PART VI. FIRE PROTECTION

1. GENERAL

1.1 APPLICATION

1.1.1 The requirements of the present Part of the Rules apply to ship's structural fire protection, fire extinguishing systems and fire detection and alarm systems, as well as fire-fighting equipment and outfit.

1.1.2 The fire protection requirements relating to the structural items of the ship hull, machinery and parts thereof, electrical equipment, pumping and piping, ship's arrangements, fuel oil and lubricating oil tanks, construction and location of boilers, refrigerating plants, ship's spaces, etc. are set out in the relevant parts of the Rules.

1.1.3 Conformity of passenger ships with distinguishing marks **A**, **A-R1, A-R2**, **A-R2-RS**, **A-R2-S**, **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S**, **D-R3-RS** in the ship class symbol by the provisions of the European Parliament and Council Directive 2009/45/EC of May 6, 2009 concerning the rules and standards of safety for passenger ships, which entered into force on July 15, 2009 (revised version as amended by the EU Commission Directive 2010/36/EU of June 1, 2010), hereinafter referred to as the Directive 2009/45/EC, should be implemented according to the requirements of Section 2.6.1 of the General Provisions relating to the technical supervision of the application of these Rules and/or the special requirements of these Rules to the ship depending on the distinguishing mark in the ship class symbol for new or existing (refer to paragraphs 2.6.1.1.4.2 or 2.6.1.1.4.3 of General Provisions relating to the technical supervision, respectively) ships referred to in certain items with (or without) reference to the distinguishing marks in the ship class symbol, namely compliance with the following requirements:

— new ships with distinguishing marks **A**, **A-R1, A-R2**, **A-R2-RS**, **A-R2-S** — all applicable requirements of this part with regard to references to the distinguishing mark in the ship class symbol subject to availability of specific requirements for these marks in certain items;

— existing ships with distinguishing marks **B-R3-S**, **B-R3-RS** —1.3.5, 2.2.1.2;

— existing ships with distinguishing marks **B-R3-S**, **B-R3-RS** that carry more than 36 passengers *(on or prior to October 1, 2000)* — 2.2.2.8, 2.2.4.1*), 4.2.1.2,

*) *"leaf fire doors in enclosures of stairs, bulkheads, main vertical zones, and bulkheads of galleys that are usually kept open must meet the requirements of 2.2.4.1.1, 2.2.4.1.3, 2.2.4.1.4, 2.2.4.1.6"*;

— existing ships with distinguishing marks **B-R3-S**, **B-R3-RS** that carry more than 36 passengers *(on or prior to October 1, 2003)* — 2.2.2.4, 2.2.2.4.4, 2.2.2.4.8, 2.2.3.1, 2.2.3.3,

2.2.3.5, 2.2.4.1**[)], 3.1.2.1, 4.2.1.1.4, Table 5.1.2: item 16.3; item 3.5; item 4.14**,**

**[)] *"all fire doors in enclosures of stairs, bulkheads, main vertical zones, and bulkheads of galleys that are usually kept open must meet the requirements of 2.2.4.1.1, 2.2.4.1.3, 2.2.4.1.4, 2.2.4.1.6"*;

— existing ships with distinguishing marks **B-R3-S**, **B-R3-RS** that carry more than 36 passengers *(on or prior to October 15, 2005 or 15 years after the date of building of the ship, whichever occurs later)* — 3.3, 4.2.1.2;

— new ships with distinguishing marks **A**, **A-R1**, **A-R2**, **A-R2-S**, **A-R2-RS**, **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS**, and existing ships **B-R3-S**, **B-R3-RS** — 3.1.2.5, 3.1.2.14, 3.1.2.15;

— new ships with distinguishing marks **B-R3-RS**, **C-R3-RS** and **D-R3**, and existing ships **B-R3-RS** — 1.4, 1.5.4.3, 1.5.9, 2.1.1.1, 2.1.1.2, 2.1.1.3, 2.1.1.11, 2.1.13, 2.1.3.3, 2.1.4.1, 2.1.4.2, 2.1.4.3.3, 2.1.4.4, 2.1.4.6, 2.2.1.1, 2.2.2.4, 2.2.4.1, 2.2.4.3, 2.2.4.4, 2.2.4.7, 3.1.2.1, 3.1.3.2.2, 3.2.1.1, 5.1.9.1, 5.1.9.6, 5.1.9.12, 5.1.15, Table 3.1.2.1"[13]", Table 5.1.2"[2, 3]";

— new ships with distinguishing marks **A**, **A-R1**, **A-R2**, **A-R2-S**, **A-R2-RS**, **B-R3-S**, **B-R3-S**, **C-R3-S**, **C-R3-RS**, **D-R3-S**, **D-R3-RS** — 2.1.1.5;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS**, constructed before January 1, 2011, and existing ships **B-R3-S**, **B-R3-RS**, with the length of 24 m and longer — 3.1.4.2, 3.2.1, 3.2.1.1, 3.2.1.2, 3.2.1.10, 3.2.1.11, 3.2.1.13, 3.3.2.2.1, 2.3, 3.2.3.8, 3.2.5, 3.2.5.2, 3.2.6.1, 3.2.6.2, 3.2.6.5, 3.2.6.10, 5.1.4.1, 5.1.5, Table 5.1.2;

— new ships with distinguishing marks **A**, **A-R1**, **A-R2**, **A-R2-S**, **A-R2-RS**, **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** — 2.1.1.1;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** — 2.1.1.1, 2.1.1.6, 2.1.1.7, 2.1.1.8, 2.1.1.10, 2.2.1.2, 2.2.1.3, 2.2.2.4.1, 2.2.2.4.2, 2.2.2.5, 2.2.2.8, 2.2.4.1, 2.2.4.1.3, 2.2.4.1.4, 2.2.4.1.8, 2.2.4.1.10, 2.2.4.1.11, 2.2.4.1.12, 2.2.4.1.13, 2.2.4.2, 2.2.4.3, 2.2.4.8, 4.1.2, 4.1.3, 4.1.4, 4.1.7, 4.2.1.2, 4.2.3, 4.2.3.1, Table 2.2.1.3-1, Table2.2.1.3-2;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** with the length of less than 24 m, and existing ships **B-R3-S**, **B-R3-RS** — 3.1.2.1, Table 5.1.2: item 5.1, item4.3;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** and existing ships **B-R3-S**, **B-R3-RS** with the length of 40 m and more — 5.1.23;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** and existing ships **B-R3-S**, **B-R3-RS**, that carry no more than 36 passengers — 2.2.4.4;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-**

RS, and existing ships **B-R3-S**, **B-R3-RS** — 2.2.2.4, 3.1.1.1, 3.1.1.4, 3.1.2.2, 3.1.2.14, 3.1.3.1, 3.1.3.2.1, 3.1.3.2.8, 3.1.4.5, 3.1.5.8, 3.3, 3.4, Table 3.7.1.3"[7]", 3.7.3.2, 3.7.3.4, 3.7.3.6, 3.8.1.1, 3.8.1.5.1, 3.8.1.7, 3.8.2.5, 3.8.4.2, 4.1.1, 4. 1.2, 4. 1.5.1, 4. 1.5.2, 4. 1.5.4, 4.1.6, 4.1.8, 4.1.9, 4.2. 1.2.9, 4.2.1.2, 4.2.1.2.14, 4.2.1.3, 4.2.1.4, Table 4.2.1.4, 4.2.1.6, 4.2.2.2.1, 4.2.2.6, 4.3, 5.1.1, 5.1.9.3, 5.1.9.4, 5.1.9.7, 5.1.9.8, 5.1.9.10, Table 5.1.2:item 3.5; item 4.4.14; item 16.3,

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that carry no more than 36 passengers, and existing ships **B-R3-S**, **B-R3-RS** that carry more than 36 passengers — 2.2.1.5, 2.2.2.1, 2.2.2.2, 2.2.2.3, Table 2.2.1.5-2, Cat. 3;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that were constructed before January 1, 2011, and existing ships **B-R3-S**, **B-R3-RS** that carry more than 36 passengers — 2.2.1.2, 2.2.3, 2.2.3.1, 2.2.3.3, 2.2.3.5, 4.2.1.1.6, Table 5.1.2, item16;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS** and existing ships **B-R3-S**, **B-R3-RS** with the length of 24 m and longer, and all new ships **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** with the length of 40 m and longer — Table 5.1.2"[3]";

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that carry more than 36 passengers — 2.2.2.1, 2.2.4.4;

— new ships with distinguishing marks **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** with the length of less than 24 m — 3.13;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that carry no more than 36 passengers and have the length of less than 24 m — 4.2.1.2****[)];

****[)] *excluding the fixed smoke-detection alarm system;*

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS,** that carry more than 36 passengers and have the length of more than 24 m — 4.2.1.2;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** with the length of 24 m and longer — 3.1.2.1, 5.1.9.9, Table 5.1.2:item 3., item 5.1;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS**, that were constructed before January 1, 2003 — 3.2.5.7;

— new ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that were constructed before January 1, 2003, existing ships **B-R3-S**, **B-R3-RS**, and all ships that carry more than 400 passengers *(not*

later than until October 1, 2005) — 3.12;

— ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS**, that were constructed on or after January 1, 2003 that carry more than 36 passengers — 2.2.4.4;

— ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that were constructed on or prior to January 1, 2003 and have a length of 24 m and longer — 2.2.2.4, 3.12;

— ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS** that were constructed on or prior to January 1, 2003 — 2.1.1.1, 2.1.2.2, 2.1.4.7, 2.2.4.1, 2.2.4.5, 2.2.4.7, 2.2.4.8, 3.1.3.2.9, 3.1.3.2, 3.1.3.3, 3.2.6.2, 3.3.2.2, 4.1.1, 5.1.2;

— ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS**, that were constructed on or after January 1, 2003 that carry more than 36 passengers — 4.2.2.2.6, 4.2.2.3;

— ships with distinguishing marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS**, **D-R3-S, D-R3-RS**, that were constructed on or after January 1, 2003 and that carry no more than 36 passengers and have the length of less than 24 m — 4.2.1.2.

1.1.4 Requirements for structural fire protection, fire protection systems and equipment, fire detection and alarm system, and fire-protection systems for tankers carrying crude oil and oil products with a flashpoint of 60 °C and below (as tested in a closed crucible) specified by the device of an approved type and with vapour according to Reid below the atmospheric pressure or other liquid products that are similar in terms of fire safety specified in Section II-2 of SOLAS-74 Convention as amended.

1.2 DEFINITIONS AND EXPLANATIONS

The definitions and explanations relating to general terminology of the Rules referred to in the Guidelines on technical supervision and in Part I "Classification" of the Rules for the Classification and Construction of Sea-Going Ships[1].

The following definitions have been adopted in this Part of the Rules.

Atriums are public spaces within a single main vertical zone spanning three or more open decks.

Cabin balcony is an open deck space which is provided for exclusive use of the occupants of single cabin and has direct access from such a cabin.

Continuous "B" class ceilings or linings are those "B" class ceilings or linings which terminate at an "A" or "B" class division.

Adjacent compartments or spaces are those compartments or spaces which are separated from one another by a bulkhead, deck, platform, or any other fixed division without openings or with openings provided with means of closure.

Compartments or spaces continuous

[1] Hereinafter referred to as Part I "Classification".

to one another at the comers only are not considered as adjacent.

Compartments and spaces separated from one another by removable divisions (i. e. those removable under normal service conditions) or having openings not fitted with means of closing, in the bulkhead or deck that separates them, are considered as one single space.

A standard fire test is a test in which the relevant specimens are exposed in a test furnace to temperatures corresponding approximately to the time-temperature curve. The test methods shall comply with Fire Test Procedures Code.

Smothering is filling of a protected space with a medium not supporting combustion.

Surface extinction is cooling, wetting or restriction of oxygen access to burning surfaces.

Fire-fighting outfit is portable fire-fighting equipment (apparatus, appliances, consumable materials) intended for:

fire extinction;

ensuring effective fire-fighting actions of the crew;

ensuring operation of fire extinguishing systems.

Structural fire protection is a complex of the passive means of structural fire protection intended for:

prevention of fire;

containment of flame and smoke spreading throughout the ship;

creation of conditions for safe evacuation of people from the ship's spaces and from the ship, as well as for effective fire extinction.

Safe area in the context of a casualty is, from the perspective of habitability, any area(s) which is not flooded or which is outside the main vertical zone(s) in which a fire has occurred such that it can safely accommodate all persons on board to protect them from hazards to life or health and provide them with basic services.

Code on Alerts and Indicators means Code on Alerts and Indicators, as adopted by IMO resolution A.1021(26).

Fire Safety Systems Code means International Code for Fire Safety Systems, as adopted by the IMO Maritime Safety Committee by IMO resolution MSC.98(73) as amended by IMO resolution MSC.311(88).

Fire Test Procedures Code means the International Code for Application of Fire Test Procedures, 2010 (2010 FTP Code), as adopted by the IMO Maritime Safety Committee by resolution MSC.307(88); this code will enter into force on July 1, 2012; until that date, the use of the Code as adopted by the resolution MSC.61 (67) shall be permitted.

Nominal foam expansion ratio is the ratio of the volume of foam to the volume of foam solution from which it was made, under non-fire conditions, and at an ambient temperature of e. g. around 20 °C.

Lower flammable limit (LFL) is minimum concentration of oil gases and vapours in air capable of igniting from a source of ignition and propagating combustion in the mixture.

Fire-fighting equipment and systems are those active means of fire protection which are intended for fire extinction and containment of fire spreading throughout the ship.

Primary deck covering is the first layer of a floor construction, which is applied directly on top of the deck plating and is inclusive of any primary covering, corrosion-resistant compound or adhesive, which is necessary to provide protection or adhesion to the deck plating. Other layers of a floor construction, which are applied directly on top of the deck plating, constitute floor coverings.

Foam delivery ducts are supply ducts for introducing high expansion foam into the protected space from foam generators located outside the protected space.

Casualty threshold, in the context of a fire includes:

— loss of the space of origin up to the nearest "A" class boundaries, which may be a part of the space of origin, if the space of origin is protected by a fixed fire extinguishing system; or

— loss of the space of origin and adjacent spaces up to the nearest "A" class boundaries which are not part of the space of origin.

Fire control station is a control station where items of fire detection and fire alarm systems or control of fire extinguishing systems are centralized.

Protected space is a space equipped with one of the fire extinguishing systems or with an automatic fire detection system.

Rooms containing furniture and furnishings of restricted fire risk for the purpose of application on ships carrying more than 36 persons are the rooms (whether cabins, public spaces, offices or other types of accommodation referred to in 1.5.2) in which:

all furniture, such as desks, wardrobes, dressing tables, bureaux, dressers, is constructed entirely of approved non-combustible materials, except that a combustible veneer not exceeding 2 mm in thickness may be used on the working surface of such articles;

all free-standing furniture, such as chairs, sofas, tables, is constructed with frames of non-combustible materials;

all draperies, curtains and other suspended textile materials have qualities of resistance to the flame spread not inferior to those of wool of mass 0.8 kg/m^2, this being determined in accordance with Fire Test Procedures Code;

all floor coverings have low flame spread characteristics;

all exposed surfaces of bulkheads, linings and ceilings have low flame spread characteristics;

all upholstered furniture has qualities of resistance to ignition and flame spread, this being determined in accordance with Fire Test Procedures Code;

all bedding components have qualities of resistance to ignition and flame spread, this being determined in accordance with Fire Test Procedures Code.

Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (e. g. paints, varnishes, lacquers, etc.) which give off flammable vapours at or below 60 °C closed cup test.

Rated volume of a protected space is the gross volume of a space bounded by water-tight or gas-tight bulkheads and decks with the de-

duction for the volume occupied by main machinery reduction gear, auxiliaries, boilers, condensers, evaporators, tanks, ventilation and exhaust gas piping.

Sauna is a hot room with temperatures normally varying between (usually 80 to 120 °C) where the heat is provided by a hot surface (e. g., by electrically-heated oven). The hot room may also include the space where the oven is located and adjacent bathrooms.

Combustible medium is flammable liquids; flammable gases, compressed, liquefied or dissolved under pressure; solid combustible materials and substances, including cargoes, fuel, finishing materials, equipment, insulation, furniture.

Crude oil means any oil occurring naturally in the earth whether or not treated to render it suitable for transportation and includes crude oil from which certain distillate fractions may have been removed and crude oil to which certain distillate fractions may have been added.

Water-screen systems are systems which create a water barrier in the form of sufficiently thick curtain of water fed through spray nozzles. Such systems are fitted where the use of "A" class divisions is impracticable.

Water drenching systems are those systems which supply water onto vertical or horizontal ship's structures.

Fixed fire extinguishing systems are those systems which are intended to supply fire extinguishing medium to the protected spaces or directly therein and structurally fixed to the ship's hull.

Outside air foam system is a fixed high expansion foam system with foam generators installed outside the protected space that are directly supplied with fresh air.

Inside air foam system is a fixed high expansion foam fire extinguishing system with foam generators located inside the protected space and drawing air from that space.

High expansion foam fire extinguishing systems are fixed total flooding extinguishing systems that use either inside air or outside air for aeration of the foam solution. A high expansion foam system consists of both the foam generators and the dedicated foam concentrate approved during the fire testing specified in 3.7.3.1.1.

A system equivalent to a deck foam system for cargo tanks is a system which shall be capable of extinguishing spill fires, precluding ignition of spilled oil not yet ignited and fire extinction in ruptured tanks.

Steel or other equivalent material means any non-combustible material, which by itself or due to insulation provided, has structural and integrity properties equivalent to steel at the end of the applicable fire exposure during a standard fire test (e. g., aluminium alloy with appropriate insulation).

Flash point is the temperature in degrees Celsius (closed cup test), at which liquid will give off enough flammable vapours to be ignited as determined by an approved flash point apparatus.

Motor vehicle without fuel in its tanks is motor vehicle, motor bike, tractor, etc., powered with an internal combustion engine and having empty fuel system and fuel tanks, as well as both battery leads disconnected from

the accumulator.

Fuel oil units refer to definition given in 1.2, Part VII "Machinery Installations".

Safety centre is a control station dedicated to the management of emergency situations. Safety systems operation, control and/or monitoring are an integral part of the safety centre.

Central control station (CCS) is a control station where the following control and indicator functions are centralized:

fixed fire detection and fire alarm systems;

automatic sprinkler system, fire detection and alarm systems, as well as remote starting controls of other fire extinguishing systems;

fire door indicator panels;

fire door closures;

watertight door indicator panels;

watertight door closures;

ventilation fans;

general/fire alarms;

ship communication systems including telephones; and

microphones for public address systems.

Continuously manned central control station is a central control station, which is continuously manned by a responsible member of the crew (refer to Section 4).

1.3 SCOPE OF SURVEYS

1.3.1 General provisions relating to classification procedure, surveys during construction and classification inspections, as well as requirements for technical documentation submitted to the Register for consideration and approval, are set forth in the Guidelines on technical supervision and in Part I "Classification".

1.3.2 Subject to the Register survey during construction of a ship are: structural fire protection, materials used for the interior finishing of ship's spaces, as regards fire hazardous properties thereof, fire extinguishing, fire detection and alarm systems subject to the provisions of the present Part.

As regards fire-fighting outfit, it shall only be checked for correct location and for complete availability in accordance with the requirements of the present Part.

1.3.3 The following shall be submitted to the Register for approval of active fire-fighting means and passive means of structural fire protection:

.1 documents on fire tests run by competent bodies, confirming the efficiency of newly applied fire extinguishing medium with the recommended standards on composition and application rates, as well as information on storage life and conditions;

.2 reports of the recognized laboratories on the fire tests of "A" and "B" class fire-fighting divisions, closures of openings and passages (cut-outs) in such divisions ("A" and "B" class doors included) (refer to 1.6);

.3 drawings of fire-fighting divisions together with the protocols of the recognized laboratories on tests, which confirm their compliance with "A" and "B" class divisions;

.4 reports of the recognized laboratories on tests of the fire hazardous material features (refer to 1.6);

.5 drawings for individual standard assemblies (equipment) of fire extinguishing systems and fire-fighting outfit;

.6 required calculations, which confirm the fulfilment of the requirements of the present Part.

1.3.4 After repair, revamping, and modification and associated changes in equipment, all ships shall at least comply with the requirements with which they complied before.

Such ships, if constructed before July 1, 2012, shall usually comply with requirements for ships constructed on and after this date, at least to the same extent as before the implementation of the repair, revamping, modification, or change in equipment.

After the repair, revamping, and modifications that significantly alter the size of the ship or accommodation spaces for passengers or significantly increase the life of ships as well as related changes in equipment, such ships shall comply with requirements for ships constructed on or after July 1, 2012 to the extent deemed appropriate and practicable by the Register.

1.3.5 Passenger ships that carry more than 36 passengers, except ships of a restricted navigation area **C-R3-S**, **C-R3-RS** and **D-R3-S**, **D-R3-RS**, which were modified in accordance with 1.3.4 shall comply with the following requirements:

.1 all materials used in replacements for these ships must comply with requirements to materials used to build new ships; and

.2 all repairs, revamping, modifications, and changes in equipment that include the replacement of materials in the amount of 50 tons or more other than those required to upgrade the ship shall comply with requirements applicable to new ships.

1.4 FIRE PLANS

1.4.1 At the main fire control station, wheelhouse or in conspicuous positions in corridors and lobbies of any ship, there shall be exhibited general arrangement plans clearly showing the following for each deck:

.1 location of control stations;

.2 arrangement of fire-resisting and fire-retarding divisions;

.3 spaces protected by the fire detection and alarm system;

.4 spaces protected by fixed fire extinguishing systems with indication of the location of instruments and fittings for their control and also the disposition of fire hydrants;

.5 means of access to different compartments, decks etc., with indication of escape routes, corridors and doors;

.6 ventilation system including the controls of fans and showing the disposition of dampers and the identification numbers of the fans serving the groups of spaces, fenced off by fire-resistant boundaries;

.7 arrangement of fire-fighting outfit;

.8 location of the documents referred to in 1.4.6;

.9 location of emergency escape breathing devices specified in 5.1.23.

1.4.2 In lieu of the plans, information specified in 1.4.1 may be set out in a booklet, a copy of which shall be supplied to each officer, and one copy at all times shall be available on board in an accessible position.

1.4.3 A duplicate set of the plans or the booklet protected against marine environment shall be permanently stowed outside the deck-house in a weather-tight enclosure painted red and marked as indi-

cated in Fig. 1.4.3-1 in compliance with IMO MSC/Circ. 541.

The enclosure shall be capable of being easily opened, be readily available to the shore-side fire-fighting personnel, be located in a well-illuminated position, if possible including illumination from an emergency source.

In oil tankers, chemical tankers and gas carriers the enclosure of fire control plans shall not be located on exterior bulkheads of superstructures which face cargo area and the surfaces within 3 m from them along the side.

If the enclosure is not adjacent to the gangway, there shall be guide signs as indicated in Fig. 1.4.3-2 showing the way thereto. The dimensions of the signs shall be not less than 300 x 400 mm.

1.4.4 Description in such plans and booklets shall be in the state language and in the English/French language. The symbols for items listed in 1.4.1 shall be in agreement with IMO resolution A.952(23) "Graphical Symbols for Fire Control Plans".

For ships not engaged on international voyages, translation into English or French is not required.

The graphical symbols shall be coloured.

1.4.5 All alterations in the fire protection of a ship shall be entered in the ship's documents stated in 1.4.1 and 1.4.2.

1.4.6 To be kept in a separate file in an accessible position are technical instructions for maintenance and use of all ship's installations for extinction and containment of fire.

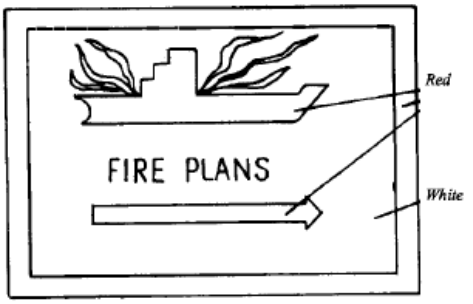


Fig. 1.4.3-1

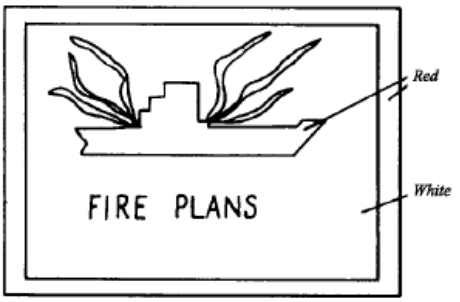


Fig. 1.4.3-2

1.4.7 On passenger ships carrying more than 36 passengers, plans and booklets shall provide information regarding fire protection, fire detection and fire extinction in accordance with 1.4.1 and considering IMO resolution A.756(18)[2].

1.5 CATEGORIES OF SHIP'S SPACES

1.5.1 Control stations:

.1 spaces in which the ship's radio or main navigational equipment (in particular: steering stand, compass, radar and direction finding equipment), or the emergency power source, (including: accumulator batteries regardless of their

[2] IMO Resolution A.756 (18) "Guidelines on the information to be provided with fire control plans and booklets required by Regulations II of SOLAS 74."

capacity, according to Part XI "Electrical Equipment"), or in which items of fire detection and fire alarm systems or control of fire extinguishing systems are centralized.

Steering gear room containing its emergency control is not considered as a control station.

If in the present Part there are no specific requirements for the centralization within a control station of major components of the fixed fire extinguishing systems, then such major components may be placed in spaces, which are not considered as control stations;

.2 control stations (refer to 1.5.1.1), which may also be considered as machinery spaces, such as emergency diesel generators rooms;

.3 spaces containing equipment for the control of submersion, emersion and heeling;

.4 control stations for fire and rescue operations (refer to 6.6.2).

1.5.2 Accommodation spaces:

.1 spaces used as cabins, corridors, offices, medical rooms, cinema halls, games and entertainment halls, barbers shops, pantries which are not used for taking meals and do not contain equipment for cooking hot meals (however such pantries may have the following appliances: coffee machines, toasters, dish washing machines, microwave ovens, induction heaters and similar appliances each consuming not more than 5 kW; electric stoves and kitchen stoves for food heating consuming not more than 2 kW and having a surface temperature of not more than 150 °C), and other similar spaces;

.2 public spaces: the accommodation spaces used as halls, dining rooms, lounges and similar permanently enclosed spaces;

.3 sanitary spaces: the public spaces used as shower-rooms, bathrooms, toilets, small laundries, indoor swimming pools etc.

1.5.3 Service spaces:

.1 service spaces used as galleys (spaces containing electric stoves and kitchen stoves with a capacity of more than 5 kW), pantries containing equipment for cooking hot meals (such pantries may have the following appliances: toasters, microwave ovens and similar appliances each consuming not more than 5 kW; electric stoves and kitchen stoves for food heating consuming up to 5 kW), various workshops not forming part of machinery spaces and similar spaces as well as trunks leading to such spaces;

.2 service spaces used as storerooms:

.2.1 storerooms for explosives;

.2.2 storerooms for flammable materials and substances: paint lockers, spaces for flammable liquids, flammable liquefied and compressed gases, sheltered garages, fuel distribution systems, etc.;

.2.3 storerooms other than mentioned in 1.5.3.2.1 and 1.5.3.2.2;

.2.4 working spaces defined in 1.5.8;

.3 cargo control rooms (refer to definitions in 1.2, Part VII "Machinery Installations").

1.5.4 Cargo spaces:

.1 cargo tanks intended for the carriage of liquids in bulk, slop tanks included;

.2 spaces for dry cargoes other than ship stores: dry cargo and refrigerated cargo holds and 'tween-decks, including those intended also for carriage of containers and portable tanks, dangerous

goods in packaged form or in bulk, motor vehicles without fuel in their tanks; storage spaces for ready produce, utilisable refuse, fishing equipment, packages, etc., as well as produce discharge trunks, cargo lifts and access trunks leading to such spaces;

.3 ro-ro cargo spaces not normally subdivided in any way and extending to either a substantial length or the entire length of the ship, spaces in which motor vehicles with fuel in their tanks for their own propulsion, and/or goods packaged (in tare or in bulk, on rail or road cars, vehicles (including road or rail tanks), trailers, containers, pallets, demountable tanks or similar enlarged units, or other tanks) are normally loaded and unloaded in a horizontal direction.

Such spaces are divided into:

.3.1 closed ro-ro cargo spaces which are not spaces specified in 1.5.4.3.2 and 1.5.4.5;

.3.2 open ro-ro cargo spaces either open at both ends, or open at one and provided with adequate natural ventilation effective over their entire length through permanent openings in the side plating or deck-head or from above while the total square of openings shall be at least 10% of the square of side plating of spaces;

.4 vehicle spaces intended for carriage of motor vehicles with fuel in their tanks for their own propulsion, which divide into:

.4.1 enclosed spaces, for vehicles which are not open spaces for vehicles neither weather decks;

.4.2 open vehicle spaces, open similar to 1.5.4.3.2;

.5 weather deck is a deck fully open for environmental exposure from above and at least from two sides.

1.5.5 Machinery spaces — refer to definition of 1.2, Part VII "Machinery Installations".

1.5.6 Machinery spaces of category A — refer to definition given in 1.2, Part VII "Machinery Installations".

1.5.7 Pump rooms on tankers and combination carriers:

.1 cargo pump rooms where cargo pumps are located as well as exits and trunks leading to such spaces; pump rooms adjacent to cargo tanks and bilge tanks (refer to 2.4.7);

.2 pump rooms where pumps transporting water and liquid fuel are located.

1.5.8 Working spaces are spaces on special purpose ships, which are neither machinery spaces nor part of them such as workshops, laboratories and other similar spaces, as well as trunks leading to such spaces, where:

.1 fuel oil or flammable liquids are used or combustible materials are processed;

.2 neither flammable liquids are used, nor combustible materials are processed.

Working spaces shall comply with the requirements of the present Part for service spaces if not specified otherwise.

1.5.9 Special category spaces are enclosed spaces located above or below the bulkhead deck into and out of which motor vehicles can be driven under their own propulsion and to which passengers have access.

These spaces may be located on more than one deck if total overall clear height for the motor vehicles does not exceed 10 m.

1.5.10 Special electrical spaces — refer to 1.2, Part XI "Electrical Equip-

ment".

1.6 SUBDIVISION AND TESTING OF MATERIALS AND PRODUCTS ACCORDING TO THE FIRE TEST PROCEDURES CODE

1.6.1 The Fire Test Procedures Code is applied to materials and products subject to testing and assessment in accordance with the provisions of the Code and approved by the Register, as required by the Rules.

1.6.2 Where reference to the Fire Test Procedures Code is made in the text of any requirement of the present Rules, it means that the material or product shall be tested in compliance with an applicable fire test procedure or procedures, stipulated by the Code, except cases specified by the same Code.

1.6.3 In accordance with applicable parts of Annex 1 of the Fire Test Procedures Code materials and products shall be tested mentioned in the present Rules as:

.1 non-combustible materials (refer to 2.1.1.5, 2.1.2, 2.2.2.5, and 2.3.4).

Non-combustible material is a material, which neither bums nor gives off flammable vapours in the amount sufficient for self-ignition when heated to 750 °C approximately. Any other material is a combustible material.

However, products made only of glass, concrete, ceramics, natural stone, masonry units, common metals and metal alloys are considered being non-combustible and may be installed without testing;

.2 not generating excessive quantities of smoke and toxic products (refer to 2.1.1.7 and 2.1.2.6) or not hazardous as regards generation of toxic or explosive products at elevated temperatures (refer to 2.1.1.6);

.3 "A" or "B" class divisions, such as: decks, bulkheads, doors, continuous ceilings and linings, windows, fire dampers, places of piping and cabling passage (refer to 2.1.2 and 2.1.3);

.4 fire doors control systems capable of operating in case of fire (refer to 2.2.4.1.15);

.5 low flame-spread surfaces (refer to 2.1.1.5, 2.1.1.8, 2.1.2.6, and 2.1.2.8). Low flame-spread means that the surface restricts the spread of flame to a sufficient extent;

.6 not readily ignitable primary deck coverings (refer to 2.1.1.6);

.7 draperies, curtains and other vertically supported textile materials, which meet the requirements as regards flame spread resistance not inferior to those of wool having a mass of 0.8 kg/m^2 (refer to 2.1.1.9);

.8 upholstered furniture meeting the requirements as regards ignition and flame-spread resistance (refer to 2.1.1.9);

.9 bedding components (blankets, covers, pillows, mattresses), which meet the requirements as regards ignition and flame-spread resistance (refer to 2.1.1.9).

1.6.4 When testing and approving the materials and products in accordance with the Fire Test Procedures Code additional requirements specified in the appropriate parts of Annex 1 of the Fire Test Procedures Code.

1.7 ALTERNATIVE DESIGN AND ARRANGEMENTS

1.7.1 General.

1.7.1.1 Fire safety design and arrangements may deviate from the requirements

of the present Part, provided that the design and arrangements meet the fire safety objectives and the functional requirements.

1.7.1.2 If the design and arrangements deviate from the prescriptive requirements of the present Part, engineering analysis, evaluation and approval of the alternative design and arrangements shall be carried out in accordance with the requirements of the present Chapter.

1.7.2 Engineering analysis.

1.7.2.1 The engineering analysis submitted to the Register shall be prepared based on the Guidelines on Alternative Design and Arrangements for Fire Safety[3], and shall include, as a minimum, the following elements:

.1 determination of the ship type and space(s) concerned;

.2 identification of prescriptive requirement(s) with which the ship or the space(s) will not comply;

.3 identification of the fire and explosion hazards of the ship or the space(s) concerned including:

.3.1 identification of the possible ignition sources;

.3.2 identification of the potential for the spread of fire of each space concerned;

.3.3 identification of the smoke and toxic products generation potential for each space concerned;

3.4 identification of the potential for the spread of fire, smoke or of toxic products generation from the space(s) concerned to other spaces;

.4 determination of the required fire safety performance criteria for the ships or the space(s) concerned addressed by the prescriptive requirements, which shall:

.4.1 be based on the fire safety objectives and on the functional requirements of the present Part;

.4.2 provide a degree of fire safety not less than that achieved by using the prescriptive requirements;

.4.3 be quantifiable and measurable;

.5 detailed description of the alternative design and arrangements, including a list of the assumptions used in the design and any proposed operational restrictions or conditions;

.6 technical justification demonstrating that the alternative design and arrangements meet the required fire safety performance criteria.

1.7.3 Evaluation of the alternative design and arrangements.

1.7.3.1 The engineering analysis required in 1.7.2 shall be evaluated and approved by the Register taking into account the Guidelines (refer to 1.7.2.1).

1.7.3.2 A copy of the documentation, as approved by the Register, indicating that the alternative design and arrangements comply with the requirements of the present Chapter shall be carried on board a ship.

1.7.4 Re-evaluation due to change of conditions.

1.7.4.1 If the assumptions and operational restrictions that were stipulated in the alternative design and arrangements are changed, the engineering analysis shall be carried out again under the changed condition and shall be approved by the Register.

[3] Refer to MSC/Circ.1002

2. STRUCTURAL FIRE PROTECTION

2.1 GENERAL

2.1.1 Requirements for materials.

2.1.1.1 The hull, superstructures, structural bulkheads decks and deckhouses shall be manufactured of steel or other equivalent material.

For the purpose of using the definition of steel or other equivalent material, given in 1.2.1, "applicable fire exposure" shall correspond to the standards of fire integrity and insulation, specified in the appropriate bulkheads and decks fire integrity tables. For example, if for such divisions as decks or side and end bulkheads of deck-houses fire integrity equal to "B-0" is allowed, then "applicable fire exposure" shall be equal to half an hour.

Where aluminium alloys or grass-reinforced plastic is used, compliance with 2.1.1.3 or 2.1.1.12 as appropriate shall be required.

The use of materials other than those mentioned above, for the manufacture of the hull, superstructure, structural bulkheads, decks and logging is subject to special consideration by the Register in each case depending on the purpose and size of the ship.

2.1.1.2 Casings and crowns of machinery spaces of category A shall be of steel and insulated as required by Tables 2.3.3-1 or 2.3.3-2 and 2.4.2-1 or 2.4.2-2, as appropriate.

Slabs of decks of ordinary passages in "A" class machinery spaces shall be constructed of steel.

2.1.1.3 If any part of the division is manufactured of aluminium alloys, the following requirements shall be complied with:

.1 parts of "A" or "B" class divisions, made of aluminium alloy, except the divisions, which are not load-bearing, shall be insulated so, that the temperature of the structural core of the specimen does not rise more than 200 °C above the ambient temperature at any time during the applicable fire exposure at the standard fire test;

.2 special attention shall be given to insulation of aluminium ahoy components of columns, stanchions and other structural members required to support lifeboat and life raft stowage, launching and embarkation areas and "A" and "B" class divisions to ensure that:

2.1 such members required to support lifeboat and life raft stowage, launching and embarkation areas and "A" type divisions comply with the temperature rise limitation requirement, as specified in 2.1.1.3.1, at the end of an hour;

2.2 such members required to support "B" class divisions comply with the temperature rise limitation requirement, as specified in 2.1.1.3, at the end of half an hour.

2.1.1.4 In accommodation spaces, service spaces and control stations of all types of ships the total mass of combustible materials of each enclosed space shall be calculated based on the following formula:

$$M_{rel} = M_{\Sigma} / S,$$

where M_{rel} = the total mass of combustible materials per unit area of the space, in kg/m^2;

M_{Σ} — the total mass of combustible materials of the space, in kg;

S — the floor area of the space, in m^2.

The following combustible materials shall be included to the calculations:

.1 construction materials as cables insulation, plastic pipes, veneers and combustible materials permitted to be used according to the present Rules;

.2 outfitting, which may be installed during construction or provided by the shipowner or crew, including furniture, bedding components and electrical appliances.

Maximum values for the total mass of combustible materials per unit area (M_{rel}) in kg/m^2 shall not exceed the values specified in Table 2.1.1.4.

Space categories shall correspond to the ones specified in 2.2.1.3, 2.2.1.5, 2.3.3 or 2.4.2, depending on the ship type.

Table 2.1.1.4

Space Category	Ship Type. Total mass of combustible materials per unit area of the space (M_{rel}) in kg/m^2		
	Passenger ships carrying more than 36 passengers	Passenger ships carrying not more than 36 passengers	Cargo ships
Stairways, corridors	5	5	5
Control Stations	5	5	5
Accommodation spaces	15 — minor fire risk 35 — moderate and greater fire risk	35	35
Service spaces surrounded by “A” class divisions	45	45	45

2.1.1.5 Insulation materials shall be non-combustible, except for use in cargo spaces, postal and baggage storerooms and refrigerated storerooms of service spaces.

Vapour barriers and adhesives used in conjunction with insulation, as well as insulation of piping fittings of cooling systems and piping of cooling water of the conditioning systems may be combustible, but they shall be kept to the minimum as far as practicable, while their exposed surfaces shall be low flame-spread.

In the spaces where oily products may be present the insulation surface shall be oily vapour-impermeable, which may be provided by coating insulation with metallic film or glass cloth that are reliably insulated at the joints.

Insulating materials shall not contain asbestos.

2.1.1.6 Primary deck coverings, if applied within accommodation and service spaces and control stations or on cabin balconies of passenger ships constructed on or after July 1, 2008 shall be of an approved material, which has low flame spread characteristics, this being determined in accordance with the Fire Test Procedures Code.

Where a floor covering is required to be low flame-spread according to 2.1.1.8 all layers shall comply with the requirement of 1.6.3.5.

If the floor covering has a multilayer construction, the tests shall be conducted for each layer or combinations of some layers of such covering. At that, the Register approval is applicable to the tested combinations of layers.

When a primary deck covering is also the exposed surface (refer to 2.1.1.8), it shall comply with the requirements of 1.6.3.5. However, primary deck covering, which comply with the requirements of 1.6.3.6, are considered as complying with the requirements of 1.6.3.5 for floor coverings. Primer or similar thin film of paint on deck plating need not comply with the requirements of 1.6.3.6.

On passenger ships constructed on or after July 1, 2008, primary deck coverings on cabin balconies shall not give rise to smoke, toxic or explosive hazards at elevated temperatures, this being determined in accordance with the Fire Test Procedures Code.

2.1.1.7 Paints, varnishes and other finishings used on exposed surfaces inside service and accommodation spaces, control stations and stairways enclosures shall not generate excessive quantity of smoke and toxic vapours, this being determined in accordance with Fire Test Procedures Code.

This requirement applies to the finish materials of bulkheads, decks, floor coverings, linings and ceilings, but is not applicable to cables insulation, plastic piping and furniture.

Finish materials and primary deck coverings (refer to 2.1.1.6) with total thermal emission of not more than 0.2 MJ and maximum value of thermal emission factor not more than 1.0 kW (both values are determined in accordance with Part 5 of the Fire Test Procedures Code) and are considered as complying with the requirements of 1.6.3.2 without tests.

On board oil tankers, chemical tankers and oil recovery ships the use of aluminium coatings containing greater than 10% aluminium by weight in the dry film is prohibited in cargo tanks, cargo tank deck area, pump rooms, coffer-dams or any other area where cargo vapour may accumulate.

On passenger ships constructed on or after July 1, 2008, paints, varnishes and other finishes used on exposed surfaces of cabin balconies, excluding natural hard wood decking systems, shall not be capable of producing excessive quantities of smoke and toxic products, this being determined in accordance with the Fire Test Procedures Code.

2.1.1.8 In accordance with Fire Test Procedures Code the following surface shall have low flame spread characteristics:

.1 on passenger ships:

.1.1 exposed surfaces in corridors and stairway enclosures, as well as bulkheads and plating, ceiling linings in accommodation and service spaces (except saunas) and control stations;

.1.2 surfaces and grounds in concealed and inaccessible spaces in accommodation and service spaces and control stations;

.2 on cargo ships with gross tonnage more than 500:

.2.1 exposed surfaces in corridors and stairway enclosures and of ceilings in accommodation and service spaces (except saunas) and control stations;

.2.2 surfaces and grounds in concealed and inaccessible spaces in ac-

commodation and service spaces and control stations;

.3 glues and sealants used in the "A" and "B" class divisions;

.4 exposed surfaces of cabin balconies, except for natural hard wood decking systems;

.5 primary deck coverings.

The above requirements apply to finish materials of bulkheads, decks, floor coverings, linings and ceilings, but is not applicable to plastic piping, electrical cables and furniture.

2.1.1.9 On passenger ships carrying more than 36 passengers in accommodation spaces, the furniture and furnishings of which constitute restricted fire risk, upholstered furniture, bedding components, draperies and curtains and other vertically supported textile materials shall be satisfactorily tested in compliance with the Fire Test Procedures Code (refer to 1.6.3.7–1.6.3.9).

For other types of ships, the said requirements are recommended only.

2.1.1.10 On passenger ships, "A", "B" and "C" class divisions in accommodation and service spaces and cabin balconies, which are faced with combustible materials, facings, mouldings, decorations and veneers shall comply with the requirements of the present paragraph and 2.1.1.6 to 2.1.1.8.

However, traditional wooden benches and wooden linings of bulkheads and ceilings are allowed in saunas and such materials may not be taken into calculation required by the paragraph.

On cargo ships, non-combustible bulkheads, ceilings and linings fitted in accommodation and service spaces may be faced with combustible materials, facings, mouldings, decorations and veneers provided such spaces are bounded by non-combustible bulkheads, ceilings and linings in accordance with the requirements of the present paragraph and 2.1.1.6 to 2.1.1.8.

Combustible materials used on the surfaces and linings shall have calorific value not exceeding 45 MJ/m^2 taking into consideration their thickness. Requirements of this article are not applicable to the surfaces of furniture fixed to linings or bulkheads.

Calorific value Q, in MJ/m^2, taking into consideration the thickness of covering material, is determined by the formula

$$Q = Q_g\, ps, \quad (2.1.1.10)$$

where Q_s — the maximum specific heat of combustion determined oil in accordance with ISO 1716 "Construction Materials. Determination of the Calorific Potential", in MJ/kg;

p — the density of material, in kg/m^3;

s — the thickness of material, in m.

Where combustible materials are used in accordance with the present paragraph, they shall comply with the following requirements:

.1 the total volume of combustible facings, mouldings, decorations and veneers in any accommodation or service spaces shall not exceed a volume equivalent to 2.5 mm veneer of the combined area of the walls and ceiling linings. The furniture fixed to linings, bulkheads or decks may be not included into the calculation of the total volume of combustible materials; and

.2 in case of ships fitted with an automatic sprinkler system complying with the provisions of Fire Safety Systems Code, the volume specified in 2.1.1.10.1 may include some combustible materials

used for erection of "C" class divisions.

On non-self-propelled ships without regard of their gross tonnage it is permissible to fit non-combustible bulkheads, linings and ceilings with combustible covering less than 2 mm thick except corridors, stairway enclosures as well as control stations where thickness of covering shall not exceed 1.5 mm.

The furnishings specified in 2.1.1.10.1 and 2.1.1.10.2 and applied on cabin balconies may not be taken into calculation required by the paragraph.

2.1.1.11 All waste receptacles shall be constructed of non-combustible materials with no openings in the sides and bottom.

