number of spares and tools

Item	Name of spare part or tool	Number required per ship
1	2	3
1	Water fire main system:	
	.1 fire hoses of each length and diameter used in the ship, fitted complete with couplings and hose nozzle;	– for ships exceeding 1000 displacement – 5 pcs; – for ships below 1000 tonnes displacement – 3 pcs.
	.2 reducers with couplings for each size fitted (if the ship is provided with fire hydrants of various diameters);	2 pcs
	.3 hose couplings – for ships below 4000 tonnes displacement;	2 pcs (for each diameter)
	.4 hose couplings – for ships exceeding 4000 tonnes displacement;	4 pcs (for each diameter)
	.5 rubber joints for couplings, hose nozzles, etc.;	5% of the total number, but not less than 10 pcs

1	2	3
	.6 fire hose clamps; .7 wrenches for hose couplings; .8 complete fire hydrants of each size fitted.	4 pcs (2 pcs for ships below 300 tonnes displacement) 2 pcs 2 pcs per each size
2	Sprinkler system: .1 sprinkler heads, complete; .2 wrenches for sprinkler heads (where heads are fitted by means of special wrenches); .3 parts for section valve.	10 pcs per section 1 pc per section 1 set, in accordance with delivery specification
3	Water-spraying system: .1 spraying nozzles employed in the system; .2 wrenches for spraying nozzles.	5% of the number of spraying nozzles fitted 1 pc
4	Foam fire-extinguishing system: .1 fire hydrants of each type and size fitted; .2 air-foam nozzle; .3 isolating diaphragms; .4 disks for inserting diaphragms; .5 dosing device diaphragm.	1 pc 1 pc 200% of the number of diaphragms fitted 10% of the total number of those fitted, but not less than 2 pcs 1 pc
5	Carbon dioxide system: .1 adjustable spanner; .2 plugs for pipes leading from cylinder valves to manifolds; .3 thrust bushes and washers for protective devices; .4 protective caps for cylinders; .5 non-return valves; .6 discharge nozzles of each type and size fitted.	1 pc 25% of the number of cylinders 10% of the number of cylinders 100% of the number of cylinders 5% of the number of cylinders, but not less than 1 pc 2 pcs
6	Inert gas system: .1 control valve for admitting gas into spaces protected; .2 parts for automatic control.	1 pc according to delivery specification
7	Dry powder system: .1 parts of nozzles and monitors means of control; .2 nozzles of each type and size fitted; .3 special wrenches for the assembly of valves, nozzles, monitors, spraying nozzles.	1 set per each part 1÷2 pcs 1 set

1	2	3
8	<p>Other gas fire-extinguishing systems:</p> <p>.1 plugs for pipes leading from cylinder valves to manifolds;</p> <p>.2 thrust bushes and washers for protective devices;</p> <p>.3 protective caps for cylinders;</p> <p>.4 non-return valves;</p> <p>.5 O-rings;</p> <p>.6 discharge nozzles of each type and size fitted;</p> <p>.7 reduction valves (or orifice plates), for the number of items installed:</p> <ul style="list-style-type: none"> – less than 50 pcs – 51 ÷ 100 pcs – above 100 pcs. <p>.8 pressure gauges, for the number of cylinders installed:</p> <ul style="list-style-type: none"> – less than 50 pcs – 51 ÷ 100 pcs – 100 pcs and more. 	<p>25% of the number of cylinders</p> <p>10% of the number of cylinders</p> <p>100% of the number of cylinders</p> <p>5% of the number of cylinders, but not less than 1 pc</p> <p>100% of the set</p> <p>2 pcs</p> <p>1 pc</p> <p>2 pcs</p> <p>3 pcs</p> <p>1 pc</p> <p>2 pcs</p> <p>3 pcs</p>
9	<p>General requirements for all systems:</p> <p>.1 instruments and gauges: pressure gauges and thermometers of each type fitted in the systems;</p> <p>.2 sufficient quantity of packing material for onboard repairs;</p> <p>.3 fuses for automatic closing fire doors and dampers;</p> <p>.4 spares for pumps, fans, compressors and motors serving fire-extinguishing systems;</p> <p>.5 spare parts and tools for remote control equipment of fire-extinguishing systems;</p> <p>.6 spare parts and tools for fire alarm systems;</p> <p>.7 flame arresters (inserts) of each type and size;</p> <p>.8 spare parts for electrical equipment of fire-extinguishing systems.</p>	<p>1 pc each</p> <p>1 set</p> <p>100% of automatic fire doors and dampers closing upon activation of the fuses</p> <p>in accordance with the requirements specified in Annex 2 to <i>Part VII – Machinery, Boilers and Pressure Vessels</i></p> <p>in accordance with technical specification agreed with PRS</p> <p>in accordance with technical specification agreed with PRS</p> <p>1÷2 sets</p> <p>in accordance with the requirements of Chapter 23, <i>Part VIII – Electrical Installations and Control Systems</i></p>
10	<p>Fire detection and fire alarm system – fire detectors</p>	<p>5% (however, not less than 2 pcs) of each type of fire detectors used</p>