Containers constructed of combustible materials may be used in galleys, pantries, bars, garbage handling or storage spaces and incinerator rooms provided they are intended purely for the carriage of wet waste, glass bottles or metal cans and are suitably marked.

2.1.1.12 If the ship's structures are made of glass-reinforced plastic in accordance with Part XVI "HULL STRUCTURE AND STRENGTH OF GLASS-REINFORCED PLASTIC SHIPS AND BOATS", the fire-retardant properties and fire resistance of such structures shall be tested according to the procedure set out in the Fire Test Procedures Code.

2.1.2 Fire-fighting divisions.

2.1.2.1 "A" class divisions are those divisions which are formed by bulkheads or decks complying with the following requirements:

.1 they shall be constructed of steel or other equivalent material;

.2 they shall have respective stiffening elements;

.3 they shall be so constructed as to be capable of preventing the passage of smoke and flame up to the end of the 60-min standard fire test;

.4 they shall be so insulated with approved non-combustible material 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.

Depending on the time during which the above-indicated temperature rise is ensured in the course of the standard fire test, the following symbols are given to divisions: "A-60" — during 60 min; "A-30" — during 30 min; "A-15" — during 15 min; "A-0" — during 0 min.

2.1.2.2 When approving the structural fire protection the danger of heat transfer through joints and ends of insulation shah be taken into account.

Insulation of steel and aluminium decks and bulkheads shall extend for at least 450 mm beyond boundaries of structures forming the given space.

If a space is divided by the "A" class deck or bulkhead with an insulation of different size, then an insulation of greater size shah extend over the deck and bulkhead for at least 450 mm from the less insulated structure.

Measures taken to prevent heat transfer through joints and ends of insulation of decks and bulkheads are shown in Fig. 2.1.2.2-1 and 2.1.2.2-2.

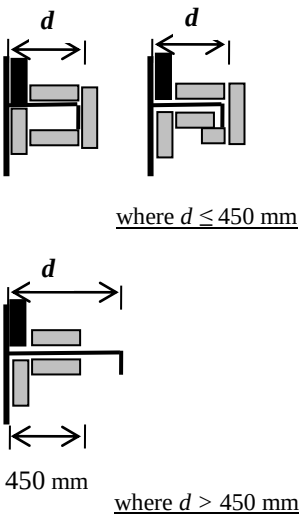


Fig. 2.1.2.2-1

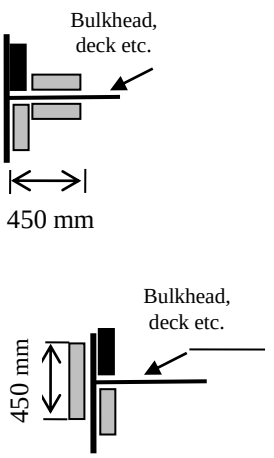


Fig. 2.1.2.2-2

The Register may approve some other variants of such measures, provided the efficacy of the proposed structure is verified by the results of tests conducted in accordance with the Fire Test Procedures Code.

Where the lower part of insulation is cut off to provide drainage, the structure shall comply with Fig. 2.1.2.2-3.

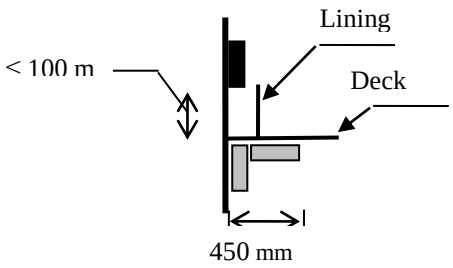


Fig. 2.1.2.2-3

Note to Fig. 2.1.2.2:

d — height of the stiffener at the longitudinal member.

— structural insulation;

— insulation according to 2.1.2.2.

2.1.2.3 Lightweight (honeycomb and other) structures made of steel or other equivalent material may be used as internal divisions of "A" class in the accommodation and service spaces, provided they are not load-bearing structures and successfully passed prescribed tests in accordance with the Fire Test Procedures Code. Such lightweight structures shall not be used as the components of the main fire protection zones and stairways enclosures in passenger ships.

2.1.2.4 The following elements may be fitted without tests:

.1 "A-0" class bulkheads, if made of steel and having the dimensions not less than the following:

plate thickness — 4 mm;

stiffeners 60 x 60 x 5 mm located at a distance of 600 mm from each other or having similar construction;

.2 "A-0" class decks if made of steel and having the dimensions not less than the following:

plate thickness — 4 mm;

stiffeners 95 x 65 x 7 mm located at

a distance of 600 mm from each other or having similar construction.

2.1.2.5 "B" class divisions are those divisions which are formed by bulkheads, decks, ceilings or linings which comply with the following requirements:

.1 they are made of approved non-combustible materials.

Use of combustible veneer is permitted (refer to 2.1.1.8 and 2.1.1.10);

.2 divisions shall be so constructed as to remain capable of preventing the passage of flame up to the end of the 30-minute standard fire test;

.3 divisions shall have an insulation value such that the average temperature on the unexposed side during the fire test 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 when either side is exposed to the fire test.

According to the time during which the above-mentioned temperature rise is ensured in the course of the standard fire test, the following symbols are given to divisions: "B-30" — during 30 min; "B-15" — during 15 min; "B-0" — during 0 min.

2.1.2.6 Materials used in the "A" and "B" class divisions, which according to the present Part shall have particular characteristics (be non-combustible, low flame-spread or not generating excessive quantities of smoke and toxic agents), shall comply with the requirements of the Fire Test Procedures Code (refer to 1.6.3.1, 1.6.3.2, and 1.6.3.5).

2.1.2.7 Continuous "B" class ceilings and linings with the relevant decks or bulkheads may be considered as fully or partially ensuring insulation and fire integrity of structures, as required by the respective fire integrity tables.

2.1.2.8 "C" class divisions are the divisions made of approved non-combustible materials. They do not need meet any requirements relative to the passage of smoke and flame or the limiting of temperature rise. It is not required that gluing materials in these structures be non-combustible, however, these materials shall be low flame-spread.

2.1.2.9 Divisions consisting of non-combustible core and combustible veneers may be accepted as "B" or "C" class divisions, provided that the non-combustible core is tested and complies with the requirements of 1.6.3.1, and the "B" class division is tested and complies with the requirements of 2.1.2.4, and the veneers, if applicable, are tested and comply with the requirements of 1.6.3.2 and 1.6.3.5.

2.1.3 Closures of openings in fire-fighting divisions.

2.1.3.1 Fire integrity of doors shall be equal to fire integrity of the divisions where they are installed, which is determined in accordance with the Fire Test Procedures Code and applicable provisions of IMO MSC.1/Circ.1319 for large fire doors.

Doors and door-frames in "A" class divisions shall be made of steel or other equivalent material.

Doors in "B" class divisions shall be non-combustible.

2.1.3.2 The doors designed in compliance with the requirements of 7.5.2 and 7.12, Part III "Equipment, Arrangements and Outfit" and fitted according to 7.12 of the above mentioned Part, and, in certain cases (e. g., for providing gas-tightness), if specially agreed with the

Register, may be fitted in "A" class bulkheads.

Watertight doors may be not insulated and they do not require fire tests if fitted below the bulkhead deck.

Doors, which are installed above the bulkhead deck subject to fire integrity and water tightness requirements, shall be tested in accordance with the Fire Test Procedures Code.

2.1.3.3 If the "A" class divisions are penetrated, then such penetrations (cut-outs) shall be tested in accordance with the Fire Test Procedures Code, considering the provisions of 2.2.1.4.

The requirements of 12.2.3 and 12.2.12, Part VIII "Systems and Piping" are applied to ventilation ducts.

Tests may not be conducted if the pipes penetrations are made of steel or other equivalent material with a thickness of 3 mm or greater and a length of not less than 900 mm (preferably 450 mm at each side of the division) and do not have any openings. Such penetrations shall be insulated similar to the division itself.

In case where pipe penetrations and cable transits are constructed without structural sockets and consist of removable sleeves welded or bolted to the division and/or of soft or intumescent filling material, these sleeves shall be of minimum 3 mm thickness and of minimum 60 mm length and filling material shall be adequately secured by bonded materials or mechanical means in order to prevent damage or fall out.

Such penetrations shall not impair fire integrity and structural strength of the divisions.

2.1.3.4 If "B" class divisions are penetrated for the passage of electric cables, pipes, ducts, trunks, etc., or for the fitting of the ventilation terminals, lighting fixtures and similar devices, arrangements shall be provided to ensure fire integrity of a division.

Ventilation ducts shall comply with the requirements of 12.2.5, Part VIII "Systems and Piping".

Pipes other than steel or copper that penetrate "B" class divisions shall be protected by the following:

.1 fire tested penetration device, adequate to the fire integrity of the division penetrated and the type of pipes used; or

.2 steel sleeve, having a thickness of not less than 1.8 mm and a length of not less than 900 mm for pipe diameters of 150 mm or greater and not less than 600 mm for pipe diameters of less than 150 mm (preferably equally divided at each side of the division).

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

2.1.3.5 Uninsulated metallic pipes penetrating "A" or "B" class divisions shah be made of materials having a melting temperature exceeding 950 °C for "A-0" class divisions and 850 °C for "B-0" class divisions.

2.1.3.6 In ships other than passenger ships carrying more than 36 passengers external boundaries, which shall be made of steel or other equivalent material, may be penetrated for the fitting of windows and side scuttles, provided there is no requirement in the present Part for such boundaries to be of "A" class.

In such boundaries, which are not required to be of "A" class, doors on

agreement with the Register may be made of materials the ventilation ducts than the ones of the boundary.

2.1.3.7 Balancing openings or ducts between two enclosed spaces are prohibited except for the openings permitted by 2.2.4.3 and 2.3.8.

2.1.4 Measures for prevention of spread of fire and smoke.

2.1.4.1 For machinery spaces provision shall be made to control the opening and closing of skylights, arrangements for closing openings in funnels, which normally ensure exhaust ventilation as well as closing of ventilation flaps.

The controls shall be located outside the serviced space where they would not be isolated in case of fire in the space.

2.1.4.2 For the protection of openings in the boundaries of A category machinery spaces the following measures shall be taken:

.1 the number of skylights, doors, ventilation openings, openings in funnels to permit exhaust ventilation and other openings shall be reduced to a minimum required for ventilation, as well as proper and safe operation of ship;

.2 skylights shall be made of steel and shall have no glass panels;

.3 provision shall be made to control the closing of power operated doors or actuating release mechanism of doors other than watertight power operated doors. The controls shall be located outside the serviced space where they would not be isolated in case of fire in the space;

.4 windows shall not be fitted in machinery spaces boundaries. However, this does not preclude the use of glass in control stations within the machinery spaces;

.5 in passenger ships the requirements of 2.2.4.1 shall be met additionally.

Skylights of cargo pump rooms, specified in 1.5.7.1, shall be made of steel and shall be closed from a position located outside the pump room.

2.1.4.3 In accommodation and service spaces, as well as in control stations stairways and lift trunks shall be protected in the following way:

.1 in cargo ships stairways which penetrate only a single deck shah be protected at least at one level by at least “B-0” class divisions and self-closing doors.

Lifts which penetrate only a single deck shah be surrounded by “A-0” class divisions with steel doors at both levels.

Stairways and lift trunks which penetrate more than a single deck shall be surrounded by at least “A-0” class divisions and protected by self-closing doors at all levels. Stairway enclosures may be arranged so as to allow to go from one stair to a superimposed stair within such enclosure (Fig. 2.1.4.3.1-1), or to enclose the stairs only with doors at each end of the stair (Fig. 2.1.4.3.1-2), or to enclose the stairs only in combination with fully closed steel stairs and doors fitted at the end of each stair (Fig. 2.1.4.3.1-3);

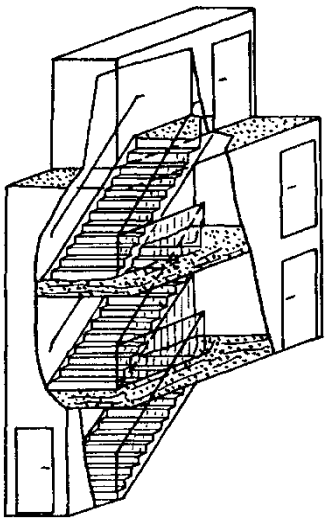


Fig. 2.1.4.3.l-l

.2 on ships having accommodation for 12 persons or less, where stairways penetrate more than a single deck and where there are at least two escapes direct to the open deck at every accommodation level, stairways and lift trunks may be protected by "B-0" class divisions;

.3 in passenger ships the stairways and lift trunks shall be protected in compliance with 2.2.2.4;

.4 the construction of stairways shall comply with the requirements of 8.5.4, Part III "Equipment, Arrangements and Outfit".

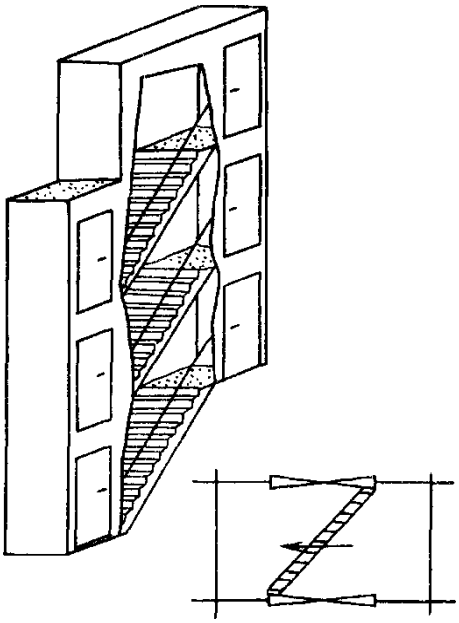


Fig. 2.1.4.3.1-2

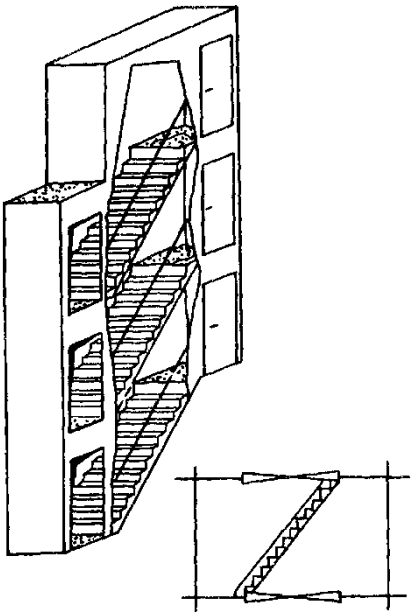


Fig. 2.1.4.3.1-3

2.1.4.4 Air spaces enclosed behind ceilings, panellings, or linings shall be divided by close-fitting draught stops

spaced not more than 14 m apart.

In the vertical direction, such air spaces, including those behind linings or stairways, trunks, etc. shall be closed at each deck.

2.1.4.5 In machinery spaces from which two stairways are provided in accordance with 4.5, Part VII "Machinery Installations" one of them shall be protected by enclosure along its whole length meeting requirement 2.2.1.3 category (*2*) or requirements 2.2.1.5, 2.3.3 or 2.4.2 category (*4*) as appropriate.

Self-closing fire doors of the same type of fire integrity shall be fitted in the enclosure.

Stairways shall be arranged to avoid transfer of heat to the enclosure through uninsulated fixing points.

2.1.4.6 In addition to watertight door separating the machinery space of category A from the shaft tunnel, from the side of the latter a light steel fire-screen door shall be fitted to be operated from each side.

2.1.4.7 Permanent openings in the side shell, ends and ceiling of enclosed spaces for the carriage of vehicles, enclosed ro-ro spaces, as well as special category spaces shall be so situated that a fire in these spaces does not endanger stowage areas and embarkation stations for lifeboats and liferafts, accommodation spaces, service spaces and control stations in superstructures and deckhouses above the mentioned spaces.

2.1.5 Additional requirements to spaces of separate categories.

In addition to the requirements of Section 2, the following requirements to structural fire protection shall be complied with.

2.1.5.1 Saunas shall comply with the following requirements:

.1 the perimeter of the sauna shall be of "A-60" class boundaries except spaces inside of the perimeter and spaces of categories (*5*), (*9*) and (*10*) as specified in 2.2.1.3, or spaces of categories (*5*), (*7*) and (*10*) as specified in 2.2.1.5.1, 2.3.3 or 2.4.2, depending on the purpose of ship;

.2 saunas may include changing rooms, showers and toilets. Bathrooms with direct access to saunas may be considered as part of them. In such cases, the door between sauna and the bathroom need not comply with fire safety requirements;

.3 the traditional wooden lining on the bulkheads and ceiling are permitted in the sauna. The ceiling above the oven shall be lined with non-combustible plate with an air gap of at least 30 mm. The distance from the hot surfaces to combustible materials shall be at least 500 mm or the combustible materials shall be protected (e. g., by a non-combustible plate with an air gap of at least 30 mm);

.4 the traditional wooden benches are permitted in saunas;

.5 the sauna door shall have no locks and open outwards by pushing;

.6 electrically heated ovens shah be provided with a timer and meet the requirements of Section 15, Part XI "Electrical Equipment", while cables and wires shall meet the requirements of 16.8 of the same Part.

2.1.5.2 Galleys shall comply with the following requirements:

.1 galleys utilizing sources of power other than electricity shall not be adjacent to storerooms for flammable materials and substances or to fuel oil and lubricating oil tanks;

.2 galley decks shall be covered with ceramic tiles or similar non-combustible covering;

.3 exhaust ventilation ducts from galley ranges shall meet the requirements of 12.2.7 or 12.3.6, Part VIII "Systems and Piping".

2.1.5.3 Storerooms for flammable materials and substances shall comply with the following requirements:

.1 storerooms for flammable materials shall not be generally situated in common with accommodation spaces in superstructure or deck-house. Access to the storerooms shall be provided from the open deck directly or through a corridor and/or a stairway leading only to these storerooms;

.2 all electrical equipment of the storeroom shall be explosion proof in compliance with 2.9, Part XI "Electrical Equipment".

2.1.5.4 Spaces for electric and gas welding operations shah comply with the following requirements:

.1 the spaces shall be separated from adjacent spaces by "A-60" class divisions;

.2 spaces shall have direct access from the open deck; the doors shall open outwards and be fitted with locks;

.3 location and arrangement of such spaces in oil tankers is subject to special consideration by the Register and shall comply with at least the following additional requirements:

.3.1 spaces shall be located toward the stern from cargo tanks, drain tanks, and coffer-dams that separate them;

.3.2 spaces shall not be located in "A" class machinery spaces and within 5 m from the spaces for the storage and transportation of hazardous materials;

.3.3 distance from the space to vapour holes of cargo compartments and drain tanks shall be at least 9 m;

.3.4 premise shall be fitted with mechanical ventilation to ensure at least 20 air changes per hour;

.3.5 welding power source shall have a lock that eliminates the possibility of switching on and operation if the front door is opened or the artificial ventilation is non-functional;

.3.6 The light board shall be installed at the front door: "Do Not Enter! Welding!";

.4 oxygen and acetylene cylinders for electric and gas welding operations shall be kept in the vertical position with nests, clamps, or other attachments that ensure rigid fastening and quick release of cylinders, inside separate spaces, complying with the following requirements:

.1 acetylene cylinders storeroom shall be independent of the oxygen cylinder storeroom;

.2 storerooms shall not be located below accommodation spaces and control stations or be adjacent to them. Besides, storerooms shall not be adjacent to machinery spaces of category A, galleys, storerooms for flammable materials and substances, as well as to fuel oil and lubricating oil tanks;

.3 divisions separating the storerooms from adjacent spaces shall be of "A-60" class;

.4 such spaces shall have direct access from the open deck, the doors shall open outwards and be fitted with locks providing their reliable closure to prevent unauthorized access;

.5 the warning plates: "Danger of explosion!" and "No smoking!"

shall be provided on the storerooms

doors.

2.1.5.5 Cargo spaces specified in 1.5.4.3, 1.5.4.4 and 1.5.9, in which motor vehicles with fuel in their tanks are carried, shall comply with the following requirements:

.1 entrances to the cargo spaces from accommodation, machinery and special electrical spaces shall be equipped with self-closing permanently closed doors. The coamings height of these doors shall not be less than 450 mm;

.2 warning plates prohibiting smoking shall be provided near the entrances to the cargo spaces:

"Do Not Smoke!";

.3 the cargo spaces shall comply with the requirements of 12.6, Part VIII "Systems and Piping" and 19.3, Part XI "Electrical Equipment".

2.1.5.6 A portion of open deck recessed into a deck structure, machinery casing, deck house etc., used for the exclusive storage of gas bottles shall comply with the following requirements:

.1 such a recess shall have an unobstructed opening, except for small appurtenant structures, such as opening comer radii, small sills, pillars etc. The opening may be provided with grating walls and doors;

.2 the depth of such a recess shall not be greater than 1 m;

.3 a portion of the open deck complying with the requirements of 2.1.5.6.1 and 2.1.5.6.2, is considered as open deck in applying Tables 2.2.1.3-1, 2.2.1.3-2, 2.2.1.5-1, 2.2.1.5-2, 2.3.3-1, 2.3.3-2, 2.4.2-1, 2.4.2-2.

2.1.5.7 Fan rooms serving engine rooms shall meet the following requirements:

.1 a fan room solely serving the engine room or multiple spaces containing an engine room may be treated as machinery space having little or no fire risk, in this case boundaries between the fan room and engine room casing shall be of "A-0" fire integrity;

.2 a fan room solely serving the engine room may be considered as part of the engine room, in this case the requirements for fire integrity of the horizontal boundary between fan room and engine room need not apply;

.3 for both of the cases described above, for any space(s) adjacent to the fan room superstructure, the fire integrity of the separating bulkhead(s) shall meet the applicable fire integrity requirements contained in the present Rules.

2.1.6 The materials used in structures, machinery, electrical plants and equipment shall not contain asbestos[4].

2.2 PASSENGER SHIPS

2.2.1 General.

2.2.1.1 The requirements of this Chapter are additional to those set out in 2.1.

2.2.1.2 For ships carrying more than 36 passengers, the hull, superstructure and deck-houses shall be divided into main vertical zones by "A-60" class divisions.

Steps and recesses shall be kept to a minimum, but where they are necessary they shall also be "A-60" class divisions.

Where a class 2.2.1.3 *(5),* 2.2.1.3 *(9)* or 2.2.1.3 *(10)* space is on one side of the division the class may be reduced to "A-0".

For ships carrying not more than 36 passengers, the hull, superstructure

[4] Refer to the resolution IMO MSC.282 (86).

and deck-houses in way of accommodation and service spaces shall be divided into main vertical zones by "A" class divisions. These divisions shall have insulation values in accordance with Tables 2.2.1.5-1 and 2.2.1.5-2.

As far as practicable, the bulkheads forming the boundaries of the main vertical zones above the bulkhead deck shall be in fine with watertight subdivision bulkheads situated immediately below the bulkhead deck.

The length and width of main vertical zones may be extended to a maximum of 48 m in order to bring the ends of main vertical zones to coincide with subdivision watertight bulkheads or in order to accommodate a large public space extending for the whole length of the main vertical zone provided that the total area of the main vertical zone is not greater than 1600 m^2 on any deck.

If a stairway serves two main vertical zones, then maximum length of one main vertical zone shall be measured from the far side of the main vertical zone stairway enclosure. In this case, all boundaries of the stairway enclosure are to be insulated as main vertical zone bulkheads and access doors leading to the stairway are to be provided from these zones (refer to Fig. 2.2.1.2-1–2.2.1.2-4).

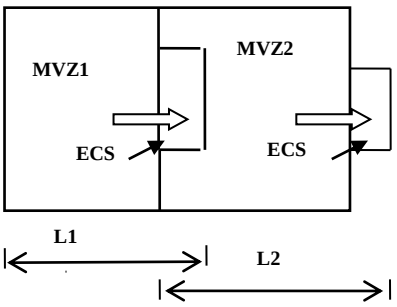
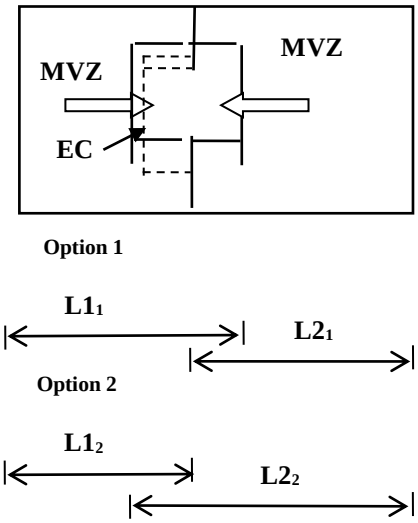


Fig. 2.2.1.2-1 ECS serves one MVZ.



Option 1. ECS belongs to MVZ1.
Option 2. ECS belongs to MVZ2.

Fig. 2.2.1.2-2 ECS serves two MVZ.

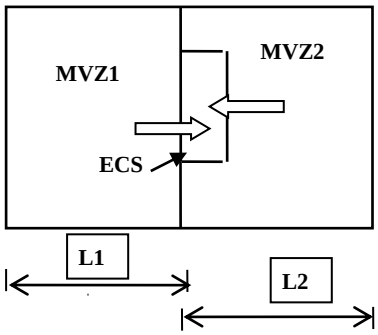
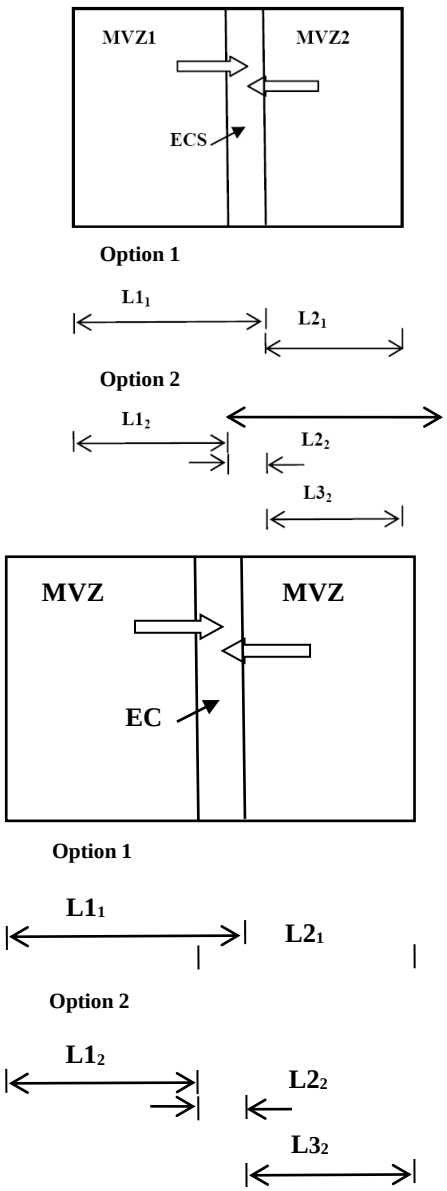


Fig. 2.2.1.2-3 ECS serves two MVZ (ECS belongs to MVZ2).



Option 1. ECS belongs to MVZ1.
Option 2. ECS belongs to MVZ2.

Fig. 2.2.1.2-4 ECS serves two MVZ.

Notes to Fig. 2.2.1.2-1–2.2.1.2-4:
MVZ — main vertical zone;
ECS — escape stairway;
$L1_1$... $L3_2$ — limits of the main vertical zones.

" - - - - " — possible limit changes;
⇒ — direction of escape

However, the stairway is not to be included in calculating size of the main vertical zone if it is treated as its own main vertical zone.

Bulkheads forming the boundaries of main vertical zones shall extend from deck to deck and to the shell or other boundaries.

Where the main vertical zone is divided by horizontal "A" class divisions into horizontal zones for the purpose of providing an appropriate barrier between sprinklered and non-sprinklered zones of the ship, the divisions shall extend between adjacent main vertical zone bulkheads and to the shell or exterior boundaries of the ship and shall be insulated in accordance with the fire insulation classes given in Table 2.2.1.5-2.

On ships designed for special purposes, such as automobile or railway car ferries, where the provision of main vertical zone bulkheads would defeat the purpose for which the ship is intended, equivalent means for controlling and limiting a fire, such as water screens complying with the requirements of 3.5, shall be provided. Service spaces and storerooms if they are not protected in compliance with the applicable requirements shall not be located on decks of ships specified in 1.5.4.3.

2.2.1.2.1 Protection of atriums:

.1 atriums shall be within enclosures formed of "A" class divisions having a fire rating determined in accordance with Tables 2.2.1.3-2 and 2.2.1.5-1, as applicable;

.2 decks separating spaces within atriums shall have a fire rating determined in accordance with Tables 2.2.1.3-

2 and 2.2.1.5-1, as applicable.

2.2.1.3 The minimum fire integrity of all bulkheads and decks separating adjacent spaces in ships carrying 36 passengers and more shall be as prescribed in Tables 2.2.1.3-1 and 2.2.1.3-2 complying with the following.

For the purpose of determining the class of structures between adjacent spaces, such spaces are classified according to their fire risk as follows:

1) *Control stations* — spaces accommodating emergency sources of electrical power and lighting; wheelhouse and navigation room; spaces accommodating ship radio equipment; fire stations; main machinery control room if it is located outside the space accommodating such machinery; spaces accommodating centralized fire alarm system; spaces accommodating central control stations and emergency loud speaking system equipment.

2) *Stairways* — interior stairways, lifts, fully enclosed trunks for evacuation and escalators for passengers and crew (except those, which are fully located in machinery spaces) and their enclosures.

A stairway which is enclosed at only one level shall be regarded as part of the space from which it is not separated by a fire door.

3) *Corridors:*

corridors and lobbies for passengers and crew.

4) *Evacuation stations and external escape routes; survival craft stowage area; open deck spaces and enclosed promenades forming lifeboat and life-raft embarkation and launching stations; muster stations, internal and external; external stairs and open decks used for escape routes; the ship's side to the waterline in the lightest seagoing condition, superstructure and deck-house sides situated below and adjacent to the life-raft's and evacuation slide's embarkation areas.*

5) *Open deck spaces:*

open deck spaces and enclosed promenades clear of lifeboat and liferaft embarkation and launching stations.

To be considered in this category, enclosed promenades shall have no fire risk. This means that furnishings shall be restricted to deck furniture. In addition, such places shall be naturally ventilated by permanent openings;

air spaces—spaces outside superstructures and deck-houses.

6) *Accommodation spaces of minor fire risk* — cabins, offices, dispensaries and public spaces containing furniture and furnishings of restricted fire risk and having a deck area of less than 50 m^2 (refer to 1.2).

7) *Accommodation spaces of moderate fire risk*:

accommodation spaces as in category (*6*) containing furniture and furnishings other than of restricted fire risk;

public spaces containing furniture and furnishings of restricted fire risk and having a deck area of 50 m^2 and greater;

isolated lockers and small storerooms in accommodation spaces having areas less than 4 m^2 (in which flammable liquids are not stowed);

cleaning gear lockers, laboratories (in which flammable liquids are not stowed); drying rooms (having a deck area of 4 m^2 or less); diet kitchens (containing no open flame);

specie rooms;

motion picture projection rooms and film rooms;

drug-stores;

operating rooms;

spaces accommodating electrical distribution boards with an area less, than 4 m^2.

8) *Accommodation spaces of greater fire risk:*

public spaces containing furniture and furnishings of other than restricted fire risk and having a deck area of 50 m^2 and greater, sale shops;

barber shops, beauty parlours;

saunas.

9) *Sanitary and similar spaces:*

communal sanitary facilities, showers, baths, water closets etc.;

small laundry rooms;

indoor swimming pool area;

isolated serving pantries containing no cooking appliances in accommodation spaces.

Individual sanitary spaces shall be considered a portion of the spaces in which they are located.

10) *Tanks, voids and auxiliary machinery spaces having little or no fire risk*:

water tanks forming part of the ship's structure;

voids and coffer-dams;

auxiliary machinery spaces which do not contain machinery having a pressure lubrication system and where storage of combustibles is prohibited,

such as: ventilation and air-conditioning rooms; windlass room; steering gear room; spaces accommodating stabilizer equipment; electrical propulsion motor room; rooms containing section switchboards and purely electrical equipment, except oil transformers (with capacity over 10 kVA); shaft alleys and pipe tunnels; spaces for pumps and refrigeration machinery (not handling or using flammable liquids);

closed trunks serving the spaces listed above;

other closed trunks such as pipe and cable trunks.

11) *Auxiliary machinery spaces, cargo spaces, cargo and other oil tanks and other similar spaces of moderate fire risk*:

cargo oil tanks;

cargo holds, trunkways and hatchways;

refrigerated chambers;

fuel oil tanks (where installed in a separate space with no machinery);

shaft alleys and pipe tunnels allowing storage of combustibles;

auxiliary machinery spaces as in category (*10*) which contain machinery having a pressure lubrication system or where storage of combustibles is permitted;

fuel oil filling stations;

spaces containing: turbine and reciprocating steam engine driven auxiliary generators and small internal combustion engines up to 110 kW driving generators, sprinkler, drencher or fire pumps, bilge pumps etc.;

closed trunks serving the spaces listed above;

closed trunks serving the spaces listed above; spaces accommodating oil transformers (with capacity over 10 kVA).

12) *Machinery spaces and main galleys:*

engine and boiler rooms (other than electric propulsion motor rooms);

auxiliary machinery spaces other than those in categories (*10*) and (*11*) which contain internal combustion ma-

chinery or other oil-burning, heating or pumping units;

main galleys and annexes;

trunks and casings to the spaces listed above.

13) *Storerooms, workshops, pantries etc.:*

main pantries, not annexed to galleys;

main laundry;

large drying rooms (having a deck area of more than 4 m^2);

miscellaneous stores;

mail and baggage rooms;

garbage rooms;

workshops (not part of machinery spaces, galleys etc.);

lockers and storerooms having areas of more than 4 m^2 and not having provisions for the storage of flammable liquids;

14) *Other spaces in which flammable liquids are stowed:*

paint rooms;

storerooms containing flammable liquids (including dyes, medicines etc.);

laboratories (in which flammable liquids are stowed).

2.2.1.4 On ships carrying not more than 36 passengers, where a space is protected by an automatic sprinkler system or fitted with a continuous "B" class ceiling, openings in decks not forming steps in main vertical zones nor bounding horizontal zones shall be closed reasonably tight and such decks shall meet the "A" class requirements.

2.2.1.5 The minimum fire integrity of all bulkheads and decks separating adjacent spaces in ships carrying not more than 36 passengers shall be as prescribed in Tables 2.2.1.5-1 and 2.2.1.5-2 with regard to the following:

.1 for determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, such spaces are classified according to their fire risk as shown in categories below:

1) *control stations*: spaces accommodating emergency sources of electrical power and lighting; wheelhouse and navigation room; spaces accommodating ship radio equipment; fire stations; main machinery control room if it is located outside machinery spaces; spaces accommodating centralized fire alarm system;

2) *corridors and lobbies;*

3) *accommodation spaces* as defined in 1.5.2, except corridors;

4) *stairways* — interior stairways, lifts, totally enclosed emergency escape exits trunks and escalators (other than those wholly contained within machinery spaces) and enclosures thereto.

A stairway which is enclosed at only one level shall be regarded as part of the space from which it is not separated by a fire door;

5) *service spaces* (low fire risk):

lockers and storerooms not having provisions for the storage of flammable liquids and having areas less than 4 m^2, drying rooms and laundries, spaces accommodating electrical distribution boards with an area less than 4 m^2;

6) *machinery spaces of category A*: machinery spaces as defined in 1.2, Part VII "Machinery Installations";

7) *other machinery spaces*:

machinery spaces excluding spaces referred to in (*6*) and spaces accommodating electrical equipment (automatic telephone stations, spaces for air conditioning ducts);

8) *cargo spaces*:

all spaces, which are not special category spaces used for the carriage of cargo (including cargo tanks for oily products), as well as ventilation and hatch trunks servicing such spaces;

9) *service spaces* (high fire risk):

galleys, pantries containing appliances for hot food preparation, paint rooms, lockers and storerooms with an area of 4 m^2 and over;

spaces for storage of flammable liquids, saunas, workshops and similar spaces, which are not part of machinery spaces;

10) *open decks*:

open deck spaces and enclosed promenades having no fire risk.

To be considered in this category, enclosed promenades shall have no fire risk. This means that furnishings shall be restricted to deck furniture.In addition, such places shall be naturally ventilated by permanent openings;

air spaces (spaces outside superstructures and deck-houses);

11) *special category spaces* as defined in 1.5.9 and ro-ro spaces in compliance with 1.5.4.3.

.2 The doors from the cabins to individual sanitary spaces may be of combustible materials.

2.2.2 Accommodation and service spaces within a main vertical zone.

2.2.2.1 For ships carrying more than 36 passengers all bulkheads which are not required to be “A” class divisions shall be “B” class or “C” class divisions as prescribed in Table 2.2.1.3-1.

For ships carrying not more than 36 passengers all bulkheads within accommodation and service spaces which are not required to be “A” class divisions shall be “B” class or “C” class divisions as prescribed in Table 2.2.1.5-1.

All such divisions may be faced with combustible materials in accordance with the provisions of 2.1.1.10.

2.2.2.2 For ships carrying not more than 36 passengers all corridor bulkheads where not required to be “A” class divisions shall be “B” class divisions which shall extend from deck to deck except:

.1 when continuous “B” class ceilings or linings are fitted on both sides of the bulkhead, the portion of the bulkhead behind the continuous ceiling or lining shall be of material which, in thickness and composition, is acceptable in the construction of “B” class divisions but which shall be required to meet “B” class integrity standards only in so far as is reasonable and practicable in the opinion of the Register;

Table 2.2.1.3-1 **Bulkheads not bounding either main vertical zones or horizontal zones**

Space	Space Category	*1)*	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*	*12)*	*13)*	*14)*
Control Stations	*1)*	B-0[1]	A-0	A-0	A-0	A-0	A-60	A-60	A-60	A-0	A-0	A-60	A-60	A-60	A-60
Stairways	*2)*		A-0[1]	A-0	A-0	A-0	A-0	A-15	A-15	A-0[3]	A-0	A-15	A-30	A-15	A-30
Corridors	*3)*			B-15	A-60	A-0	B-15	B-15	B-15	B-15	A-0	A-15	A-30	A-0	A-30
Evacuation stations and external escape routes	*4)*					A-0	A-60[2]	A-60[2]	A-60[2]	A-0	A-0	A-60[2]	A-60[2]	A-60[2]	A-60[2]
Open deck spaces	*5)*					–	A-0[4]	A-0[4]	A-0[4]	A-0[4]	A-0	A-0	A-0	A-0	A-0
Accommodation spaces (low fire risk)	*6)*						B-0	B-0	B-0	C	A-0	A-0	A-30	A-0	A-30
Accommodation spaces of moderate fire risk	*7)*							B-0	B-0	C	A-0	A-15	A-60	A-15	A-60
Accommodation spaces (greater fire risk)	*8)*								B-0	C	A-0	A-30	A-60	A-15	A-60
Sanitary and similar spaces	*9)*									C	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk	*10)*										A-0[1]	A-0	A-0	A-0	A-0
Auxiliary machinery spaces, cargo spaces, special category [5] space, cargo tanks and other oil tanks and other similar spaces of moderate fire risk	*11)*											A-0[1]	A-0	A-0	A-15
Machinery spaces and main galleys	*12)*												A-0[1]	A-0	A-60
Storerooms, workshops, pantries etc.	*13)*													A-0[1]	A-0
Other spaces in which flammable liquids are stowed	*14)*														A-30

End of Table 2.2.1.3-1

[1] If adjacent spaces marked with Footnote 1 have the same fire integrity, it is not necessary to divide such spaces with a bulkhead or deck. For instance for spaces of category (12) it is not necessary to divide a galley and buffets which are part thereof with bulkheads provided the bulkheads and buffet decks have the same fire resistance equal to that of structures bordering the galley. However, it is necessary to erect a bulkhead between the galley and machinery space although both spaces have the same category (12).

[2] The ship's side, to the waterline in the lightest seagoing condition, superstructure and deck-house sides situated below and adjacent to the liferafts and evacuation slides may be reduced to "A-30" class.

[3] Where public toilets are installed completely within the stairway enclosure, the public toilet bulkhead within the stairway enclosure can

be of “B” class fire integrity.

[4] Where spaces of categories *(6), (7), (8) and (9)* are located completely within the outer perimeter of the muster station, the bulkheads of these spaces are allowed to be of “B-0” class fire integrity. Control positions for audio, video and light installations may be considered as part of the muster station.

[5] Where fuel oil tanks are located under a special category space, the fire integrity of the separating deck may be reduced to “A-0” class.

N o t e s . 1. In respect of category *(5)* spaces, it is subject to the special consideration by the Register whether the insulation values in Table 2.2.1.3-1 shall apply to ends of deck-houses and superstructures, and whether the insulation values in Table 2.2.1.3-2 shall apply to weather decks. In no case shall the requirements of category *(5)* of above tables necessitate enclosure of spaces which in the opinion of the Register need not be enclosed.

2. Where, due to any particular structural arrangements in the ship, difficulty is experienced in determining from the tables the minimum fire integrity value of any divisions, such values are subject to the special consideration by the Register.

3. Where the contents and use of a space are such that there is a doubt as to its classification, it shall be treated as a space within the relevant category having the most stringent boundary requirements.

4. Notwithstanding the provisions of 2.2.2 there are no special requirements for material or fire integrity of boundaries where only a dash appears in the tables.

5. Small enclosed spaces inside the room are treated as separate spaces if square of doorways to adjacent spaces is less than 30% of openings (doorways). Fire integrity of bulkheads and decks surrounding such spaces shall comply with the requirements set forth in tables of the paragraph of the Rules.

Table 2.2.1.3-2 **Decks not forming steps in main vertical zones nor bounding horizontal zones**

Spaces below	Space Category	Spaces above													
		1)	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*	*12)*	*13)*	*14)*
Control Stations	*1)*	A-30	A-30	A-15	A-0	A-0	A-0	A-15	A-30	A-0	A-0	A-0	A-60	A-0	A-60
Stairways	*2)*	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-30	A-0	A-30
Corridors	*3)*	A-15	A-0	A-0[1]	A-60	A-0	B-0	A-15	A-15	A-0	A-0	A-15	A-30	A-0	A-30
Evacuation stations and external escape routes	*4)*	A-0	A-0	A-0	A-0	–	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Open deck spaces	*5)*	A-0	A-0	A-0	A-0	–	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Accommodation spaces (low fire risk)	*6)*	A-60	A-15	A-0	A-60	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0

Spaces below	Space Category	Spaces above													
		1)	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*	*12)*	*13)*	*14)*
Accommodation spaces of moderate fire risk	*7)*	A-60	A-15	A-15	A-60	A-0	A-15	A-15	A-15	A-0	A-0	A-0	A-0	A-0	A-0
Accommodation spaces (greater fire risk)	*8)*	A-60	A-15	A-15	A-60	A-0	A-0	A-15	A-30	A-0	A-0	A-0	A-0	A-0	A-0
Sanitary and similar spaces	*9)*	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0
Tanks, voids and auxiliary machinery spaces having little or no fire risk	*10)*	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0	A-0[1]	A-0	A-0	A-0	A-0
Auxiliary machinery spaces, cargo spaces, special category space, cargo tanks and other oil tanks and other similar spaces of moderate fire risk	*11)*	A-60	A-60	A-60	A-60	A-0	A-0	A-15	A-30	A-0	A-0	A-0[1]	A-0	A-0	A-30
Machinery spaces and main galleys	*12)*	A-60	A-60	A-60	A-60	A-0	A-60	A-60	A-60	A-0	A-0	A-30	A-30[1]	A-0	A-60
Storerooms, workshops, pantries etc.	*13)*	A-60	A-30	A-15	A-60	A-0	A-15	A-30	A-30	A-0	A-0	A-0	A-0	A-0	A-0
Other spaces in which flammable liquids are stowed	*14)*	A-60	A-60	A-60	A-60	A-0	A-30	A-60	A-60	A-0	A-0	A-0	A-0	A-0	A-0

[1] Refer to Footnote 1 to Table 2.2.1.3-1.

N o t e s . Refer to Footnotes to Table 2.2.1.3-1.