8 ADDITIONAL REQUIREMENTS FOR SPECIFIC NAVAL SHIP TYPES

The requirements of the present Chapter are additional to those given in Chapters 1 to 7, which constitute the basic requirements applicable to each type of naval ship.

8.1 Naval Ships Constructed of Aluminium Alloy

8.1.1 The present requirements are applicable to naval ships with the hull and superstructure made, entirely or partly, from aluminium alloy (Al).

8.1.2 The insulation of A and B Class fire divisions, except structures which are non-load-bearing, shall be such that the temperature of the structural core does not rise more than 200 °C above the ambient temperature at any time during standard fire test.

8.1.3 The insulation of aluminium alloy components of columns, stanchions and other structural members required to support life-saving appliances, launching and embarkation areas, as well as A and B Class divisions shall be such as to ensure the following:

- .1** for structural members required to support life-saving appliances and A Class divisions – the resistance of their core to the temperature rise, specified in 8.1.2, during 1 hour; and
- .2** for structural members required to support B Class divisions – the resistance of their core to the temperature rise, specified in 8.1.2, during 30 minutes.

8.1.4 Where A Class division having a core of aluminium alloy separates two adjacent spaces containing combustible medium, both sides of the metallic core shall be insulated.

8.1.5 Stairways and routes which are part of means of escape shall be made of material with a melting point not below 950 °C.

8.1.6 The use of finishing combustible materials shall be restricted to the required minimum.

8.1.7 A and B Class divisions shall be of the type approved by PRS or an authorized body.

8.2 Naval Ships Constructed of Glass-Reinforced Plastic Laminate

8.2.1 The present requirements are applicable to naval ships with the hull and superstructure made, entirely or partly, from glass-reinforced plastic laminate (hereinafter referred to as GRP laminate).

8.2.2 The external layer of the hull structure in machinery spaces, control stations, accommodation spaces and service spaces shall be made from GRP laminate with low flame-spread characteristics or shall be covered with a non-combustible material.

8.2.3 The sides and ceilings located within machinery spaces, as well as the boundary bulkheads of machinery spaces for a distance of 200 mm below the waterline to the deck above these spaces shall be of B-15 Class standard and shall be insulated on the inside.

8.2.4 The following structures shall be of B-15 Class standard: the casings of machinery spaces, stairway enclosures, the walls and decks enclosing control stations, corridors in accommodation spaces, as well as the walls and decks in survival craft stowage positions.

8.2.5 The insulation thickness of B-15 Class divisions shall be such that the temperature of the GRP laminate core, at the end of 15-minute exposure to the standard fire test, does not rise above the point at which the GRP laminate strength is reduced to 50% of the initial value.