Table 2.2.1.5-1 **Fire integrity of bulkheads separating adjacent spaces**

Space	Space Category	*1)*	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*
Control Stations	*1)*	A-0[1]	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*	A-60
Corridors and lobbies	*2)*		C[2]	B-0[2]	A-0[5] B-0[2]	B-0[2]	A-60	A-0	A-0	A-15 A-0[3]	*	A-30[7]
Accommodation spaces	*3)*			C[2]	A-0[5] B-0[2]	B-0[2]	A-60	A-0	A-0	A-15 A-0[3]	*	A-30 A-0[3]
Stairways	*4)*				A-0[5] B-0[2]	A-0[5] B-0[2]	A-60	A-0	A-0	A-15 A-0[3]	*	A-30[7]

Service spaces (low fire risk)	*5)*					C[2]	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces of category A	*6)*						*	A-0	A-0	A-60	*	A-60
Other machinery spaces	*7)*							A-0[4]	A-0	A-0	*	A-0
Cargo spaces	*8)*								*	A-0	*	A-0
Service spaces (greater fire risk)	*9)*									A-0[4]	*	A-30
Open decks	*10)*										–	A-0
Ro-ro cargo spaces and spaces for motor vehicles	*11)*											A-30[7]

Table 2.2.1.5-2 **Fire integrity of decks separating adjacent spaces**

Spaces below	Space Category	Spaces above										
		1)	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*
Control Stations	*1)*	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*	A-60[7]
Corridors and lobbies	*2)*	A-0	*	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30[7]
Accommodation spaces	*3)*	A-60	A-0	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30 A-0[3]
Stairways	*4)*	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	A-0	*	A-30[7]
Service spaces (low fire risk)	*5)*	A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces of category A	*6)*	A-60	A-60	A-60	A-60	A-60	*	A-60[5]	A-30	A-60	*	A-60
Other machinery spaces	*7)*	A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	*	A-0
Cargo spaces	*8)*	A-60	A-0	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	A-0
Service spaces (greater fire risk)	*9)*	A-60	A-30 A-0[3]	A-30 A-0[3]	A-30 A-0[3]	A-0	A-60	A-0	A-0	A-0	*	A-30
Open decks	*10)*	*	*	*	*	*	*	*	*	*	–	A-0

Ro-ro cargo spaces and spaces for motor vehicles	*11)*	A-60	A-30[7]	A-30 A-0[3]	A-30[7]	A-0	A-60[7]	A-0	A-0	A-30	A-0	A-30[7]

Footnotes to Tables 2.2.1.5-1 and 2.2.1.5-2:

1 Bulkheads separating the wheelhouse and chartroom from each other may be "B-0" class. No fire rating is required for those partitions separating the navigation bridge and the safety centre when the latter is within the navigation bridge.

2 "B-0" or "C" class bulkheads, where appearing in the table as main fire-fighting bulkheads required by 2.2.1.2 shall be read as "A-0" class.

3 Where each of the adjacent spaces is protected by an automatic sprinkler system, the lower of the two values given in the tables may be used.

4 Where the spaces are used for the same purpose, no divisions may be fitted between them.

5 For clarification of the applicable fire integrity standard, refer to 2.2.2.1, 2.2.2.2, and 2.2.2.4.

6. Where other machinery spaces of category (*7*) are the spaces of low fire risk, i. e., they do not contain machinery operating in fuel oil or having a pressure lubrication systems, "A-0" class divisions are permitted (Table 2.2.1.5-2).

7. Ships constructed before July 1, 2014 shall at least comply with previous requirements applicable during the construction of the ship.

Notes to Tables 2.2.1.5-1 and 2.2.1.5-2:

1. Where an asterisk appears in the tables the division shall be of steel or equivalent material, but is not required to be of "A" class. However, if in the deck except for the decks in a space of category (*10*), there are penetrations for electric cables, piping and ventilation ducts, such penetrations shall be flame and smoke tight. Divisions between control stations (emergency generators) and open decks may have air intake openings without closing appliances, except cases when fixed gas fire-fighting system is installed.

End of Table 2.2.1.5-1–2.2.1.5-2

Where the requirements of 2.2.1.2 are applicable, an asterisk (Table 2.2.1.5-2) means "A-0" class, except categories *(8)* and *(10)*.

2. Refer to Notes 3 and 5 to Table 2.2.1.3-1.

.2 on ships equipped with an automatic sprinkler system complying with the provisions of Fire Safety Systems Code, corridor bulkheads may end by the corridor ceilings provided that such bulkheads and ceilings are of "B" class in accordance with 2.2.1.5.

All doors and door frames in such bulkheads shall be made of non-combustible materials and they shall have the same fire integrity as the bulkhead in which they are fitted.

2.2.2.3 Bulkheads required to be "B" class divisions, except corridor bulkheads required by 2.2.2.2, shall extend from deck to deck and to the shell or other boundaries unless the continuous "B" class ceilings or linings, having at least the same fire integrity as the adjacent bulkhead, are fitted on both sides of it, in which case the bulkhead may terminate at the continuous ceiling or lining.

If an air gap between the cabins results in an opening in the continuous "B-15" class ceiling, the bulkheads on both sides of the air gap shall be of "B-15" class.

2.2.2.4 Stairways and lifts shall be protected in the following way:

.1 stairways shall be enclosed by "A" class divisions with positive closing appliances of all openings, except that a stairway connecting only two decks need not be enclosed, provided the integrity of the deck is ensured by proper bulkheads or self-closing doors in the same 'tween deck.

When a stairway is enclosed in 'tween deck, then this enclosure shall be protected in compliance with Tables 2.2.1.3-2 or 2.2.1.5-2;

.2 stairways in public spaces may not have enclosures, provided they are located wholly within the public space;

.3 lift trunks shall be so fitted as to prevent the penetration of smoke and flame from one 'tween-deck compartment to another and shall be provided with closing appliances to prevent draught and smoke penetration.

Lifts machinery located within stairways enclosure shall be arranged in a separate space, surrounded by steel boundaries, except that small passages for lift cables are permitted.

Lifts, which open into spaces other than corridors, public spaces, special category spaces, stairways and external spaces shall not open (stop) into stairways serving as the means of escape;

.4 stairway enclosures shall have direct communications with the corridors and be of sufficient area to comply with 8.5.4.2, Part III "Equipment, Arrangements and Outfit".

Within the perimeter of such stairway, enclosures, only public toilets, lockers of non-combustible material providing storage for safety equipment and open information counters are permitted.

Only corridors, public toilets, special category spaces, other escape stairways required by Part III "Equipment, Arrangements and Outfit" and external areas are permitted to have direct access to these stairway enclosures.

Public spaces may also have direct access to stairway enclosures except for the backstage of a theatre;

.5 one of the means of escape from a

watertight compartment or a main fire vertical zone as required in 8.5.2.1, Part III "Equipment, Arrangements and Outfit" shall consist of enclosed stairways which provide a continuous shelter according to the requirements of 2.2.1.3 or 2.2.1.5;

.6 protection of escape routes from the stairways enclosures to the life boats and life rafts embarkation stations shall be provided either directly, or by protected interior passageways, having fire integrity and insulation values for the stairways enclosures as specified by Tables 2.2.1.3-1, 2.2.1.3-2, 2.2.1.5-1, 2.2.1.5-2, as applicable;

.7 on passenger ships constructed on or after July 1, 2008, non-load bearing partial bulkheads which separate adjacent cabin balconies shall be capable of being opened by the crew from each side for the purpose of fighting fires.

.8 On ships in the designation marks **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS** and **D-R3-S**, **D-R3-RS**, within enclosures of such stairways, spaces other than those specified in this paragraph may be located that shall be: empty, permanently closed, and disconnected from the power supply; separated from stairway enclosures by "A" class divisions in accordance with Table 2.2.1.5-1.Such spaces may have direct access to stairway enclosures via "A" class doors in accordance with Table 2.2.1.5-1; also, these spaces shall be fitted with a fire sprinkler system.

On these ships, category (*10*) spaces as defined in 2.2.1.3 and auxiliary premises (offices) that are located behind open-space information offices can directly access stairway enclosures provided that they are protected by smoke detectors and that such auxiliary premises contain only furniture of restricted fire risk.

2.2.2.5 In all spaces, except for refrigerated provision storerooms, cargo spaces,
mail baggage cabins and saunas, the ceilings, bulkheads, linings, draught stops and grounds shall be made of non-combustible materials.

2.2.2.5.1 Partial bulkheads and decks on passenger ships:

.1 partial bulkheads or decks used to subdivide a space for utility or artistic treatment shall be of non-combustible materials;

.2 linings, ceilings and partial bulkheads or decks used to screen or to separate adjacent cabin balconies shall be of non-combustible materials.

2.2.2.6 In the case of ships fitted with an automatic sprinkler system, combustible materials used for erection of "C" class divisions may be added to the total volume of combustible materials mentioned in 2.1.1.10.

2.2.2.7 The construction of ceiling and bulkheading shall be such that it will be possible, without impairing the efficiency of the fire protection, for the fire patrols to detect any smoke originating in concealed and inaccessible places, except where there is no risk of fire originating in such places.

2.2.2.8 The furniture in stairway enclosures shall consist of seats only. It shall be fixed to six seats on each deck in each stairway enclosure, be of restricted fire risk determined in accordance with Fire Test Procedures Code and shall not create obstacles for passengers at the routes of escape. The Register may permit additional seating in the main recep-

tion area within the stairway enclosure if it is fixed, non-combustible and do not create obstacles for passengers at the routes of escape.

The furniture shall not be permitted in passenger and crew corridors forming escape routes in cabin areas.

In addition to the above lockers of non-combustible material, providing storage for fire-fighting equipment and life-saving appliances required by the present Rules may be permitted. Drinking water automation devices and ice cube machines may be permitted in corridors provided they are properly fixed and do not restrict the width of the escape routes. This applies as well to decorative flower or plant arrangements, statues or other objects of art such as painting and tapestries in corridors and stairways enclosures.

2.2.2.9 Linings, ceilings and partial bulkheads used to screen or to separate adjacent cabin balconies shall be of non-combustible materials.

Cabin balconies on passenger ships constructed before July 1, 2008 shall comply with the requirements of this paragraph by the first survey after July 1, 2008.

2.2.2.10 Furniture and furnishings on cabin balconies shall comply with the requirements for rooms containing furniture and furnishings of restricted fire risk (refer to definitions in 1.2 "Rooms containing furniture and furnishings of restricted fire risk for the purpose of application on ships carrying more than 36 persons") unless such balconies are protected by a fixed pressure water-spraying and fixed fire detection and fire alarm systems complying with the requirements of 3.4.1 and 4.2.1.1.5.

2.2.3 Motor vehicles spaces, ro-ro spaces, special category spaces.

2.2.3.1 When the special category spaces cannot be protected by main vertical fire zones, their protection shall be ensured by subdivision into horizontal zones.

These zones may cover more than one deck, but their overall height calculated as a sum of distances between adjacent decks without regard of framing height shall not exceed 10 m.

Fire doors and passages (cut-outs) in decks and bulkheads of "A" class, forming boundaries, which separate horizontal areas from each other as well as the remain part of the ship shall meet the requirements applicable to fire doors and penetrations (cut-outs) in horizontal areas (refer to 2.2.4).

2.2.3.2 In ships carrying more than 36 passengers the boundary bulkheads and decks of special category spaces shall be "A-60" class. However, where category 2.2.1.3 (*5*), 2.2.1.3 (*9*) or 2.2.1.3 (*10*) space is on one side of the division the class may be reduced to "A-0".

If fuel oil tanks are located under special category spaces, the fire integrity of decks between such spaces may be of "A-0" class.

In ships carrying not more than 36 passengers the boundary bulkheads of special category spaces shall be as required for category (*11*) spaces in 2.2.1.5-1 and the horizontal boundaries as required for category (*11*) spaces in Table 2.2.1.5-2.

In passenger ships carrying not more than 36 passengers, the bulkheads and decks forming boundaries of enclosed

and open ro-ro spaces shall have fire integrity required for spaces of category (*8*) according to 2.2.1.5-1, while the horizontal boundaries shall have fire integrity required for spaces of category (*8*) according to 2.2.1.5-2.

2.2.3.3 Indicators shall be provided on the navigating bridge which shall indicate when any fire door of special category spaces is closed.

2.2.3.4 Special category spaces shall have means of escape leading to the lifeboat and liferaft embarkation places complying with the requirements of 8.5.1, 8.5.2.3, Part III "Equipment, Arrangements and Outfit" as well as the requirements of 2.1.4.7 and 2.2.2.4.1 of this Part.

One of escape routes from machinery spaces where the crew is normally engaged shall not have a direct access to the special category spaces.

2.2.3.5 Special category spaces shall be equipped with an approved water sprinkler system that complies with applicable provisions of 3.4.

2.2.4 Doors and windows.

2.2.4.1 Except hatches between the cargo spaces, special category spaces, storerooms and baggage rooms, as well as between such spaces and open decks, all openings shall be provided with permanent closing appliances, having at least such fire integrity as the divisions, in which they are fitted.

Construction of doors and doorframes in the bulkheads of "A" class with locking devices shall provide the same fire integrity and smoke and flame tightness as the bulkheads, in which those doors are fitted as determined in compliance with the Fire Test Procedures Codes.

Doors approved without the sill being part of the frame, which are installed on or after July 1, 2010, shall be installed such that the gap under the door does not exceed 12 mm. A non-combustible sill shall be installed under the door such that floor coverings do not extend beneath the closed door.

Each door fitted in "A" class division shall be capable of being opened and closed manually from both sides of the bulkhead by one person only.

Fire doors in main vertical bulkheads, 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 with an angle of inclination of up to 3.5° opposing closure;

.2 the approximate time of closure for hinged fire doors shall be no more than 40 s and no less than 10 s from the beginning of their movement with the ship in the upright position.

The approximate uniform rate of closure for sliding fire doors shall be no more than 0.2 m/s and no less than 0.1 m/s from the beginning of their movement with the ship in the upright position;

.3 the doors shall be capable of remote

release from the continuously manned central control station, either simultaneously or in groups and shall be capable of release also individually from a position at both sides of the door.Release switches shall have an on-off function to prevent automatic resetting of the system;

.4 hold-back hooks not subject to

main fire control station release are prohibited;

.5 a door closed remotely from the main fire control station shall be capable of being re-opened at both sides of the door by local control. After such local opening, the door shall automatically close again;

.6 indication shall be provided at the fire door indicator panel in the continuously manned main fire control station whether each of the remote-released doors is closed;

.7 the release mechanism shall be so designed that the door will automatically close in case of disruption of the control system or main source of power;

.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 after disruption of the control system or main source of electrical power at least ten times (fully opened and closed) using the local controls;

.9 disruption of the control system or main source of electrical power of one door shall not impair the safe functioning of 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 the main fire control station 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 far from the point of contact;

.12 double-leaf doors equipped with a latch necessary to their fire integrity shall have a latch that is automatically activated by the operation of the doors when released by the control system;

.13 doors giving direct access to special category spaces which are power-operated and automatically closed need not be equipped with the alarms and remote-release mechanisms required in 2.4.4.1.3 and 2.4.4.1.10;

.14 the components of the local control system shall be accessible for maintenance and adjusting; and

.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 in accordance with Fire Test Procedures Code. This system shall satisfy the following requirements:

the control system shall be able to operate the door at the temperature of at least 200 °C for at least 60 min, served by the power supply;

the power supply for all other doors not subject to fire shall not be impaired; and

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.

2.2.4.2 Except watertight doors, watertight doors (semi watertight doors), doors leading to the open decks, and doors required to be adequately gastight, all “A” class doors located in stairways, public spaces and main vertical zone bulkheads in escape routes shall be equipped with a self-closing hose port of material,

construction and fire integrity of which is equivalent to the door into which it is fitted, and shall be a 150 cm^2

opening with the door closed and shall be inset into the lower edge of the door, opposite the door hinges, or in the case of sliding doors, nearest the opening.

2.2.4.3 Doors and doorframes in "B" class divisions and their locking devices shall ensure the same fire integrity as the divisions where they are installed in accordance with the Fire Test Procedures Code, except that ventilation openings may be permitted in the lower portion of such doors.

If such ventilation openings are located in the door or under it, their total net area shall not exceed 0.05 m^2.

Alternatively, pressure-balancing ventilation duct made of non-combustible material is allowed to be arranged between the cabin and the corridor, and located below sanitary room, if an area of its cross section does not exceed 0.05 m^2.

All such openings shall be fitted with grills made of non-combustible material.

Doors shall be non-combustible.

Doors approved without the sill being part of the frame, which are installed on or after July 1, 2010, shall be installed such that the gap under the door does not exceed 25 mm.

Cabin doors in "B" class divisions shall be of the self-closing type and shall have no hold-backs.

2.2.4.4 Windows facing life-saving appliances, embarkation and muster areas, external stairs and open decks used for escape routes, and windows situated below liferaft and escape slide embarkation areas shall have the fire integrity as required in Table 2.2.1.3-1.

Where automatic dedicated sprinkler heads are provided for windows, "A-0" class windows may be accepted as equivalent. Sprinklers shall be located above windows in addition to sprinklers of ceilings; alternatively these may be sprinklers of ceilings fitted in such manner that a window is protected by water flow with a feed of at least 5 l/min-m^2, the square of a window shall be included into calculation of the area covered by the sprinkler; alternatively these may be water-mist nozzles complying with the requirements of IMO resolution A.800(19) as amended.

Windows located in the ship's side below the lifeboat embarkation areas shall have the fire integrity at least equal to "A-0" class.

All windows and side scuttles in bulkheads within accommodation and service spaces, and control stations, except those subject to provisions of 2.2.4.5 and 2.2.4.8, shall be fitted so as to ensure that fire integrity of the bulkheads they are fitted in is not impaired, which is determined in accordance with the Fire Test Procedures Code.

Despite the requirements of Tables 2.2.1.3-1, 2.2.1.3-2, 2.2.1.5-1 and 2.2.1.5-2, windows and side scuttles in the outer bulkheads of accommodation spaces, service spaces and control stations shall have frames made of steel or other equivalent material and meet the requirements of 7.2.2.4, Part III "Equipment, Arrangements and Outfit".

2.2.4.5 The requirements for "A" class fire integrity of ship external boundaries do not apply to glassed bulkheads, windows and side scuttles, provided that 2.2.4.4 does not contain the requirement that such boundaries shall be of "A" class.

The requirements for "A" class fire integrity of the outer boundaries of a ship

shall not apply to exterior doors, except for those in superstructures and deck-houses facing life-saving appliances, embarkation and external muster station areas, external stairs and open decks used for escape routes. Stairway enclosure doors need not meet this requirement.

2.2.4.6 In passenger ships carrying not more than 36 passengers, it is allowed to use combustible materials for manufacture of doors separating cabins from internal individual sanitary spaces such as showers.

2.2.4.7 Doors to machinery spaces of category A, other than power-operated watertight doors shall be arranged to ensure their positive closing by power operated closings arrangements or by fitting self-closing doors capable of being closed with an angle of inclination of up to 3.5° opposite to the door closure and equipped with locking device and remotely controlled release mechanism.

Doors for the emergency escape trunks may not to be equipped with locking devices and remotely controlled release mechanisms.

Doors closure controls required by 2.1.4.2.3 shall be located in one place or centralized at possibly less number of places. These places shall have free access from the open deck.

2.2.4.8 The requirements for "B" class fire integrity of ship external boundaries do not apply to glassed bulkheads, windows and side scuttles. Such requirements **for** "B" class fire integrity do not apply to exterior doors in superstructures and deck-houses.

2.2.5 External areas on passenger ships.

2.2.5.1 Fire risk of external areas on passenger ships is evaluated in accordance with the provisions of IMO MSC.1/Circ.1274.

2.2.6 Casualty threshold, safe return to port and safe areas.

2.2.6.1 Passenger ships having length, as defined in 1.2.1 of Load Line Rules for Sea-Going Ships, of 120 m or more or having three or more main vertical zones, shall comply with the requirements of 2.2.6 in order to meet functional requirements and performance standards for safe areas in case of casualty that does not exceed the casualty threshold.

2.2.6.2 When fire damage does not exceed the casualty threshold, the ship shall be capable of returning to port while providing a safe area as defined in 1.2.

To be deemed capable of returning to port the fixed fire extinguishing systems, including the fire main system, and the fire detection and fire alarm system shall remain operational in the remaining part of the ship not affected by fire.

2.2.6.3 The fire main system shall remain operational in all main vertical zones not directly affected by the casualty. Water feed for fire-fighting purposes shall be available to all areas of the ship.

2.2.6.4 The automatic sprinkler system or any other fixed fire extinguishing system designed to protect an entire space shall be operational in all spaces not directly affected by the casualty.

2.2.6.5 The fire detection and fire alarm system, including smoke detection system, shall be operational in all spaces not directly affected by the casualty.

2.2.6.6 Means of access to life-saving appliances shall be provided from each safe area, taking into account that a main vertical zone may not be available for internal transit.

2.2.6.7 In addition to the requirements of 2.2.6.2, the following systems, machinery and equipment shall remain operational in the remaining part of the ship not affected by fire:

.1 propulsion and essential auxiliary machinery;

.2 steering systems and steering-control systems;

.3 power-operated watertight doors;

.4 fuel oil systems for propulsion and essential auxiliary machinery;

.5 ballast and bilge systems;

.6 internal communication between the bridge, engineering spaces, safety centre, fire-fighting and damage control teams, and as required for passenger and crew notification and mustering; internal communication shall be provided by effective fixed or portable means;

.7 flooding detection systems;

.8 navigation lights in accordance with the requirements of International Regulations for Preventing Collisions at Sea;

.9 GMDSS radio equipment (radio communication by GMDSS radio equipment) shall be provided or, if the main GMDSS radio equipment is out of service due to casualty, the distress alert initiating shall be provided on the VHF frequencies including two-way VHF radiotelephone apparatus for communications with aircraft;

.10 navigational equipment essential for navigation, indicating the ship location and collision risk assessment.

2.2.6.8 The systems, machinery and equipment specified in 2.2.6.2 and 2.2.6.7 shall remain operational in case of flooding of any watertight compartment.

2.2.6.9 If systems are needed to fight with fire and flooding which are not specified in 2.2.6.2 and 2.2.6.7 they shall comply with the requirement of 2.2.6.7.

2.2.6.10 Ventilation of safe area(s) shall comply with the requirements of 2.2.6.7 and 2.2.6.8.

Ventilation design shall reduce the risk that smoke and hot gases could affect the use of the safe area(s).

2.2.6.11 Power supply of electrical equipment specified in 2.2.6.7 and 2.2.6.13 shall be provided to ensure their simultaneous operation.

2.2.6.12 The safe area(s) shall generally be internal space(s);

however, the use of an external space as a safe area may be allowed taking into account any restriction due to the area of operation and relevant expected environmental conditions.

2.2.6.13 The safe area(s) shall provide all occupants with the following basic services to ensure that the health of passengers and crew is maintained:

.1 sanitation;

.2 fresh water;

.3 food;

.4 alternate space for medical care;

.5 shelter from the weather;

.6 means of preventing heat stress and hypothermia;

.7 light;

.8 ventilation.

2.2.7 Systems to remain operational after a fire casualty.

2.2.7.1 Passenger ships having length, as defined in 1.2.1 of Load Line Rules for Sea-Going Ships, of 120 m or more, or having three or more main vertical zones shall comply with the requirements of 2.2.7 to provide the systems operability if the casualty threshold is exceeded.

2.2.7.2 In case any one main vertical

zone is unserviceable due to fire, the fire main system shall be so arranged and segregated as to remain operational for at least 3 h based on the assumption of no damage outside the unserviceable main vertical zone.

In particular, the fire main system shall remain operational in all main vertical zones not directly affected by the casualty. Water feed for fire-fighting purposes shall be available to all areas of the ship. The fire main system is not required to remain operational within the unserviceable main vertical zones.

2.2.7.3 Cabling and piping within a trunk constructed to an "A-60" class shall remain intact and serviceable while passing through the unserviceable main vertical zone.

An equivalent degree of protection for cabling and piping may be approved by the Register.

2.2.7.4 In addition to 2.2.7.2 the following systems, machinery and equipment shall be so arranged and segregated as to remain operational for at least 3 h based on the assumption of no damage outside the unserviceable main vertical zone:

.1 bilge systems for removal of fire-fighting water;

.2 lighting along escape routes (corridors, stairs, and exits), at assembly stations and at embarkation stations of life-saving appliances;

.3 low location lighting of escape routes with electrical power supply;

.4 internal communications (in support of fire-fighting as required for passenger and crew notification and evacuation); internal communication shall be provided by effective fixed or portable means;

.5 GMDSS radio equipment (radio communication by GMDSS radio equipment) shall be provided or, if the main GMDSS radio equipment is out of service due to casualty, the distress alert initiating shall be provided on the VHF frequencies including two-way VHF radiotelephone apparatus for communications with aircraft.

2.2.7.5 The systems, machinery and equipment specified in 2.2.7.4 are not required to remain operational within the unserviceable main vertical zones.

2.2.7.6 Power supply of electrical equipment for evacuation from ship including life-saving appliances, as well as of systems, machinery and equipment specified in 2.2.7.4 shall be provided to ensure their simultaneous operation.

2.2.8 Safety centre on passenger ships (refer also to MSC.1/Circ.1368).

2.2.8.1 Passenger ships shall have on board a safety centre, as defined in 1.2, complying with the requirements of 2.2.8.

2.2.8.2 The safety centre shall either be a part of the navigation bridge or be located in a separate room adjacent to and having direct access to the navigation bridge so that the control of actions in emergency situations does not distract the rotational captain's mate from his duties.

General plan and the ergonomics of the safety centre shall duly account for provisions of the Guidelines in accordance with Circular MSC/Circ.982 with possible amendments.

2.2.8.3 Means of communication between the safety centre, the storage room(s) for fire extinguishing system(s) and fire equipment lockers shall be provided.

2.2.8.4 The functionality, i. e. acti-

vation, control, monitoring or combination thereof, of the following safety systems shall be available from the safety centre: fire detection and fire alarm system, sprinkler and equivalent systems, water-based systems for machinery spaces, fixed fire-fighting local application systems as well as fire pumps and emergency fire pumps.

2.2.8.5 In addition to 2.2.8.3 means of communication between the safety centre, the central control station, the navigation bridge, the engine control room shall be provided.

2.2.8.6 In addition to 2.2.8.4 the functionality, i. e. activation, control, monitoring or combination thereof, of the safety systems listed below shall be available from the safety centre:

.1 all powered ventilation systems;

.2 atrium smoke extraction systems;

.3 indication of closing watertight and fire doors;

.4 general emergency alarm system;

.5 public address system;

.6 low location lighting of escape routes with electrical power supply;

.7 indicators for shell doors, loading doors and other closing appliances;

.8 flooding detection system.

2.3 CARGO SHIPS

2.3.1 The requirements of this Chapter are additional to those set out in 2.1 and apply to cargo ships of 500 gross tonnage and upwards.

2.3.2 In way of accommodation and service spaces and control stations one of the following methods of protection shall be adopted:

Method IC: construction of internal subdivision bulkheads of non-combustible "B" or "C" class divisions, generally without installation in the accommodation and service spaces of the automatic sprinkler fire extinguishing system and fire detection and fire alarm system;

Method IIC: the fitting of an automatic sprinkler system and fire detection and fire alarm system in all spaces in which fire might be expected to originate, generally with no restriction on the type of internal bulkheads;

Method IIIC: the fitting of a fixed fire detection and fire alarm system of approved type complying with requirements of 4.1 and 4.2 in spaces where fire might develop, generally with no restriction on the class of internal subdivision bulkheads, except that in no case shall the area of any accommodation space bounded by "A" or "B" class division exceeds 50 m^2.

Consideration may be given by the Register to increasing this area for public spaces.

The requirements on using non-combustible materials for the construction and insulation of bulkheads bounding machinery spaces, control stations, service spaces etc., as well as protection of above mentioned trunks and stairways enclosures are common for all three methods described above.

2.3.3. The minimum fire integrity of the bulkheads and decks separating adjacent spaces shall be as prescribed in Tables 2.3.3-1 and 2.3.3-2.

For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, the spaces are classified according to their fire risk as follows:

1) *control stations*: spaces accommodating emergency sources of electri-

cal power and lighting; wheelhouse and navigation room; spaces accommodating ship radio equipment; fire stations; main machinery control room if it is located outside machinery spaces; spaces accommodating centralized fire alarm system;

2) *corridors and lobbies;*

3) *accommodation spaces* as defined in 1.5.2, except corridors;

4) *stairways*:

interior stairways, lifts, totally enclosed emergency escape exits trunks and escalators (other than those wholly contained within machinery spaces) and enclosures thereto.

In this connexion, a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door;

5) *service spaces* (low fire risk):

storerooms not having provisions for the storage of flammable liquids and having areas less than 4 m^2, drying rooms, laundries and refrigerated provision storerooms (insulated

Table 2.3.3-1. **Fire integrity of bulkheads separating adjacent spaces**

Space	Category	*1)*	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*
Control Stations	*1)*	A-0[1]	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*	A-60
Corridors and lobbies	*2)*		C	B-0	A-0[2] B-0	B-0	A-60	A-0	A-0	A-0	*	A-30
Accommodation spaces	*3)*			C[3, 4]	A-0[2] B-0	B-0	A-60	A-0	A-0	A-0	*	A-30
Stairways	*4)*				A-0[2] B-0	A-0[2] B-0	A-60	A-0	A-0	A-0	*	A-30
Service spaces (low fire risk)	*5)*					C	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces of category A	*6)*						*	A-0	A-0[5]	A-60	*	A-60[6]
Other machinery spaces	*7)*							A-0[7]	A-0	A-0	*	A-0
Cargo spaces	*8)*								*	A-0	*	A-0
Service spaces (greater fire risk)	*9)*									A-0[7]	*	A-30
Open decks	*10)*										–	A-0
Ro-ro cargo spaces and spaces for motor vehicles	*11)*											A-30[10]

Footnotes to Tables 2.3.3-1 and 2.3.3-2:

1 Bulkheads separating the wheelhouse, chartroom and radio room from each other may be “B-0” class.

2 For clarification as to which applies, refer to 2.1.4.3.

3 Doors separating cabins from individual sanitary accommodation may be constructed of combustible materials in method IC fire protection. No special requirements are imposed upon bulkheads in methods IIC and IIIC.

For ending, refer to Table 2.3.3-2.

Table 2.3.3-2. **Fire integrity of decks separating adjacent spaces**

Spaces below	Cate-gory	Spaces above										
		1)	*2)*	*3)*	*4)*	*5)*	*6)*	*7)*	*8)*	*9)*	*10)*	*11)*
Control Stations	*1)*	A-0	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0	*	A-60
Corridors and lobbies	*2)*	A-0	*	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30
Accommodation spaces	*3)*	A-60	A-0	*	A-0	*	A-60	A-0	A-0	A-0	*	A-30
Stairways	*4)*	A-0	A-0	A-0	*	A-0	A-60	A-0	A-0	A-0	*	A-30
Service spaces (low fire risk)	*5)*	A-15	A-0	A-0	A-0	*	A-60	A-0	A-0	A-0	*	A-0
Machinery spaces of category A	*6)*	A-60	A-60	A-60	A-60	A-60	*	A-60[9]	A-30	A-60	*	A-60
Other machinery spaces	*7)*	A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	*	A-0
Cargo spaces	*8)*	A-60	A-0	A-0	A-0	A-0	A-0	A-0	*	A-0	*	A-0
Service spaces (greater fire risk)	*9)*	A-60	A-0	A-0	A-0	A-0	A-60	A-0	A-0	A-0[7]	*	A-30
Open decks	*10)*	*	*	*	*	*	*	*	*	*	–	A-30[10]
Ro-ro cargo spaces and spaces for motor vehicles	*11)*	A-60	A-30	A-30	A-30	A-0	A-60	A-0	A-0	A-30	A-0[10]	A-30[10]

The end of the footnotes to the Tables 2.3.3-1 and 2.3.3-2:

4 In case of method IIIC bulkheads of "B-0" class shall be provided between spaces or groups of spaces of 50 m^2 and over in area.

5 For cargo spaces intended for carriage of dangerous goods refer to 7.2.12.

6 "A-0" class may be used if no dangerous goods are intended to be carried.

7 Where the spaces are used for the same purpose, no divisions may be fitted between them.

9 Where other machinery spaces of category (*7*) are the spaces of low fire risk, i. e., they do not contain machinery operating in fuel oil or having a pressure lubrication systems, "A-0" class divisions are permitted.

10 Ships constructed before July 1, 2014 shall at least comply with previous requirements applicable during the construction of the ship.

Notes to Tables 2.3.3-1 and 2.3.3-2. 1. Where an asterisk appears in the tables the division shall be of steel or equivalent material, but is not required to be of "A" class. However, if in the deck except for the decks in a space of category (*10*), there are penetrations for electric cables, piping and ventilation ducts, such penetrations shall be flame and smoke tight. Divisions between control stations (emergency generators) and open decks may have air intake openings without closing appliances, except cases when fixed gas fire-fighting system is installed.

2. Refer to Note 5 to Table 2.2.1.3-1.

with non-combustible materials); spaces accommodating electrical distribution boards with an area less, than 4 m^2;

6) *machinery spaces of category A*: machinery spaces as defined in 1.2, Part VII "Machinery Installations";

7) *other machinery spaces*:

machinery spaces excluding spaces referred to in (*6*) and spaces accommodating electrical equipment (automatic telephone stations, spaces for air conditioning ducts);

8) *cargo spaces*:

all spaces used for the carriage of cargo (including cargo tanks for oily products), as well as trunks servicing such spaces;

9) *service spaces* (high fire risk):

galleys and pantries containing appliances for hot food preparation, saunas, paint lockers and storerooms with an area of 4 m^2 and over, spaces for storage of flammable liquids, workshops and similar spaces, which are not part of machinery spaces; refrigerated provision storerooms insulated with combustible materials; saunas;

10) *open decks*:

open deck spaces and enclosed promenades having no fire risk.

This means that their furnishings shall be restricted to deck furniture. In addition, such places shall be naturally ventilated by permanent openings.

Air spaces (spaces outside superstructures and deck-houses);

11) *ro-ro cargo spaces* and motor vehicles spaces as defined in 1.5.4.3 and 1.5.4.4.

2.3.4 Linings, ceilings, draught stops and their associated grounds shall be made of non-combustible materials:

in accommodation and service spaces, and in control stations, if protection method IC is used;

in corridors and stairway enclosures serving accommodation and service spaces, and control stations, if protection methods IIC and IIIC are used.

2.3.5 Within accommodation and service spaces bulkheads not required to be "A" or "B" class divisions shall be:

.1 at least "C" class division in method IC fire protection;

.2 not subject to any restrictions, except in cases where "C" class bulkheads are required in accordance with Table 2.3.3-1 in method IIC fire protection;

.3 not subject to any restrictions except that in no case shall the area of any accommodation space or spaces bounded by "A" or "B" class divisions exceed 50 m^2 (except in cases where "C" class bulkheads are required in accordance with Table 2.3.3-1), in method IIIC fire protection.

Consideration may be given by the Register to increasing this area for public spaces.

If the IC method of protection has been used while ship construction, application of combustible materials may be allowed for doors separating cabins from internal sanitary spaces such as showers.

2.3.6 The doors installed in the bulkheads bounding machinery spaces of category A shall be self-closing and adequately gas-tight.

"A" class doors approved without the sill being part of the frame, which are installed on or after July 1, 2010, shall be installed such that the gap under the door does not exceed 12 mm, and a non-combustible sill shall be installed under the door such that floor coverings do not

extend beneath the closed door.

"B" class doors approved without the sill being part of the frame, which are installed on or after July 1, 2010, shall be installed such that the gap under the door does not exceed 25 mm.

2.3.7 The doors required to be self-closing shall not be equipped with locking devices. However, locking devices may be used equipped with remotely controlled release mechanisms.

2.3.8 In the corridor bulkheads ventilation openings may be permitted in and under the doors of cabins and public spaces.

Ventilation openings are also permitted in "B" class doors leading to sanitary rooms, studies, pantries, lockers and storerooms.

Except for the permitted below, openings shall be provided in the lower portion of such doors only.

If such ventilation opening is located in or under the door, the total net area of such opening shall not exceed 0.05 m^2.

Alternatively, pressure-balancing ventilation duct made of non-combustible material is allowed to be arranged between the cabin and the corridor, and located below sanitary room, if an area of its cross section does not exceed 0.05 m^2.

Ventilation openings except the ones located under the door shall be fitted with grills made of non-combustible material.

2.3.9 All bulkheads required to be "B" class divisions within accommodation spaces, shall extend from deck to deck and to the hull shell or other boundaries.However, if the continuous "B" class ceilings or linings are fitted on both sides of the bulkhead may terminate at the continuous ceiling or lining.

2.3.10 For the purpose of application of the requirements of 2.1.1.7, 2.1.1.8 and 2.1.1.10 it is necessary to follow Table 2.3.10 and Fig. 2.3.10.

Table 2.3.10

Ser. No.	Structural members	Requirements to materials						
		Non-combustibility (refer to 2.3.4)	Non-combustibility (refer to 2.1.1.5)	Low flame spread (refer to 2.1.1.8)	Total volume of combustible materials (refer to 2.1.1.10.1)	Calorific value (refer to 2.1.1.10)	Smoke generation (refer to 2.1.1.7)	Hardened combustibility[7] (refer to 2.1.1.6)
1	2	3	4	5	**6**	7	8	9
1. Applied in IC protection method								
1.1	Mouldings				×			
1.2	Panels	×						
1.3	Painted surfaces, linings, textiles, films			×	×	×	×	
1.4	Decorations				×		×[2]	
1.5	Painted surfaces, linings, textiles, films in concealed and inaccessible spaces				×	×	×[2]	
1.6	Plinth				×			
1.7	Insulation		×[1]					
1.8	Surfaces and paints in concealed and inaccessible places			×				
1.9	Draught prevention seals	×						
1.10	Furring	×		×				
1.11	Linings	×						
1.12	Primary deck covering						×	×
1.13	Floor covering			×[3]			×[3]	
1.14	Scuttle frame	×						
1.15	Scuttle frame surface			×[3]	×	×	×[3]	
1.16	Scuttle frame surface in concealed and inaccessible places			×				
1.17	Ceiling panel	×						
2. Applied in IIC and IIIC protection methods								
2.1	Mouldings				×			
2.2	Panels	×[4]						
2.3	Painted surfaces, linings, textiles, films			×	×	×	×	

End of Table 2.3.10

1	2	3	4	5	6	7	8	9
2.4	Painted surfaces, linings, textiles, films			×	×[6]	×[5]	×	
2.5	Decorations				×[6]		×[2]	
2.6	Painted surfaces, linings, textiles, films in concealed and inaccessible spaces				×[6]	×[5]	×[2]	
2.7	Plinth				×[6]			
2.8	Insulation		×[1]					
2.9	Surfaces and paints in concealed and inaccessible places							
2.10	Draught prevention seals	×[4]		×[2]				
2.11	Furring	×[4]		×				
2.12	Linings	×[4]						
2.13	Primary deck covering						×	×
2.14	Floor covering			× [3]			×[4]	
2.15	Scuttle frame	×[4]						
2.16	Scuttle frame surface			×[6]	×[6]	×[5]	×[4]	
2.17	Scuttle frame surface in concealed and inaccessible places			×				
2.18	Ceiling panel	×[4]						

[1] Vapour barriers used for coating of the cooling systems piping (refer to 2.1.1.5) may be combustible, provided they are low flame-spread.

[2] Applied to paints, varnishes and other coatings.

[3] In corridors and stairways enclosures only.

[4] Only in corridors and stairways enclosures servicing accommodation and service spaces and control stations.

[5] When combustible materials are fitted on non-combustible bulkheads, ceilings and linings in accommodation and service spaces.

[6] Applied to such accommodation and service spaces, which are bounded by non-combustible bulkheads, ceilings and linings.

[7] Hardened combustibility — characteristics applicable to deck coatings (primary or general deck applied within accommodation and service spaces and control stations or on cabin balconies of passenger ships) that shall be made of approved non-flammable material or material that is not hazardous due to emission of toxic or explosive substances at elevated temperatures, which shall be determined by the Fire Test Procedures Code.

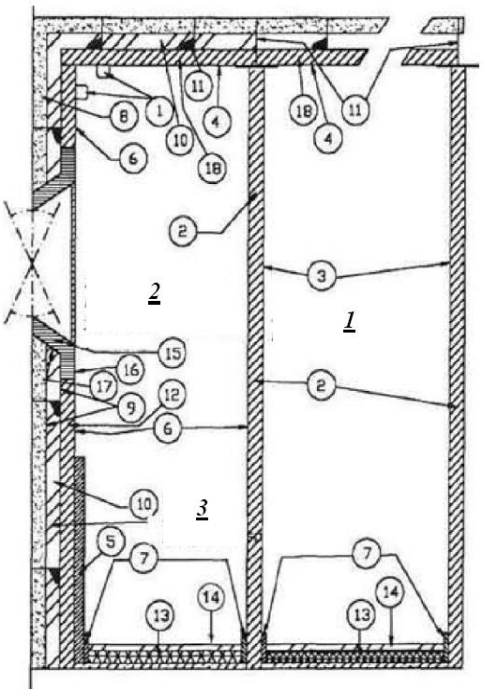


Fig. 2.3.10 Structural members in accommodation spaces (*1* — corridors and stairway enclosures; *2* — accommodation and service spaces and control stations; *3* — concealed or inaccessible places).

1. Mouldings; 2. Panels; 3. Painted surfaces, linings, textiles, films; 4. Painted surfaces, linings, textiles, films; 5. Decorations; 6. Painted surfaces, linings, textiles, films; 7. Plinth; 8. Insulation; 9. Surfaces and paints in concealed and inaccessible places; 10. Draught prevention seals; 11.Furring; 12.Linings; 13. Primary deck covering; 14. Floor covering; 15.Scuttle frame; 16.Scuttle frame surface; 17.Scuttle frame surface in concealed and inaccessible places; 18. Ceiling panel.

2.4 OIL TANKERS

2.4.1 The requirements of this Chapter are additional to those set out in 2.1 and 2.3 (except for 2.3.3) when only method IC fire protection is adopted and apply to oil tankers and combination carriers of 500 gross tonnage and upwards.

2.4.2 The minimum fire integrity of bulkheads and decks separating adjacent spaces shall be as prescribed in Tables 2.4.2-1 and 2.4.2-2 with regard to the following.

For determining the appropriate fire integrity standards to be applied to divisions between adjacent spaces, the spaces are classified according to their fire risk as follows:

1) *control stations*:

spaces accommodating emergency sources of electrical power and lighting; wheelhouse and navigation room; spaces accommodating ship radio equipment; fire stations; main machinery control room if it is located outside machinery space; spaces accommodating centralized fire alarm system;

2) *corridors and lobbies;*

3) *accommodation spaces* as defined in 1.5.2, except corridors;

4) *stairways*:

interior stairways, lifts, totally enclosed emergency escape exits trunks and escalators (other than those wholly contained within machinery spaces) and enclosures thereto.

In this connexion, a stairway which is enclosed only at one level shall be regarded as part of the space from which it is not separated by a fire door;

5) *service spaces* (low fire risk):

storerooms having areas less than 4 m^2 and not having provisions for the storage of flammable liquids, drying rooms, laundries and refrigerated provision storerooms insulated with non-combustible materials; spaces accommodating electrical distribution boards having an area of less than 4 m^2;

6) *Machinery spaces* of category A.

Spaces as defined in 1.2, Part VII "Machinery Installations";

7) *other machinery spaces*:

machinery spaces excluding spaces referred to in (*6*) and spaces accommodating electrical equipment (automatic telephone stations, spaces for air conditioning ducts);

8) *cargo pump rooms* as defined in 1.5.7.1;

9) *service spaces* (high fire risk):

galleys and pantries containing appliances for hot food preparation, saunas, paint lockers and storerooms with an area of 4 m^2 and over, spaces for storage of flammable liquids, workshops and similar spaces, which are not part of machinery spaces; refrigerated provision storerooms insulated with combustible materials;

10) *open decks*:

open deck spaces and enclosed promenades having no fire risk. This means that their furnishings shall be restricted to deck furniture.In addition, such spaces shall be naturally ventilated by permanent openings.

Air spaces (spaces outside superstructures and deck-houses).

Table 2.4.2-1 **Fire integrity of bulkheads separating adjacent spaces**

Space	Category	*1*)	*2*)	*3*)	*4*)	*5*)	*6*)	*7*)	*8*)	*9*)	*10*)
Control Stations	*1*)	A-0[1]	A-0	A-60	A-0	A-15	A-60	A-15	A-60	A-60	*
Corridors and lobbies	*2*)			B-0	A-0 B-0[2]	B-0	A-60	A-0	A-60	A-0	*
Accommodation spaces	*3*)		C	C	A-0 B-0[2]	B-0	A-60	A-0	A-60	A-0	*
Stairways	*4*)				A-0 B-0[2]	A-0 B-0[2]	A-60	A-0	A-60	A-0	*
Service spaces (low fire risk)	*5*)					C	A-60	A-0	A-60	A-0	*
Machinery spaces of category A	*6*)						*	A-0	A-0[3]	A-60	*
Other machinery spaces	*7*)							A-0[4]	A-0	A-0	*
Cargo pump rooms	*8*)								*	A-60	*
Service spaces (greater fire risk)	*9*)									A-0[4]	*
Open decks	*10*)										–

Table 2.4.2-2 **Fire integrity of decks separating adjacent space**

Spaces below	Category	Spaces above									
		1)	*2*)	*3*)	*4*)	*5*)	*6*)	*7*)	*8*)	*9*)	*10*)
Control Stations	*1*)	A-0	A-0	A-0	A-0	A-0	A-60	A-0	–	A-0	*
Corridors and lobbies	*2*)	A-0	*	*	A-0	*	A-60	A-0	–	A-0	*
Accommodation spaces	*3*)	A 60	A-0	*	A-0	*	A-60	A-0	–	A-0	*
Stairways and lifts	*4*)	A-0	A-0	A-0	*	A-0	A-60	A-0	–	A-0	*
Service spaces (low fire risk)	*5*)	A-15	A-0	A-0	A-0	*	A-60	A-0	–	A-0	*
Machinery spaces of category A	*6*)	A-60	A-60	A-60	A-60	A-60	*	A-60[5]	A-0	A-60	*
Other machinery spaces	*7*)	A-15	A-0	A-0	A-0	A-0	A-0	*	A-0	A-0	*
Cargo pump rooms	*8*)	–	–	–	–	–	A-0[3]	A-0	*	–	*
Service spaces (greater fire	*9*)	A-60	A-0	A-0	A-0	A-0	A-60	A-0	–	A-0[4]	*

risk)											
Open decks	*10*)	*	*	*	*	*	*	*	*	*	*

End of Table 2.4.2.

Footnotes to Tables 2.4.2-1 and 2.4.2-2:

1 Bulkheads separating the wheelhouse, chartroom and radio room from each other may be "B-0" class.

2 For clarification as to which applies, refer to 2.1.4.3.

3 Where bulkheads and decks are penetrated by cargo pump shafts, electric cables etc. refer to 2.4.8.

4 Where the spaces are used for the same purpose, no divisions may be fitted between them.

5 Where other machinery spaces of category (7) are the spaces of low fire risk, i. e., they do not contain machinery operating in fuel oil or having a pressure lubrication systems, "A-0" class divisions are permitted.

Notes .1. Where an asterisk appears in the tables the division shall be of steel or other equivalent material but is not required to be of "A" class. However, if in the deck except for the decks in a space of category (10), there are penetrations for electric cables, piping and ventilation ducts, such penetrations shall be flame and smoke tight. Divisions between control stations (emergency generators) and open decks may have air intake openings without closing appliances, except cases when fixed gas fire-fighting system is installed.

2. Refer to Note 5 to Table 2.2.1.3-1.

2.4.3 Exterior boundaries of superstructures and deck-houses enclosing accommodation and including any overhanging decks which support such accommodation, shall be constructed of steel and be "A-60" class for the whole of the portions which face the cargo area and on the outward sides for a distance of 3 m from the end boundary facing the cargo area.

The distance of 3 m shall be measured horizontally and parallel to the centreline of the ship from the boundary facing the cargo area at the each deck level.

The insulation above shall be provided up to the underside of navigation bridge deck. Lower part of the navigation bridge facing the cargo area shall be "A-60" class.

2.4.4 Arrangement of openings shall meet the requirements of 2.4.4.1 to 2.4.4.3.

2.4.4.1 Except as permitted in 2.4.4.2, access doors, air inlets and openings to accommodation spaces, service spaces, control stations and machinery spaces shall not face the cargo area.

They shall be located on the transverse bulkhead not facing the cargo area or on the outboard side of the superstructure or deck-house at the distance of at least 4% of the ship length but not less than 3 m from the end of the superstructure or deck-house facing the cargo area. However, this distance need not exceed 5 m.

Access to forecastle spaces containing sources of ignition may be permitted through doors facing cargo area provided the doors are located outside hazardous areas (refer to 19.2, Part XI "Electrical Equipment").

2.4.4.2 The Register may permit access doors in superstructures or deck-houses on transverse bulkheads facing the cargo area or on side bulkheads within 5 m (distance specified in 2.4.4.1), to cargo control rooms and to such service spaces as provision rooms, lockers and storerooms, provided they do not give direct or indirect access to any another space containing or providing for ac-

commodation, control stations or service spaces such as galleys, pantries or workshops or similar spaces containing sources of vapour ignition.

Boundaries of such space shall be of "A-60" class except for boundary facing the cargo area. Within the limits specified in 2.4.4.1 it is allowed to fit bolted plates for the removal of machinery. Wheelhouse doors and windows may be located within the limits specified in 2.4.4.1, so long as they are designed to ensure that the wheelhouse can be made rapidly and efficiently gas and vapour tight.

2.4.4.3 The Register may permit access to a deck foam system room where foam tanks and control station are located within the distances specified in 2.4.4.1 provided the requirements of 2.4.4.2 are fulfilled and the door is located flush with a bulkhead.

2.4.5 Windows and sidescuttles facing the cargo area and located on the sides of superstructures and deck-houses within the limits specified in 2.4.4.1 shall be of the fixed (non-opening) type. Such windows and sidescuttles, except wheelhouse/navigation bridge window, shall be of "A-60" class.

Except that "A-0" class standard is acceptable for windows and sidescuttles outside the limit specified in 2.4.4.1.

2.4.6 The Register may permit a navigation position to be fitted above the cargo area where this is for navigation purposes only, and it shall be separated from the cargo tank deck by means of an open space with a height of at least 2 m. The fire protection of such a navigation position shall be as required for control stations in 2.4.2 and other provisions, as applicable, of this Part.

Where the control station is on the forecastle deck or in the forward part of the ship equipped with a fore cargo gear, an emergency exit shall be provided to ensure safe escape in case of fire.

2.4.7 Machinery spaces shall be positioned aft of cargo tanks and slop tanks; they shall also be situated aft of pump rooms and coffer-dams, but not necessarily aft of the fuel oil tanks.

Any machinery space shall be isolated from cargo tanks and slop tanks by coffer-dams, pump rooms, fuel oil tanks, or ballast tanks.

Pump rooms containing pumps and their accessories for ballasting those spaces situated adjacent to cargo tanks and slop tanks, and pumps for fuel oil transfer may be used for isolation of machinery spaces from cargo tanks and slop tanks provided that such pump rooms have the same safety standard as that required for cargo pump rooms.

The lower portion of the pump room bulkhead may be recessed into machinery spaces of category A to accommodate pumps. The deck head of the recess may be not more than one third of the moulded depth above the keel.

In ships of not more than 25,000 t, for reasons of access and satisfactory piping arrangements and on agreement with the Register, the deck head of the recess may be at a level of up to one half of the moulded depth above the keel.

A cargo tank or a slop tank adjoining machinery spaces by a comer shall be isolated therefrom by a comer coffer-dam.

The design and dimensions of coffer-dams shall comply with the requirements of 2.7.5.2, Part II "Hull".

Comer coffer-dams inaccessible for

inspection shall be fitted with suitable media.

No cargoes or wastes shall be stowed in coffer-dams.

Void space or ballast water tank protecting fuel oil tank as shown in Fig. 2.4.7, need not be considered as a cargo area even though they have a cruciform contact with the cargo oil tank or slop tank.

The void space protecting fuel oil tank is not considered as a coffer-dam required above.

Void spaces may be located as shown in Fig. 2.4.7 even though they have a cruciform contact with the slop tank.

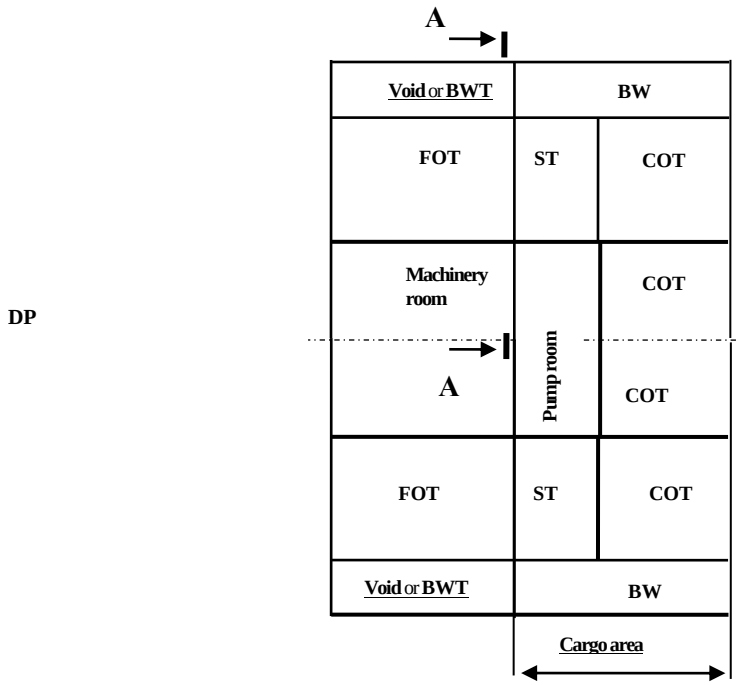
2.4.8 Pump rooms shall be closed in by gastight bulkheads.

Permanent approved gastight fighting enclosures may be installed in bulkheads and decks separating pump rooms from other spaces. These enclosures are intended for fighting of pump rooms provided that they are sufficiently durable and that fire integrity and gastightness of the bulkhead or deck is preserved.

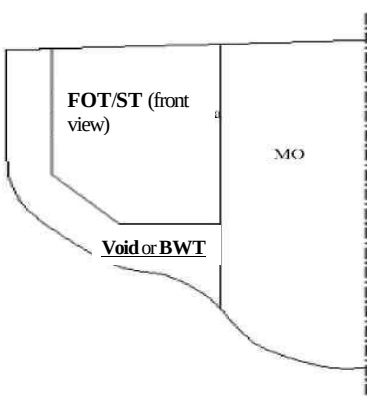
2.4.9 Control stations, cargo control stations, accommodation and service spaces (except for isolated cargo handling gear lockers) shall be positioned aft of all cargo tanks, slop tanks and spaces isolating cargo or slop tanks from machinery spaces, but not necessarily aft of the fuel oil tanks and ballast tanks, and shall be arranged in such a way that a single failure to a deck or bulkhead shall not permit the entry of gas or fumes from the cargo tanks into any of the above space.

The recess provided in accordance with 2.4.7 may be disregarded when determining the location of the said spaces.

Plan



A —A (side view)



COT — cargo oil tank
ST — slop tank
FOT — fuel oil tank
Void — void space
BWT — ballast water tank

Fig. 2.4.7

Enclosed smoking rooms shall be provided within the accommodation area. These

spaces shall be formed by "B-15" class divisions, and facings shall be made of materials having low flame spread characteristics.

2.4.10 Where deemed necessary and on agreement with the Register, control stations, cargo control rooms, accommodation and service spaces may be positioned forward of the cargo tanks, slop tanks and spaces which isolate cargo tanks and slop tanks from machinery spaces but not necessarily forward of fuel oil tanks or ballast tanks.

Machinery spaces other than category A may be permitted forward of the cargo tanks and slop tanks provided they are isolated from the cargo tanks and slop tanks by coffer-dams, pump rooms, fuel oil tanks or ballast tanks.

All of the above-mentioned spaces shall be subject to an equivalent standard of safety and appropriate availability of fire-fighting arrangements.

Control stations, cargo control rooms, accommodation and service spaces shall be arranged in such a way that a single failure of a deck or a bulkhead shall not permit the entry of gas or fumes from the cargo tanks into such spaces.

In addition, where deemed necessary for the safety of navigation of the ship, machinery spaces containing internal combustion engines not being main propulsion machinery having output greater than 375 kW may be located forward of the cargo area.

Paint lockers, regardless of their use shall not be positioned above the tanks and spaces as determined in 2.4.9.

2.4.11 No access holes to fuel oil tanks located in the double bottom below cargo tanks are permitted in cargo tanks and in the machinery space.

2.4.12 Means shall be provided to keep deck spills away from the accommodation and service spaces.

This may be accomplished by
provision of a permanent continuous coaming of a height at least 300 mm from side to side.

Similar measures and arrangements shall be provided for stem loading, if available.

2.4.13 Manholes, openings for cleaning cargo tanks and other openings shall not be arranged in completely enclosed or in semi-enclosed spaces.

2.4.14 The following requirements shall be also met in combination carriers:

.1 the slop tanks shall be surrounded by coffer-dams, except where the boundaries of the slop tanks are the hull, main cargo deck, cargo pump room bulkhead or fuel oil bunker tank.

These coffer-dams shall not be open to a double bottom, pipe tunnel, pump room or other enclosed space, as well as they shall not be used for carriage of cargo or ballast and they need not be connected with cargo or ballast systems.

Means shall be provided for filling the coffer-dams with water and draining them.

Where the boundary of the slop tank is the cargo pump room bulkhead, the pump room shall not be open to the double bottom, pipe tunnel or other enclosed space. However, openings provided with gas-tight bolted covers may be permitted;

.2 hatches and tank cleaning openings to slop tanks shall be only permitted on the open deck; they shall be fitted with closing arrangements, except where they consist of

bolted plates with bolts at watertight spacing.

Closing arrangements shall be fitted with securing devices controlled by responsible person out of ship officers;

.3 arrangement of openings for cargo handling operations in decks and bulkheads separating the spaces for the carriage of oil and oil products from the spaces not intended or fitted for their carriage is permitted only provided equivalent tightness for oil products and their vapours is ensured;

.4 detailed instructions shall be exhibited on board, covering safety measures to be taken during loading or unloading of the ship and when dry cargoes are carried with oil product residues in the slop tanks.

2.4.15 Where the electrochemical protection is fitted on the ship it shall comply with the following requirements:

.1 where the electrochemical protection of structures or their elements is fitted, anodes can be made of zinc, magnesium or aluminium alloys;

.2 magnesium alloy anodes that are applied for protection of unpainted structure elements of light metals shall be screened with protection devices that do not conduct the electrical current.

Where magnesium alloy anodes on conserved structural elements of steel or aluminium are applied, strengthening of paint layers shall be ensured;

.3 magnesium alloy anodes and electrochemical protection systems with superimposed current are not permitted in oil cargo tanks and tanks adjacent to them of ships carrying oil products;

.4 aluminium alloy anodes are only permitted in cargo tanks and tanks adjacent to cargo tanks of ships carrying oil products in locations where the potential energy does not exceed 275 J. The height of the anode shall be measured from the bottom of the tank to the centre of the anode, and its weight shall be taken as the weight of the anode as fitted, including the fitting devices and inserts.

However, where aluminium alloy anodes are located on horizontal surfaces such as bulkhead girders and stringers not less than 1 m wide and fitted with an upstanding flange or face flat projecting not less than 75 mm above the horizontal surface, the height of the anode may be measured from the surface.

Aluminium alloy anodes shall not be located under tank hatches or openings (in order to avoid any metal parts falling on the fitted anodes), unless protected by adjacent structure;

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

Anodes shall be fitted with delimiters from sides and bottom made of the material which does not spark while in contact with the anode. The steel inserts shall be attached to the structure by means of a continuous weld of adequate section, the weld elements shall be free of stress concentrations. Alternatively they may be attached to separate supports by bolting, provided a minimum of two bolts with locknuts are used.

In case of the use of a weld, the absence of concentration of stresses in welded

members shall be ensured.

However, the ways of attachment are subject to special consideration by the Register. The supports at each end of an anode shall not be attached to separate items which are likely to move independently.

3. FIRE-FIGHTING EQUIPMENT AND SYSTEMS

3.1 GENERAL

3.1.1 General

3.1.1.1 The requirements of this Section apply to all fire-fighting equipment and systems fitted in sea-going ships for the purpose of fire protection of the ship concerned.

Where provision is made in a ship for extra fire extinguishing systems in addition to those prescribed by this Section, such systems shall also comply with the requirements set out below, to an extent approved by the Register.

During design and manufacture of fire extinguishing systems requirements of Fire Safety Systems Code and Sections 1 to 5, Part VIII "Systems and Piping" shall be complied with.

3.1.1.2 Fire-fighting equipment and systems shall be so constructed that they are efficient and readily available for operation under all service conditions (refer to 2.3.1, Part VII "Machinery Installations").

3.1.1.3 Containers and pressure vessels used in fire extinguishing systems shall meet the requirements set forth in 6.4, Part X "Boilers, Heat Exchangers and Pressure Vessels".

3.1.1.4 The use of a fire extinguishing medium which either inherently or under expected conditions of use gives off toxic gases in such quantities as to endanger the persons is not permitted.

It is prohibited to install in ships new fire extinguishing plants utilizing halon 1211, halon 1301 halon 2402, as well as perfluoridecarbons.

3.1.2 Fire extinguishing systems

3.1.2.1 In addition to the water fire main system and in accordance with the purpose for which they are intended, all ship's spaces shall be protected by one of the fixed fire extinguishing systems according to Table 3.1.2.1, unless expressly provided otherwise.

The Register may consider the use of other equivalent systems, ensuring equivalent protection.

In category A machinery spaces and pump rooms as specified in 1.5.7.1, instead of CO_2 fire-extinguishing systems equivalent Register-approved fire extinguishing systems may be used, meeting the requirements of IMO MSC/Circ. 848, as amended by IMO MSC.1/Circ. 1267 ("V/S" in 3.4.2.3.1 of the Circular is substituted with "VS"), with existing approvals for equivalent systems designed in compliance with IMO MSC/Circ. 848 valid until July 1, 2012.

Instead of water-spraying systems, water mist fire fighting systems may be used, as approved based on MSC/Circ. 1165, MSC.1/Circ. 1269, MSC.1/Circ. 1385, MSC.1/Circ. 1386.

For protection of spaces specified in 1.5.4.3, 1.5.4.4 and 1.5.9, the use of a fixed fire extinguishing system other than stated in Table 3.1.2.1 may be approved by the Register, provided that field tests in conditions that imitate combustion of gasoline leakage in this space show that this system is of equivalent efficiency (refer to IMO Circular MSC/Circ.914).

Table 3.1.2.1

No. No.	Space	Fixed fire extinguishing systems								
		sprinkler	water-spraying	water screen	water drenching	foam chemical	CO_2	inert gas	dry chemical	aerosol
1	2	3	4	5	6	7	8	9	10	11
1	Control stations, refer to 1.5.1.1	+[1]								
2	Control stations, refer to 1.5.1.2[2]		+			+	+			+
3	Accommodation spaces, refer to 1.5.2.1 and 1.5.2.2	+[1]								
4	Service spaces, refer to 1.5.3.1, 1.5.3.2.3 and 1.5.3.2.4	+[1]								
5	Store rooms, refer to 1.5.3.2.1				+					
6	Service spaces, refer to 1.5.3.2.2[3]	+[1]	+			+[4]	+		+	+[5]
7	Cargo spaces, refer to 1.5.4.3, 1.5.4.4		+	+[6]		+[8]	+[9]	+[9]		
8	Petroleum product tanks, refer to 1.5.4.1					+				
9	Cargo spaces, refer to 1.5.4.2[7,10]		+[11.12]			+[4]	+	+		
10	Category A machinery spaces[2,13], hangars and spaces with equipment for helicopter fuelling and maintenance		+			+[8]	+			+
11	IC-engine mufflers, waste heat boilers, steam boiler and incinerator uptakes, exhaust heat economizers[14] as well as exhaust ducts and galley ranges[19]		+				+			

Table 3.1.2.1

1	2	3	4	5	6	7	8	9	10	11
12	Periodically unattended machinery spaces in which EPM, steam machinery or steam turbines with a capacity of at least 375 kW are located		+[14]			+[8]	+			+
13	Pump rooms under 1.5.7.1		+			+[8]	+[16]			+[5]
14	Processing spaces under 1.5.8.1		+			+[8]	+			+
15	Fire hazardous zones of machinery in category A machinery spaces				+[17]					
16	Special category spaces under 1.5.9		+							
17	Cargo decks of gas carriers, including cargo piping and cargo tanks								+	
18	Separator spaces and equivalent (refer to 4.2.7, Part VII "Machinery Installations")		+			+[8]	+			+
19	Blow-down chambers of crank IC-engines (refer to 2.2.4, Part IX "Machinery")						+			
20	Fore and aft loading/unloading device area in oil tankers, helidecks					+				
21	Chain stoppers and cargo hose connections area in oil tankers suitable for single point mooring and fitted with a fore loading device		+							
22	Alley ways and stairs	+[18]								

Table 3.1.2.1

[1]Automatic sprinkler systems shall be provided:

- at control stations, in accommodation and service spaces, including alley ways and stairs, of passenger ships that carry over 36 passengers. As an alternative, control stations in which water may cause damage to essential equipment may be fitted with approved fixed fire fighting systems of another type (refer to 3.3.1.1). Fire fighting systems are not necessary in low fire hazardous or non-fire hazardous spaces, e. g. empty spaces, public toilets, CO_2 cylinder spaces etc.;

- in accommodation and service spaces, and, where considered necessary by the Register, at control

stations of passenger ships that carry not more than 36 passengers (equipped with a fixed smoke detection system only in alley ways, stairways, escape routes within accommodation spaces) (refer to 3.3.1.1), except for low fire hazardous or non-fire hazardous spaces, e. g. empty spaces, sanitary spaces etc.;

- in cargo ships with IIC protection level – in accommodation spaces, galleys and other service spaces, except for low fire hazardous or non-fire hazardous spaces, e. g. empty spaces, sanitary spaces etc.

[2] In glass-reinforced plastic ships specified in 2.9 CO_2 fire extinguishing systems shall be fitted. Where the emergency diesel generator capacity is less than 375 kW, control station spaces may be fitted with portable fire extinguishers as per Table 5.1.2.

[3] In paint rooms, storerooms for combustible liquids, liquefied and compressed gases, fixed fire extinguishing systems are not necessary where the cross-sectional area of each storeroom does not exceed 4 m^2 (refer to 3.1.3.4). Fire extinguishing systems in cargo sample spaces located in the cargo area of oil tankers are not necessary.

[4] Foam fire extinguishing systems with a medium foam expansion ratio of 100:1 shall be used, except for helicopter hangars and closed garages in which foam fire fighting systems with a foam expansion ratio of about 1000:1 shall be used.

[5] Aerosol generators of flameproof design shall be used.

[6] Water screens shall be used in addition to systems in column 4, 7, 10 where provided for in 2.2.1.2.

[7] Cargo spaces of container carriers shall not be fitted with foam fire extinguishing systems.

[8] Foam fire extinguishing systems with a medium foam expansion ratio of 100:1 shall be used to the extent that the foam generator is suitable for smothering of the cargo carried.

[9] CO_2 or inert gas fire extinguishing systems may only be fitted in cargo spaces that are capable of being tightly closed from locations outside the spaces. Also refer to 3.1.2.13.

[10] Break-bulk cargo spaces, except for dangerous goods spaces, as agreed by the Register, need not be fitted with fixed fire fighting systems:

- in passenger ships engaged on short voyages;

- in passenger ships of less than 1,000 gross tonnage, where the ship is equipped with portable fire fighting means for cargo spaces and with steel hatch covers, as well as with efficient closures for all ventilation outlets and other openings into cargo spaces;

- in cargo ships of less than 2,000 gross tonnage or cargo ships designed solely to carry ore, coal, grain, unseasoned timber, non-combustible or low fire hazardous cargo (refer to Table 1 of IMO MSC.1/Circ. 1395), where the ship is equipped with steel hatch covers and efficient closures for all ventilation outlets and other openings into cargo spaces;

- in cargo spaces, only cargo for which gas fire extinguishing is not suitable may be carried (refer to Table 2 of IMO MSC.1/Circ. 1395), provided that the requirements of 7.2.5.2 are met.

End of Table 3.1.2.1

[11] In fish meal spaces only.

[12] Class 1 (except for 1.4S) dangerous cargo spaces, in addition to fire smothering systems, shall be protected as per 7.2.5.3. Also refer to 3.2.14.7, Load Line Rules for Sea-Going Ships.

[13] Where a liquid-fuel auxiliary boiler or boilers, as well as incinerators, installed within the machinery space so that they are not enclosed by gastight enclosures and platforms, such spaces shall be fitted with one of the above fire fighting systems based on the need to cover the entire space even where the space has no other equipment or machinery that runs on fuel oil, except as mentioned above.

In passenger ships, in spaces for organic coolant boilers an additional fixed or portable local pressurized water spraying system or a foam fire fighting system may be fitted for fires above and under the floor plates.

[14] Water spraying systems are only suitable for spaces in which steam turbines or closed-type steam machinery are located.

[15] One of the above systems is mandatory for all ships that carry combustible liquids and respective maintenance ships; all ships that carry flammable dry cargo, irrespective of the gross tonnage, as well as

for other ships with the aggregate capacity of main and auxiliary machinery in excess of 740 kW.

[16] A warning notice shall be displayed next to CO_2 system controls to state that due to static discharge ignition hazard the system shall be used for fire fighting instead of inertization.

[17] Refer to 3.12.

[18] Sprinkler systems are mandatory in passenger ships that carry over 36 passengers only.

[19] In passenger ships that carry no more than 36 passengers and in cargo ships sprinkler systems shall be installed where ducts pass through any spaces located in way of accommodation spaces.

3.1.2.2 The necessary amount of an extinguishing medium shall be calculated for every space to be protected. The determined amount of an extinguishing medium for storage shall be established based on the biggest of the obtained design values.

The fire extinguishing system shall be fitted with valves that are normally closed to charge the extinguishing medium into a space.

Where two or more adjacent spaces with fire hazard of different levels are not separated by gas- or watertight bulkheads or decks, or where fuel oil may flow from one space to another and this possibility is not eliminated by design means, the choice of extinguishing media and the respective fire fighting system shall apply to the space with higher fire hazard.

The necessary amount and delivery rate of an extinguishing medium shall be calculated based on the total area or volume (respectively) of all adjacent spaces.

3.1.2.3 Where a fixed gas fire fighting system is used, provision shall be made to ensure proper closing of openings through which air may enter or gas may exit the safe space, from locations outside the space.

Water- and gastight doors may be used as a means for closing within the division between adjacent machinery spaces only provided that the doors are of self-closing type or are controlled remotely, and door closing alarms are fitted next to stations from which extinguishing media may be charged. Where no such alarms are fitted, calculation and supply of the extinguishing medium shall be based on the total volume (area) of adjacent spaces to be covered by fire extinguishing means.

3.1.2.4 In tweendeckers, 'tweendecks are deemed separated from each other or from holds with a gastight deck only provided that the clearances of the cargo hatch as well as other manholes and openings on this deck are closed with steel watertight/gastight hatch covers and closures, and openings through which framework passed are closed with watertight plugs.

Where no such closures and plugs are available, the spaces are considered to be adjacent, and the amount of the extinguishing media is calculated based on the total volume of the spaces.

3.1.2.5 Where airtanks are fitted in spaces with CO_2 or air-spray fire extinguishing systems, the amount of the extinguishing medium shall be determined based on the design volume of the space to be protected and on the excess compressed air volume.

Where air discharge from the protected space is provided through safety valves and fused plugs of airtanks, the amount of CO_2 in CO_2 extinguishing systems need not be increased, and air volume in the airtanks within air-spray extinguishing systems need not be taken into account (refer to 3.11.1.3).

3.1.2.6 In order to prevent excess pressure build-up in the spaces equipped with fire smothering systems, where necessary, breather valves shall be fitted or available devices (e. g., air pipes or ventilation ducts) shall be used.

3.1.2.7 Spaces for oil-burning installations (refer to item 18 of Table 3.1.2.1) enclosed within machinery spaces shall be provided with an autonomous fire extinguishing system or shall be protected with a fire extinguishing system of the machinery space.

3.1.2.8 Independently from the fixed system provided for in Table 3.1.2.1, boiler rooms of oil tankers utilizing crude oil and cargo residues as boiler fuel shall be equipped with 135 l foam extinguishers as per 5.1.10 or with equivalent foam fire fighting installations equipped with fixed foam generators to provide foam supply to boiler faces and to trays under burners, valves and connections.

The fire extinguisher (installation) shall be controlled remotely from outside the boiler room.

3.1.2.9 Extinguishing systems shall supply extinguishing media over the entire space, including enclosed areas (e. g. control stations, workshops etc. in machinery spaces).

3.1.2.10 The use of steam in addition to the required extinguishing medium is subject to approval by the Register in each case. Steam generating capacity of the boiler or boilers shall be at least 1.0 kg/h for each 0.75 m^3 of gross volume of the largest steam-protected space.

3.1.2.11 Where combustion gas is used as an extinguishing medium, systems utilizing this medium to protect machinery and cargo spaces shall meet the requirements of the Fire Safety Systems Code.

3.1.2.12 Liquid cargo with flash point above 60 °C other than petroleum products or liquid cargo subject to the requirements of the IMO Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk shall be considered low fire hazardous cargo and shall not require protection by fixed foam fire extinguishing systems.

3.1.2.13 Cargo spaces of container carriers with hatch covers partially flooded under the effect of waves (refer to MSC/Circ.1087), CO_2 system calculations shall be based on the requirements of Sect. 2 of the above Circular.

Where the size of hatch cover clearances exceeds 50 mm, a fixed water spraying system shall be installed in a cargo space.

3.1.2.14 Fat cooking equipment shall be provided with an automatic or manual fire extinguishing system tested for compliance with the international standard ISO 15371 – Fire-extinguishing systems for protection of galley cooking equipment.

Manual controls of such systems shall be clearly marked. When the system is actuated, the following provisions shall be made:

.1 automatic power shut-off of fat cooking appliances;

.2 alarms to indicate actuation of the fire extinguishing system in the galley where the cooking device is installed.

Fat cooking equipment shall be fitted with a main and redundant thermostat with failure alerts.

3.1.2.15 All doors of spaces protected with fire smothering systems shall be marked: "Room protected with fire smothering system/air-spray fire extin-

guishing system. Leave the room when system actuation alert trips".

3.1.3 Arrangement and equipment of fire extinguishing stations

3.1.3.1 Mechanical equipment (e. g. foam mixers, tanks, cylinders or vessels for extinguishing media or compressed air, inert gas or high-expansion foam generators, refrigerating plants etc.) as well as starting devices of all fire fighting systems, except for water extinguishing systems, as a rule, shall be fitted at fire extinguishing stations outside the protected spaces.

Spaces for extinguishing media storage arranged below the weather deck or spaces with no access from the open deck shall be fitted with mechanical ventilation systems as per 12.9.1, Part VIII "Systems and Pipelines".

Spaces at stations for equipment of fixed gas fire extinguishing systems shall not be used for other purposes.

Pumps other than those serving the water extinguishing system are needed for water supply into fire extinguishing systems. Energy sources and controls of such pumps shall be fitted outside the space (spaces) protected with fire extinguishing systems, and shall be arranged so that fire in any protected space (spaces) does not render any such system inoperable.

3.1.3.2 Equipment of fire extinguishing stations shall meet the following requirements:

.1 station entrances, as a rule, shall be arranged from open deck side and shall be independent from the protected space. Where the station is located below deck, it may not be more than one deck below the open deck and shall be directly connected to it with a stairway enclosure or a stairway itself.

Fixed fire extinguishing system controls shall be readily accessible and shall be localized in as few places as possible which shall not be isolated in case of fire in the protected space;

.2 stations may not be installed forward of the collision bulkhead;

.3 bulkheads and decks (including doors and other closing means) that form boundary structures along with adjacent enclosed spaces shall be gastight.

For the purposes of using fire resistance tables for respective boundary structures, spaces for extinguishing media storage shall be treated as fire stations;

.4 spaces of stations shall be thermally insulated and heated, where above-zero temperatures need be maintained for normal operation of the station. Temperature at the CO_2 extinguishing station shall not exceed 45 °C;

.5 temperature control at the station shall be provided by a thermometer with indications readily visible from inside and outside of the station through a porthole; in case of remote control beyond the temperature limit, no porthole is required;

.6 fire extinguishing stations for cargo spaces shall have telephones or another reliable means of communication with the fire control station (FCS)/central control station (CCS) and the machinery space, where operation of the station depends on the equipment installed in the machinery space;

.7 the access doors shall open outwards and shall be locked at all times, with one key set stored in closed boxes with glass doors fitted next to the locks;

.8 all valves and other arrangements of the stations shall be fitted with nameplates to indicate the space for which they are intended. In addition, a fire extinguishing system layout shall be fitted in a conspicuous place inside the station, indicating starting devices in the spaces protected and a brief manual for bringing into operation and maintenance of the system.

.9 the spaces of stations located below deck or spaces with no access available from the open deck shall be fitted with a mechanical ventilation system with air intake at the bottom part of the space and 6 air changes per hour.

3.1.3.3 In storerooms with deck area less than 4 $m^{2,}$ that contain flammable liquids (refer to 1.5.3.2.2) and have no access into the accommodation spaces, fixed systems may be substituted with a portable CO_2 extinguisher to provide minimum amount of free gas of 40 per cent of the gross space volume.

Inlets in the storeroom divisions shall be so arranged as to enable supply of the extinguishing medium without entering the space to be protected. The portable extinguisher shall be fitted as close to the inlet.

As an alternative, inlets may be fitted with fire hoses for water supply from the fire mains.

.1 Paint lockers of passenger ships shall be provided with protection as follows:

.1.1 CO_2 extinguishing system designed based on the filling of 40 per cent of gross volume of the space to be protected;

.1.2 dry chemical extinguishing system designed based on the supply of at least 0.5 kg/m^3 of dry chemical;

.1.3 water spraying or sprinkler system designed based on the supply of at least 5 l/m^2 of water per minute. The water spraying system shall be connected to the ship's fire mains; or

.1.4 any equivalent system as approved by the Register.

In any case, the system shall be actuated from locations outside of the space to be protected.

3.1.3.4 In passenger ships, controls for fire extinguishing systems in machinery spaces, along with the controls specified in 2.1.4.1, 2.1.4.2.3 as well as in 12.2.11 and 13.1.3, Part VIII "Systems and Pipelines", shall be located in the same place or shall be localized in as few places as possible. These places shall have safe access from the open deck.

3.1.3.5 Requirements for the arrangement of cylinders containing extinguishing media for equivalent fixed gas extinguishing systems.

Cylinders containing extinguishing media that are arranged in the protected space shall be arranged across the entire space so that cylinders or cylinder group are available at least in six different locations.

Backup launch-control lines shall be arranged so as to provide for a simultaneous charge of the extinguishing medium from all cylinders. Discharge lines shall be so arranged that in case any of the lines is damaged, five sixths of extinguishing gas may be charged. Cylinder valves shall be treated as part of the discharge lines; single failure shall include failure of such valves.

In systems with less than six cylinders (with cylinders of the least capacity), the total amount of extinguishing gas shall be such as to enable discharge of

five sixths of extinguishing gas in case of a single failure in any discharge line, including cylinder valves. However, the rated level of unsupervised harmful exposure at the maximum temperature possible in the machinery space shall not be exceeded in case full amount of gas is discharged simultaneously.

Systems that do not meet the above requirements, e. g. systems with a single cylinder located in the protected space, are prohibited. Such systems shall be so designed that the cylinder (cylinders) is (are) arranged outside of the protected space in a separate space as per 3.1.3.2.

3.1.3.6 The extinguishing medium for the protection of cargo spaces may be stored in a space located forward of the cargo spaces but to the collision bulkhead, provided that both manual and remote control of discharge is available and that remote control is of reliable design or is protected so as to remain operable in case of fire in protected spaces.

Remote controls shall be located in way of the accommodation spaces to allow personnel access.

Remote controls shall provide for discharging different amounts of extinguishing media into different cargo spaces.

3.1.4 Pipelines and valves

3.1.4.1 The laying of pipelines shall meet the following requirements:

.1 extinguishing media shall be supplied into each space to be protected via a separate distribution manifold with shut-off valves fitted on it at the fire station.

Shut-off valves shall bear markings to clearly indicate the space to which the pipes are laid. Provisions shall be made to prevent inadvertent discharge of the extinguishing medium into any protected space.

This does not apply to foam extinguishing systems intended for foam supply outside of the cargo tanks using foam monitors and portable air aspirator foam applicators or medium expansion foam generators;

.2 where cargo spaces equipped with fire (gas) smothering systems are used to accommodate passengers and/or special personnel, throughout such use of this space extinguishing medium discharge pipes shall be fitted with plugs;

.3 pipelines of fire extinguishing systems may not be laid through liquid fuel oil and lube oil storage spaces.

Besides, pipelines of fire extinguishing systems may not be laid through refrigerated spaces;

.4 pipelines of gas extinguishing systems may pass through accommodation spaces provided they have walls of adequate thickness and their gas- and water tightness has been tested with test pressure of at least 5 N/mm² following installation on board. In addition, pipelines that pass through accommodation areas shall have no detachable joints (welded) or condensate draw-offs (plugs) or other outlets within such areas;

.5 the design of fire extinguishing systems shall provide for periodical action tests.

Fire extinguishing systems fitted with extinguishing medium (CO_2, dry chemical etc.) discharge nozzles shall have devices for action testing with compressed air, instead of action testing using the extinguishing medium.

Pipelines that feed compressed air into the fire station tanks shall be fitted with non-return shut-off valves;

.6 gaskets and flexible joints used

within fire extinguishing systems shall be made of materials resistant to the extinguishing media and to marine environment;

.7 pipeline sections that are enclosed due to the valve arrangement shall be fitted with pressure relief valves, with discharge pipes laid to the open deck.

3.1.4.2 The pipes shall be made of steel.

As an alternative, copper, copper-nickel or other bimetallic (with a steel or copper layer) pipes may be used.

Carbon steel pipes shall be lined with interior and exterior corrosion-resistant coating.

Valves (including sprinklers and spray nozzles) of fire extinguishing systems shall be made of materials resistant to the extinguishing media and to marine environment.

Sprinklers and spray nozzles shall be of a Register-approved type and shall be tested for compliance with the applicable sections of IMO circulars MSC/Circ.668 and MSC/Circ.728 or IMO Resolution A.800(19), as amended by IMO MSC.265(84)/Corr.1 and MSC.284(86), as applicable.

All distribution manifolds, valves, discharge pipes and nozzles in protected spaces shall be made of materials with a melting temperature exceeding 925 °C.

Pipelines and associated equipment shall be properly secured.

3.1.5 System startup

3.1.5.1 Fire extinguishing systems shall be started without additional switching to stations and shall operate quickly and reliably under any operating conditions, including sub-zero temperatures and fire.

The controls of fixed gas extinguishing systems shall be readily accessible, easy in operation and shall be localized in as few places as possible, provided that such places are not isolated in case of fire in the protected space.

Clear operating instructions shall be provided for the system with special provisions made for personnel safety.

3.1.5.2 Inadvertent startup of the extinguishing system shall be excluded under any operating conditions, as well as due to rolling/pitching, shaking and vibrations.

3.1.5.3 Starting devices of the systems shall be so arranged and, where necessary, so protected as to allow free access and prevent mechanical damage.

3.1.5.4 Starting devices of the systems shall be so designed as to allow sealing.

3.1.5.5 Irrespective of the availability of remote control, the system shall be capable of being manually controlled at the fire station, and the pump – from where it is installed.

3.1.5.6 Remotely started systems (utilizing air, nitrogen, CO_2 etc.) shall have two starting cylinders each providing for a single startup of the fire extinguishing system.

3.1.5.7 Where a remotely started system provides for mechanical devices, the valves shall be operated using handwheels or levers rigidly connected to spindles or shafts.

3.1.5.8 Automatic discharge of the extinguishing medium, except as indicated in Subsections 3.3, 3.6.3 and 3.11.2.7, is not allowed.

3.2 WATER FIRE MAIN SYSTEM

3.2.1 Number and capacity of fire pumps

3.2.1.1 Fire pumps, pipelines, hydrants and hoses required by this Subsection shall be provided in all ships, except as specified in 3.2.1.6.

The number of fixed independently-driven fire pumps and the minimum pressure at the level of any hydrant in case of simultaneous supply by two pumps through adjacent hydrants of the amount of water as specified in 3.2.5.1, shall be at least equal to those set forth in Table 3.2.1.1; the length of hoses shall meet the requirements of 5.1.4, and the diameter of nozzles – of 5.1.5.

In ships that navigate in restricted areas, not engaged in international voyages (except for passenger ships), of less than 2,000 gross tonnage, the number of pumps required under Table 3.2.1.1 may be changed upon special agreement with the Register.

In floating cranes of less than 2,000 gross tonnage, one fire pump may be installed.

Pressure generated by fire pumps shall be sufficient to provide operation of other fire fighting systems utilizing water (e. g. water spraying or foam extinguishing systems etc.), provided that they are fed from the same pumps.

In passenger ships marked **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS** and **D-R3-S**, **D-R3-RS** in their class notation, with the length of 24 m and more, the number of fixed fire pumps and the minimum pressure at the level of any hydrant in case of adequate water supply through the hydrant, shall be at least equal to those specified in 3.2.1.12.

3.2.1.2 In passenger ships of less than 1,000 gross tonnage, as well as in ships marked **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS** and **D-R3-S**, **D-R3-RS** in their class notation, with the length of 24 m and more, that carry 250 or more passengers, and in cargo ships of gross tonnage of 2,000 and more, emergency fire pumps with the capacity of not less than 25 m^3/h, and in cargo ships of less than 2,000 gross tonnage − with the capacity of not less than 15 m^3/h shall be provided, independently driven from a source of energy, where fire in any single space may render other main fire pumps inoperable.

Pump energy sources and sea-valves shall be arranged outside the spaces in which main fire pumps or respective energy sources are installed (refer to 3.2.4.2).

Table 3.2.1.1

Gross tonnage	Passenger ships		Other ships	
	Number of pumps	Minimum pressure at hydrant level, MPa	Number of pumps	Minimum pressure at hydrant level, MPa
Less than 500	2	0.30	1	0.20
500 to + 1,000	2	0.30	2	0.25
1,000 to + 4,000	2	0.30	2	0.25
4,000 to + 6,000	3	0.40	2	0.25
6,000 and more	3	0.40	2	0.27

N o t e s : 1. The emergency fire pump, if any, shall not be included in the above number of pumps.

2. The maximum pressure in any fire hydrant shall not exceed the pressure under which efficient fire monitor operation is possible.

3.2.1.3 The emergency fire pump, if any, shall meet the requirements of 3.2.4.

3.2.1.4 In addition to the emergency pump specified in 3.2.1.2, passenger ships of less than 1,000 gross tonnage and cargo ships shall also be fitted with emergency fire pumps in cases as follows:

.1 two main fire pumps with sea-valves and energy sources for each pump are not installed in spaces with at least class A-0 divisions, so that in case of fire in one of the compartments both pumps remain operable;

.2 one of the main fire pups is located in a space with more than one adjacent divisions or decks with a space in which the second main fire pump is installed.

3.2.1.5 The total capacity of fixed fire pumps, except for an emergency fire pump (where any), provided that pressure next to any hydrant is at least equal to that specified in Table 3.2.1.1, shall supply the amount of fire-fighting water, in m^3/h, not less than that determined from the formula

$$Q = km^2, \qquad (3.2.1.5)$$

where $m = 1{,}68\sqrt{L(B+D)} + 25$;

L = length of ship (refer to 1.1.3, Part II "Hull").

In sludge carriers, the length of the hopper space shall be excluded, provided that no fuel or oil reserve tanks are stored therein, in m;

B = greatest moulded breadth of ship, in m;

D = moulded depth to bulkhead deck amidships, in m;

k = coefficient equal to:

0.016 – for passenger ships with a subdivision index R of 0.5 and more;

0.012 – for passenger ships with a subdivision index R of less than 0.5;

0.008 – for other ships;

R = subdivision index determined under 2.3, Part V "Subdivision".

In all cases, in passenger ships and cargo ships of less than 500 gross tonnage fire pumps shall provide adequate supply of fire-fighting water under pressure as per Table 3.2.1.1 as follows:

.1 in passenger ships – not less than two-thirds of the amount of water pumped from the holds by bilge pumps;

.2 in cargo ships –not less than four-thirds of the amount of water pumped from the holds of passenger ships of the same size by each separate bilge pump in accordance with 7.1, Part VIII "Systems and Pipelines".

For ships with twin hulls and similar ships, the total capacity of fire pumps shall be determined as a double pump capacity for one hull.

3.2.1.6 In ships other than passenger ships, the total capacity of fire pumps need not exceed 180 m^3/h, provided that a larger value is not required for other systems utilizing water that operate in parallel.

3.2.1.7 The capacity, head and number of fire pumps for floating docks shall be selected with account of the largest cargo ship as the dock may accommodate, based on the water demand of the water fire main system.

In nonautonomous floating docks with a water fire main system supplied from shore, no emergency fire pumps are necessary.

3.2.1.8 Each fixed fire pump, other than the emergency fire pump, shall be

rated for at least two jets of water supplied in accordance with 3.2.6.2.

3.2.1.9 Every fixed fire pump, other than the emergency fire pump, shall have a capacity of at least 80 per cent of the total required capacity divided by the required number of fire pumps, but shall not be less than 25 m^3/h.

Where the number of fire pumps on board is in excess of the required number, the capacity of auxiliary pumps shall not be less than 24 m^3/h and shall ensure operation of at least two water monitors in accordance with 3.2.6.2.

3.2.1.10 Where other fire extinguishing systems utilizing water from fixed fire pumps are provided for on board the ship, such pumps shall be of adequate capacity to enable operation of the water fire main system with the capacity of at least 50 per cent as determined from the formula (3.2.1.5), and parallel operation of one of the systems utilizing the greatest amount of water. In this case the amount of fire-fighting water shall allow supply of at least two jets of water by the largest nozzles used on board, but not more than six jets, and in cargo ships, the capacity of not more than 90 m^3/h is required. In this case possible increase in water flow through each hydrant due to pressure buildup in the pipelines shall be taken into account to enable operation of other fire extinguishing systems.