8.2.6 Stairways and ladders used as escape routes from spaces located below deck shall be constructed of steel or steel equivalent material.

8.2.7 Thermal and acoustic insulation, framing, the shell plating, the plating of bulkheads, walls and ceilings shall be made of non-combustible materials. The plating of bulkheads, walls and ceilings in accommodation spaces and control stations may be covered with veneers having low flame-spread characteristics and the thickness of not more than 1.5 mm.

8.2.8 Exhaust and ventilation ducts shall be so arranged and insulated as not to constitute a fire hazard.

8.2.9 Structures made from GRP laminate, as well as B-15 Class divisions made from GRP laminate shall be of the type approved by PRS or an authorized body.

8.3 Landing Craft and Logistic Ships

8.3.1 Cargo Spaces for the Carriage of Military Vehicles with Fuel in their Tanks for their Own Propulsion

8.3.1.1 Structural Fire Protection

8.3.1.1.1 The walls and decks separating cargo spaces from other ship spaces shall be of A-60 Class standard. The remaining walls and decks shall be constructed of steel or steel equivalent material.

8.3.1.1.2 Cargo spaces shall not be adjacent to spaces of high fire risk and spaces vital for the naval ship survivability and combat capability.

8.3.1.1.3 Cargo spaces shall be divided vertically into fire zones by water screens creating “water wall” applied in lieu of A-60 Class division; the water screens shall comply with the requirements of sub-chapter 3.4.4 and shall be spaced not more than 30 m apart.

8.3.1.2 Means of Escape

8.3.1.2.1 From each fire zone separated by water screens, means of escape through a door or hatchway shall be provided. In each cargo space, at least two escape routes shall be provided, one of the routes being regarded as the main escape route – through a fire door and the other being regarded as the emergency escape route – through e.g. a hatch.

8.3.1.2.2 The escape and access routes shall be so arranged and marked as to ensure adequate escape routes during loading and unloading of vehicles in the cargo space, as well as after securing the vehicles.

8.3.1.3 Fixed Fire-Extinguishing Systems

8.3.1.3.1 Cargo spaces, which can be tightly closed, shall be fitted with a fixed gas fire-extinguishing system. In the case of carbon dioxide fire-extinguishing system, the quantity of CO₂ shall be sufficient to give a minimum volume of free gas equal to 45% of the gross volume of the largest space to be protected. The fire-extinguishing system shall ensure the supply of two-thirds of the required amount of carbon dioxide in 10 minutes.

8.3.1.3.2 Provision shall be made for closing tightly the cargo space from a position located outside the space.

8.3.1.3.3 The use of high-expansion foam fire-extinguishing system is permitted, provided it gives equivalent protection.

8.3.1.3.4 Open cargo spaces, as well as cargo spaces which cannot be tightly closed shall be fitted with water-spraying fire-extinguishing system, complying with the requirements of sub-chapter 3.4.2 and protecting all parts of the vehicle deck.

8.3.1.3.5 The water-spraying fire-extinguishing system shall be capable of delivering water from below to cool the bottoms of the vehicles.

8.3.1.3.6 Cargo spaces shall be fitted with fire hydrants so arranged as to ensure the delivery of four jets of water to any part of the space, through the required nozzles. One fire hydrant shall be located at each access to the cargo space.

8.3.1.3.7 The water fire main system shall be kept permanently pressurized and the fire pump shall be put automatically into action by opening a fire hydrant and a pressure drop in the system.

8.3.1.3.8 The water screen system, required in 8.3.1.1.3, dividing a cargo space into fire zones shall comply with the requirements of sub-chapter 3.4.4 and shall be capable of creating all water screens within the cargo space simultaneously. The water screen system may be supplied from the water fire main system pumps.

8.3.1.4 Fire Detection

8.3.1.4.1 Cargo spaces shall be provided with fire detection and fire alarm system complying with the requirements of sub-chapter 4.1. Proper arrangement of fire detectors in the cargo space shall be confirmed by operation test, taking into account the effect of ventilation and other relevant factors.