The amount of water for fire extinguishing systems, except for water fire main systems, shall be designated in accordance with 3.3.2.2, 3.4.2, 3.5.2 (within one main vertical zone), 3.6.5 and Subsect. 3.7.

3.2.1.11 In passenger ships marked **B-R3-SN**, **B-R3-RSN**, **C-R3-SN**, **C-R3-RSN** and **D-R3-SN**, **D-R3-RSN** in their notation class, with the length of 24 m and more, shall be fitted with fixed fire pumps in the amount as follows:

.1 in ships carrying more than 500 passengers − not less than three, one of which may be driven from the main engine;

.2 in ships carrying 500 passengers and less − not less than two, one of which may be driven from the main engine.

The fire pumps shall supply fire-fighting water in the amount not less than two-thirds of the amount supplied by bilge pumps when pumping water from the holds and, in case of adequate water supply through hydrants, the minimum pressure at the level of each hydrant:

in ships carrying more than 500 passengers − 0.41 MPa;

in ships carrying 500 passengers and less − 0.31 MPa.

3.2.2 Arrangement of fire pumps

3.2.2.1 In passenger ships of gross capacity of 1,000 and more, as well as in ships marked **B-R3-S**, **B-R3-RS**, **C-R3-S**, **C-R3-RS** and **D-R3-S**, **D-R3-RS** in their class notation, with the length of 24 m and more, carrying more than 250 passengers, sea inlets, fire pumps and respective energy sources shall be arranged so that fire in a single watertight compartment does not render all fire pumps at a time inoperable.

3.2.2.2 In ships with twin hulls and similar ships, which require at least two pumps as per Table 3.2.1.1, shall be fitted with a pump in each hull.

Water from each pump shall be supplied into the fire main of each ship's hull.

3.2.3 Basic requirements for fire pumps

3.2.3.1 In all self-propelled ships fixed fire pumps shall be independently driven.

In cargo ships of 500 to 1,000 gross tonnage, one of the fire pumps shall be independently driven.

In passenger ships of less than 150 gross tonnage with main engines total output less than 220 kW, fire pumps may be driven from the main pump provided that the design of the engine-shafting-propeller system ensures operation of the fire pump where the ship is not running.

3.2.3.2 Fixed fire pumps, including emergency fire pumps, may be utilized for other ship's purposes where not less than two independently driven pumps are provided on board, with one of these in permanent readiness for immediate operation as intended.

If in accordance with Table 3.2.1.1 one fire pump is installed, it may be used for other purposes, but with short-time use of water only (e. g. for deck and hawse washing etc.).

The use of fire pumps for emergency drainage of machinery spaces is allowed.

3.2.3.3 In cargo ships in which other pumps, e. g. general purpose, bilge or ballast pumps, are installed in the machinery space, provision shall be made to ensure that at least one of these pumps with the capacity and head required under 3.2.1.11 and Table 3.2.1.1 supplies water into the fire mains.

However, if the necessary number of fire pumps of adequate capacity and head are installed on board, an interconnection strip between the general purpose pump and the water fire main shall suffice. Such pumps shall also meet the requirements of 3.2.3.2 and 3.2.3.4.

3.2.3.4 Pumps and pipelines for fire extinguishing purposes shall not be used to pump petroleum products, oil or other flammable substances, and they shall not be used as ballast pumps for tanks that are alternatively filled with fuel and ballast water.

3.2.3.5 A pressure gauge shall be fitted on the discharge end of the fire pump.

Pumps capable of generating overpressure in the fire main, hydrants and hoses shall be fitted with safety valves adjusted for pressure in excess of the working pressure in the fire mains of not more than 10 per cent, and shall ensure water discharge into the suction main.

Such valves shall be so arranged and adjusted as to prevent overpressure in any section of the fire main.

3.2.3.6 Fixed fire pumps and associated sea-valves shall be fitted below the lightship waterline.

Fixed emergency pumps shall be arranged in accordance with 3.2.4.

Fire pumps arranged below Category A machinery spaces shall be fitted with a sea-valve in each compartment where a pump is installed.

In ice-going ships, at least one of the pumps shall be connected with a heated ice box (refer to 4.3.1.2, Part VIII "Systems and Pipelines").

3.2.3.7 All fire pumps, including emergency fire pump, shall be located in spaces with above-zero temperatures.

3.2.3.8 In passenger ships of 1,000 gross tonnage and more, as well as in ships marked **B-R3-S**, **B-R3-RS** in their class notation, with the length of 24 m and more, that carry more than 250 passengers, and in all passenger ships in-

cluding normally unattended spaces in which fire pumps are located, water fire main system shall be pressurized at all times to ensure immediate supply of at least one jet of water from any hydrant, and provision shall be made for automatic start of any of the pumps in case of pressure drop.

In passenger ships of less than 1,000 gross tonnage, water fire main systems shall provide for automatic or remote control of one fire pump from the navigation bridge. In case of automatic pump actuation, or where a bottom sea-valve may not be opened from where the remote pump controls are located, the bottom sea-valve shall be open at all times.

3.2.3.9 In cargo ships including normally unattended spaces or spaces continuously manned with a single crew member, in which fire pumps are located, provision shall be made for remote control of a main fire pump from the navigation bridge and from the fire station, where any, as well as for water supply into the main without opening the valves in the pump room. A mains water pressure indicator shall be fitted at the location of the remote starting device.

The remote starting device is not necessary where the water fire main is under pressure in accordance with 3.2.3.8.

In ships of less than 1,600 gross tonnage, this requirement is not mandatory provided that the fire pump starting device is readily accessible in the machinery space.

3.2.4 Fixed emergency fire pump

3.2.4.1 The emergency fire pump may be driven from a diesel engine or an electric motor fed from an emergency energy source.

3.2.4.2 The pump, energy sources and sea inlets shall be arranged so that they do not get inoperable in the event of fire in spaces in that contain the main fire pumps.

Emergency fire pump, associated sea-valve, pipeline suction connections, discharge line and isolation valves shall be located outside the machinery space. Where such arrangement is impracticable, the sea chest may be installed in the machinery space, if the valve is operated remotely from a location in the same compartment where the emergency fire pump is installed, and the suction connection is as short as practicable.

Short suction or discharge connections may pass through the machinery space provided that they are enclosed with a strong steel casing or are insulated to A-60 standard. They shall be welded, except for the flanged connection to the sea valve, and shall be at least 11 mm thick.

Pump and pump drive arrangement shall be such as to enable free access for maintenance and repair.

3.2.4.3 Where the pump is installed above the lowest waterline permissible under the ship's operating conditions, reliable self-priming devices shall be fitted.

Under heel and trim, rolling or pitching as may occur in operation, the total suction head and net positive suction head of the pump shall ensure that the requirement 3.2.4.6 is met.

Design conditions to meet the above requirements shall be the provisions of Circular MSC.1/Circ. 1388.

3.2.4.4 The space that contains the fire pump shall not be adjacent to the

boundaries of Category A machinery spaces or to spaces that contain the main fire pumps. Where the above is impracticable, the common division between these two spaces shall meet the requirements of Table 2.3.3-1 for control stations.

In case that access to the emergency fire pump space is possible through any space that is adjacent to the Category A machinery space or to any space that contains the main fire pumps, the structures that form boundaries between the two spaces and the Category A machinery space or space that contains the main fire pump, shall be Class A-60 structures.

Direct access from the machinery space to the space that contains the emergency fire pump and its energy source shall not be allowed. Where this is impracticable, access is allowed through the air lock, with the machinery space door of Class A-60 and the other door at least made of steel, both doors being of self-closing gastight type, or through the watertight door operated from the space distant from the machinery space and the space that contains the emergency fire pump, which shall not be isolated in case of fire in these two spaces. In this case another access point to the space that contains the emergency fire pump and its energy source shall be provided.

The above doors shall not have devices to keep them open.

3.2.4.5 A diesel-driven energy source that supplies the emergency fire pump shall be easily cold-started manually within the temperature range including 0 °C. If this energy source is located in an unheated space, provisions shall be made for electrical heating of the cooling water or oil to provide quick startup of the source. Where manual startup of the energy source is impracticable, starting devices and equivalent arrangements powered by compressed air, hydraulic or electric power shall be utilized as approved by the Register. These arrangements shall such as to enable at least 6 starts of the diesel-powered energy source within 30 min. and at least 2 starts within the first 10 min.

The pump shall be driven from an oil service tank with the capacity sufficient for pump operation at full load for not less than 3 h.

In addition, fuel reserve shall be available outside the Category A space to enable pump operation at full load for 15 h more.

3.2.4.6 The emergency fire pump capacity shall be at least 40 per cent of the total necessary capacity of fire pumps, with account of the provisions of 3.2.1.2.

3.2.4.7 The emergency fire pump shall supply water in accordance with 3.2.4.6.

If the pump is to be used for water supply into the water spraying system for machinery spaces as per 3.4, it shall be of the capacity sufficient to ensure operation of this system as well as to ensure parallel operation of two hand fire nozzles.

Water supply from the hand fire nozzles shall be rated for nozzles of the maximum diameter as available on board, but shall not be less than 25 m^3/h. When the maximum diameter nozzles are determined, the nozzles available in the space with the main fire pumps may be excluded from consideration. One fire nozzle with the diameter of 16 mm shall have the capacity of 16 m^3/h, while the fire nozzle with the diameter of 19 mm

shall have the capacity of 23.5 m³/h respectively, provided the pressure at the hydrant level is 0.27 MPa.

3.2.4.8 Where a sea-valve is fitted in the machinery space, arrangements shall be provided to open the valve in case of fire.

3.2.5 Piping

3.2.5.1 The fire main diameter and diameters of its deadlegs shall allow efficient distribution of water with the maximum capacity of two fire pumps that operate in parallel. In cargo ships, the diameter of the fire main and of its deadlegs only needs to ensure capacity of 140 m^3/h.

In ships of 500 gross tonnage and more, and in floating cranes (refer to 3.2.5.6), water fire main pipelines shall be rated for the working pressure of at least 1 MPa.

3.2.5.2 Pipe sections of the water fire main system that are laid to the open decks or into unheated spaces shall have shut-off valves fitted in heated spaces as well as with water draining arrangements to prevent freezing.

Shut-off valves shall be fitted in all deadlegs of the fire main on open deck that are used for purposes other than fire extinguishing.

3.2.5.3 Shut-off valves shall be fitted on suction and discharge pipes of each fire pump.

Sluice valves may be provided on suction pipes.

In ships of 500 gross tonnage and more, valves on discharge pipes of the pumps shall be of non-return shut-off type.

3.2.5.4 Water fire main systems of oil tankers shall meet the additional requirements as follows:

.1 isolating valves shall be installed in the main pipeline at the exit from the aft superstructure and in readily accessible places on cargo tank deck not more than 40 m apart; each valve on the open deck shall be fitted with a warning notice to indicate that in normal conditions the valve shall be kept open at all times;

.2 dual hydrants with the diameter of about 70 mm shall be installed upstream of every isolating valve on the main to ensure that the distance between the dual hydrants over the ship's length is uniform and that the requirements of 3.2.6.2 are met;

.3 upstream of each isolating valve in the aftercastle superstructure one branch of the water fire main laid into the fore deck of the aftercastle on each side of the ship. The diameter of each branch shall allow simultaneous water supply through two sleeves connected to two hydrants installed at the end of each branch. Each hydrant in ships of 1,000 gross tonnage and more shall have the diameter of about 70 mm, and in ships of less gross tonnage – about 50 mm.

Where fire pumps are arranged forward of the cargo tanks, two similar branches with the diameter as specified above shall be made from the main and on the aft deck of the forecastle superstructure. In addition, an isolating valve shall be fitted on the mains within the superstructure downstream of the branches.

3.2.5.5 In ships with twin hulls and similar ships, each hull shall be equipped with a water fire main with hydrants, sleeves and columns.

3.2.5.6 In all ships of 500 gross tonnage and more, as well as in floating cranes, the water fire main on each side

of the open deck shall have arrangements for international shore connection (refer to 5.1.18).

3.2.5.7 A cut-off valve (valves) to disconnect the pipeline located in the Category A machinery space that contains a fire pump (pumps) from the main outside the space shall be fitted on pipelines in readily accessible places outside the machinery space.

The fire main shall be so arranged that with cut-off valves closed water from another fire pump outside the above machinery space is supplied through pipelines bypassing this space to all fire hydrants, except for hydrants fitted on the pipeline that is disconnected from water supply by these valves.

3.2.6 Fire hydrants

3.2.6.1 Every fire hydrant shall be fitted with a shut-off valve and a standard quick-acting coupling. Hydrants installed on open decks shall also be fitted with quick-acting plug couplings or with equivalent arrangements.

3.2.6.2 The number and arrangement of fire hydrants shall be such as to ensure at least two jets of water from different hydrants, one of which is supplied from a single length of hose as specified in 5.1.4.1, reach any part of the ship that is normally accessible for passengers and the crew during voyage, as well as any section of any empty cargo space, ro-ro space, and for special category spaces − any part of such space. Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.

In passenger ships, the number and arrangement of fire hydrants in accommodation, service and machinery spaces shall be such as to ensure compliance with the above requirements with all watertight doors and doors in the main vertical zones closed.

On container open decks two water jets shall be supplied to any available vertical side of the container from a single length of hose.

3.2.6.3 Fire hydrants installed in interior spaces shall not be more than 20 m apart; fire hydrants on open decks shall not be more than 30 m apart.

3.2.6.4 No fire hydrants may be installed at the ends of dead-end aisles, in special electrical spaces, as well as in closed and normally unattended spaces.

3.2.6.5 In ships that carry deck cargo, fire hydrants shall be so arranged that they are readily accessible at all times, and pipelines, as far as practicable, shall be so arranged as to avoid damage by cargo.

3.2.6.6 Not less than two fire hydrants shall be provided in a Category A machinery space.

3.2.6.7 A fire hydrant shall be fitted in the fore part of shaft alleys in all ships.

3.2.6.8 All hydrants shall be painted red.

3.2.6.9 In shaft alleys of passenger ships, that are utilized as an escape route, two fire hydrants shall be installed next to the Category A machinery space. Instructions of 3.2.6.7 are not mandatory.

Where another space is utilized as an escape route, two fire hydrants shall be installed there next to the entrance to the Category A machinery space.

3.2.7 Water fire main systems of ships marked C-R3-S, C-R3-RS and D-R3-S, D-R3-RS in their class notation, with the length less than 24 m

3.2.7.1 The requirements of this Subsection apply to water fire systems of ships marked **C-R3-S**, **C-R3-RS** and **D-**

R3-S, **D-R3-RS** in their class notation, with the length of less than 24 m.

3.2.7.2 Every ship shall be fitted with a fixed fire pump capable of supplying at least one jet of fire-fighting water from a fire hose with monitor nozzles of 12, 16 or 19 mm, that is connected to a hydrant, in the amount of at least two-thirds of the amount supplied by bilge pumps when pumping water from holds and, where a sufficient amount of water is supplied through the hydrants, the minimum pressure at the level of each hydrant:

in ships carrying more than 500 passengers − 0.41 MPa;

in ships carrying 500 passengers and less − 0.31 MPa.

3.2.7.3 In all ships carrying more than 250 passengers an additional fixed fire pump driven from an energy source shall be fitted.

Such pump with an energy source and a sea chest shall not be positioned in the same machinery space in which the main fire pump is located. It shall supply at least one jet of water from any fire hydrant under pressure of not less than 0.31 MPa in the amount not less than 25 m^3/h.

3.2.7.4 Sanitary, ballast, bilge or general purpose pumps may be used as fire pumps.

3.2.7.5 All ships shall have fire mains with the diameter such as to allow efficient distribution of the maximum amount of water supplied by the concerned fire pump.

The number and arrangement of fire hydrants shall be such as to ensure that at least one jet of water reaches any part of the ship from a single length of hose.

3.2.7.6 All ships shall be fitted with at least one fire hose for each hydrant.

3.2.7.7 In ships including normally unattended machinery spaces or spaces continuously manned with a single crew member, provision shall be made for immediate water supply from the fire main under proper pressure by remote actuation of the main fire pump from the navigation bridge and the fire station, where any, or by way of maintaining steady pressure in the fire main.

3.2.7.8 Every fire pump shall be provided with a non-return shut-off valve on its discharge side.

3.3 SPRINKLER SYSTEM

3.3.1 General.

3.3.1.1 Automatic sprinkler systems shall be of a wet type in accordance with definition 9 of MSC/Circ.1165. In small-size external sections of the system and at control stations, dry pipe systems or pre-action systems in accordance with definitions 5 or 7 of MSC/Circ.1165 may be used upon approval of the Register. Any system sections exposed to low temperatures during operation shall have proper protection against freezing.

3.3.1.2 Sprinkler systems shall turn on automatically in case of temperature rise in the protected space up to the values specified in 3.3.4.2.

3.3.1.3 Continuous pressure shall be maintained in the sprinkler system, and provisions shall be made to ensure uninterrupted water supply to the system in accordance
with the requirements of this Subsection.

3.3.1.4 Air cylinder, compressor, pumps and pipes of the sprinkler system, except for pipes that connect the sprinkler system to the water fire main system,

shall be independent of other systems.

3.3.1.5 Sprinkler pumps and pneumohydraulic tanks shall be positioned outside the spaces to be protected at a sufficient distance from Category A machinery spaces. A pressure gauge to indicate system pressure shall be provided next to each shut-off valve of the section and in the fire control station or central control station.

3.3.1.6 Arrangements shall be provided to check automatic activation of the sprinkler pump in case of pressure drop in the system.

3.3.1.7 Where equivalent sprinkler systems are used, they shall be approved by the Register in accordance with the Guideline adopted by the IMO Resolution A.800(19) as amended by IMO MSC.265(84)/Corr.1 and MSC.284(86).

When such systems are being approved,
special attention shall be paid to the compliance with the requirements 3.3.1.1 − 3.3.1.3, 3.3.1.6, 3.3.2.1, 3.3.4.1, 3.3.5.1 and 3.3.5.2.

3.3.2 Sprinkler system pumps

3.3.2.1 A separate pump shall be provided to ensure uninterrupted automatic water supply through sprinklers.

This pump shall be actuated automatically in case of pressure drop in the system before complete depletion of fresh water in the pneumohydraulic tank.

3.3.2.2 The pump and the piping system shall maintain continuous working pressure at the level of the top sprinkler to ensure uninterrupted water flow sufficient to cover an area of at least 280 $m^{2,}$ with the rate specified in 3.3.4.1.

For ships of less than 280 m^2 of total protected area, in particular ships marked **C-R3-S**, **C-R3-RS** and **D-R3-S**, **D-R3-RS** in their class notation, with the length less than 40 m, the allowable area for the selection of pump and system components specifications may be approved by the Register.

3.3.2.3 A testing valve with an open-ended discharge pipe shall be fitted at discharge end of the pump. The cross-sectional area of the valve and the pipe shall be such as to transmit water in the amount equal to the necessary water supply, provided that pressure as specified in 3.3.2.2 is maintained in the system.

3.3.2.4 Pump sea-valve, as a rule, shall be located in the same space where the pump is installed, and shall be so arranged that during the ship's operation no need arises to interrupt seawater flow to the pump for any reason, except for inspection or repair purposes.

3.3.2.5 The main feed line shall be connected to the water fire main of the ship. The connecting conduit shall be fitted with a lockable non-return shut-off valve.

3.3.2.6 The pump shall be driven from at least two energy sources. Where the pump is electrically driven, it shall be energized in accordance with the provisions of 4.3.1.5, 19.1.1.1, 19.1.1.2 and 19.1.2.1.7, Part XI "Electrical Equipment".

The pump may also be driven from an internal combustion engine arranged so (except where in compliance with 3.3.1.5) that fire in the protected space does not interfere with water supply to the space.

3.3.3 Pneumohydraulic tank

3.3.3.1 The pneumohydraulic tank shall be fitted with the following instruments and arrangements:

.1 automatic pressurizer;

.2 water glass;

.3 safety valve;

.4 pressure gauge.

3.3.3.2 A perennial supply of fresh water equivalent to the capacity of the sprinkler pump during 1 min. shall be available in the pneumohydraulic tank.

The tank capacity shall not be less than the double water supply as specified above.

The air pressure in the pneumohydraulic tank shall be such that following complete depletion of fresh water supplies the tank pressure is at least equal to the working pressure of the sprinkler plus hydrostatic pressure from the tank bottom up to the top sprinkler.

Provision shall be made for arrangements to replenish the compressed air and fresh water supplies, as well as arrangements to prevent sea water entry into the tank.

3.3.3.3 The pneumohydraulic tank shall meet the requirements for pressure vessels as specified in Part X "Boilers, Heat Exchangers and Pressure Vessels".

3.3.4 Sprinklers

3.3.4.1 Sprinklers shall be fitted in the upper part of the protected space, and shall be arranged at such distance from each other so as to provide medium water flow of at least 5 l/min. per 1 m^2 of the horizontal area of this space. For this purpose, the nominal area shall be equal to the maximum horizontal area to be covered.

This requirement may be revised by the Register based on the structural features of the space to be protected.

Where windows are protected with sprinklers, requirements of 2.2.4.4 shall be met.

3.3.4.2 Sprinklers shall be corrosion-resistant in marine air conditions. Sprinklers in accommodation and service spaces shall be operate within the temperature range from 68 to 79 °C, except that when the sprinklers are positioned in bilge spaces or similar spaces (where high ambient temperatures may be expected), the response temperature may be increased by not more than 30 °C above the maximum temperature at the ceiling.

Saunas shall be fitted with dry pipe sprinkler systems with the response temperature up to and including 140 °C.

Refrigerated storerooms may be fitted with dry pipe sprinkler systems.

3.3.5 Control and signalling device

3.3.5.1 Each sprinkler section shall be provided with control and signalling devices or other means for automatic visual and audible signalling on one or more alarm panels where any of the sprinklers is actuated.

These alarm systems shall be arranged so as to indicate any type of system failure. Alarm panels shall indicate the group of spaces protected by the system in which the fire occurs. The panels shall be localized on the navigation bridge or in the permanently attended central control station; visual and audible alarms from the panel shall be moved to a place other than specified above, so as to ensure immediate reception of the fire-alarm signal by the crew.

3.3.5.2 One of the alarm panels as specified in 3.3.5.1 shall be provided with switches to check alarm actuation and LED operation for each sprinkler section. A list or a layout of spaces and areas to be protected by each section shall be displayed next to each alarm

panel.

Inspection and maintenance manuals for the system shall be available on board.

3.3.5.3 Every sprinkler section shall have a testing valve to check the automatic alarm actuation by draining water through the valve with a flow equal to the flow that occurs in case of actuation of the sprinkler. Testing valves of each section shall be fitted next to a shut-off valve or a control and signalling device of the section.

3.3.6 Piping

3.3.6.1 Sprinklers shall be arranged in separate sections. Each section shall not have more than 200 sprinklers.

In passenger ships, any sprinkler section shall serve no more than two decks and shall only be positioned in one main vertical area. However, upon approval by the Register, such section may serve more than two decks or may be positioned in more than one vertical area, unless this impairs the ship's fire safety, as the Register may determine.

3.3.6.2 Every section shall be provided with arrangements for compressed air purging and fresh water flushing of the pipelines.

3.3.6.3 Every sprinkler section shall be shut off with a single shut-off valve upstream of the pressure gauge.

Shut-off valves of each section shall be fitted in a readily accessible place outside the section or in cabinets within stairway enclosures. The position of the valve shall be clearly and indelibly marked.

Measures shall be taken so as to prevent unauthorized persons from operating the shut-off valves.

3.3.6.4 Suction pipes of the pumps feeding the sprinkler system shall be fitted with strainers two prevent contamination of the system and sprinklers.

3.3.6.5 The sprinkler system pipelines shall be of such diameters as to ensure operation of sprinklers at water pressure and flow as specified in 3.3.2.2 and 3.3.4.1.

3.3.6.6 Sprinkler system pipelines shall be fitted with non-return shut-off valves to prevent seawater from entering the pneumohydraulic tank as well as to prevent water leakage from the tank and the system.

3.4 WATER SPRAYING SYSTEM

3.4.1 The water spraying system in Category A machinery spaces and pump rooms as specified in 1.5.7 shall be fed from an independent pump automatically actuated in case of pressure drop in the system, as well as from the water fire main. A non-return shut-off valve shall be installed in the connecting conduit to the water fire main.

In cargo spaces specified in 1.5.4.3 and 1.5.4.4, and in special category spaces (refer to 1.5.9), the water spraying system shall meet the requirements of IMO Resolution A.123(V) – Recommendation on Fixed Fire Extinguishing Systems for Special Category Spaces, and in applicable provisions of the Guidelines for the Approval of Fixed Water-Based Fire-Fighting Systems for Ro-Ro Spaces and Special Category Spaces Equivalent to That Referred to in Resolution A.123(V) introduced by IMO Circular MSC.1/Circ.1272.

This system shall protect all parts of any deck and vehicle platform in such spaces, shall be manually operated and be

fitted with a pressure gauge on each switch-box, clearly marked to indicate the protected space, as well as with valve maintenance and operating manuals.

Taking into account a significant loss in stability due to accumulation of big amounts of water on decks of the above spaces during operation of the system, provisions as specified in 7.6.12, Part VIII "Systems and Pipelines" shall be made.

In spaces where flammable liquids are stored the water spraying system may be fed from the water fire main only.

Where a high-pressure water spraying system is used, the necessity for reserve supply of such system is subject to approval by the Register in each case; the rate of water discharge shall be at least equal to that specified in 3.4.2.1.

A fixed water spraying system meeting the requirements of the International Fire Safety Systems Code shall be provided on cabin balconies, provided that the furniture and furnishings of such balconies are not as specified in 2.1.1.9.

Atomized water mist fire extinguishing systems in machinery spaces and cargo pump-rooms specified in 1.5.7.1 shall be submitted for Register approval in accordance with the Revised Guidelines for the Approval of Equivalent Water-Based Fire Extinguishing Systems for Category A Machinery Spaces and Cargo Pump-Rooms (refer to IMO Circular MSC/Circ.1165 as amended by IMO circulars MSC.1/Circ.1237, MSC.1/Circ.1269, MSC.1/Circ.1286 and with application of MSC.1/Circ.1385, MSC.1/Circ. 1386.).

3.4.2 The number and arrangement of spray nozzles shall allow efficient distribution of water in the protected space, with the average rate of discharge not less than:

.1 5 l/min. per 1 m^2 of the horizontal area over which fuel may be spilt, or the cargo space area;

.2 1.5 l/min. per 1 m^2 of the maximum plan area of the fish meal hold.

In cargo, processing and special purpose spaces with the system divided into sections, this pump shall ensure operation of two sections with the total length of at least 40 m.

3.4.3 In Category A machinery spaces and pump rooms specified in 1.5.7, the water spraying system shall be filled with water at all times and shall be pressurized upstream of the distribution valves of the pipelines. The water feeding pump shall be actuated automatically in case of pressure drop within the system.

3.4.4 Strainers shall be fitted on the suction pipe of the water feeding pump and in the connection conduit to the water fire main to prevent choking of the system and the spray nozzles.

3.4.5 Distribution valves shall be arranged in readily accessible places outside the protected space, which shall not be easily isolated in case of fire in the protected space.

In permanently attended protected spaces provision shall be made for remote control of the distribution valves from these spaces.

3.4.6 Spray nozzles in protected spaces shall be arranged as follows:

.1 below the ceiling;

.2 above equipment and machinery running on liquid fuel oil or other flammable liquids as well as above other hazardous locations;

.3 above bilges, floor plates of the inner bottom and other surfaces over

which fuel oil or flammable substances may be spilt;

.4 above stacked fish meal bags.

Spray nozzles in protected spaces shall be so arranged that the each spray nozzle covers the area of operation of adjacent spray nozzles.

3.4.7 The pump of a system that protects Category A machinery spaces and pump rooms shall supply water under the rated pressure into all system sections at a time in any protected space. The pump and pump controls in this case shall be positioned outside the above spaces.

The pump may be driven from an independent IC-engine arranged so that fire in the protected space does not affect air supply to the engine. Where the pump is electrically driven from an emergency generator, such generator shall meet the requirements of Sect. 9, Part XI "Electrical Equipment".

3.4.8 The average water discharge rate as specified in 3.4.2 shall be enhanced in places as follows:

.1 20 l/min. per 1 m^2 of the area of boiler front and surfaces, fuel oil pumps, centrifugal separators (other than oily bilge water separators) and fuel strainers;

.2 10 l/min. per 1 m^2 for heated fuel lines next to gas exhaust pipes or similar heated surfaces of the main and auxiliary diesel motors.

3.4.9 Water mist extinguishing systems in Category A machinery spaces and cargo pump rooms shall be approved by the Register in accordance with the requirements of IMO Circular MSC/Circ.1165 as amended by MSC.1/Circ.1237, MSC.1/Circ.1269, MSC.1/Circ.1286 and with application of MSC.1/Circ.1385.

3.4.10 Fixed water spraying systems in ro-ro spaces, vehicle spaces and special category spaces.

Fixed water-based fire extinguishing systems for ro-ro spaces, vehicle spaces and special category spaces shall be approved by the Register in accordance with the requirements of MSC.1/Circ.1430 – Revised Guideline for the Design and Approval of Fixed Water-Based Fire-Fighting Systems for Ro-Ro Spaces and Special Category Spaces.

3.5 WATER-SCREEN SYSTEM

3.5.1 The water-screen systems in these Rules shall be provided for:

.1 in special purpose ships in which water screens are allowed instead of Type A structures upon special approval by the Register in accordance with 2.2.1.2;

.2 for protection of the hull vertical surfaces in accordance with 6.6.6.

3.5.2 The design capacity of pumps serving the water-screen system shall be based on at least 70 l/min. per 1 m of the screen length.

3.6 WATER DRENCHING SYSTEM

3.6.1 Water drenching systems in these Rules shall be provided for the drenching of powder magazine racks (refer to 6.2.2.18 and Table 3.1.2.1);

3.6.2 The water drenching system shall be fed from the water fire main.

Pumps with energy sources shall be fitted outside the protected spaces.

3.6.3 System start shall be effected from outside the protected spaces.

Automatic systems, that are actuated in case of temperature rise in the space above the limit value, are recommended.

3.6.4 The water drenching systems of powder magazines and water spraying systems of cargo spaces for explosive substances may be used for emergency flooding of these spaces.

3.6.5 The capacity of the pumps serving the drenching system shall be such as to allow drenching of powder magazine racks at the rate of 24 l/min. per 1 m^2 of the total floor area of the powder magazine.

3.7 FOAM EXTINGUISHING SYSTEM

3.7.1 General

3.7.1.1 Foam extinguishing systems shall generate air foam for fire extinguishing based on the foam expansion rate:

low expansion foam – about 10:1,

medium expansion foam – between 50:1 and 150:1,

high expansion foam – about 1000:1.

Foam extinguishing systems may utilize foam machines for separate generation and simultaneous supply of low and medium expansion foam (combined foam).

3.7.1.2 Use shall be made of foam concentrate of types approved by the Register (refer to 1.3.3.1).

Foam generators for low and medium expansion foam shall be fed by fresh and sea water.

Foam generators for low and medium expansion foam shall be of a Register-approved type in accordance with MSC.1/Circ.1312 and MSC/Circ.798, respectively.

Foam generators for high expansion foam shall be of a Register-approved type in accordance with MSC/Circ.670.

3.7.1.3 The capacity of the foam extinguishing system and the amount of the foam concentrate shall be calculated based on the foam expansion rate, solution feed rate and duration of system operation as specified in Tables 3.7.1.3 and 3.7.2.1.

3.7.1.4 Foam concentrate tanks shall have arrangements for filling and discharge of liquids, as well as a liquid level gauge and a filler neck for cleaning and inspection purposes. The capacity of the tank shall be such as to allow storage of the bulk foam concentrate reserve.

Where no excess pressure is to be generated in the tanks during system operation, non-return valves shall be fitted between the system and the main.

Where fresh water-based foam concentrate is utilized within the high-expansion foam extinguishing system, the fire station shall be provided with adequate water supply at least equivalent to that necessary for simultaneous filling with foam of the largest protected space.

Table 3.7.1.3

Space	Solution feed rate for foam expansion rate (l/min. per 1 m^2)			Design duration of uninterrupted operation, min.
	10:1	100:1 [1,7]	1,000:1	
Cargo tanks and cargo tank deck	$(6 ; 0.6; 3)^2$	6^3	–	$20^4/30$
Petroleum product tanks with flash point above 60 °C (fuel oil	6^3	4.5^3	–	20

tanks)				
Dry cargo holds	–	4[3]	–	45
Machinery spaces and similar spaces that contain equipment running on fuel oil	–	–	1[3]	–[5]
Paint lockers, storerooms for flammable liquids, flammable liquefied and compressed gases	–	4.5[3]	–	20
Helicopter hangars, enclosed garages and spaces listed under 1.5.4.3 and 1.5.8.1	–	–	–[6]	45

[1] Solution feed rate regulations shall apply to combined foam generation.

[2] The solution feed rate shall be at least equal to the largest of the following values:

.1 6 l/min. per 1 m^2 of the plan area of a tank with the largest plan area;

.2 0.6 l/min. per 1 m^2 of the cargo tank deck area calculated as the product of the maximum ship's width by the total length of areas that contain cargo tanks;

.3 3 l/min. per 1 m^2 of the area protected by the foam monitor of the maximum capacity, that is arranged forward from the monitor, but not less than 1,250 l/min.

[3] For the maximum plain area of the largest protected space.

[4] Foam concentrate supply shall be such as to allow generation of foam for not less than 20 min. in oil tankers equipped with an inert gas system, or 30 min. in tankers not equipped with an inert gas system, at the maximum solution feed rate as specified in footnote 1.

[5] Foam generator supply shall be enough to generate foam in the amount equal to 5 times the volume of the largest protected space.
The foam expansion rate shall not exceed 1,000:1.

[6] The foam concentrate feed rate shall be enough to fill
the entire volume of the protected space within 15 min.

[7] In passenger ships and ships marked **A**, **A-R1**, **A-R2**, **A-R2-RSN**, **B-R3-RSN**, **C-R3-RSN** and **D-R3** in their class notation – the feed rate to allow generation of foam layer at least
1 m thick in 1 min. when filling the largest protected space.

The remaining water may be provided from the ship's supplies. Arrangements (pumps, valves etc.) to allow feeding the tank with fresh water shall be positioned outside the space to be protected, shall be supplied from the emergency diesel generator and shall have the capacity that is enough to allow uninterrupted system operation in accordance with the requirements of Table 3.7.1.3.

3.7.1.5 Mixers for foam concentrate water solution with the required concentration shall be of a Register-approved type. The mixers shall supply both water canons and/or foam generators.

3.7.1.6 The main control station of the fixed deck system shall be positioned at the fire station outside the cargo area, in the vicinity of accommodation spaces, shall be readily available and shall ensure system control in case of fire in the protected areas.

A sampling arrangement shall be fitted in the main pipeline of the fire station as far apart as practical from the mixers to measure the percentage of the foam concentrate in the solution.

In addition, a pressure gauge shall be fitted in the water feed line of the fire station.

The main equipment of the deck system (foam concentrate tanks, pumps,

mixers etc.) may be located in the machinery space.

3.7.1.7 Upon special approval by the Register, the use of a common deck main for foam and water extinguishing systems is allowed on board the ship, provided that it is demonstrated that the foam monitor may be operated by one person where the foam is fed by pressure as specified for the monitors.

An additional amount of the foam concentrate shall be provided to ensure operation of the two monitors for a period specified by Table 3.7.1.3.

3.7.1.8 The fire safety of the enclosed pipe tunnel located within the cargo area on oil tanker decks shall be in accordance with the requirements of IMO Circular MSC.1/Circ.1276.

3.7.2 Fixed deck system

3.7.2.1 The deck foam extinguishing system shall be easy to operate and quick-acting.

Foam generating devices shall allow foam supply for the entire cargo tank deck area as well as any cargo tank on an open deck.

3.7.2.2 Efficient operation of the deck foam extinguishing system shall allow simultaneous use of the minimum required quantity of water jets from the fire main under required pressure.

Where the deck system is supplied from the common pipeline of the fire main, an additional foam concentrate shall be provided to operate two foam monitors (refer to 5.1.6) during the same period of time as required for the foam extinguishing system.

The simultaneous use of the minimum required quantity of the water jets shall be available on the deck throughout the ship's length, in accommodation and service spaces, control stations and machinery spaces.

3.7.2.3 Foam solution

In tankers carrying:

.1 petroleum products with flash point over 60 °C (closed cup tested) measured by a flash point analyzer of an approved type; or

.2 products listed under Chapter 17 of the IBC Code (International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk), with flash point over 60 °C (closed cup tested) measured by a flash point analyzer of an approved type (refer to 11.1.3 of the IBC Code),

the foam colution feed rate shall not be less than the largest of the following values:

- 0.6 l/min. per square metre of the cargo tank deck area;

the cargo tank deck area shall be calculated as the product of the maximum ship's width by the total length of spaces that contain cargo tanks;

- 6 l/min. per 1 m^2 of the plan area of a tank with the largest plan area;

or

- 3 l/min. per 1 m^2 of the area protected by the foam monitor with the maximum capacity and arranged forward of the monitor; however, the capacity of a foam monitor shall not be less than 1,250 l/min.

3.7.2.4 Foam concentrate

.1 The foam concentrate supplied in the ship shall be of a type approved by the Administration of the country of flag (refer to the Guidelines for the performance and testing criteria, and surveys of low-expansion foam concentrates for fixed fire-extinguishing systems,

MSC.1/Circ.1312) for the cargoes to be carried.

Class B foam concentrate for the protection of crude oil, petroleum products and non-polar solvent cargo shall be provided (refer to the recommendations of the International Electrotechnical Commission, namely IEC 60079 – Electrical apparatus for explosive gas atmospheres).

Class A foam concentrate for polar solvent cargo listed in a table in Chapter 17 of IBC Code shall be provided.

A supply of foam concentrate of the same class shall be available on board, efficient for the maximum permissible amount of cargo to be carried.

Additional provisions shall be made for cargoes for which foam is inefficient or unsuitable, in accordance with the requirements of the Administration of the country of flag.

.2 Foam concentrate supply shall be such as to allow generation of foam for not less than 20 min. in oil tankers equipped with an inert gas system, or 30 min. in tankers not equipped with an inert gas system, or those that require no inert gas system.

3.7.2.5 Foam monitors and portable foam applicators

.1 Foam from a fixed extinguishing system shall be supplied via foam monitors and portable foam applicators. Foam monitor and portable foam applicator prototypes shall be tested to ensure that the foam expansion rate and the drying time do not differ from the design values for foam concentrater as specified in **3.7.2.4** by more than +/-10 per cent.

If a medium expansion foam is applied (with the expansion rate between 21:1 and 200:1), the foam feed rate and foam monitor capacity shall comply with the requirements of the Administration of the country of flag.

Each foam monitor shall supply foam solution at the rate at least equal to 50 per cent of the required rate.

In oil tankers of less than 4,000 t deadweight foam monitors are not necessary and portable foam applicators may be used instead.

However, in such case each portable foam applicator shall supply foam solution at the rate at least equal to 25 per cent of the required rate.

A portable foam applicator shall have a capacity of not less than 400 l/min., and the length of jet ejected at no wind of not less than 15 m.

3.7.2.6 Arrangement requirements

.1 Main control station

The main control station of the system shall be positioned at the suitable location outside the cargo area, in the vicinity of accommodation spaces, shall be readily available and shall ensure system control in case of fire in the protected areas.

.2 Foam monitors

.2.1 The number and arrangement of foam monitors shall meet the provisions of **3.7.2.1**.

.2.2 The distance from the monitor to the remotest boundary of the protected area forward of the monitor shall not be less than 75 per cent of the length of jet ejected by the foam monitor at no wind.

.2.3 One foam monitor and one hose adapter for a portable foam applicator shall be fitted on the port side and on the starboard side next to the fore aftercastle bulkhead or to accommodation spaces facing the cargo tanks deck.

Foam monitors and hose adapters shall be fitted aft of any cargo tanks but

may be positioned in the cargo area above the pump compartments, cofferdams, ballast tanks and empty spaces adjacent to the cargo tanks, where they may protect the deck below, and aft of each other.

One hose adapter for a portable foam applicator shall be fitted on the port side and on the starboard side next to the fore aftercastle bulkhead or to accommodation spaces facing the cargo tanks deck shall be fitted in oil tankers of less than 4,000 t deadweight.

.2.4 It is recommended to equip foam monitors with a switching device to enable alternating water/foam supply. Deadlegs of the water fire main and foam solution main shall be piped into the switching device.

Shut-off valves may serve as switching devices where valve interlocking is possible.

.3 Portable foam applicators

.3.1 At least 4 portable foam applicators shall be provided for all oil tankers.

The number and arrangement of the foam main hydrants shall be such that foam to any part of the cargo tank deck may be supplied from at least two portable foam applicators.

.3.2 The portable foam applicators shall ensure manoeuvrability during fire fighting and shall protect parts inaccesible for foam monitors.

.4 Isolating valves

.4.1 Valves shall be provided in the foam main and the fire water main, if the latter is integrated into the deck foam extinguishing system, to isolate damaged sections of these mains forward of each foam monitor and immediately behind the monitor.

3.7.2.7 Sluice valves or isolating valves shall be fitted in readily accessible places on the cargo tank deck, in the foam main, and shall be arranged about 30 m apart from each other. Each valve shall be fitted with a warning notice to indicate that in normal conditions the valve shall be kept open at all times.

Dual hydrants with the diameter of about 70 mm shall be installed upstream of every isolating valve on the main for connecting the hoses of air aspirator foam monitors at a distance in compliance with 3.2.6.2.

Deadlegs of the main pipelines of water and foam extinguishing systems laid to the foam monitors shall also be laid to isolating valves.

Where medium expansion foam is used, distribution chests shall be provided instead of dual hydrants, which shall include the quantity of hydrants equivalent to half the design quantity of foam generators.

3.7.2.8 At foam extinguishing stations of oil tankers a shut-off device shall be fitted at the main pipeline outlet from the station.

Pipeline deadlegs shall be laid upstream of the shut-off device to the foam monitors installed on the port side and on the starboard side next to the fore aftercastle bulkhead or to accommodation spaces facing the cargo tanks deck, and to the dual hydrant with the diameter of at least 70 mm to connect fire hoses to the foam monitors.

Deadlegs to the above fire hydrant in oil tankers of less than 4,000 t deadweight shall suffice.

Where medium expansion foam is used, distribution chests shall be provided instead of dual hydrants, which shall

include the quantity of hydrants equivalent to half the design quantity of foam generators.

3.7.2.9 Foam extinguishing systems in dry cargo spaces shall meet the following requirements:

.1 a shut-off valve shall be fitted at the main pipeline outlet to the open deck;

.2 distribution chests with fire hydrants shall be provided in the main pipeline on each side. The distance between the chests on each side shall not exceed 40 m. The quantity of hydrants shall be equivalent to half the design quantity of foam generators.

3.7.2.10 Where the ship is equipped with a low and/or medium expansion foam systems, deadlegs shall be fitted from the solution pipeline to inlets into the machinery spaces from the weather deck, as well as to the fuel oil bunkering area. Each deadleg shall have two cocks for fire hoses with air foam monitors or foam generators.

3.7.2.11 In ships in which use is made of the medium expansion air foam, it is recommended to connect the solution pipeline with the water fire main in order to use the air foam from the water fire main for fire fighting at accommodation and service spaces. For this purpose, a sufficient number of portable foam generators shall be provided next to the hydrants at accommodation and service spaces.

3.7.2.12 The foam shall be supplied to the helidecks with the area limited by the helicopter length via foam monitors or foam generators capable of feeding the foam to any part of the deck, provided that the environmental conditions are suitable for the operation of helicopters.

The system shall feed the foam within at least 5 min. at the rate as specified in 3.7.2.12.

The minimum capacity of the helideck foam extinguishing system shall be based on the size of the protected area and shall meet the requirements of 6.1.1.2.

3.7.2.13 Fixed and portable combined foam units may be utilized instead of foam monitors and foam generators.

Table 3.7.2.12

Total length of the helicopter, in m	Solution feed rate, l/min.
up to 15	250
15 to 24	500
24 to 35	800

3.7.3 High-expansion foam extinguishing system

3.7.3.1 General

3.7.3.1.1 The system of an approved type shall be used and shall have a test extinguishing efficiency in compliance with the procedure set forth in Appendix 1 to the Circular MSC.1/Circ. 1384.

3.7.3.1.2 A manual startup of the system shall be possible. The design foam feed rate shall be reached within 1 min. from the start.

Automatic startup is possible only provided that adequate operating measures or interlocking are taken to preclude simultaneous actuation of the local fire extinguishing systems or other systems as may impair the efficiency of the system.

3.7.3.1.3 The design of foam generators shall be such as to ensure operability under normal operating conditions of the ship, with provision made for the ambient temperature change, vibrations, increased humidity, jerking, clogging, corrosion, as confirmed by the results of tests in accordance with the requirements of Ap-

pendix 2 to MSC.1/Circ.1384.