8.3.1.4.2 Manually operated call points shall be provided throughout the cargo spaces, one call point being placed close to each exit from such spaces.

8.3.1.4.3 To avoid false alarm, the detector sections in the cargo spaces may be fitted with a timer for disconnecting the sections during loading and unloading the vehicles. This requirement does not apply to manually operated call points. Control panel shall indicate whether the detector sections are disconnected or not.

8.3.1.5 Ventilation

The ventilation system shall comply with the requirements specified in sub-chapter 11.11, *Part VI – Machinery Installations and Refrigerating Plants*.

8.3.1.6 Precautions against Ignition

Electrical equipment and wiring in closed cargo spaces carrying military vehicles with fuel in their tanks for their own propulsion shall be explosion-proof and shall comply with the applicable requirements of sub-chapter 2.8, *Part VIII – Electrical Installations and Control Systems*.

8.3.1.7 Drainage of Cargo Spaces

The requirements concerning the drainage of cargo spaces are specified in paragraph 6.3.2.2, *Part VI – Machinery Installations and Refrigerating Plants*.

8.3.1.8 Portable Fire Equipment

8.3.1.8.1 Each cargo space shall be provided with fire-extinguishers, spaced not more than 20 m apart on both sides of the cargo space. In addition, each cargo space shall be provided with:

- .1 water-fog applicators – 3 pcs;
- .2 a portable foam applicator unit – 2 pcs.

8.3.1.8.2 Fire-extinguishers shall be suitable for extinction of A and B fires and shall have a capacity of 12 kg dry powder or equivalent.

8.3.1.8.3 NO SMOKING AND USE OF OPEN FIRE sign shall be posted at the entrance to cargo spaces and inside the spaces.

8.3.2 Open Cargo Spaces for the Carriage of Military Vehicles

Open cargo spaces for the carriage of military vehicles shall comply with the requirements of sub-chapter 8.3.1, with the exception of paragraphs: 8.3.1.4 – concerning fire detection, 8.3.1.5 – concerning ventilation and 8.3.1.6 – concerning precautions against ignition.

8.4 Ships Provided with Helicopter Landing Area

8.4.1 Structural Fire Protection

8.4.1.1 The construction of helideck shall be of steel or steel equivalent material. If the helideck forms the bulkhead of a deckhouse or superstructure, it shall be insulated to A-60 Class standard.

8.4.1.2 In special cases, subject to PRS' consent, aluminium or other low-melting metal construction may be permitted. If the helideck platform is located above the ship's deckhouse or a similar structure, the following requirements shall be complied with:

- .1** the deckhouse top and the bulkheads under the platform shall have no openings;
- .2** all windows in the superstructure under the platform shall be provided with steel covers.

8.4.1.3 The helideck shall be provided with the main and emergency escape routes and access for damage control team (DCT). The means of escape shall be located as far apart from each other as practicable and preferably on the opposite sides of the helideck.

8.4.1.4 Flammable liquids store-rooms, as well as portable fire-fighting equipment (e.g. fire pumps), fitted with an engine operating on fuel with a flash-point of less than 60°C and an integral fuel tank shall not be located at a distance less than 8 m from the helideck edge.

8.4.1.5 The helideck shall be provided with drainage facilities, constructed of steel and led directly overboard, independent of any other system and so designed that drainage will not fall onto any part of the ship.

8.4.2 Fire-Fighting and Rescue Equipment

8.4.2.1 The helideck/platform in way of helicopter landing area shall be provided with water-foam spraying nozzles. The nozzles shall be so arranged as to provide upright water-foam jets over the whole length and breadth of the helicopter. The foam solution may be supplied from the foam fire-extinguishing system used for the protection of the helideck. The discharge rate shall be at least 5 l/min per square metre of the helicopter landing area. The foam fire-extinguishing system shall be controlled from helicopter flight control station.

8.4.2.2 The foam fire-extinguishing system, complying with the requirements of sub-chapter 3.5.4, shall be used for the protection of the helideck.

8.4.2.3 In close proximity to the means of access to the helideck/platform, the following fire-fighting equipment shall be provided:

- .1 two mobile dry-powder fire-extinguishers for extinction of A, B, C groups of fire, having a capacity of not less than 45 kg dry powder;
- .2 5 kg carbon dioxide fire-extinguishers (or equivalent) – 4 extinguishers;
- .3 nozzles of dual purpose type and fire hoses permanently coupled with fire hydrants, capable of delivering water to any part of the helideck;
- .4 two sets of fire-fighter's outfit, complying with the requirements of sub-chapter 5.1.4, in addition to those required elsewhere in the present Part of the *Rules*;
- .5 one rescue kit, consisting of:
 - thermal protective clothing;
 - adjustable wrench;
 - blanket (fire resistant);
 - cutters, bolt 60 cm;
 - hook;
 - hacksaw, heavy duty, complete with 6 spare blades;
 - ladder;
 - lifeline of 5 mm in diameter and 15 m in length;
 - pliers, side-cutting;
 - a set of assorted screwdrivers;
 - harness knife complete with sheath;
 - set of hydraulic rescue tools (cutters, spreader-cutter, lift, a set of pulling chains);
 - a set of dressings and anti-burn blankets.

The fire-fighting equipment and the rescue kit shall be kept in an easily accessible store-room, located in the vicinity of the helideck.

8.4.2.4 Operation manual, including instructions, description and a checklist of safety precautions, procedures and equipment requirements in the event of fire shall be placed near the helideck.

8.4.3 Helicopter Flight Control Station

8.4.3.1 Helicopter flight control station shall be located in way of the helideck and far from the spaces which constitute fire hazard.

8.4.3.2 The walls separating the helicopter flight control station from the helideck shall be A-60 Class divisions. The other walls and decks shall be constructed of steel or steel equivalent material. Entrance doors shall face the ship spaces.

8.4.3.3 The helicopter flight control station window facing the helideck shall be fitted with a steel cover closed from the inside or shall be of A-60 Class standard.

8.4.3.4 The helicopter flight control station with access to the helideck or helicopter hangar shall be provided with an emergency exit – through a window or a hatch.

8.4.4 Helicopter Hangar

8.4.4.1 The walls and decks separating the hangar from other ship spaces shall be A-60 Class divisions. The remaining walls shall be constructed of steel or steel equivalent material.

8.4.4.2 Helicopter hangar shall be provided with the main and emergency escape routes. The escape routes shall be as widely separated as practicable.

8.4.4.3 The hangar shall be fitted with a fixed foam fire-extinguishing system, complying with the requirements of sub-chapter 3.5, as well as with a fire detection and fire alarm system, complying with the requirements of sub-chapter 4.1.

8.4.4.4 The hangar foam fire-extinguishing system may be supplied from the foam system used for the protection of the helideck. The discharge nozzles shall be placed in the overhead position and shall be capable of covering with foam both the entire hangar and the helicopter sheltered in the hangar. The system shall be operated from the foam fire-extinguishing station, located outside the hangar.

8.4.4.5 Helicopter hangar shall be provided with at least two 6 kg dry powder fire-extinguishers and at least one 5 kg carbon dioxide fire-extinguisher.

8.4.4.6 Helicopter hangars shall be provided with mechanical ventilation complying with the requirements of sub-chapter 11.15, *Part VI – Machinery Installations and Refrigerating Plants*.