Pipelines, valves and associated components (except for seals) positioned in the protected spaces shall withstand the temperature of 925 °C.

3.7.3.1.4 Foam concentrate vessels as well as pipelines and other components in direct contact with the vessels shall be made of corrosion-resistant materials suitable for use with the concentrate in question. Other system pipelines and foam generators shall be made of galvanized steel or equivalent material.

3.7.3.1.5 Arrangements for safe check of the foam concentrate reserve be the crew members, as well as the check of system operability with the design pressure, flow rate and foam quality, shall be made. For this purpose, pressure gauges shall be fitted in the water and concentrate supply lines, and a pressure gauge and a sampling device – in foam solution pipelines downstream of the mixer.

Arrangements shall be provided for the design pressure drop in the distribution manifold downstream of the mixer. The distribution manifold shall allow for self-drainage and shall be fitted with flushing, draining and air purging connections in each section. The above connections shall be dismountable to allow inspection and check for clogging.

3.7.3.1.6 An operating instruction shall be displayed at each system control station. In addition, an equipment layout scheme and an installation, operating and test manual shall be available in a readily accessible place on board.

The above technical documents shall be provided in English and in the official language.

3.7.3.1.7 Where the system water pump is driven from an IC-engine, the fuel tank of the engine shall contain the amount of fuel sufficient for pump operation at full load for a minimum of 3 h.

In addition, fuel oil reserve sufficient to ensure pump operation at full load for additional 15 h shall be available outside the machinery space.

Where other IC-engines are served by the same fuel oil tank, the total tank capacity shall be equivalent to the total flow rate of the engines served.

3.7.3.1.8 The arrangement of foam generators and pipelines of the system in a protected space shall not obstruct access to the machinery installed for its normal operation and maintenance.

3.7.3.1.9 The electrical energy source of the system, equipment for foam generator storage and supply, and system controls shall be easy to operate and shall be positioned in readily accessible places outside the protected space, which shall not be isolate in case of fire in the protected space.

All electric components related to foam generators shall have the degree of protection not below IP54.

3.7.3.1.10 Foam generators shall be positioned in spaces fitted with ventilation and heating arrangements to ensure generator protection against overpressure and freezing.

Fresh air supply to the foam generators within the foam extinguishing systems with external foam generation shall be provided in the amount equivalent to its specifications.

3.7.3.1.11 The available supply of foam concentrate shall be sufficient to produce nominal expansion foam in the amount equivalent to a minimum of five volumes of the largest protected space enclosed with steel divisions, or shall be

sufficient to ensure system operation in the largest protected space during 30 min., whichever is the bigger.

3.7.3.1.12 Machinery, cargo pump, vehicle, ro-ro and special category spaces shall be equipped with visual and audible alarms to indicate the system startup.

The alarms shall be actuated for a period of time sufficient for personnel evacuation from the space, but at least 20 s prior to the startup.

3.7.3.2 System for protection of machinery spaces and cargo pump spaces

3.7.3.2.1 The electric power supply of the system shall be provided both by a main and an emergency energy sources in accordance with 4.3.1, 9.3 and 19.1.2, Part XI "Electrical Equipment".

Electricity sources shall be positioned outside the protected space.

3.7.3.2.2 The system capacity shall be such as to ensure filling of the largest protected space during 10 min. Where a machinery space includes an additional space enclosed by exhaust line casings of IC-engines and/or boilers, the top level of the design foam filling volume shall be 1 m above the top point of the highest hazardous location, or up to the lowest boundary of the casing, whichever is higher.

Hazardous locations in this case include at least the equipment listed in definitions "Category A machinery spaces" and "Fuel oil units" in 1.2, Part VII "Machinery Installations".

3.7.3.2.3 The arrangement of foam delivery ducts of the foam extinguishing system with external foam generation/foam generators of the foam extinguishing system with internal foam generation shall be based on the test results in accordance with 3.7.3.1.1.

Each space in which IC-engines, boilers, fuel processing units and similar equipment are located, shall be fitted with not less than two foam delivery ducts/foam generators.

Small processing spaces and storerooms listed under 1.5.8.1 and 1.5.3.2.2 may be protected with a single foam delivery duct/foam generator.

3.7.3.2.3 Foam delivery ducts of the foam extinguishing system with external foam generation/foam generators of the foam extinguishing system with internal foam generation shall be evenly arranged within protected spaces and shall be fitted in the areas with the highest ceilings, including spaces enclosed by exhaust line casings of engines. Their number and arrangement shall ensure protection of all fire hazardous locations in the space at all height levels. Where foam distribution in separate parts of the spaces is obstructed, additional foam delivery ducts/foam generators shall be installed in such spaces.

Unless otherwise specified by test results, foam delivery ducts/foam generators shall be arranged so as to provide free space in front of the foam supply inlets of at least 1 m.

Foam delivery ducts/foam generators shall be arranged above protected engines and boilers, in places with the least likelihood of damage in case of explosion of the above equipment.

3.7.3.2.4 The outlet ducts of the foam generator of the foam extinguishing system with external foam generation shall be arranged so that fire in the protected space does not damage the foam generating equipment.

Where the foam generator is positioned in a space adjacent to the protected

space, its outlet ducts shall be arranged so as to ensure the minimum distance of 450 mm between the foam generator and the protected space, and the divisions in the space shall have a fire-resistance rating of A-60.

3.7.3.2.5 Foam delivery ducts shall be made of steel with the thickness of at least 5 mm.

Foam delivery duct penetrations through bulkheads and decks which isolate foam generators from the protected spaces shall be fitted with single- or multi-plate dampers made of stainless steel with a thickness of at least 3 mm.

The dampers shall be automatically driven from an electrical, pneumatic or hydraulic drive and shall be adjusted using remote controls of the associated foam generators. The dampers shall remain closed before actuation of the foam generators.

3.7.3.3 System for protection of vehicle, ro-ro, special category and cargo spaces

3.7.3.3.1 The system shall be supplied from the main energy source.

3.7.3.3.2 The system capacity shall be such as to ensure the minimum filling rate determined during tests in accordance with 3.7.3.1.1 and, in addition, full filling of the largest protected space within 10 min.

The filling rate for systems that protect spaces enclosed with gastight decks at least 3 m high shall not be less than two-thirds of the rate specified in accrodance with 3.7.3.1.1, but it shall be sufficient to fill the largest protected space within 10 min.

3.7.3.3.3 The system may be divided into sections. In this case, the system capacity and design shall be determined by the protected area which requires the supply of the largest foam amount.

No foam supply is required to adjacent protected spaces divided by class A structures.

3.7.3.3.4 Foam shall be supplies to each protected space through not less than two foam delivery ducts of the foam extinguishing system with external foam generation/two foam generators of the foam extinguishing system with internal foam generation.

The foam delivery ducts/foam generators shall be arranged as per test pattern for system type approval and shall ensure uniform distribution of foam over the space with account of the design arrangement of cargo. Foam supply through a single outlet of the foam delivery duct or a foam generator shall be provided for at least every second deck.

The horizontal distance between the foam delivery ducts shall ensure fast foam supply to all parts of the protected space as determined based on the results of full-scale testing.

3.7.3.3.5 The foam delivery ducts/foam generators shall be arranged so as to ensure free space in front of their outlets of at least 1 m, unless otherwise specified by test results.

3.7.3.3.6 The design and arrangement of equipment of the foam extinguishing system with external foam generation shall meet the requirements of 3.7.3.2.5 and 3.7.3.2.6.

3.7.3.4 Systems with foam generators installed inside the protected space, which generate foam using external air

3.7.3.4.1 The spaces listed under 3.7.3.2 and 3.7.3.3 may be protected using high-expansion foam extinguishing

systems with foam generators installed in the protected spaces to generate foam using the external air supplied from outside via the air duct.

Such systems shall be equivalent to foam extinguishing systems with external foam generation.

3.7.3.4.2 At least the following shall be taken into account when deciding on the equivalence of the systems:

.1 the high and low limit pressure and flow rate values for the air duct,

.2 performance and reliability of the dampers,

.3 equipment and distribution of air supply ducts and foam delivery duct outlets,

.4 isolation of air supply ducts from the protected space.

3.8 EXTINGUISHING SYSTEM

3.8.1 General

3.8.1.1 The amount of CO_2, in kg, shall be determined from the formula

$$G = 1.79V\varphi, \qquad (3.8.1.1)$$

where V = design volume of the largest protected space, in m^3;

φ = coefficient equal to:

0.3 – for dry cargo holds and other spaces, except as listed below;

0.35 – for machinery spaces with the design volume determined with account of the full volume of the trunks;

0.4 – for machinery spaces with the design volume determined without account of the volume of the trunks from the level at which the plan area of the trunks equals 40 per cent of the plane area of the machinery space measured in between the floor plates of the inner bottom and the trunk bottom, or less, and the spaces listed under 1.5.3.2.2 (refer also to Note 3 to Table 3.1.2.1);

0.45 – for vehicle spaces and ro-ro spaces that are not special category spaces and may be tightly closed from outside.

For machinery spaces the coefficient φproviding the larger value of G shall be chosen. In ships of less than 2,000 gross tonnage, except for passenger ships, coefficients 0.35 and 0.4 may be reduced to 0.3 and 0.35, respectively, if two or more machinery spaces that are not completely isolated from each other are considered one space.

The available amount of CO_2 in vehicle spaces and ro-ro spaces that are not special category spaces shall be at least sufficient to obtain a minimum volume of free gas equal to 45 per cent of the full volume of the largest cargo space as may be tightly closed.

For the purposes of this clause, the volume of free CO_2 shall be determined at the rate of 0.56 m^3/kg.

CO_2 systems shall not be used to protect special category spaces.

Adjacent spaces not divided with at least type A-0 divisions with independent ventilation systems shall be considered as one space.

3.8.1.2 Where the CO_2 extinguishing system piping is used as smoke detection system piping, a distribution manifold of the CO_2 system with starting devices for CO_2 supply to each space protected by the smoke detection system may be installed next to the intakes of this system. However, it is recommended that this manifold does not prevent the discharge of CO_2 into any protected space from the fire station.

3.8.1.3 The total flow cross-sectional area of the manifolds and the flow cross-sectional area of the distribution manifold shall not be more than the

sum of flow cross-sectional areas of cylinder valves that open simultaneously for the protected space of the largest volume (for a high-pressure system), or shall not be more than the cross-sectional area of the tank discharge valve (for a low-pressure system).

3.8.1.4 The total flow cross-sectional area of the manifolds and the flow cross-sectional area of the distribution manifold shall not be more than the sum of flow cross-sectional areas of cylinder valves that open simultaneously for the protected space of the largest volume (for a high-pressure system), or shall not be more than the cross-sectional area of the tank discharge valve (for a low-pressure system). The sum of flow cross-sectional areas of exhaust pipelines shall not exceed the flow cross-sectional area of the feeding pipeline, except where it is proved by calculation that pressure drop in any pipe cross-section is at least equal to 1 MPa.

3.8.1.5 CO_2 shall be supplied in the amounts as follows:

.1 85 per cent of the rated amount for not more than 2 min. – for machinery spaces, emergency diesel generator spaces and other spaces in which fuel oil and other flammable liquids are used;

.2 ⅔ of the rated amount for not more than 10 min. – for spaces specified in 1.5.4.3.1 and 1.5.4.4.1;

.3 for vehicle spaces and ro-ro spaces that are not special category spaces as may be tightly closed, the fixed pipeline shall be such that at least two-thirds of the required amount of gas for a respective space is supplied for 10 min.;

.4 the fixed piping in container and general cargo spaces (mainly intended for various cargoes, separately secured or packaged) shall allow supply of at least two-thirds of the required amount of gas for a respective space for 10 min.

The fixed piping in bulk cargo spaces shall allow supply of at least two-thirds of the required amount of gas for a respective space for 20 min.

System control shall allow supply of one-third, two-thirds or a full amount of gas based on the hold loading.

3.8.1.6 The pipe wall thickness shall be calculated in accordance with 2.3, Part VIII "Systems and Pipelines" (in which case the design pressure p shall be taken equal to the design pressure of cylinders or tanks in accordance with 3.8.2.1 or 3.8.3.1) and shall not be less than specified in Table 2.3.8 of the same part of the Rules.

3.8.1.7 CO_2 shall be supplied to the protected spaces through nozzles positioned in the upper parts of these spaces.

The arrangement of the distribution pipeline and of the discharge nozzles shall be such as to ensure uniform distrubution of the extinguishing medium.

Where the floor plates of the Category A machinery spaces is more than 1 m above the inner bottom, a portion of nozzles (about 15 %) shall be positioned in the upper part of the space above the floor.

3.8.1.8 The sum of cross-sectional areas of discharge nozzles in the space shall not exceed 85 per cent of the total flow cross-sectional area of the distribution pipeline.

3.8.1.9 Perforated pipes may be used instead of nozzles in mufflers, waste heat boilers and boiler uptakes. The sum of pipe perforation areas shall be 10 per cent less than its cross-sectional area.

3.8.1.10 Signal whistles that operate

under CO_2 outlet pressure shall be fitted in pipelines laid in the spaces specified in 4.3.1 in addition to sound signals required under 4.3.4.

3.8.1.11 The materials of valve seals and flexible hoses shall remain operable at sub-zero temperatures of up to –60 °C.

3.8.1.12 Pipelines with sections that are enclosed due to the valve arrangement shall be fitted with pressure relief valves, with discharge pipes laid to the open deck.

3.8.1.13 All discharge pipelines, valves and nozzles in protected spaces shall be made of materials with a melting temperature exceeding 925 °C. Pipelines and
associated equipment shall be properly secured.

3.8.1.14 A nozzle for air pressure tests shall be fitted in the distribution pipeline.

3.8.2 High pressure system

3.8.2.1 The quantity of liquefied CO_2cylinders shall be determined based on the filling rate (CO_2 amount per 1 l of cylinder capacity) which shall not exceed 0.675 kg/l under rated cylinder pressure of 12.5 MPa and above, or 0.75 kg/l under rated cylinder pressure of 15 MPa and more.

When filling the cylinders, a tolerance of not more than ± 0.5 kg of the design amount of CO_2 per cylinder is allowed.

To the extent provided for in 3.1.3.3 and 3.8.5, the filling rate shall be reduced by 0.075 kg/l of the above limits.

3.8.2.2 The cylinders shall be arranged vertically in rows set on (wooden) cushions, and shall be accessible for inspection and check of CO_2 amount. The cylinders shall be numbered.

Starting cylinders shall be located at the fire station and shall be of a special colour.

3.8.2.3 The connecting pipe between the cylinder and the manifold, as a rule, shall be a seamless red copper pipe.

Special flexible hoses of approved materials may be used.

A non-return valve shall be fitted at a cylinder/manifold connection.

The arrangement of manifolds shall allow complete drying.

3.8.2.4 A pressure gauge calibrated to at least 1 MPa above the cylinder hydraulic test pressure shall be fitted in the CO_2 extinguishing station manifold. The pressure gauge increment shall not exceed 0.5 MPa.

3.8.2.5 A cylinder weighing device or a cylinder liquid level gauge shall be fitted at the CO_2 extinguishing station.

Complete displacement of the cylinders from their fixed position shall not be necessary.

3.8.2.6 Cylinder valves

3.8.2.6.1 The valves shall be fitted with safety devices meeting the requirements as follows:

bursting disk rupture shall occur in case of cylinder pressure rise of up to $(1.3 \pm 0.1)p$, MPa (with p = design cylinder pressure). In valves with slotted diaphragms additionally fitted with bursting disks, the rupture pressure for slotted diaphragms shall exceed the high rupture limit for bursting disks by not less than 1 MPa;

a control device shall be fitted to indicate safety device actuation.

3.8.2.6.2 Where a lever-type valve opening device is used, it shall provide for complete valve opening by lever turn to an angle not exceeding 90º. This de-

vice shall allow for individual or group valve opening.

3.8.2.6.3 Cylinder valves shall have skewed tubes that stop short of the cylinder bottom by 5 to 15 mm. The bore diameter of the above tubes, as well as of the connecting tubes between the cylinder valves and the manifold, shall not be less than 10 mm.

3.8.2.6.4 Where starting cylinder valves differ from other cylinder valves in their design, they shall be painted with another colour and shall bear the mark "starting" on their bodies.

3.8.2.7 Gas from safety devices of the valves shall be discharged:

.1 outside the station into atmosphere via a separate pipeline fitted with an audible alarm device on its outlet dead-leg; or

.2 into the distribution manifold with:

two pipelines, one of which is fitted with a shut-off valve and is open-ended, and the other fitted with a bursting disk;

a manifold pressure signalling device installed in permanently attended space.

The control device to indicate safety device actuation shall not be necessary in this case.

3.8.3 Low pressure system

3.8.3.1 The design amount of liquefied CO_2 shall be maintained in the tank (tanks) at the working pressure of about 1.8 – 2.2 MPa provided by maintaining the temperature of about -18 °C.

The rate of filling with liquefied gas shall be limited so as to allow sufficient free space for steam with the increased amount of liquid at the maximum storage temperature in compliance with the set-point for safety valves, but shall not exceed 95 per cent of the tank capacity.

3.8.3.2 The tank shall be served by two independent automatic refrigerating plants, each comprising a compressor, condenser and a cooling coil.

The refrigerating capacity and automatic control of each plant shall allow maintaining a required temperature during continuous operation for 24 h at seawater temperature of 32 °C and ambient temperature of 45 °C.

Where a plant in operation fails, the other plant shall turn on automatically.

Each plant shall have separate or shared cooling coils made up of at least two disconnectable sections with a surface rated for full capacity.

In other respects, refrigerating plants shall meet the requirements of Part XII "Refrigerating Plants" for unclassed plants (except for 3.3, 3.4, 3.5; 6.2.6), and the requirements of 2.1.1, 2.3.11, 2.3.12 and 7.2.2 for classed plants.

System controls and refrigerating plants shall be positioned in the same space in which the tanks are arranged.

3.8.3.3 The tank shall include:

connections with shut-off valves for tank filling;

flow tube;

a device for immediate control of the liquid CO_2 level installed on the tank;

two safety valves with pipes for discharge into atmosphere, so arranged that each valve may be disconnected while the other remains connected to the tank;

pressure gauge;

high (not more than the safety valve set point) and low (not less than 1.8 MPa) pressure alarms;

minimum permissible level alarm.

Each safety valve shall be actuated at the pressure of (1.1–1.2)p and shall

have such cross-sectional area that the tank pressure in case of complete opening of the safety valve does not exceed 1.35*p* (where *p* = tank working pressure, in MPa).

The tank design pressure shall be equal to the biggest value of the safety valve opening pressure.

3.8.3.4 The remote level gauge sensor pipe, where located outside the tank, shall be isolated with two valves (normally open during operation) and fitted with a single additional rated filling (100 %) test cock. This pipe with a test cock shall be thermally insulated.

3.8.3.5 Where more than one space is protected by the system, CO_2 supply controls shall be provided, e. g. an automatic timer or a calibrated level gauge positioned at the system control station. Manual gas supply regulation shall also be possible.

3.8.3.6 The tank with off-take piping permanently filled with CO_2 shall have thermal insulation to prevent safety valve actuation within 24 h following de-energizing of the plant, at the ambient temperature of 45 ºC and initial pressure equal to the starting pressure of the refrigerating plant.

3.8.3.7 The tank material shall meet the requirements of 3.3, Part XIII "Materials". Welds shall be checked to the extent required for Class II as per Table 3.3.2-2, Part XIV "Welding".

3.8.3.8 Safety valves with forced lifting devices shall be fitted at each piping section as may be isolated by shut-off valves and the pressure in which may rise above the permissible value for any component.

3.8.3.9 Alarm system shall send visual and audible alarms in cases as follows:

when maximum (not exceeding the set point for the safety valve) and minimum (not less than 18 bar) pressure limit is reached;

when CO_2 level in the tank is reduced to the minimum permissible level;

in case of refrigerating plant failure;

in case of CO_2 discharge.

Alarms shall be addressed to central control stations and engineer's cabins.

3.8.4 Discharge control

3.8.4.1 The control arrangements of systems intended for protection of normally attended or accessed spaces shall meet the requirements of 3.8.4.2 (refer also to 4.3.1).

3.8.4.2 Two separate arrangements for control of gas discharge into protected spaces shall be provided and a separate device to ensure actuation of gas discharge shall be fitted.

The former shall be used to open the shut-off valve of the gas discharge pipeline.

The latter shall be used for gas discharge from the cylinders (tanks).

Arrangements shall be provided to ensure operation of both control devices in the above sequence only.

These controls shall be positioned inside the cabinet, and controls for certain protected spaces shall be easily identified.

Where the control cabinet is locked, the key shall be kept in a breaking glass cap case positioned in a conspicuous place next to the cabinet.

3.8.4.3 In pipelines that feed CO_2 from starting cylinders to servo-motors, shut-off valves interlocked with the starting cylinder opening device shall be fitted.

3.8.4.4 CO_2 discharge in low-pressure systems shall be effected manually.

Where a device for automatic control of the discharge of design CO_2 amount into protected spaces is provided, manual regulation of gas supply shall also be possible.

Where the system serves more than one spaces, provision shall be made for supplied CO_2 control arrangements, e. g. an automatic flow meter or a precise level gauge positioned at the control station (stations).

3.8.4.5 CO_2 extinguishing systems for protection of vehicle and ro-ro spaces, container holds fitted with embedded refrigerated containers, spaces with access through doors or hatches, and of other normally attended or accessed spaces shall meet the requirements of **3.8.4.2.**

3.8.5 Local CO_2 extinguishing stations

Where justified, the local stations of separate protected spaces may be equipped with not more than 5 cylinders (not more than 125 kg of CO_2).

Cylinders used to protect crankcases, IC-engine mufflers, boiler uptakes and other enclosed spaces may be installed inside the machinery space.

3.9 INERT GAS SYSTEM

3.9.1 General

3.9.1.1 The inert gas system may be used as:

.1 the basic fire extinguishing means in dry cargo holds provided that an isolated inert gas generator is available;

.2 the means to prevent fire by creating and maintaining non-flammable atmosphere in cargo tanks, except when degasification of tanks is necessary.

.3 as regards equipment for oil tankers of 20,000 t deadweight and more, carrying flammable liquids with flash point of 60 °C and lower, as well as for any oil tankers equipped with a crude-oil washing system for cargo tanks, refer to 9.16, Part VIII "Systems and Pipelines" of these Rules.

3.9.1.2 Gas utilized for fire extinguishing shall be a gaseous product of combustion with O_2, CO content as well as the content of corrosive agents and any soild combustible particles shall be reduced to a minimum.

3.9.2 The system capacity shall be as follows:

.1 for machinery spaces, protection equivalent to that provided by the CO_2extinguishing system;

.2 for cargo spaces, the amount of gas shall be such as to allow hourly flow rate of free gas at least equal to 25 per cent of the gross volume of the largest protected space within 72 h.

3.9.3 The design of the distribution manifold and the arrangement of discharge nozzles shall be such as to ensure uniform distribution of fire extinguishing gas.

Inert gas pipelines shall be laid into dry cargo holds through the bottom parts of the protected spaces. Such holds with the capacity of 500 m^2 and more shall have two inlets arranged in the opposite parts of the space.

3.9.4 System for inert gas supply from cylinders

3.9.4.1 The system is intended for purposes specified in 3.9.1.1.2 (the means to prevent fire by creating and maintaining non-flammable atmosphere

in cargo tanks, except when degasification of tanks is necessary), as regards fuel storages listed under 11.5.1.2, Part III "Equipment, Arrangements and Outfit".

3.9.4.2 The system cylinders are normally filled with nitrogen; the cylinder spaces shall meet the requirements of 12.7.3, Part VIII "Systems and Pipelines" and 6.4.4, Part X "Boilers, Heat Exchangers and Pressure Vessels".

3.9.4.3 System pipelines that refer to Class I and II, respectively, shall be tested on board in accordance with Sect. 21, Part VIII "Systems and Pipelines".

3.10 DRY CHEMICAL EXTINGUISHING SYSTEM

3.10.1 General

3.10.1.1 Dry chemical of the Register-approved type shall be used within the dry chemical extinguishing system.

3.10.1.2 Nitrogen or another inert gas as approved by the Register shall be used as a carrier gas for the dry chemical.

3.10.1.3 The system shall include:

stations for dry chemical tanks, carrier gas cylinders and a distribution manifold;

extinguishing points;

pipelines and valves for system starting and dry chemical supply to the points.

3.10.1.4 The system shall be started remotely from any extinguishing point.

The system shall be actuated not later than 30 s following the opening of the starting cylinder at the remotest extinguishing point that is operated from this station.

3.10.2 Amount of dry chemical and carrier gas. Number and capacity of monitors

3.10.2.1 Every tank at the station shall contain the design amount of dry chemical determined based on uninterrupted operation of all portable and fixed monitors of the given station for at least 45 s.

3.10.2.2 The dry chemical flow rate for each portable monitor shall not be less than 3.5 kg/s, and the length of dry chemical jet – not less than 8 m. When the maximum action area for each portable monitor is determined, the length of the hose shall be taken into account.

The dry chemical flow rate of each fixed monitor shall not be less than 10 kg/s; the maximum action area for fixed monitors with the capacity of 10, 25 and 45 kg/s shall be 10, 30 and 40 m, respectively.

3.10.2.3 The number of portable and fixed monitors shall ensure the supply of dry chemical to any part of the cargo deck and the cargo pipeline from two portable monitors or from a fixed and a portable monitor.

At least one portable or fixed monitor shall be positioned aft of the cargo deck.

3.10.2.4 In cargo areas of gas carriers one fixed monitor shall be provided to protect the cargo manifold and ensure dry chemical supply locally and remotely.

3.10.2.5 The dry chemical extinguishing system used to protect spaces specified in 1.5.3.2.2 shall ensure dry chemical supply at the rate not less than 0.5 kg/m³ per hour for not more than 10 s.

3.10.2.6 The amount of carrier gas shall ensure a single discharge of the entire supply of dry chemical from the tank.

3.10.3 Dry chemical extinguishing stations

3.10.3.1 The stations shall be locat-

ed behind the cargo compartment deck.

Where the cargo compartment deck length is more than 150 m, one of the stations may be positioned on this deck.

3.10.3.2 The dry chemical extinguishing station shall consist of not more than two separate stations, and in gas carriers with the cargo compartment capacity less than 1,000 m^3 one station shall suffice.

3.10.3.3 Ships fitted with a fore or aft cargo manifold shall have an additional dry chemical extinguishing station with at least one fixed and one portable monitor to protect the manifold.

3.10.3.4 Where two or more extinguishing points are connected to the station, dry chemical supply to any of these shall be effected from the station manifold via a separate pipeline with a starting valve.

The station shall ensure independent and parallel operation of all extinguishing points.

3.10.4 Dry chemical extinguishing point

3.10.4.1 Each dry chemical extinguishing point shall comprise cylinders for remote start of the system and either a portable monitor with a rigid hose of a non-rotating type, with the length not more than 33 m, or a fixed monitor.

3.10.4.2 The equipment of the point, except for the fixed monitor, shall be stored in a watertight box or a cabinet.

3.10.4.3 The portable monitor shall be fitted with a dry chemical supply actuation and shutdown device.

3.10.4.4 The flow cross-sectional area of the monitor shall be equal to the area of the flow cross-sectional area of the hose or shall be not more than 50 per cent less.

3.10.4.5 Pressure gauges shall be fitted on starting cylinders.

3.10.4.6 A system actuation manual shall be available for the point.

3.10.5 Tanks, pipelines and valves

3.10.5.1 A flow tube shall be fitted in the tank, such as about 100 mm short of the bottom.

3.10.5.2 A device for gas supply into tank shall be installed in the bottom part of the tank, so as to prevent ingress of dry chemical into the gas main.

3.10.5.3 The dry chemical filling degree for the tank shall not be more than 0.95.

3.10.5.4 Pipelines and valves of the system shall not have narrow parts or abrupt enlargements of the flow cross-section.

3.10.5.5 The area of flow cross-section of the manifold of the station shall be at least equal to the total cross-sectional area of the pipelines connected to it for simultaneous supply of dry chemical, or shall be twice as big.

3.10.5.6 The distribution manifold of the station shall be fitted with a device for pipeline purging following the system shutdown.

3.10.5.7 The bend radius of the dry chemical pipeline shall not be less than 10 pipeline diameters.

3.10.5.8 The supply of dry chemical into spaces listed under 1.5.3.2.2 shall be effected via spray nozzles. The design, arrangement and quantity of the spray nozzles shall be such as to ensure uniform spraying of the dry chemical throughout the entire space. The pressure at the remotest spray nozzle shall be at least equal to the value required to ensure efficient dry chemical spraying.

3.11 AEROSOL EXTINGUISHING SYSTEM[5]

3.11.1 General

3.11.1.1 The aerosol fire extinguishing system shall make use of fire extinguishing aerosol (the product of solid aerosol-generating compound combustion) generators of the Register-approved type.

3.11.1.2 The aerosol fire extinguishing system shall comprise:

fire extinguishing aerosol generators;

system control unit (SCU);

aerosol fire extinguishing system actuation alarms;

cable ducts.

3.11.1.3 The design weight of aerosol-generating compound, in kg, shall be determined from the formula

$$G = (V + \sum_{j=1}^{n} V_{arj} \cdot P_{arj} \cdot P_a^{-1}) \cdot k \cdot q \quad , \qquad (3.11.1.3)$$

where V = design (net) volume of the protected space, in m^3;

V_{arj} = volume of the *j-th* air tank, in m^3 — refer to 3.1.2.5;

n = number of air tanks in the protected space;

j = sequence number of the air tank;

P_{arj} = work pressure in the *j*-th air tank, in MPa;

P_a = atmospheric pressure, in MPa;

q = rated fire-extinguishing capacity of the aerosol, in kg/m^3;

k = safety factor equal to 1.5.

3.11.1.4 The rated fire-extinguishing concentration of aerosol is based on the generator type and, as a rule, shall not exceed 0.2 kg/m^3.

3.11.1.5 The following shall be provided when starting the system:

automatic actuation of the alarm in the protected space, as per 4.3;

automatic shutdown of ventilation in the protected space;

automatic shutdown of electric drives of the furnace arrangements of boilers and incinerators, when installed in the protected space.

3.11.1.6 In machinery spaces, emergency diesel generator spaces and other spaces in which use is made of fuel oil or flammable liquids, the generator operation time (rated aerosol amount supply time) shall not exceed 2 min.

3.11.1.7 The arrangement of generators in the protected space shall be such as to allow uniform distribution of fire-extinguishing aerosol.

Where dead-air zones created by equipment and its enclosing structures are present in the space, fire-extinguishing aerosol shall be supplied straight to these dead-air zones.

3.11.1.8 When installed, generators shall be so oriented (in accordance with the requirements of 3.11.2.2) that during their operation fire-extinguishing aerosol jets have no thermal effect over the escape routes, ship's equipment, cable ducts, emergency lighting, alarms, fuel oil and lube oil tanks and pipelines, etc.

Generators shall be as far apart from the escape routes and other areas in which the presence of personnel is possible, as specified in accordance with the provisions of IMO MSC.1/Circ. 1270, at a minimum safe distance for the impact of temperatures up to 75 ºC, as well as from combustible materials, at a mini-

[5] Refer to IMO MSC.1/Circ. Guidelines for the approval of fixed aerosol fire-extinguishing systems equivalent to fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces.

mum safe distance for the impact of temperatures up to 200 ºC.

3.11.1.9 Aerosols shall not have ozone-depleting potential.

3.11.2 Fire-extinguishing aerosol generators

3.11.2.1 The fire-extinguishing aerosol generators shall comprise a casing that contains aerosol-generating compound supply, starting unit, electrical disconnection unit, and a device for connection to the ship's hull structures.

The generator casing shall have a device (nozzle) for aerosol discharge.

3.11.2.2 Every generator type shall be accompanied with the data for the distance (along the axis of the aerosol jet) from its outlet from the generator to the boundary of the thermal region with the temperature of +70 °C and +200 ºC.

3.11.2.3 The generator starting operation time (refer to 3.11.1.6) shall not exceed 10 s.

3.11.2.4 The time of generator operation shall not be less than 20 s (refer to 3.11.1.6).

3.11.2.5 The design number of generators, in pieces, shall be determined from the formula

$$N = G/m \qquad (3.11.2.5)$$

where G = design weight of the aerosol-generating compound, in kg;

m = weight of the aerosol charge in one generator, in kg.

The number of generators in a protected space shall be such that in case of damage to any starting line or to the generator itself by other generators, a provision shall be made to supply an amount of aerosol not less than required to reach the specified fire-extinguishing concentration with account of the provisions of 3.11.1.7. For design number of generators N = 1, the number of generators shall be 2, and for N=2 – 3.

3.11.2.6 The generator casing, support and fastening elements shall be made of non-combustible materials.

3.11.2.7 Generators shall be fitted with arrangements for automatic (spontaneous) start at the ambient temperature rise to over 250 °C.

Generators shall be so designed as to eliminate the possibility of spontaneous start at temperatures below 250 °C.

3.11.3 Aerosol fire extinguishing system control unit (SCU)

3.11.3.1 The SCU shall meet the requirements of Sect. 2, Part XI "Electrical Equipment".

3.11.3.2 The SCU shall provide for a remote start of all generators in the protected space.

Based on the number of generators, generator start in groups is possible, provided that the requirements of 3.11.1.6 and 3.11.2.3 met.

3.11.3.3 Where the system is used to protect several spaces, the SCU shall ensure separate start of generators in each space.

3.11.3.4 The SCU shall be fed from two independent energy sources, one main and one emergency source.

3.12.3.5 The SCU shall ensure automatic fault check of the starting circuits (e. g. wire failure, earth fault etc.) with failure alarm indication on the front panel, as well as operability check of the ventilation start and shutdown alarms.

3.11.4 Local aerosol fire extinguishing stations

Where justified, the local stations of separate protected spaces may be equipped with one or two generators and

a starting device next to the entrance into the space (without the SCU).

Provision shall be made for regular checks of aerosol fire extinguishing system operability by imitated start.

3.11.5 Cable ducts

3.11.5.1 Cable ducts shall meet the requirements of Sect. 16, Part XI "Electrical Equipment".

3.11.5.2 Electrical circuits to connect generators shall be duplicated and shall be arranged as far apart as possible.

Electrical starting circuits within the protected space shall be fire-resistant in accordance with the requirements of IMO circular MSC.1/Circ. 1270.

3.12 FIXED LOCAL APPLICATION FIRE EXTINGUISHING SYSTEMS INSIDE MACHINERY SPACES

3.12.1 Fixed local application fire extinguishing systems shall be fitted in passenger ships of 500 gross tonnage and more and in cargo ships of 2,000 gross tonnage and more.

3.12.2 Category A machinery spaces with the volume above 500 m^3, in addition to the fixed fire extinguishing system as per Table 3.1.2.1, shall be equipped with a fixed local application fire extinguishing system utilizing water or an equivalent local application fire extinguishing system in accordance with IMO Guideline[6].

Fire extinguishing systems in periodically unattended machinery spaces shall be both manually and automatically started. Permanently attended machinery spaces shall be fitted with manually started systems only.

Where automatic start is available, manual start shall be mandatory.

Manual start controls for the system shall be positioned in a readily accessible place inside and outside the protected space. Controls inside the protected space shall not be arranged in places which may be isolated in case of fire in the space.

Automatic system start shall be effected from the fire detection system which indicates hazardous zones. In this case, structural precautions shall be made to prevent inadvertent start of the local fire extinguishing system.

3.12.3 Fixed local application fire extinguishing systems shall protect fire hazardous parts (zones) of the following machinery and equipment (without engine stop, personnel evacuation or space sealing):

.1 IC-engines or, in ships built before July 1, 2014, main IC engines and diesel generators;

.2 incinerators;

.3 heated fuel oil separators;

.4 boiler furnace fronts (at places where burners are installed);

.5 inert gas generators as specified in 3.9;

.6 fuel heaters.

At least two sections of the system shall be provided for installations with two or more engines.

3.12.4 Startup of any local application fire extinguishing system shall be followed by visual and audible alarm other than normal alarms in the protected space, at the machinery control station and the wheelhouse. The alarm, which may be of a single-tone type, shall indicate a specific system being actuated.

[6]Refer to MSC.1/Circ.1387. Revised Guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces (MSC/Circ.913)

Alarm system requirements specified herein shall be supplementary requirements and shall not substitute the fire alarm system as required in accordance with any clause of this section.

3.12.5 System electrical equipment and actuation alarm shall meet the requirements of 7.13, Part XI "Electrical Equipment".

3.12.6 The arrangement of spray nozzles on board the ship shall match the test arrangement as per Revised IMO Guidelines (refer to MSC.1/Circ.1387).

3.13 FIRE EXTINGUISHING SYSTEMS TESTS

3.13.1 Fire extinguishing systems shall be tested with test pressure in accordance with Table 3.13.1.

3.13.2 Operation tests shall meet the requirements of the Register-approved programs, to check operability, starting devices operation, and in prototype ships – confirmation of the required time for extinguishing medium discharge into the protected spaces.

Test pressure of the design amount of CO_2 in high pressure CO_2 extinguishing systems of the protected spaces is required in prototype ships.

Test pressure is not required where the Register is provided with proper justification.

Table 3.13.1

No.	Tested systems and units	Test hydraulic pressure	
		in shop	on board
1	2	3	4
1	Foam and water extinguishing systems (refer also to Sect. 21, Part VIII "Systems and Pipelines"):		
	.1 pipelines	–	In operation
	.2 sprinkler system pipes	–	1*p*
2	Dry chemical system pipelines	1.5*p*	1*p* with air
3	CO_2 system		
3.1	High pressure:		
	.1 pipelines from cylinders to starting valves; transit pipelines passing through spaces (refer to 3.1.4.1.4);	–	1.5*p*
	.2 pipelines from starting valves to nozzles and pipelines downstream of safety devices	–	5 MPa
3.2	Low pressure:		
	.1 pipelines from tanks to starting valves;	–	1.5*p*
	.2 pipelines from starting valves to nozzles and pipelines downstream of safety valves	–	1*p*
4	Pipelines and scrubber of the inert gas system	–	1*p* with air
5	Pneumatic pipelines	–	1.5*p*
6	Cylinders and tanks:		
	.1 pressurized, including valveless cylinders;	1.5*p*	–

	.2 pressureless;	In bulk up to the top of the air pipe	As an assembly
	.3 screwed-in valve cylinders	1*p* with air	–
7	Valves	1.5*p*, but not less than 0,2 MPa	–

N o t e s : 1. *p* = maximum working pressure in the system, for CO_2 systems – design cylinder or tank pressure, in MPa.

2. Valve assemblies shall be tested for closing tightness under pressure not less than 1.25*p*. CO_2 cylinder valves shall be tested for tightness under the maximum bursting disk rupture pressure in accordance with 3.8.2.6.1.

3. Onboard system tests shall be carried out for system assemblies following the installation.

4. Pipelines listed under 3.1.1 and 3.2.1, tested in shop under hydraulic pressure of 1.5*p*, may be tested on board under pressure of 1*p*.

5. Water fire system pipelines in ships of 500 gross tonnage and more (refer to 3.2.5.1) shall be tested under pressure not less than 1 MPa

4. FIRE ALARM SYSTEMS

4.1 GENERAL

4.1.1 All electrical equipment, appliances, alerts and indicators, feeders and the electrical circuit of fire alarm systems shall meet the requirements of 7.5 and 7.6, Part XI "Electrical Equipment" as well as the Fire Safety Systems Code and Code on Alerts and Indicators.

Fire alarm systems and equipment shall have a design resistant to the effects of ambient temperature, vibration, humidity, jerking, impacts and corrosion as are normally present in ships.

4.1.2 Control panels in passenger ships shall be positioned in the ship's safety centre. Indicator panels shall indicate each automatic or manual alarm that trips separately and shall be positioned in the navigation bridge.

Control panels in cargo ships shall be positioned in the navigation bridge or in the central control station. Otherwise an indicator panel shall be available in the navigation bridge.

Every indicator panel shall be accompanied with clear information regarding the protected space and the arrangement of the alarm system loops, displayed on each panel or next to it.

Fire alarm indicator panels in cargo ships and balconies of passenger cabins shall at least indicate the loop in which the automatic or manual alarm trips.

Additionally, controls for remote closing of fire doors and shut-down of ventilators shall be localized in the permanently attended control station. Shift personnel at permanently attended control stations shall be able to restart the ventilators.

Control panels in the central control station shall have closed or open state indication for fire doors, ON or OFF state of the detectors, fire alarms and ventilators.

4.1.3 Fire alarm systems shall not be used for purposes other than closing the fire doors and similar functions from the control panel (refer to 3.12.2).

Where the fire door is of watertight type (refer to 7.12, Part III "Equipment, Arrangements and Outfit"), they shall not be closed automatically when fire detec-

tors trip.

Automatic and manual detectors shall be connected to the respective fire alarm system loops. Other sensors, e. g. sprinkler valve opening sensors, shall be connected to other (separate) loops.

4.2 FIRE DETECTION AND ALARM SYSTEM

4.2.1 Fixed fire detection and alarm systems

4.2.1.1 Fixed fire detection and alarm systems meeting the requirements of the International Fire Safety Systems Code[7] shall be fitted to protect:

.1 accommodation and service spaces and control stations (refer to 4.2.1.2);

.2 periodically unattended Category A machinery spaces and Category A machinery spaces in which automatic and remote control systems and equipment instead of the permanent attendance is approved by the Register, and the main propulsion plant with associated machinery, including main energy sources fitted with automatic or remote controls that are under permanent attendance of the shift personnel at the control station;

.3 cargo spaces that contain packaged dangerous cargo (refer to 7.2.7), as well as cargo spaces in passenger ships, that are inaccessible, except when the ship is engaged in voyages so short that this requirement is unreasonable;

.4 vehicle spaces, special category spaces and ro-ro spaces (refer to 4.2.1.3).

Fire detection and alarm systems shall not be fitted on open decks used for vehicles with fuel in their tanks;

.5 balconies of cabins in passenger ships, provided that the furniture and furnishings of such balconies are not as specified in 2.1.1.9. A fixed fire detection and alarm system for cabin balconies shall meet the provisions of the International Fire Safety Systems Code and Circular MSC.l/ Circ.1242;

.6 enclosed spaces with incinerators.

Detectors in spaces with the minimum fire hazard, e. g. empty spaces (with no flammable substances stored), personal bathrooms, public toilets, extinguishing media storerooms, cleaning gear lockers (with no flammable substances stored), areas o open decks and enclosed sections on promenade decks with little to zero fire hazard, provided with natural ventilation through fixed outlets may be omitted.

4.2.1.2 The following provisions shall be made in accommodation and service spaces and control stations:

.1 smoke detectors shall be positioned at all stairs, in all alley ways and escape routes within the accommodation area as specified in 4.2.1.2.2 to 4.2.1.2.4. Smoke detectors on stairs shall be arranged at the top stairwell and at each second stairwell up to the bottom. The advisability of installation of special smoke detectors in ventilation ducts shall be agreed;

[7] As amended by Resolution MSC.311(88) to the International Fire Safety Systems Code (FSS Code), taken into account in these amendments and applied to ships built on or after July 1, 2012 (for ships built before July 1, 2012 provisions of the said Code without the above amendments apply).

.2 in passenger ships carrying more than 36 passengers, the fixed fire detection and alarm systems shall be arranged so as to ensure smoke detection in service spaces, control stations and accommodation spaces, including alley ways, stairs and escape routes within accommodation areas.

.2.1 the fixed fire detection and alarm systems shall have arrangements for remote detection of a specific fire site by each separate automatic detector.

Where the fixed fire detection and alarm system is not provided with arrangements for remote detection of the fire site by separate automatic detectors, each loop shall not cover more than one deck within the accommodation and service spaces and control stations, except for the loop that serves the stairway enclosure;

.2.2 automatic detectors located within cabins, when activated, shall also sound or enable sounding of an audible alarm in spaces they are installed in;

.2.3 one loop of automatic and manual detectors shall not be located in more than one main vertical zone, except for cabin balconies;

.2.4 the main vertical zone that covers the atrium (i. e. public spaces spanning three or more open decks) shall be protected with smoke detection systems over its entire span;

.3 in passenger ships carrying not more than 36 passengers, each separate vertical or horizontal zone, all accommodation and service spaces and, if deemed necessary by the Register, at control stations, except for spaces that pose no significant fire hazard, e. g. empty spaces with no flammable substances stored, public toilets, personal bathrooms, extinguishing media storerooms (for CO_2 etc.) and similar spaces, spaces on open deck and enclosed promenade decks with low to zero fire hazard, provided with natural ventilation through fixed openings, either:

.3.1 a fixed fire detection and alarm system arranged so as to detect fire in such spaces, as well as to detect smoke in alley ways, stairways and escape routes within accommodation spaces; or

.3.2 a fixed fire detection and alarm system arranged so as to detect smoke in alley ways, stairways and escape routes within accommodation spaces provided that an automatic sprinkler system to protect such spaces is fitted (refer to Table 3.1.2.1);

.3.3 provision shall be made in the fixed fire detection and alarm system for remote individual identification of each automatic and manual detector.

On loop of automatic and manual detectors shall not be located in more than one main vertical zone;

.3.4 automatic detectors located within cabins, when activated, shall also sound or enable sounding of an audible alarm in spaces they are installed in;

.4 automatic detectors may be actuated when exposed to heat, smoke and other combustion products; fire or any combination of the above factors. The Register may consider the possibility of use of automatic detectors actuated when affected by other factors, provided that they are of sensibility equivalent to that of the above detectors.

Heat detectors may be utilized in refrigerated chambers, bilge spaces, saunas, parts of galleys used for cooking, laundries and other spaces in wich steam or smoke may be present;

.5 in cargo ships, accommodation and service spaces and control stations shall be protected by a fixed fire detection and alarm system and/or automatic sprinkler fire extinguishing and alarm system based on the type of protection as follows:

.5.1 for IC protection class: the fixed fire detection and alarm system shall be arranged so as to detect smoke in all alley ways, stairways and escape routes within accommodation spaces;

.5.2 for IIC protection class: the fixed fire detection and alarm system shall be arranged so as to detect smoke in all alley ways, stairways and escape routes within accommodation spaces; In addition, an automatic sprinkler system so arranged as to protect accommodation spaces, galleys and other service spaces (refer to Table 3.1.2.1);

.5.3 for IIIC protection class: the fixed fire detection and alarm system shall be arranged so as to detect fire in all accommodation and service spaces and to detect smoke in all alley ways, stairways and escape routes within accommodation spaces, except for spaces with little to zero fire hazard, e. g. empty spaces, sanitary spaces etc.

In addition, a fixed fire detection and alarm system shall be arranged so as to detect smoke in all alley ways, stairways and escape routes within accommodation spaces. However, it is not necessary to equip service spaces located at a distance from the accommodation spaces area with a fixed fire detection and alarm system;

.6 where a fixed fire detection and alarm system is required to protect spaces other than specified in 4.2.1.2.1, every such space shall be fitted with at least one detector meeting the requirements of the Fire Safety Systems Code.

.7 the loop shall not pass through the space two times. Where this is impracticable (e. g. in large public spaces), a section of the loop to pass through the space for a second time shall be fitted as far from other sections of the loop as possible;

.8 Category A machinery spaces and ro-ro spaces shall be protected by separate loops of automatic fire detectors.

4.2.1.3 The fire detection and alarm systems installed in vehicle spaces, special category spaces, and ro-ro spaces shall provide for quick fire detection at initial stages.

The type and arrangement of automatic fire detectors shall be determined based on the effect of ventilation and other factors. Following installation, the system shall be tested under normal ventilation conditions so as to determine its average response time.

The fire detection and alarm systems may be omitted in special category spaces with efficient examination service by way of permanent fire watch throughout the voyage.

4.2.1.4 Automatic detectors shall be arranged so that the maximum detecting efficiency is ensured.

Places next to beams and ventilation ducts, other places in which the air flows may impair the efficiency of automatic detector, as well as places in which the detectors may be exposed to impacts or may be damaged, shall be avoided.

Detectors installed on the ceiling shall be at least 0.5 m apart from the bulkheads, except for alley ways, storerooms and stairways.

Automatic detectors within stairway

enclosures shall be installed at the top of the stairway and at least at each second stairwell downwards.

The maximum areas and clearances for automatic detectors shall be in accordance with Table 4.2.1.4.

Based on the results of tests approved by the Register, deviations from the requirements of Table 4.2.1.4.

Automatic detectors located below movable decks/platforms in vehicle spaces, special category spaces and ro-ro spaces, shall also meet the applicable provisions of Table 4.2.1.4.

Where machinery spaces are fitted with thermal pulse detectors, the maximum deck area covered by a detector shall be 50 m^2, and the distance between its centres shall not exceed 6 m.

In ships built on or after July 1, 2014, automatic detectors installed in refrigerated spaces like refrigerated cargo holds shall be tested in accordance with the procedures including such location (refer to the IEC recommendations, namely IEC 60068-2-1, Section 1. *Environmental Testing. Part 2-1. Test. Test A: Cold.*

Table 4.2.1.4

Detector	Maximum area of the deck served by the detector, m^2	Maximum distance between centres, in m	Maximum distance from bulkheads, in m
Heat	37	9	4.5
Smoke	74	11	5.5

4.2.1.5 In cargo spaces specified in 4.2.1.1.3 and 4.2.1.1.4, except for spaces indicated in 1.5.4.3.2, 1.5.4.4.2 and 1.5.9, a smoke detection system may be installed based on space air sampling [8], of the Register-approved typemeeting the requirements of 4.2.1.6.

4.2.1.6 Smoke detection systems based on air sampling shall include the following major components: smoke samplers, air sampling pipelines, three-way valves, and, where the smoke detection system is connected to the fixed gas extinguishing system, a control panel, and shall meet the following requirements:

.1 it shall ensure uninterrupted operation. Systems based on sequential scanning may be approved by the Register, provided that the interval (*I*) between the two scans in the same space does not exceed 120 s and ensures the time (*T*) specified in 4.2.1.6.10.

A 20 per cent tolerance interval (*I*) shall be determined from the formula

$$I = 1.2 \times T \times N$$

where N = number of scanning points;

.2 the arrangement of air sampling pipes shall allow easy identification of the fire site;

.3 it shall be fabricated and installed so as to avoid leakage of toxic, flammable or extinguishing media into any accommodation or service area, control station or machinery space, as well as to avoid ignition of a flammable gas/air mixture;

.4 at least one smoke sampler shall be available for each enclosed space in which smoke detection shall be provided. Where the space is intended for carrying oil or refrigerated cargo, as well as other cargo as may require smoke detection systems, arrangements may be provided to isolate smoke samplers in the same space, as approved by the Register.

In cargo holds with gas-penetrable 'twindecks smoke samplers shall be arranged both in top and bottom parts of the holds;

.5 smoke samplers shall be so arranged as to ensure the maximum sampling efficiency, provided that the distance from the sampler to any section of the deck below measured horizontally does not exceed 12 m.

The arrangement of smoke samplers in spaces with forced ventilation shall be determined with account for the ventilation effect.

At least one smoke detector shall be fitted in the top part of each exhaust ventilation shall be provided. An additional smoke sampler shall be fitted with a filtration system to prevent dust contamination.

Smoke samplers shall not be arranged in spaces where they may be damaged due to impacts or other factors;

[8] Refer to IMO Resolution MSC.98(73) as amended by IMO Resolution MSC.292(87)

.6 the number of smoke samplers connected to each sampling pipe shall meet the requirements of 4.2.1.7;

.7 only smoke samplers from one enclosed space may be connected to the same air sampling point;

.8 air sampling pipes shall be of a self-draining type and shall be protected against damage due to impacts and other factors during cargo handling operations;

.9 the system sensor shall actuate before the smoke density inside the measuring chamber reaches the value at which the attenuation value exceeds 6.65 per cent per 1 m;

.10 at least two mutually duplicated ventilators shall be provided for air sampling.

Ventilation capacity shall be such as to allow system operation under normal operating conditions in the protected area. Based on the capacity and pipe length, ventilators shall ensure the total response delay time (T) for the system not more than 15 s.

The size of the pipe connected shall be selected based on the ventilator suction capacity, and the pipeline shall be arranged in compliance with the requirements of 4.2.1.7.

Ventilator suction capacity shall be sufficient to allow system operation in the remotest areas during the time specified in 4.2.1.7;

.11 the control panel shall allow for smoke detection within separate air sampling pipes;

.12 provision shall be made for devices to control air flow in the suction pipes to allow sampling of equivalent amounts of air from each connected smoke sampler;

.13 the internal diameter of the sampling pipes shall not be less than 12 mm. Where the pipes are also used in a fixed gas extinguishing system, the minimum diameter of such pipes shall be sufficient to feed the amount of extinguishing media required into the protected space within the time specified;

.14 arrangements shall be provided for periodic sampling pipe blow-down with compressed air;

.15 the control panel shall be positioned at the navigation bridge, the central control station or the CO_2 extinguishing station. Where the control panel is provided in the central control station or the CO_2 extinguishing station, the alarm panel shall be fitted at the navigation bridge;

.16 provision shall be made to test the system for correct actuation when normal operation is resumed with no components replaced;

.17 the detection of smoke or other combustion products shall trigger visible and audible alarms on the control panel and alarm panels;

.18 energy sources for system operation shall be monitored for the purposes of power failure detection. Power loss may trigger visible and audible alarms on the control panel and at the navigation bridge that shall be different from the smoke alarms (refer also to 7.5.4, Part XI "Electrical Equipment");

.19 the control panel shall be fitted with arrangements for manual confirmation of the failure signals received. Detectors of the audible alarm on the control panel and the alarm panels may be switched off manually. The control panel shall have clearly identified indicators of normal system operation, emergencies,

alarms received, failures and switched off signals;

.20 the system shall be so arranged that after troubleshooting it may be automatically set up for normal operation;

.21 manuals and spare parts shall be provided as required for tests and system maintenance.

4.2.1.7 Following installation, the system shall be checked in operation using a smoke generator or an equivalent device. When the smoke reaches the remotest smoke sampler, an alarm shall be triggered on the control panel and shall be displayed for not less than 180 s for vehicle decks and 300 s for container and general cargo holds.

4.2.2 Manual alarms

4.2.2.1 Manual fire alarm detectors shall be provided in ships fitted with fixed fire detection and alarm systems in accordance with 4.2.1.1.

4.2.2.2 Manual fire alarm detectors shall be fitted in all accommodation and service spaces and control stations with account of the requirements of 4.2.1.2.3.3. Installation of manual fire alarm detectors may be omitted in separate spaces within accommodation and service spaces and control stations. Manual detectors shall be installed next to each exit (from inside or outside) to open decks from the alley ways so that each pert of the alley way is not more than 20 m away from the manual detector.

4.2.2.3 Service spaces and control stations with only one exit leading to the open deck shall have manual detectors arranged not more than 20 m away from the exit.

The distance from the exit to the manual detector shall be measured along the escape route with account for the length of stairways and/or alley ways.

4.2.2.3.1 Manual detectors in separate spaces with low to zero fire hazard, e. g. in empty spaces and CO_2 extinguishing stations, are not necessary.

Manual detectors also need not be fitted next to exits from the navigation bridge, provided that the fire alarm panel is positioned in the bridge.

4.2.2.4 In special category spaces, manual fire alarm detectors shall be so arranged that no part of the space is more than 20 m away from the detector, and one detector shall be fitted next to exits from such spaces.

4.2.2.5 All manual fire alarm detectors shall be painted yellow and shall be properly illuminated in normal and emergency conditions. Detector button shall be fitted in a glass case.

4.2.2.6 In separate spaces provision shall be made for fire detection and alarm system shutdown for the period of specific works upon special consideration by the Register. In this case, arrangements for detector shutdown shall be set for automatic reversal to normal operation after the preset time is over.

4.2.3 Protection of permanently unattended machinery spaces

4.2.3.1 Category A permanently unattended machinery spaces as well as heated air ducts and main boiler or essential auxiliary boiler uptakes with steam-generating capacity of more than 3 t/h or organic coolant boilers (including waste heat boilers) located in such spaces shall be equipped with automatic fire alarm systems (refer also to 2.2.4, Part IX "Machinery").

4.3 WARNING SYSTEMS

4.3.1 Automatic systems for warning of the extinguishing media discharge shall be fitted in normally attended or accessed spaces that have doors or hatches for this purpose, including enclosed ro-ro spaces and holds of refrigerated container carriers. In standard cargo spaces, as well as in small-size spaces (compressor rooms, paint lockers etc.) provided with local control of the fire extinguishing means only, no warning alarm systems are necessary.

4.3.2 Fire extinguishing system actuation alarm shall be sent only within the space into which the extinguishing system is discharged.

Audible alarms shall be so arranged that the signal is heard in every part of the protected space with all machinery in operation, and shall differ from other audible signals in terms of acoustic pressure adjustment or sound characteristics.

4.3.3 The warning alarm systems shall be interlocked with the local and remote control stations for fire extinguishing system start so that its actuation is provided automatically any time the doors of starting cabinets are opened.

An automatic delay (not less than 20 s) in the extinguishing media supply into the protected space shall be provided for the period starting from alarm actuation so that personnel is able to leave the space before the extinguishing media is discharged there.

4.3.4 The fire extinguishing system actuation alarm shall be clear, easily audible among the noise in the space, and shall differ from other signals in tone.

Visual alarm "Gas! Leave the space!" shall be provided in addition to the audible alarm as per 4.3.2, and in spaces protected by aerosol extinguishing systems – "Aerosol! Leave the space!".

4.3.5 The audible alarm in the pump room in oil tankers shall be:

pneumatic driven by fresh dry air; or

electrical of the non-sparking type, or

electrical with a drive outside the pump room.

5. FIRE-FIGHTING OUTFIT, SPARE PARTS AND TOOLS

5.1 FIRE-FIGHTING OUTFIT

5.1.1 Items of fire-fighting outfit shall comply with Fire Safety Systems Code and be of approved type and ready for use at any time. Fire-fighting outfit shall be conveniently located so that it can be accessed easily.

In passenger ships the location of fire-fighting outfit shall be marked by luminescent material or by lighting. Such luminescent markers or lighting shall meet the requirements of 8.5.5, Part III "Equipment, Arrangements and Outfit" and International Code for Fire Safety Systems.

5.1.2 Depending on the purpose and size of the ship the standards for supplying portable fire-fighting appliances, apparatus and consumable materials shall be in compliance with Table 5.1.2.

Items of outfit in addition to those specified in the Table 5.1.2 shall be provided on ships carrying dangerous goods in accordance with 7.2.10, oil recovery ships according to 6.4.11, ships with distinguishing marks **FF** and **FFWS** in the class notation according to 6.6.11, as well

as ships equipped with helidecks with marks **HELIDECK**, **HELIDECK-F** or **HELIDECK-H** according to 6.1.1.3.

5.1.3 The couplings of all portable items of outfit (fire hoses, fire hose nozzles, portable foam generators, etc.) shall be of the standard quick-acting type and size adopted for the given ship.

Unless one hose and nozzle is provided for each hydrant in the ship, there shall be complete interchangeability of hose couplings and nozzles.

All couplings and items of outfit shall be made of a material resistant to marine environment.

Items of fire-fighting outfit installed in the dangerous areas, rooms and spaces as well as on the open decks of oil tankers and oil recovery ships, gas carriers and chemical tankers shall be of type preventing spark formation.

Aluminium alloys shall not be used for hose couplings and nozzles on weather decks of oil takers and chemical tankers.

5.1.4 Fire hoses shall comply with the following requirements:

.1 shall have a length not less than 10 m, but not more than:

.1.1 15 m in machinery spaces;

.1.2 20 m in spaces other than those specified in 5.1.4.1.1 and on weather decks;

.1.3 25 m on weather decks of ships with maximum breadth more than 30 m.

In any case the fire hose length shall be sufficient to deliver a jet of water to any of the spaces where their use may be required.

In case the requirements of **5.1.4.1.1**to **5.1.4.1.3** for hose length are not fulfilled (as standard length) the length of hose shall provide efficient and trouble-free use in accordance with **5.1.4.1.1**to **5.1.4.1.3**, and meet the requirements of **5.1.4.3**;

.2 they shah be made of approved materials resistant to wear and destruction by microorganisms (rotting);

Table 5.1.2

No. No.	Items of outfit	Number of items of outfit to be available on each ship
1	2	3
1	Fire hoses with couplings (refer to 5.1.4) **.1** for water;	In accordance with the number of hydrants fitted on board ship
	.2 for foam solution	In accordance with the number of fire hydrants to which foam solution is supplied from fixed foam fire extinguishing system. If the size of the water hoses required by 1.1 is suitable for handling foam solution, such hoses may be taken into account to complete the number of hoses to be coupled to the hydrants fitted on the upper decks
2	Fire hose nozzles: **.1** dual-purpose nozzles for producing a compact and a sprayed jet (refer to	**.1** In accordance with the number of hydrants fitted on board ship. **.2** On ships with helideck 2 additional hoses shall be installed ac-

	5.1.5);	cording to 6.1.1.3.3.
	. .2 air-foam nozzles (refer to 5.1.6);	In accordance with the number of hydrants whereto foam solution is supplied from fixed foam fire extinguishing system, but not less than 4
	.3 foam extension pipes (refer to 5.1.7);	In accordance with the number of air-foam nozzles for fire extinction in cargo tanks.
	.4 portable foam generators or portable combination-foam production units (refer to 5.1.19);	Twice the rated number of foam generators
	.5 extension pipes (refer to 5.1.7).	50 % of the number of portable foam generators or combination-foam production units intended for fire extinction in the cargo tanks.

Table 5.1.2.

1	2	3
3	Portable foam applicator (refer to 5.1.8)	**.1** In machinery spaces at least one set in spaces containing internal combustion engines and one set in each boiler room or externally close to the entrance to the boiler room; **.2** For fuel oil storage tanks (except for double bottom tanks), 1 set for each space adjacent to the walls or decks of the tanks. Where the walls of the tanks are adjacent to machinery spaces of category A, the sets contained in the latter spaces may be regarded as sets required for protecting the fuel oil storage tanks; **.3**In each fuel distributing station and each cargo hose room, 1 set; **.4**In working spaces referred to in 1.5.8.1, 1 set per fire hydrant fitted, but not more than 3 sets are required for each space. A space of less than 150 m^2 need not have more than 1 set; **.5** In ships with spaces specified in 1.5.4.3, 1.5.4.4 and 1.5.9 not less than two sets for use in these spaces and additionally one set in each such space if vehicles with fuel in their tanks for self propulsion are carried therein. There is no need to provide sets for weather decks used for the carriage of vehicles with fuel in their tanks, as well as for cargo spaces used for the carriage of vehicles with fuel in their tanks which are loaded in open or closed containers. **.6** On open deck of container ships, 2 sets.
4	Portable foam fire extinguishers, dry powder fire extinguishers and carbon dioxide fire extinguishers (refer to 5.1.9). The use of dry powder fire extinguishers is	Ships of gross tonnage 1000 and above shall have at least 5 portable fire extinguishers. The minimum number of fire extinguishers at control stations, accommodation and service spaces shall be determined on the basis of 2 fire extinguishers for every 25 m or part thereof, of the deck length on which such spaces are situated, but not less than the number required in accordance with the following provisions: **.1**) **control stations**: **.1.1** 1 foam fire extinguisher for each space, 1 fire extinguisher be-

	permitted in all spaces instead of foam and carbon dioxide fire extinguishers	ing permitted to be fitted in the corridor for a group of small spaces with a total area of up to 50 m^2, provided that the entrances to the spaces are adjacent and situated in the same corridor. One additional carbon dioxide fire extinguisher when main switchboards are arranged in the main machinery control room. **.1.2** 1 carbon dioxide fire extinguisher for each space or group of spaces (as specified in 4.1.1 of this Table) containing electrical or radio equipment, as also for chart compartments;

Table 5.1.2.

1	2	3
		.1.3 1 foam fire extinguisher for each space containing an emergency diesel-generator or a fire diesel-driven pump; **.1.4** two dry powder fire extinguishers in the wheelhouse. If the wheelhouse is less than 50 m^2, only 1 fire extinguisher is required. If the wheelhouse is adjacent with the chartroom and has a door giving direct access to the chartroom, no additional fire extinguisher is required. The same applies to the safety centres if they are within the boundaries of the wheelhouse in passenger ships. **.2 [2] Accommodation and service spaces:** **.2.1** for each full or partial 25 m of length of corridors within each deck and main vertical zone, 1 foam fire extinguisher; **.2.2** for each full or partial 250 m^2 of area of public spaces, 1 foam fire extinguisher; For spaces less than 15 m^2 in area fire extinguishers fitted near them may be used; **.2.3** in galleys and bakeries with oil-fired equipment, 1 foam fire extinguisher for each space. For galleys with deep-fat fryers, 1 additional fire extinguisher fit for extinguishing cooking grease, fat and oil; **.2.4** in galleys and bakeries with electrical, steam, coal- or gas-fired equipment, having the area of more than 50 m^2, 1 foam or carbon dioxide fire extinguisher; **.2.5** in other domestic service spaces, 1 foam fire extinguisher (where fire extinguishers are available in the corridor, at the entrance to the space, provision of fire extinguishers within the space is not compulsory); **.2.6** in each stairway enclosure and in each lobby, 1 foam fire extinguisher; **.2.7** in storerooms for readily flammable (refer also to 3.1.3.4) and combustible materials, 1 foam fire extinguisher for each space. Where the storeroom area is less than 50 m^2, the fire extinguishers may be kept in the corridor in close vicinity of the entrance to the space concerned or group of small spaces (with a total area not more than 50 m^2). **.2.8** in the hospital, 1 dry powder fire extinguisher. In addition to the above number of fire extinguishers, within the other ship's spaces the number of fire extinguishers shall be deter-

		mined as follows. **.3** In machinery spaces containing internal combustion engines the portable foam fire extinguishers shall be located within 10 m from any point of the space. Each such space shall contain not less than 2 fire extinguishers.

Table 5.1.2.

1	2	3
		.4 In machinery spaces containing oil-fired boilers — two foam fire extinguishers nearby each boiler front. If oil-fired units are located in this space — two additional foam fire extinguishers. In enclosed spaces with oil-fired inert gas generators, incinerators and waste disposal units, 2 foam fire extinguishers. **.5** In machinery spaces containing steam turbines or enclosed steam engines the number of fire extinguishers is determined in accordance with 4.3. However, such fire extinguishers shall not be required in addition to those specified in 4.4. **.6** In spaces containing electric machinery or equipment: **.6.1** 1 carbon dioxide fire extinguisher, for spaces containing main internal combustion or steam machinery, if the total power of the main machinery is less than 740 kW; **.6.2** 2 carbon dioxide fire extinguishers, for spaces containing main internal combustion or steam machinery, if the total power of the main machinery is equal to, or more than, 740 kW; **.6.3** 1 carbon dioxide fire extinguisher for each electric generator or group of generators, the total power being 500 to 1000 kW; **.6.4** 1 carbon dioxide fire extinguisher for each space or group (not more than three) of small spaces containing auxiliary machinery with electrical drives and for special electrical spaces. The carbon dioxide fire extinguishers required by this sub-item shall be provided in the above spaces whether or not provision is made for foam extinguishers required by other sub-items of this Table. **.7** In separate spaces containing switchboards, 2 carbon dioxide fire extinguishers per space. In space having an area of 15 m^2, 1 carbon dioxide fire extinguisher, near the entrance to the space. **.8** At the entrance to accumulator battery rooms, other than those for radio stations and emergency fighting, 1 carbon dioxide fire extinguisher per space. **.9** In compartments for auxiliary machinery, 1 foam fire extinguisher, when the space area is 50 m^2 and more, otherwise the fire extinguisher placed near the entrance to such space may be sufficient. **.10** For oil fuel tanks, other than those of double bottom, not less than 2 foam fire extinguishers in each space adjacent to the walls or decks of the tanks. If such adjacent spaces are already provided with fire extin-

		guishers, no additional fire extinguishers are required.

Table 5.1.2.

1	2	3
		.11 In cargo pump rooms, 2 foam fire extinguishers; in other pump rooms, fuel oil distribution stations, in the fuel pipe trunks, hose spaces, 1 foam fire extinguisher for each 30 m^2 of the space floor. **.12** In working spaces, 2 foam fire extinguishers, if the space area is under 100 m^2, plus 1 foam fire extinguisher for every 250 m^2 or part thereof, if the space area is more than 100 m^2. **.13** In welding shops and in storerooms for welding equipment, 1 foam fire extinguisher and one carbon dioxide fire extinguisher per space. **.14** In special category spaces, cargo spaces for motor vehicles with fuel in their tanks and in ro-ro cargo spaces on each deck, 1 fire extinguisher for each 20 m of deck length on both sides. At entrances to such spaces from accommodation and machinery spaces, 1 foam fire extinguisher. There is no need to provide additional fire extinguishers for weather decks used for the carriage of vehicles with fuel in their tanks, as well as for cargo spaces used for the carriage of vehicles with fuel in their tanks which are loaded in open of closed containers. **.15** At each entrance in the periodically unattended machinery spaces of category A, 1 foam fire extinguisher. **.16** In workshops forming part of machinery spaces, 1 dry powder fire extinguisher. **.17** During carriage of dangerous goods on deck, 2 fire extinguishers each having a capacity of not less than 6 kg of dry powder or equivalent. **.18** On the weather deck of tankers, 2 fire extinguishers each having weight of not more than 23 kg in the charged condition. **.19** On ships with helideck additional carbon dioxide fire extinguishers shall be provided according to 6.1.1.3.2.
5	Foam fire extinguishers of at least 45 1 capacity or at least 16 kg carbon dioxide or dry powder fire extinguishers (refer to 5.1.10 and 5.1.11).	**.1** In machinery spaces containing internal combustion engines in number according to 5.1.10.4. **.2** In machinery spaces containing steam turbines or enclosed steam engines in number according to 5.1.10.4, however such fire extinguishers are not required if the space is protected by a fixed fire extinguishing system according to Table 3.1.2.1.

Table 5.1.2.

1	2	3
		.3 In the working spaces, referred to in 1.5.8.1, 1 fire extinguisher mentioned in 5.1.11 for every 300 m^2 or part thereof, of each working space (bounded by watertight and gas-tight bulkheads). **.4** In spaces containing electric generators or propulsion motors with the total power output being 1000 to 5000 kW, 1 fire extinguisher according to 5.1.11 for each space. **.5** In separate spaces containing electric switchboards if the switchboard length is more than 5 m and the space is not protected by means of a fire smothering system, 1 fire extinguisher mentioned in 5.1.11 for a space. **.6** On ships with helideck additional dry powder fire extinguishers shall be provided according to 6.1.1.3.1.
6	Foam fire extinguishers, at least 135 l capacity, or at least 45 kg carbon dioxide fire extinguishers or dry powder fire extinguishers (refer to 5.1.10 and 5.1.11).	**.1** In machinery spaces containing oil fuel units as well as oil-fired boilers — one fire extinguisher per each space. In boiler rooms with domestic boilers of less than 175 kW the fire extinguisher is not required. **.2** In spaces containing electric generators and propulsion motors with the total power output 5000 kW and over, 1 fire extinguisher according to 5.1.11 for a space. Three fire extinguishers in accordance with item 5 of this Table may be used instead of one fire extinguisher prescribed by this item.
7	Metal receptacles containing sand or sawdust (refer to 5.1.12).	1 receptacle in: each firing space in each boiler room with oil-fired boilers; each space containing a part of the fuel oil unit, as well as near lamp and paint lockers, fuel filling and distributing positions and in other fire hazardous areas where fuel oil or other flammable liquids are liable to spread (except for machinery spaces). 1 receptacle containing sand or dry sawdust impregnated with soda may be replaced by 1 portable foam fire extinguisher.
8	Blankets (refer to 5.1.13).	**.1** 1 blanket for every 40 m, or part thereof, of open deck length of oil tankers and passenger ships. **.2** In all other ships not referred to in 8.1 of this Table, 1 blanket, if the ship is up to 1000 gross tonnage, and 2 blankets, if the ship is of 1000 gross tonnage and upwards. **.3** In machinery spaces of category A in ships of more than 500 gross tonnage, 1 blanket for each space. **.4** In working spaces indicated in 1.5.8.1, 1 blanket for each space. **.5** On ships with helideck — according to 6.1.1.3.5.

Table 5.1.2.

1	2	3
9	Sets of fire fighting tools (refer to	For gross tonnage of: up to 2000 – 1 set; from 2000 up to 4000 – 2 sets; from 4000; up to

	5.1.14).	10000 – 3 sets; from 10000 and over – 4 sets.
10	of a set Fireman's outfit (refer to 5.1.15).	**.1** In passenger ships, 2 sets and additionally for every 80 m, or part thereof, of the total length of all accommodation and service spaces on the deck they are situated, or if there are more than one such deck on the deck with the maximum total length of the above spaces 2 sets in accordance with 5.1.15 and 2 sets of personal outfit in accordance with 5.1.15.1.1 to 5.1.15.1.3. In passenger ships carrying more than 36 passengers, two additional fireman's outfits shall be provided for each main vertical zone. However, for stairway enclosures which constitute individual main vertical zones and for the main vertical zones in the fore or aft end of the ship, which do not contain spaces of categories (6), (7), (8) or (12) (refer to 2.2.1.3), no additional fireman's outfits are required. **.2** In oil tankers and combination carriers of 500 gross tonnage and upwards, 4 sets. **.3** on cargo ships with gross tonnage more than 2: **.4** In ships equipped with helidecks additional equipment according to 6.1.1.3.4.
11	Portable electric or pneumatic drills (refer to 5.1.16).	In all ships of 4000 gross tonnage and upwards, 1 drill per ship.
12	Portable fire motor-pumps[1] complete with suction and delivery hoses and fire hose nozzles (refer to 5.1.17).	**.1** In ships where the fixed water fire main system is not fitted according to 3.2.1.6, 1 pc per ship. **.2** As emergency fire pump (refer to 3.2.1.2) – 1 pc per ship.
13	International shore connection (refer to 5.1.18).	In all ships of 500 gross tonnage and upwards, and on the floating cranes, 1 set.
14	Foam concentrate	Full amount of foam concentrate required by 3.7.
15	Gaz analyzers: (refer to 5.1.22)	
	.1 for vapours of flammable liquids and exhaust gases;	In ships carrying motor vehicles with fuel oil (other than diesel oil) in their tanks and in ships with spaces specified in 1.5.4.3.1, 1.5.4.4.1 1.5.9 — 1;
	.2 for vapours of flammable liquids;	In oil tankers and combination carriers — 1 (refer to 5.1.22); In oil tankers fitted with inert gas system — 1 portable gas analyzer capable to operate in the inert gas atmosphere in addition to the above
	.3 for oxygen content;	In oil tankers and combination carriers — 1 (refer to 5.1.22);
	.4 for oxygen content and gas detection;	In ships carrying solid bulk cargoes which are liable to emit toxic or flammable gases or cause oxygen depletion in the cargo space — 1
16	Fog applicator (refer to 5.1.20).	**.1** In passenger ships carrying more than 36 passengers: in each machinery space of category A, 2 pcs; **.2** In passenger ships carrying more than 36 passengers: for each pair

		of breathing apparatuses (refer to 5.1.15.2), 1 pc;**.3** In each space: for the carriage of vehicles, ro-ro spaces and special category spaces intended for the carriage of vehicles with fuel in their tanks for self propulsion, 3 pcs. There is no need to provide applicators for weather decks used for the carriage of vehicles with fuel in their tanks as well as for cargo spaces used for the carriage of vehicles with fuel in their tanks which are loaded in open or closed containers.
17	Fire buckets (refer to 5.1.21)	In ships having no water fire main system, 3 buckets.
18	Emergency Escape Breathing Devices (EEBD) (refer to 5.1.23)	**.1** Within accommodation spaces: **.1.1** in cargo ships, 2 pcs; **.1.2** in passenger ships, 2 pcs in each main vertical zone. In passenger ships carrying more than 36 passengers, in addition to those required, two additional EEBD shall be provided in each main vertical zone. This requirement is not applied to stairway enclosures comprising separate main vertical zones and to main vertical zones at both ends of a ship which do not have spaces of categories (6), (7), (8) or (12) specified in 2.2.1.3. **.2** In machinery spaces EEBD shall be located at easily visible places, which can be easily accessed in case of fire. The location of EEBD shall take into account the arrangement of the equipment and the number of persons usually manning the space: **.2.1** in machinery spaces of category A containing internal combustion engines used for main propulsion; **.2.1.1** in the main machinery control room, if located within the machinery space, 1 pc; **.2.1.2** in workshop area, 1 pc. If there is a direct exit from the workshops, not entering the engine room, an EEBD is not required;

End of Table 5.1.2.

1	2	3
		.2.1.3 close to ladder constituting the means of escape from machinery space (refer to 4.5.5.2 and 4.5.10.2, Part VII "Machinery Installations"), 1 pc at each deck or platform; **.2.2** in machinery spaces of category A other than those specified in 18.2.1, 1 pc, as a minimum, located in accordance with 18.2.1.3; **.2.3** in other machinery spaces, the necessity, number and location of EEBD shall be determined on agreement with the Register; **.3** Provision shall be made for two spare EEBD for passenger ships and one spare EEBD for cargo ships. **.4** Provision shall be made for at least one EEBD for training in every ship.

[1] In non-self-propelled oil tankers, the motor-pump shall be replaced by a portable hand pump of at

least 6 m^3/h capacity with a nozzle 10 mm in diameter and a nozzle pressure of at least 0.20 MPa. The pump shall be provided with two suction hoses, each 4 m long, fitted with a non-return valve, two delivery hoses, each 20 m long, and a hose nozzle of dual-purpose type with an outlet 10 mm in diameter.

[2]In passenger ships in accommodation and service spaces the number of fire extinguishers and their arrangement shall be chosen so that the distance from any point to an extinguisher is not more than 10 m.

The fire extinguishers shall have, as far as practically possible, the same utilization methods.

[3]In passenger ships of restricted navigation areas:

B-R3-RSN, 24 m long and over, and new ships **C-R3-RSN** and **D-R3**, 40 to 60 m long — two sets of fireman outfit;

B-R3-RSN, 24 to 40 m long, — two sets of fireman outfit; however, only one bottle filled with pressurized air for EEBD may be allowed;

B-R3-RSN, less than 24 m long, and in ships **C-R3-RSN** and **D-R3**, less than 40 m long — fireman outfit is not required.

[4] Close to each power panel of at least 20 kW rated power fire extinguishers intended for high-voltage application shall be arranged.

.3 fire hoses in assembly with nozzles shah be stowed at hydrants or on open places on reels or in baskets. On open decks they shall be kept in spray-proof ventilated lockers or enclosures. The lockers and enclosures shall be marked with letters "FH" (fire hydrant) painted red;

.4 in passenger ships, there shall be provided at least one fire hose for each of the hydrants and these hoses shall be used only for fire fighting or testing at fire drills and surveys.

Additionally, in inner spaces in passenger ships carrying more than 36 passengers fire hoses shall be connected to hydrants at all times.

.5 on cargo ships:

.5.1 of 1000 and more gross tonnage, the number of fire hoses is determined one fire hose per each 30 m of length and one spare fire hose, but not less than five hoses per ship. This number doesn't include any hoses required for machinery or boiler spaces. The Register may require to increase number of hoses in order to ensure sufficient number of hoses and their accessibility at any time, considering the type of ship and character of voyages made by the ship.

A ship carrying dangerous goods shall be equipped with three additional hoses and nozzles in excess of those required above;

.5.2 of less than 1000 gross tonnage, the number of fire hoses is calculated in accordance with 5.1.4.5.1. However, the number of hoses shall be not less than three.

For fire hoses, the nozzle sizes shall be 12, 16 or 19 mm or as near thereto as possible.

For accommodations and service spaces, the nozzle size need not exceed 12 mm.

In ships under 150 gross tonnage nozzles having 10 mm in diameter are permitted to be used.

For machinery spaces and exterior locations, the nozzle size shall be such as to obtain maximum discharge possible from two jets at the pressure at each hydrant mentioned in Table 3.2.1.1 from the smallest pump, but nozzles sizes greater than 19 mm need not be used.

All nozzles shall be of an approved type incorporating a shut-off.

Fire hose nozzles made of plastic type material, e.g. polycarbonate, are considered acceptable provided capacity and serviceability are documented and

the nozzles are found suitable for the marine environment.

5.1.6 Air-foam nozzles for delivery of low-expansion foam (refer to 3.7) from fixed fire extinguishing system shall comply with the following requirements:

.1 on cargo tank deck of oil tankers each nozzle shall be capable of delivering 400 l/min of foam, in this case, the length of jet delivered by the fire hose at still-air shall be not less than 15 m (refer also to 3.7.2.3);

.2 in ship's spaces each nozzle shall be capable of delivering at least 2 l/min of foam solution per square meter of deck area;

5.1.7 Foam extension pipes with a hook-shaped bell-mouth at the end (for low-expansion foam) and extension pipes fitted with light supports at the middle (for medium-expansion foam) shall be of about 4 m in length.

An extended air-foam nozzle having a hook-shaped bell-mouth may be used in addition to the usual air-foam nozzle instead of a foam extension pipe.

5.1.8 Portable foam applicator unit.

5.1.8.1 A portable foam applicator unit shall consist of a foam nozzle/branch pipe, either of a self-inducing type or in combination with a separate inductor, capable of being connected to the fire main by a fire hose, together with a portable tank containing at least 20 l of foam concentrate and at least one spare tank of foam concentrate of the same capacity.

5.1.8.2 The nozzle/branch pipe and inductor shall be capable of producing effective foam suitable for extinguishing an oil fire, at a foam solution flow rate of at least 200 l/min at the nominal pressure in the fire main.

5.1.8.3 The foam concentrate shall be approved by the Register based on MSC.l/Circ.1312.

5.1.8.4 The values of the foam expansion and drainage time of the foam produced by the portable foam applicator unit shall not differ more than ±10 % of that determined in MSC.l/Circ.1312.

5.1.8.5 The portable foam applicator unit shall be designed to withstand clogging, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered on ships.

5.1.8.6 The portable foam applicator units shall be located near hydrants.

5.1.9 Portable fire extinguishers shall be of type and design approved by the Register taking into account the IMO Guidelines (refer to IMO resolution A.951(23)) and shall comply with the following requirements:

.1 no fire extinguishing medium shall be used which, either by itself or under anticipated conditions of application, would give off toxic gases in amounts dangerous to human health;

.2 fire extinguishers shall have safety devices preventing the pressure therein to rise above permissible limits;

.3 for 100 % of the first ten fire extinguishers and 50 % of the remaining fire extinguishers capable of being recharged onboard shall be provided with spare chargers. A total of not more than 60 % of spare charges of the total number of fire extinguishers are required. Instructions for recharging shall be available on board;

.4 for fire extinguishers which cannot be recharged onboard, additional portable fire extinguishers of the same quantity, type, capacity and number, as determined in 5.1.9.3 above, shall be provided in lieu of spare charges;

.5 fire extinguishers shall be mounted in special brackets of quick-detachable type at places easily visible and accessible in case of fire, and in such a way that their serviceability is not impaired by the weather, vibration and other external factors.

They shall be located at the height of not more than 1.5 m from deck and not closer than 1.5 m from sources of heat;

.6 one of the portable fire extinguishers intended for use in any space shall be stowed close to the entrance to that space;

.7 each powder or carbon dioxide fire extinguisher shall have capacity not less than 5 kg, and each foam fire extinguisher — not less than 9 l.

Mass of any portable fire extinguisher shall not exceed 23 kg.

Portable fire extinguishers shall have efficiency, which, in compliance with the recognized international or national standard, is at least equivalent to the efficiency of a 9-litre wetting agent fire extinguisher, which is determined when extinguishing model fire seat of A class, rating 2A;

.8 powder fire extinguishers shah be selected wife regard for the purpose of fee powder extinguishing medium;

.9 in fee machinery spaces fire extinguishers shall be so located feat an extinguisher is not more than 10 m walking distance from any point in fee space;

.10 carbon dioxide fire extinguishers shah not be located in accommodation spaces. In control stations and other spaces containing electrical or electronic equipment or facilities required for ship safety, fire extinguishers shall be provided, charged with the fire extinguishing medium, which does not conduct electricity and does not cause harm to equipment and facilities.

.11 portable fire extinguishers shall be provided with a visual indication of discharge;

.12 casing and other components of the fire extinguishers subject to internal pressure shall be tested by hydraulic pressure:

2.7 times exceeding the maximum working pressure, but not less than 5.5 MPa for the low pressure fire extinguishers (with working pressure not more than 2.5 MPa at environmental temperature of 20 °C);

determined in accordance with recognized national standard on safety of pressure vessels — for high pressure fire extinguishers (with working pressure more than 2.5 MPa at environmental temperature of 20 °C);

.13 fire extinguishers shall be suitable for operation under exposure to ambient temperatures according to Table 2.3.1-2, Part VII "Machinery Installations" with due regard for the materials used and maximum degree of filling established by the manufacturer.

The degree of filling for carbon dioxide fire extinguishers shall not exceed 0.75 kg/l;

.14 materials used for the manufacture of fire extinguishers, which can be exposed to marine environment during operation shall be selected with consideration for their compatibility;

.15 each fire extinguisher shall be clearly marked with at least the following information:

.15.1 manufacturer;

.15.2 types of fire for which the fire extinguisher is suitable and its fire-extinguishing capability (i.e. capability to

extinguish a model fire seat under certain conditions);

.15.3 type and nominal quantity of extinguishing medium with which the fire extinguisher is charged;

.15.4 information on the Register approval;

.15.5 instruction on actuating the fire extinguisher in the form of several pictograms with explanatory note in the language understandable to potential user, in general case, in Ukrainian and in English;

.15.6 year of manufacture;

.15.7 range of temperatures within which the fire extinguisher is operable;

.15.8 test pressure;

5.1.10 Foam fire extinguishers of at least 45 and 135 l shall meet the following requirements:

.1 fire extinguishers shall be located within the protected space, in regular fixed places near the exits.

Only fresh water shall be used for charging the fire extinguishers;

.2 the air for an air-foam extinguisher shall be kept in a cylinder provided solely for that particular extinguisher. The quantity of air in the cylinder shall be at least 25 % in excess of the rated amount. The air cylinder shall be fitted with a pressure gauge;

.3 fire extinguishers having capacity of not less than 135 l shall be provided with hoses winded on reels and provide access to any place of boiler room;

.4 location of 45-litre fire extinguishers (or their equivalents) in machinery spaces, specified in 5.1, 5.2 and 5.6 of Table 5.1.2, shall ensure the delivery of the fire extinguishing medium to any part of the fuel system, to pressure lubricating systems, drives casings covering turbine parts lubricated under pressure, engines and associated drives and other fire risk equipment.

In cargo ships a fire extinguisher having a capacity of 45 l (or equivalent) may be located outside the space for which it is intended.

5.1.11 Carbon dioxide or dry powder fire extinguishers of at least 16 and 45 kg shall meet the following requirements:

.1 carbon dioxide fire extinguishers shall not be used in spaces of such volume that the complete discharge of the carbon dioxide contained in the cylinders is liable to cause concentration of carbon dioxide in excess of 5 %;

.2 an extinguishing medium shah be delivered to any part of the protected space through fire hoses of 10 to 15 m in length and through pipes if necessary;

.3 fire extinguishers shall be placed near the exits in the spaces and shall be protected against mechanical damage.

5.1.12 Metal receptacles containing sand or dry sawdust impregnated with soda shall comply with the following requirements:

.1 the capacity of the receptacles shall be at least 0.1 m^3;

.2 each receptacle shall be provided with a readily opening watertight cover, a scoop and a device for holding the cover in the open position.

5.1.13 Fire smothering blankets shall comply with the following requirements:

.1 they shall be sufficiently stout and durable;

.2 as a rule, they are to be made of non-combustible material; clean unraised thick felt may be used;

.3 blankets shall be stowed in special cases or lockers;

.4 they shall have an area of at least 3 m^2 and be similar to a square or circle

in shape.

5.1.14 Complete sets of fire fighting tools shall comply with the following requirements:

.1 one complete set shall include one fire axe and one light-weight fire crowbar;

.2 the sets of fire fighting tools shall be stowed on regular boards. The fastening of the tools shall permit of ready availability of the tools for use;

.3 in ships for the carriage of motor vehicles with fuel (other than diesel oil) in their tanks one set of tools shall be placed near the exits from the accommodation and machinery spaces to cargo spaces.

5.1.15 The fireman's outfit shall comply with provisions of Fire Safety Systems Code and shall include:

.1 personal outfit consisting of:

.1.1 protective clothing of material approved by the competent bodies to protect the skin from the heat radiating from the fire and from bums and scalding by steam. The outer surface shall be water-resistant; tarpaulin and PVC clothes are not allowed for the outer material of the fireman's outfit. The material of outer surface of the clothing shall be of the type approved by relevant authority;

.1.2 boots and mittens of rubber or of some other dielectric material;

.1.3 a rigid helmet ensuring effective protection against impacts;

.1.4 a portable safe manual lantern with a minimum burning period of 3 h;

In ships carrying dangerous goods, in oil tankers and other ships having cargo spaces and spaces where a flammable gas, vapour or dust/air mixture is present or may arise, provision shall be made for explosion-proof lamps with explosion group 1Exd or 1Exp. The explosion group and temperature class shall be consistent with the category of the cargo carried. For example, they are 1Exd IIAT3 and 1Exp IIT3 for oil, kerosene and a number of gasolines;

.1.5 a fire axe with a helve made of hard wood; if the helve is made of some other material, it shall be insulated with some suitable dielectric material;

.2 a self-contained compressed air-operated breathing apparatus, the volume of air contained in the cylinders of which shall be at least 1200 l or other self-contained breathing apparatus which shall be capable of functioning for at least 30 min.