8.4.5 Helicopter Refuelling Facilities

8.4.5.1 Helicopter refuelling station shall be separated from other ship spaces by A-60 Class wall.

8.4.5.2 A store-room (or a sheltered storage place) for portable fuel and oil tanks (canisters) intended for helicopter service shall comply with the following requirements:

- .1 it shall be as remote as is practicable from accommodation spaces, escape routes and lifeboat and liferaft embarkation areas;
- .2 it shall be isolated from potential sources of ignition;
- .3 it shall be provided with fuel and oil leakages and drainage arrangements.

8.4.5.3 Portable fuel and oil storage tanks shall be securely fixed and protected against mechanical damage.

8.4.5.4 NO SMOKING AND USE OF OPEN FIRE sign shall be posted in the vicinity of helicopter refuelling facilities.

8.5 Naval Ships Fitted with Arrangements for Fuel Replenishment at Sea

8.5.1 Arrangements for Fuel Replenishment at Sea (RAS System)

8.5.1.1 The arrangements for fuel replenishment at sea shall be located in the aft or forward part of the ship, far from accommodation spaces and combat equipment.

8.5.1.2 Fuel replenishment stations shall be separated from other ship spaces by A-0 Class walls.

8.5.1.3 Fuel hose connection shall be provided with facilities for collection and draining fuel leakages.

8.5.2 Fuel Replenishment Facilities for Boats

8.5.2.1 Fuel replenishment station for naval aboardage boats/work boats shall be separated from other ship spaces by A-0 Class wall.

8.5.2.2 A store-room (or a sheltered storage place) for portable fuel and oil tanks intended for the boats service shall comply with the requirements of paragraph 8.4.5.2.

8.6 Naval Rescue Boats, Work Boats and Fast Combat Boats

8.6.1 Closed machinery spaces containing propulsion engine using fuel with a flash-point lower than 60 °C shall be fitted with gas fire-extinguishing system, complying with the requirements of sub-chapter 3.6 or 3.7. The system shall be activated manually.

8.6.2 Unattended closed machinery spaces shall be additionally provided with fire detection and fire alarm system complying with the applicable requirements of sub-chapter 4.1, with at least two fire detectors fitted in the space. Fire detection and fire alarm system shall automatically and rapidly (immediately after fire detection) activate a fire-extinguishing system.

8.6.3 Machinery spaces containing propulsion engine using fuel with a flash-point above 60 °C shall be provided with a fire-extinguishing device, e.g. manually activated fire-extinguisher enabling to deliver fire-fighting medium into the space from outside the space, through an opening.

8.6.4 Every self-propelled rescue boat/work boat/combat boat shall be fitted with at least one portable fire-extinguisher, mounted in an easily accessible place, for extinguishing the propulsion engine fuel fire.

8.7 Ships Carrying Special Personnel

8.7.1 Fire Protection of Accommodation Spaces, Service Spaces and Control Stations

8.7.1.1 In ships carrying more than 50 but not more than 200 special personnel, all accommodation spaces, service spaces and control stations shall be provided with:

- .1** fire detection and fire alarm system complying with the requirements of sub-chapter 4.1; or
- .2** sprinkler system, complying with the requirements of sub-chapter 3.3 and fire detection and fire alarm system, complying with the requirements of sub-chapter 4.1 and ensuring an effective smoke detection in corridors, stairways and escape routes within accommodation areas.

8.7.1.2 In ships carrying more than 200 special personnel, all accommodation spaces, service spaces and control stations, including corridors and stairways shall be provided with:

- .1** sprinkler system, complying with the requirements of sub-chapter 3.3; control stations in which water may cause damage to essential elements of equipment may be fitted with other fixed fire-extinguishing system of approved type; and
- .2** fire detection and fire alarm system, complying with the requirements of sub-chapter 4.1, ensuring an effective smoke detection in these spaces.

8.7.1.3 In ships carrying more than 50 special personnel, escape routes within accommodation spaces, including stairways, shall be marked by low-location lighting line or photoluminescent strip made in accordance with IMO Res. A.752 (18). Directions of escape routes, exit doors and emergency exits shall be also marked with signs made from photoluminescent material.