Each breathing apparatus shall be provided with a flexible fire resisting lifeline, not less than 30 m in length. The lifeline shall be subjected to a test by statical load of 3.5 kN for 5 min and withstand this load without damage. The lifeline shall be fastened to the harness of the apparatus or to a separate belt by means of a snaphook to preclude spontaneous separation of the line from the apparatus.

Provision shall be made for two spare charges or two spare breathing apparatuses per each required self-contained breathing apparatus. All air cylinders for the apparatus shall be interchangeable.

Passenger ships carrying not more than 36 passengers and cargo ships equipped with suitably located means for fully recharging breathing air cylinders by clean air may have only one spare charge for each breathing apparatus or one spare breathing apparatus per each required self-contained breathing apparatus.

In passenger ships carrying more than 36 passengers, two spare charges or two spare breathing apparatus shall be provided per each required self-contained breathing apparatus.

Passenger ships carrying more than 36 passengers constructed on or after July 1, 2010 shall be fitted with a suitably located means for fully recharging breathing air cylinders, free from contamination. The means for recharging shall be either:

breathing air compressors supplied from the main and emergency switchboard, or independently driven, with a minimum capacity of 60 l/min per required breathing apparatus, not to exceed 420 l/min; or

self-contained high-pressure storage systems of suitable pressure to recharge the breathing apparatus used on board, with a capacity of at least 1200 l per required breathing apparatus, not to exceed 50,000 l of free air

Self-contained compressed air breathing apparatus shall be fitted with an audible alarm and a visual or other device which will alert the user before the volume of the air in the cylinder has been reduced to no less than 200 l, before July 1, 2019.

Self-contained compressed air breathing apparatus shall comply with the provisions of 2.1.2.2 of Fire Safety Systems Code before July 1, 2019. Ships built before July 1, 2012 shall also comply with the requirements of this paragraph;

.3 Fireman's outfit and personal equipment shall be ready for use and stored in readily accessible locations that are permanently and clearly marked and where more than one fireman's outfit or more than one set of personal equipment is carried on board they shall be stored in widely separated places.

In passenger ships at least two fireman's outfits and, in addition, one set of personal equipment shall be available at any such place. At least two fireman's outfits shall be stored in each main vertical zone.

.4 on ships built on July 1, 2014 or later a minimum of two two-way portable radio-telephone apparatus of an explosion-proof type or intrinsically safe for each fire party.

Ships built before July 1, 2014 shall comply with the requirements of this paragraph not later than at the time of the first survey after July 1, 2018.

.5 Means for recharging the cylinders of breathing apparatus used in the course of training or proper quantity of spare cylinders shall be provided.

5.1.16 Portable electric drills shall be provided with an electric cable of sufficient length. The use of pneumatic drills instead of electric ones is permitted. The electric or pneumatic drills specified in item 11 of Table 5.1.2 may be reckoned in the number of the items prescribed for other types of ship's outfit.

5.1.17 Portable diesel fire motor-pumps shall comply with the following requirements:

.1 the pump shall ensure simultaneous operation of at least two fire hose nozzles with an outlet diameter of at least 12 mm at a pump discharge pressure of at least 0.2 MPa and at vacuum in suction piping not less than 0.05 MPa; centrifugal pumps shall be fitted with a self-priming device;

.2 the pump motor shall be capable of being readily started either by hand or

by special starters both at above-zero and below-zero ambient temperatures. The motor shall be provided with a quantity of fuel to ensure the operation of the pump for 1.5 h without refuelling; the ship shall carry an additional reserve of fuel for refuelling;

.3 each motor-pump shall be provided with suction hoses, to a total length of 8 m, fitted with a suction strainer and a non-return valve, two delivery hoses, each approximately 10 m long, two-dual purpose fire hose nozzles with an outlet diameter of at least 12 mm and a branch coupling for connecting two hoses;

.4 the dimensions and type of coupling for the delivery hoses and nozzles shall correspond to those used in the fixed water fire extinguishing systems fitted in the ship;

.5 the motor-pumps shall be provided with tools and accessories in compliance with the manufacturer's specification;

.6 motor-pumps for use in ships navigating under northern latitudes shah be placed in heated spaces, together with the suction and delivery hoses and nozzles.

5.1.18 The international shore connection (refer to Fig. 5.1.18) for water supply from shore shall be in accordance with the following specification:

outside diameter of flange — 178 mm;

inside diameter of flange — 64 mm;

bolt circle diameter — 132 mm;

holes: 4 equispaced holes 19 mm diameter equidistantly placed, slotted to the flange periphery;

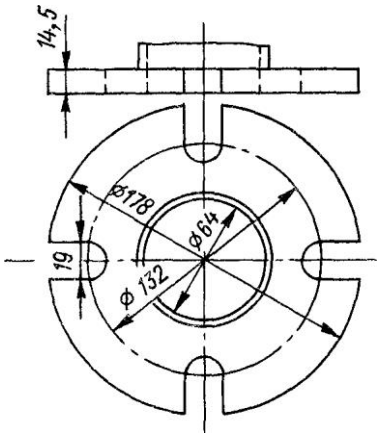
flange thickness — at least 14,5 mm;

bolts: 4 pes, each 16 mm in diameter and 50 mm in length;

bolt nuts: 4 pes, 16 mm in diameter;

washers for bolts: 8 pes.

On one side the shore connection shall have a flat-faced flange with dimensions as above, and on the other a quick-acting coupling which shall corre¬spond to the ship's hydrants and hoses both in di¬mensions and design.



The shore connection, gasket, bolts and nuts shall be made of materials suitable for 1,0 MPa.

The shore connection, gasket, bolts and nuts shall be made of materials suitable for 1,0 MPa.

The shore connection complete with gasket, four bolts, four nuts and eight washers shall be stowed together with other items of fire fighting outfit in an easily accessible position.

5.1.19 Portable medium expansion mechanical foam generators and portable combination-foam production units shall comply with the following requirements:

.1 concentrate solution discharge at a pressure of 0,6 MPa, not less than 360 1/min (refer also to 3.7.2.2);

.2 foam jet range, at least 8 m;

.3rated number of foam generators/units shall be determined by the formula

$$N=Q/q\,, \qquad (5.1.19.3)$$

Q –solution capacity of the system, in 1/min;
q - solution capacity of a foam generator/unit, in 1/min.

50 per cent of the foam generators/units and ex¬tension pipes required by items 2.4 and 2.5 of Ta¬ble 5.1.2 shall be placed in the poop, the remainder, in the forecastle and midship superstructure, if any.

5.1.20 For applicator shall consist of *L*shaped pipe with long side of about 2 m fitted for connection to fire hoses and short side of about 0,25 m equipped with fixed nozzle for producing water for or fitted for connecting water-spraying nozzle.

These applicators shall be located near the fire hyd¬rants and those for breathing apparatus near the latter.

5.1.21 Fire buckets shall be provided with the hemp rope of sufficient length and shall be stowed on the open decks in easily accessible places. The buckets shall be painted red and bear inscription "fire".

5.1.22 In tankers and combination carriers provision shall be made for use of gas analyzers with gas sampling pipes as specified in 9.14.2, Part VIIII "Systems and Piping";

gas analyzers shall be provided with a set of spares supplied by the manufacturer.

Alternatively ship may be additionally equipped with one portable instrument for measuring oxygen and one for measuring flammable vapour concentrations, or with two gas analyzers, each capable of measuring both oxygen and flammable vapour concentrations.

5.1.23 In all passenger and cargo ships of 500 gross tonnage and over provision shall be made for emergency escape breathing devices (EEBD) of a Register-approved type which shall be only used for emergency escape from a compartment with a ha¬zardous atmosphere.

EEBD shall not be used by crew for fighting fires, entering oxygen deficient void spaces or tanks. In such cases a self-contained breathing ap¬paratus specified in 5.1.15.2 shall be used.

EEBD shall comply with the following requirements:

.1 EEBD shall provide service duration of at least 10 min;

.2 EEBD shall protect eyes, nose and mouth during escape and consist of a helmet fully covering head, neck and may cover portions of the shoulders, or a mask fully covering the face so as to form a complete seal around the eyes, nose and mouth, which is secured by suitable means. The helmets and masks shall be manufactured of flame resistant materials and include a clear window for viewing;

.3 an inactivated EEBD shall be carried hands-free;

.4 EEBD shall be designed so that to enable quick and easy dressing. Brief instructions or diagrams clearly illustrating their use shall be clearly printed on each EEBD.

An EEBD, when stored, shall be suitably protected from weather exposure.

Maintenance requirements, manufacturer’s tra¬demark and serial number, shelf life and date of manufacture shall be printed on each EEBD.

EEBD intended for training shall have appropriate distinct marking.

The number and location of EEBD shall be in¬dicated on fire control plans (refer to 1.4).

5.1.24 Each patrol duty member of passenger ships with a capacity of more than 36 passengers must have a two-way personal radiophone.

5.2 SPARE PARTS AND TOOLS

5.2.1A ship shall carry spare parts and tools, the number of which shall be not less than that specified in Table 5.2.1. The quantities prescribed in the Table apply to fixed fire extinguishing systems only.

5.2.2 The spare parts and tools for the systems shall be kept in the fire extinction stations.

Spare parts shall be suitably marked.

Table 2.2.1

No. No.	Spare parts and tools	Number per ship
1	2	3
1	WATER FIRE MAIN SYSTEM **.1**a fire hose of each length and diameter fitted complete with couplings;	1 pc of each
	.2connection couplings for each size fitted (if the ship is provided with hydrants of various diameters);	2 pes
	.3quick-acting couplings (hose couplings)	2 pes (of each diameter)
	.4quick-acting couplings (hose couplings) for ships of 4000 gross tonnage and upwards	4 pes (of each diameter)
	.5rubber rings for packing of joints between couplings, hoses and apparatuses	5 per cent of total number, but not less than 10 pes
	.6hose clamps	4 pes (for ships of less than 300 gross tonnage, as many as the number of hoses, but not more than 4)
	.7wrenches for engaging or disengaging couplings (where nozzles are fitted by means of a special wrench)	according to the number of hydrants.
	.8fire hydrant of each size fitted, in assembly	1
	.9 handwheel to fire hydrant of each size fitted	1

Table 5.2.1

1	2	3
2	**.10**valve disks with packing rings to fire hydrants of each size fitted	1
	Sprinkler system: **.1**sprinkler heads, in assembly	The number of spare sprinkler heads shall be determined proceeding from their type and

		number already fitted on board: 6 - for systems having less than 300 heads; 12 - for systems having less than 300 heads; 24 - for systems having more than 1000 heads;
	.2 wrenches for sprinkler heads (where heads are fitted by means of a special wrench)	1 pc per section
	.3 parts for control valve	1 set, according to delivery specification
	Pressure water-spraying, water-screen, drenching systems: **.1** spray nozzles of various types fitted in the system	5 per cent of total number of spray nozzles fitted
	.2 wrenches for sprinkler heads (where heads are fitted by means of a special wrench)	1
4	Foam fire extinguishing system: **.1** fire hydrant of each size fitted, in assembly	1
	.2 fixed air-foam nozzle or foam generator	1
	.3 gauge glasses for tanks	1
	.4 rubber rings for joints	10
5	CO_2 system **.1** cylinder valves, assembled; for the number of cylinders:	
	Less than 50	1
	50 to 100	2
	100 and more	3
	.2 wrenches for assembling and disassembling cylinder valves and other special valves	1 set per station
	.3 plugs to be fitted on pipes leading from cylinder valves, when cylinders are removed	25 per cent of the number of cylinders
	.4 protective diaphragms	In accordance with the number of cylinders
	.5 thrust bushes and washers for protective devices	10 per cent of the number of cylinders
	.6 non-return valves	5 per cent of total number, but not less than 1 ps
	.7 discharge nozzles of each type and size fitted	2
	.8 scales for weighing cylinders or carbon dioxide level gauge	1

End of Table 5.2.1

1	2	3

	.9 parts of tank carbon dioxide contents gauges	In accordance with delivery specification
6	Inert gas smothering system: **.1**control valve (sluice valve) for admitting inert gas into protected spaces	1
	.2parts for automatic control	In accordance with delivery specification
7	Dry chemical system pipelines **.1** parts of release arrangements for hand hose lines and monitors	1 set of each
	.2 discharge nozzles of each type and size fitted	1 – 2.
	.3 wrenches for assembling and disassembling valves, hand hose lines, nozzles	1 set
8	Aerosol system: **.1** fire extinguishing aerosol generators;	One generator of each type used
9	Miscellaneous items, for all systems: **.1** control and measuring instruments pressure gauges, vacuum gauges, thermometers of each type fitted in systems	1 pc of each
	.2 adequate quantity of packing material for onboard repairs	1 set
	.3 fuses for automatic closing of fire doors and dampers	In accordance with number of doors and dampers thus controlled
	.4 spare parts for pumps, fans, compressors and engines serving fire extinguishing systems	In accordance with Section 5, Part VII "Machinery Installations"
	.5spare parts for electrical equipment of fire extinguishing systems	In accordance with Section 21, Part XI "Electrical Equipment"

6. REQUIREMENTS FOR FIRE PROTECTION OF SPECIAL PURPOSE SHIPSAND SPECIAL FACILITIES ON SHIPS

6.1 SHIPS EQUIPPED WITH HELIDECKS

6.1.1 Fire protection measures for helidecks

6.1.1.1 Requirements of this subsection supplement the requirements of Sections 1 – 5 and shall apply to helidecks and its fuel filling equipment, as well as to helicopter hangars.

Helideck – is a place on a ship specially equipped for helicopter landing, with all the necessary constructions, fire fighting equipment and other instruments and facilities required for safe helicopter operation.

6.1.1.2 Helideck must be equipped with a fixed foam extinguishing system complying with requirements of Table 20 3.1.2.1 and with specifications as per 3.7.2.12.

The foamer must be suitable for sea water and at least meet the minimum requirements of International Civil Aviation Organization (ICAO).

Location and specifications of foam

extinguishing equipment must allow using it for extinguishing of helicopter high-mounted parts.

6.1.1.3 The following fire fighting equipment must be located and stored in close vicinity to the entrance to a helideck, next to the equipment required for entrance:

.1 A minimum of two foam fire extinguishers with a total capacity of 45 kg;

.2 Carbon dioxide fire extinguishers with a total capacity of not less than 18 kg, or relevant fire extinguishers with an approved gas-alike fire extinguishing composition;

.3 al least two combined portable fire lances and hoses with a length sufficient to reach any part of a helideck;

.4 two complete fire fighting equipment kits for firemen, additionally to those specified in it. 10 of Table 5.1.2;

.5 at least the following rescue equipment, which must be stored in conditions allowing its immediate deployment in a case of emergency:

screw spanner;

fire blanket;

cutting jaws with a 60 cm handle;

hook or pike pole;

rigid metal saw with 6 spare blades;

stern ladder;

shot line 15 m long and 5 mm in diam.;

vice grip pliers;

a kit of screw drivers;

rigging cutter.

6.1.1.4 Rescuing equipment compliant with the requirements of ICAO and a flag country must be available at a helideck for rescuing and rectification of accidents consequences.

Emergency rescue equipment must be stored in tightly closed containers painted accordingly, near a helideck. These containers must have relevant labels which indicate their content.

6.1.2 Fire protection measures for helicopter fuel filling and maintenance rooms, as well as hangars.

Fire protection measures, fixed fire extinguishing equipment and fire alarm system of hangars and fuel filling facilities mush comply with the A category machinery spaces requirements.

6.1.2.2 Restricting constructions of helicopter hangars and maintenance and fuel filling rooms must be made of steel.

6.1.2.3 Helicopter hangars and fuel filling rooms must be equipped with 'NO SMOKING!' signs .

6.1.2.4 Storage of highly inflammable liquids and materials, oils, hydraulic fluids and other relevant items is strictly prohibited.

6.2 SPECIAL PURPOSE SHIPS

6.2.1 General.

6.2.1.1 The fire protection of special purpose ships shall be arranged depending on the number of persons carried on board:

.1 not more than 60 persons — similar to that of cargo ships of more than 500 gross tonnage;

.2 more than 60, but not more than 240 persons — similar to that of passenger ships carrying not more than 36 passengers;

.3 more than 240 persons — similar to that of passenger ships carrying more than 36 passengers.

6.2.1.2 Fire protection of working spaces specified in 1.5.8 shall be arranged with due regard for the purpose of the working space and equipment located therein.

As a rule the fire protection of working spaces shall be arranged similar to that of service spaces specified in 1.5.3.

.2.1 storerooms for explosives;

6.2.2.1 In special purpose ships the arrangement ofstorerooms for explosives (magazines) may be permitted. The magazines shall be of the following types:

.1 integral magazines forming an integral part of the ship;

.2 portable magazines that are non-integral, portable magazines with a capacity of 3 m3 or greater;

.3 magazine boxes that are non-integral, portable magazines with a capacity of less than 3 m3.

6.2.2.2 Integral magazines shall be located in the forward or after portion of the ship and be located not less than one watertight space apart from the propeller shaft, propeller and rudder.

They shall not be located below accommodation spaces, control stations and be adjacent to them.

6.2.2.3 Integral magazines shall not be adjacent to machinery spaces of category A, galleys and other dangerous spaces.

If it is necessary to locate the magazine in proximity to these areas, a cofferdam of at least 0,6 m shall be provided separating two spaces.

Such a cofferdam shall not be used for stowage and shall be provided with ventilation. One of the bulkheads forming the cofferdam shall be of "A-15" class, if it is adjacent to machinery space of category A it shall be "A-30" class.

6.2.2.4 Access to integral magazines shall preferably be from the weather deck, but in no case through spaces specified in 6.2.2.2 and 6.2.2.3.

6.2.2.5 Portable magazines and magazine boxes shall be located on a weather deck in a location protected from direct impact of the sea. The location shall provide sufficient protection against warm air and hazardous vapours being emitted from galleys, pump rooms, etc. Due regard shall be paid to possible risk of subjecting certain explosives to radio emissions.

6.2.2.6 Magazine boxes shall be located on a weather deck at least 0,1 m from the deck and any deckhouse and in a position suitable for jettisoning the contents.

6.2.2.7 Bulkheads and decks bounding integral magazines shall be of watertight construction of "A-15" class.

If the spaces adjacent to the magazines contain no combustible materials the construction may be of "A-0" class.

Insulation shall be provided to prevent condensation of moisture

6.2.2.8 Piping of fresh or salt water and drainage systems and piping of systems installed in the magazines themselves may be routed through magazines. Piping of other systems shall be permitted only if they are enclosed in a watertight trunk

6.2.2.9 The magazines shall be provided with means to ensure their effective closing and to prevent unauthorized access.

6.2.2.10 Racks, supports and other means shall be installed, the construction and capacity of which shall provide safe stowage of explosives in their approved containers with minimum dunnage and to prevent them from shifting and falling when the ship is rolling.

The upper rack shall not be located higher than 1,8 m above the deck. The racks shall have holes for water flowing

from the upper to the lower racks during operation of the drenching system.

6.2.2.11 Decks of magazines shall be covered with a permanent non-slip, non-sparking covering.

6.2.2.12 A free volume of the magazine, when loaded, shall be at least 70 per cent of the entire magazine volume. Not more than 100 kg of explosives or 1000 detonators shall be placed for each 1 m^2.

6.2.2.13 Integral magazines shall be provided with natural or mechanical ventilation fitted with flame arresters sufficient to maintain the magazine temperature not higher than 38 °C.

6.2.2.14 Portable magazines shall have watertight metal construction insulated with non-combustible ma¬terials on the inside as a construction of "A-15" class.

6.2.2.15 Portable magazine shall bear a label indicating mass in light condition and maximum permissible mass of explosives.

6.2.2.16 Portable magazines shall be provided with efficient natural ventilation fitted with flame arresters.

6.2.2.17 Magazines shall be fitted with automatic heat detectors operating at temperatures rising above 40 °C. An appropriate visible and audible alarms actuated by this detector shall be provided in the wheelhouse and in the chief mate's cabin.

6.2.2.18 Integral and portable magazines shall be fitted with drenching systems in accordance with 3.6.

The controls shall be clearly marked with indication of their purpose.

6.2.2.19 Magazines shall be fitted with scuppers. The scupper pipes shall be provided with valves which shall be kept permanently closed under normal service conditions. The valves shall be controlled from outside the magazines.

6.2.2.20 Integral and portable magazines shall be clearly marked:

.1 "The space is a magazine";

.2 "Open lights and flame shall be kept away";

.3 "The magazine door shall be locked";

.4 "Matches and lighters shall be removed prior to entering";

.5 "Do not lift with contents" (in case of portable magazines).

6.2.2.21 Magazine boxes shall have watertight metal construction with walls and lids not less than 3 mm thick. Boxes exposed to sun rays shall be protected with solar screens.

6.2.2.22 Magazine boxes shall be clearly labeled:

.1 "The container is a magazine box";

.2 "Open lights and flame shall be kept away";

.3 "The box shall be locked".

6.2.2.23 Electrical equipment in magazines shall comply with the requirements of 19.4.3, Part XI "Electrical Equipment"and other applicable requirements of the above Part.

6.2.2.24 Detonators shall be stowed separately from other explosives.

6.2.2.25 Charging of cartridges and other preparatory operations for using explosives shall be made in charging rooms which shall be specially provided for that purpose. Charging rooms shall be arranged in steel enclosures and located on the weather deck apart from control stations, accommodation and service spaces. Bulkheads, decks and equipment of the charging rooms shall be faced with non-sparking materials.

6.2.3 Carriage of dangerous goods.

Dangerous goods on special purpose ships shall be carried in accordance with the provisions of Chapter 7 "Dangerous Goods" of the Code of Safety for Special Purpose Ships, 2008

2.4 OIL TANKERS (> 60 °C)

6.3.1 The fire protection of oil tankers (> 60 °C) shall be similar to that of cargo ships having regard of the following:

.1 a fixed deck foam fire extinguishing system complying with the requirements of 3.7 shall be fitted;

.2 the water fire main system shall additionally meet the requirements of 3.2.5.4;

.3 two additional sets of fireman's outfit in accordance with item 10.2 of Table 5.1.2 shall be provided. 10.2 Table 5.1.2

6.3.2 In addition to the requirements of 6.3.1 the following shall be provided:

.1cargo tanks shall not be adjacent to accommodation spaces;

.2 air intakes and other openings leading to accommodation spaces shall not be faced to cargo area. Entrance doors in bulkheads of superstructures and deckhouses facing cargo area may be instalied only in cases if they do not lead to accommodation spaces;

.3 a continuous coaming not less than 150 mm high extending from side to side shall be fitted on the upper deck at a distance of about 2 m from a superstructure where accommodation and service spaces are arranged;

.4 machinery spaces of category A shall be in general arranged aft beyond cargo and slop tank area.

6.3.36.3.3 Where cargo heating arrangements are fitted, provision shall be made to prevent cargo from heating up to the temperature which is not less than 15 °C lower than the flash temperature.

6.4 OIL RECOVERY SHIPS AND BILGE WATER REMOVING SHIPS

6.4.1 The fire protection of oil recovery ships shall be similar to that of oil tankers and in addition meet the requirements of 6.4.4 to 6.4.10.

6.4.2 The fire protection of oil recovery ships (>60 °C) shall be similar to that of oil tankers (> 60 °C) and in addition meet the requirements of 6.4.4 and 6.4.10.

6.4.3 The fire protection of bilge water removing ships shall be similar to that of oil tankers (> 60 °C) and in addition meet the requirements of 6.4.10.

2.1.1.1 The hull, superstructures, structural bulkheads decks and deckhouses shall be manufactured of steel or other equivalent material. The use of aluminium alloys for this purpose is not permitted.

6.4.5 The spaces intended for removable equipment which is used for oil recovery shall meet the following requirements:

.1 fire integrity of their structures shall meet the requirements of 2.4.2 for service spaces of category (*9*);

.2 they shall be protected by fire extinguishing system according to item 6 of Table 3.1.2.1;

.3 may be regarded as cofferdams specified in 2.4.7.

6.4.6 The ship shall be provided with a fixed drenching system for drenching of ship's outside surfaces with the following rate of water discharge:

.1 10 1/min per 1 m of superstructure outside walls length;

.2 5 1/min per 1 m of cargo area horizontal surface.

The drenching system specified in 6.4.6.2 may not be installed if the fixed deck foam fire extinguishing system ensures effective cooling by water of the entire surface of cargo area with the use of monitors remotely controlled from the navigation bridge.

6.4.7 The water fire main system and drenching and foam fire extinguishing systems specified in 6.4.6 shall use sea water coming only from sea openings arranged in ship's bottom.

6.4.8 Remote starting of fire pumps, fixed fire extinguishing systems for machinery space of category A and drenching systems specified in 6.4.6 shall be provided from navigation bridge.

6.4.9 The high expansion foam system shall not be used for protection of spaces specified in 6.4.5.

6.4.10 The ship shall be provided with a fixed or portable oil flash point tester.

6.4.11 For small ships of up to 1000 t deadweight periodically engaged in recovery of oil products at the sea surface, the fixed automatic system for atmosphere monitoring may be replaced, on agreement with the Register, by a monitoring system with portable analyzers specified in item 15.1 of Table 5.1.2. Atmosphere monitoring shall be applied during the whole period of stay of the ship within oil spot in locations specified in 9.14.5, Part VIII "Systems and Piping".

6.5. BERTH-CONNECTED SHIPS

6.5.1 The fire protection of berth-connected ships used as floating hotels and hostels shall be designed depending on the number of persons who sojourn therein:

.1 not more than 60 persons — similar to that of cargo ships of more than 500 gross tonnage;

.2 more than 60, but not more than 240 persons — similar to that of passenger ships carrying not more than 36 passengers;

.3 more than 240 persons — similar to that of passenger ships carrying more than 36 passengers.

6.5.2 The fire protection of floating docks, power plants, workshops and floating warehouses shall be similar to that of cargo ships of more than 500 gross tonnage.

If a special personnel of 50 persons and more is carried on these ships, the fire protection shall comply with the requirements of 6.5.1.2 or 6.5.1.3.

6.5.3 For berth-connected ships operating at shore quay wall the Register may revise the requirements specified in 6.5.1 and 6.5.2, taking into account operating conditions of the ship and its fire protection determined by the ship designer on agreement with the customer.

6.6. SHIPS HAVING A DISTINGUISHING MARK OF PROVISION WITH MEANS FOR FIRE-FIGHTING ABOARD OTHER SHIPS

6.6.1 The fire protection of ships having a distinguishing mark of provision with means for firefighting aboard other ships shall be designed in similar manner to other ships with due regard for the following:

.1 hull, superstructures, deckhouses and decks shall be made of steel;

.2 structural fire protection shall be made in compliance with the 1C method.

6.6.2 Ships shall be provided with a fire and rescue operations control station.

The control station shall be placed so that the ship structures do not impair, as far as practicable, the vision of the water around the ship.

6.6.3 The ships shall have:

special systems and equipment, the minimum number of which is indicated in Tables 6.6.3-1 and 6.6.3.-2;

items of fire-fighting outfit in compliance with 6.6.11.1;

additional bilge arrangements (systems) and additional reserve of fuel in accordance with 7.1.10 and 13.7.7, Part VIII "Systems and Piping";

additional internal service communications in compliance with 7.2.2, Part XI "Electrical Equipment".

6.6.4 Special systems installed on board ships for fire-fighting on other objects and for their own protection (water-screen, drenching, water fire main, foam fire extinguishing, dry powder systems) shall also comply with the requirements of Section 3 of this Part and Sections 2, 4, 5, Part VIII "Systems and Piping".

Where special systems other than specified in this Section of the Rules are installed, they shall comply with the requirements of the Rules to the extent agreed with the Register in each particular case.

Table 6.6.3.-1.

Special equipment	Distinguishing mark notation in the class				
	FF1	**FF1WS**	**ETA 2**	**FF2WS**	**FF3WS**
	–	+	–	+	+
Drenching system[1]	–	+	–	+	+
Water fire main system	+	+	+	+	+[2]
Foam fire-extinguishing	+	+	+	+	+
Dry powder system	+[3]	+[3]	+[3]	+[3]	+[3]
Bilge system[4]	+	+	+	+	–

[1]Refer to 6.6.6.6.
[2]Refer to 6.8.8.2.
[3]Refer to 6.6.10.1.
[4]Refer to 7.1.10, Part VIII "Systems and Piping".

Table 6.6.3.-2.

Special equipment	Distinguishing mark notation in the class		
	FF1, FF1WS	**FF2, FF2WS**	**FF3WS**
Pumps, in pes	2 – 4.	2 – 3.	1
Monitors:			
water monitors, in pes.	4	3	2
with supply rate of each monitor, in m^3/hour	2,500	1,200	100[1]/500/1000
jet range, in m	150	120	80[1]/100/120

foam monitors, in pes	2	–[2]	–[2]
Dry powder monitors[3], in pes.	1	1	1
valve manifolds, in pes	4	4	2

[1]The smaller value is for ships referred to in 6.6.8.2.

[2]A necessity in installation and characteristics to be indicated by the customer in accordance with the requirements of 6.6.9.2.

[3]For ships referred to in 6.6.10.1.

6.6.5 The equipment of special systems (pumps, fittings, monitors) may be remote-controlled from the fire and rescue operations control station.

Air-operated and hydraulic control systems shall be supplied from two independent sources of power.

Electrically driven items shall comply with the requirements of 5.1 to 5.3, Part XI "Electrical Equipment".

6.6.6. WATER-SCREEN SYSTEM

6.6.6.1 In ships having distinguishing marks **FF1WS**, **FF2WS** and **FF3WS**in the class notation outer vertical hull surfaces, including superstructures and deckhouses, shall be protected with the water-screen system.

The water-screen system shall totally cover the ship and not impede visibility from the wheelhouse, fire and rescue operations control stations and manually operated monitor platforms.

6.6.6.2 Doors and side scuttles of ships having distinguishing marks **FF1** or **FF2** in the class nota¬tion, which are not fitted with the above system, shall comply with the requirements of 7.2.1.10, Part III “Equipment, Arrangements and Outfit”.

6.6.6.3 The capacity and pressure of pumps serving the system shall be sufficient to supply water through spray nozzles at a rate indicated in 3.5.2.

6.6.6.4 Where the system is subdivided into sections, manual operation shall be provided from the place of their installation in spite of the provision of the remote control.

6.6.6.5 The water-screen system shall protect also the manually operated monitor platforms; the system shall be put into operation directly at each monitor.

6.6.6.6 The ship shall be fitted with water-screen system in combination with the drenching or pressure water-spraying system or one of these two systems provided they are capable to ensure adequate protection of all the outer surfaces of the ship.

In any case the letters **WS** shall be retained in class notation.

6.6.7 Drenching and pressure water-spraying systems

6.6.7.1 The drenching and pressure water-spraying systems in ships having distinguishing marks **FF1WS**, **FF2WS** or **FF3WS** in the class notation shall protect outer vertical surfaces of the hull, superstructures and deckhouses as well as horizontal surfaces of the hull where it is appropriate with regard to 6.6.6.6.

6.6.7.2 The rate of water discharge to the protected surface shall be at least 10 1/min per 1 m of the tier length where the drenching system is applied and 10 l/min per 1 m^2 of the protected surface

where the pressure water-spraying system is applied.

Intensity of water discharge may be reduced to 5 1/min provided the protected surfaces are of "A- 60" class.

6.6.7.3 For protection of superstructures and deckhouses the sections of the system shall be arranged on each tier; the arrangement of spray nozzles shall ensure uniform discharge of water onto the protected outer surface.

Where the system is subdivided into sections, the requirements of 6.6.6.4 shall be met.

6.6.8. WATER FIRE MAIN SYSTEM

6.6.8.1 The system is generally intended for water supply to water monitors, distribution valve manifolds, as well as for supply of water-screen and pressure water-spraying systems. The system may be used for pumping out the water from compartments of a ship in distress (refer to 7.1.10, Part VIII “Systems and Piping”).

The requirements for installation of pumps, laying of pipes, water intake arrangements, fittings and tests shall comply with the provisions of the present Part and Part VIII "Systems and Piping" as far as they are applicable and reasonable with regard to the requirements given below.

6.6.8.2 The special water fire extinguishing system in ships having distinguishing marks **FF1**, **FF1WS**, **FF2** or**FF2WS** in the class notation shall be independent.

In ships having distinguishing mark **FF3WS** in the class notation the ship water fire main system may be used as part of the special water fire extin¬guishing system.

6.6.8.3 Availability of remote starting and control of the system shall not prevent starting of the pumps, control of monitors and fittings from the place of their installation (refer to Section 5, Part XI “Electrical Equipment”).

Remote-controlled fittings shall have devices for their opening/closing during the time allowing to prevent water hammers.

6.6.8.4 Provision shall be made for operation of pumps without overheating in case of no or small supply of water to consumers.

6.6.8.5 The number of monitors shall be not less than that indicated in Table 6.6.3-2 and their arrangement shall:

provide supply of water from each monitor to both sides of the ship;

prevent water from being discharged to the ship’s own deck and its equipment;

provide the water jet range in accordance with Table 6.6.3-2.

6.6.8.6 Each monitor shall have an independent connection to the main of the system.

6.6.8.7 Distribution valve manifolds shall be arranged on the weather deck. The number of valves on the manifold shall be determined by the designer upon agreement with the customer.

6.6.8.8 The capacity of the pumps shall be calculated so that water can be simultaneously delivered to monitors, the number of which shall comply with Table 6.6.3-2 depending on the distinguish-

ing mark in the class notation.

6.6.9 Special foam fire extinguishing system.

6.6.9.1 The special foam fire extinguishing system shall be provided in ships having distinguishing marks of provision with means for fire-fighting aboard other ships.

The system may use totally or partly the equipment of the special water fire extinguishing system (pumps, pipes, monitors).

The number and type of the equipment of the foam fire extinguishing system shall be determined by the designer on agreement with the customer.

6.6.9.2 Ships with distinguishing marks **FF2**, **FF2WS** or**FF3WS** in the class notation may have the system fitted with air-foam nozzles, foam generators or combination foam units, in this case foam monitors may be omitted.

6.6.9.3 Ships with distinguishing marks **FF1** or**FF1WS** in the class notation shall be fitted with foam monitors or foam nozzles for monitors of the special water fire extinguishing system.

The number of foam monitors shall be not less than that indicated in Table 6.6.3-2; the requirements for their installation shall be in line with 6.6.8.5

6.6.9.4 The reserve of foam concentrate shall be calculated on the basis of the operating time of a specified number of foam generators or one monitor during at least 30 min.

6.6.9.5 The type of foam concentrate shah be chosen with regard for:

water salinity in the prescribed ship service area;

class of liquids, materials or goods the concentrate is intended to extinguish (oil and petroleum products, alcohols, ketons, aldehydes, etc.).

6.6.10 Special dry powder system.

6.6.10.1 The system shall be generally installed on ships servicing the operation area of gas carriers and chemical tankers.

6.6.10.2 Applicable requirements of 3.10 also cover the special dry powder system.

6.6.10.3 The powder rate through the monitor shall be not less than 40 kg/s.

The monitor shall be placed on a special platform fitted with devices for remote starting of the system (refer to 6.6.6.5).

6.6.10.4 The quantity of the extinguishing powder shall be determined by the designer on agreement with the customer.

6.6.11 Fire-fighting outfit

6.6.11.1 In addition to the fire-fighting outfit specified in Table 5.1.2, the following outfit shall be provided on board ships:

fireman's outfits;

Fire hoses.

dual-purpose manual fire nozzles;

portable air-foam nozzles, foam generators or combination foam units;

international shore connections;

complete sets of fire-fighting tools;

gas analyzers for flammable vapours and gases;

induced-draught fans.

The number and composition of the additional firefighting outfit and spare parts thereto shall be determined by the designer on agreement with the customer.

6.6.11.2 Additional fire-fighting outfit shall be kept in special storerooms.

Part of the fire-fighting outfit (hoses,

hand nozzles, foam generators, air-foam nozzles, hose wrenches) may be placed at the fire stations near each distribution valve manifold.

6.6.11.3 For charging cylinders of self-contained com¬pressed air breathing apparatus ships shall be provided with compressors approved by competent authorities.

The capacity and the number of simultaneously charged cylinders shall be specified by the customer. There shall be at least four charged cylinders on board the ship.

The need for a compressor to be provided on board ship may be specially considered by the Register depending on the main purpose of the ship and number of crew.

6.6.11.4 Ships shall have two searchlights in accordance with 9.2.12, Part III "Equipment, Arrangements and Outfit".

6.7 REQUIREMENTS FOR ELECTRICAL EQUIPMENT OF SHIPS UTILIZING GAS AS FUEL FOR PROPULSION PLANT

6.7.1 General.

6.7.1.1 Requirements of this subsection supplement the requirements of Sections 1–5 and apply to ships utilizing gas as fuel for propulsion plant.

6.7.1.2 The following operational documentation shall be available on board:

.1 Instructions for bunkering fuel gas;

.2 Instructions for inerting and gas removal;

.3 Instructions for the use of gas fuel;

.4 Instructions that describe actions of the crew in emergency situations that may arise in the process of operations with gas fuel.

6.7.1.3 Periodic inspection and maintenance schedule for the equipment related to utilization of gas as fuel shall be available on board.

6.7.1.4 Medical supplies and devices needed to provide first aid to persons with burn or freezing injuries (including cryogenic) and subjected to poisoning by gas (gas fuel) or incomplete combustion products shall be provided on board.

6.7.2. STRUCTURAL FIRE PROTECTION

6.7.2.1 Fuel vessels on the open deck shall be separated from accommodation, service, cargo and machinery spaces by a special screen designed and constructed as A-60 fire resistant structure.

6.7.2.2 Gas fuel vessel storage spaces and relevant vent ducts shall be separated from accommodation, service, cargo and machinery spaces by A-60 fire resistant structures; separation from other spaces of low fire risk may by performed by A-0 fire resistant structures**.**

6.7.2.3 Gas fuel piping passing through open cargo spaces of ro-ro ships shall be specially protected against damage by motor vehicles.

Fire insulation of such pipelines is subject to special consideration by the Register.

6.7.2.4 Machinery spaces of ships having two or more machinery spaces shall be separated (enclosed) by type A-60 structures.

6.7.2.5 Gas compressor spaces (gas fuel spaces) shall be considered as a machinery space of category A and shall be provided with appropriate fire protection.

6.7.2.6 Gas fuel filling space shall be separated from other spaces by A-60 fire

resistant structures, except cofferdams, ballast tanks and other low fire risk spaces, which may by separated by type A-0 structures.

6.7.3. WATER FIRE MAIN SYSTEM

6.7.3.1 Water fire main system shall meet the requirements of 3.2 with due regard for the main class of ship.

6.7.3.2 If pumps of the water extinguishing system are used in water drenching system, the required capacity of the water extinguishing system pumps shall be determined based on simultaneous operation of water extinguishing and drenching systems.

6.7.3.3 If fuel vessels are located on the open deck, the fire main shall be provided with valves allowing to isolate damaged pipeline section, so that the system remains operational.

6.7.4. WATER DRENCHING SYSTEM

6.7.4.1 Water drenching system shall be provided for protection and cooling of GFSV located on the deck or its protruding parts.

6.7.4.2 The system shall be designed to ensure the following water delivery rates for the protected surfaces specified in **6.7.4.1**:

.1 for horizontal surfaces – 10 l/min per 1 m^2;

.2 for vertical surfaces – 4 l/min per 1 m^2.

6.7.4.3 The water main line shall be equipped with shut-off valves used to isolate its damaged sections.

The system can be divided into two independent sections instead. Controls for the sections shall be placed in an easily accessible location.

6.7.4.4 The water fire main and water drenching systems shall be connected using an isolating valve located in a protected location on the open deck space, outside the gas fuel filling station.

6.7.4.5 Remote start of pumps supplying water to the water drenching system and remote valves control shall be performed from a safe and easily accessible location that can not isolated in case of fire.

6.7.4.6 Full-bore water drenching nozzles shall be used; they shall ensure effective water distribution over the protected surfaces.

6.7.5 Dry chemical extinguishing system.

6.7.5.1 Dry chemical extinguishing system that meets the requirements of 3.10 shall be provided to protect the fuel bunkering space, including any areas of potential fuel spills and the fuel filling station.

The dry chemical extinguishing system shall have a capacity of at least 3.5 kg/s and dry chemical amount sufficient for operation during at least 45 s.

6.7.6 Fire detection and alarm system.

6.7.6.1 Gas fuel vessel storage spaces and relevant vent ducts shall be provided with fire detection and alarm system of the approved type.

The fire detection system shall ensure distinct identification and location of the tripped sensor.

6.7.6.2. The smoke detection system shall not be considered as an effective and fast fire detection system that meets the requirements of **6.7.6.1**, unless additional fire detection means are provided.

6.7.7 Fire-fighting and safety equipment.

6.7.7.1 Two portable powder fire extinguishers with a capacity of at least 5 kg (each) shall be provided, one of which shall be located near the gas fuel filling station.

6.7.7.2 A machinery space where a fuel gas heavier than air is used shall be equipped with two portable powder fire extinguishers with a capacity of at least 5 kg (each) located near the entrance.

6.7.7.3 At least two sets of safety equipment to ensure safety of the crew members entering and working in spaces filled with gas fuel (gas) (in addition to those specified in 5.1.15) shall be provided on board of ships equipped with gas-confining systems, installed in the enclosed ship hull spaces.

6.7.7.4 Each protective equipment set mentioned in 6.7.7.3 shall include:

.1 one self-contained compressed air breathing apparatus with cylinders containing at least 1200 l of free air;

.2 tight goggles, gloves, protective clothing and footwear made of non-sparking materials;

.3 life buoy rescue line with steel core and intrinsically safe belt;

.4 explosion-proof lamp.

6.7.7.5 Each self-contained breathing apparatus mentioned in **6.7.7.4.1** shall be provided with filled air cylinders containing total 3600 l of free air.

6.8 PROTECTION OF SPACES FOR VEHICLE CARRIAGE, SPECIAL CATEGORY SPACES AND RO-RO SPACES

6.8.1 Fixed fire extinguishing systems

6.8.1.1 Spaces used for the carriage of vehicles and ro-ro spaces that are not special category spaces and may be tightly closed from a location outside cargo spaces shall be equipped with one of the following fixed fire extinguishing systems:

.1 fixed gas extinguishing system complying with the provisions of Fire Safety Systems Code (refer to **3.8.1)**;

.2 fixed high expansion foam extinguishing system complying with the provisions of Fire Safety Systems Code (refer to **3.7.3.3)**; or

.3 fixed water fire extinguishing system for ro-ro spaces and special category spaces complying with the provisions of Fire Safety Systems Code, clauses **6.8.1.2.1** ÷ **6.8.1.2.4**.

6.8.1.2 Spaces used for the carriage of vehicles and ro-ro spaces that are not special category spaces and can not be tightly closed, as well as special category spaces shall be equipped with a fixed water fire extinguishing system for ro-ro spaces and special category spaces complying with the provisions of Fire Safety Systems Code, which shall protect all parts of any deck and vehicle platforms in such spaces. Such water fire extinguishing system shall include:

.1 a pressure gauge on the distribution box;

.2 clear marking for each valve installed in the distribution box with indication of the room it serves;

.3 operating and maintenance manuals for all valves within the valve compartment; and

.4 sufficient number of drain valves to ensure complete drainage of the space (refer to 7.6.12.3, Part VIII "Systems and Piping").

6.8.1.3 Ships constructed before July 1, 2014 shall meet Regulations II-2/20.6.1.1

and II-2/20.6.1.1 of the SOLAS Convention as amended.

7. SPECIAL REQUIREMENTS FOR SHIPS CARRYING PACKAGED DANGEROUS GOODS AND DANGEROUS GOODS IN BULK

11.1 GENERAL

7.1.1 The requirements of the present Section are aimed at providing additional safety measures in respect of ships carrying packaged dangerous goods and dangerous goods in bulk.

7.1.2 The following definition has been adopted in the present Section.

INF cargo means packaged irradiated nuclear fuel, plutonium and high-level radioactive wastes carried as cargo in accordance with Class 7 of the IMDG Code.

Spent nuclear fuel – material containing uranium, thorium and/or plutonium isotopes used for a self-sustaining nuclear chain reaction.

High-level radioactive wastes mean liquid wastes resulting from the operation of the first stage extraction system or the concentrated wastes from subsequent extraction stages, in a facility for reprocessing irradiated fuel, or solids into which such liquid wastes have been converted/

IMDG Code means the International Maritime Dangerous Goods Code adopted by IMO resolution MSC. 122(75), as amended by MSC resolution 262(84) as amended.

IMSBC Code means the International Maritime Solid Bulk Cargoes Code, adopted by the resolution MSC.268(85) as amended.

INF code means the International Code for the Safe Carriage of Packaged Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes on Board Ships, adopted by IMO resolution MSC.88(71) as amended.

Dangerous goods mean substances, materials and products covered by the IMDG Code.

Dangerous goods in bulk mean any materials other than liquid or gas, consisting of mixture of particles, granules or larger pieces of material, generally homogeneous, covered by the IMSBC Code, and which are loaded directly into cargo spaces without the use of any intermediate package, including the same materials loaded into shipbome barges.

Plutonium means the resultant mixture of isotopes of that material extracted from irradiated nuclear fuel from reprocessing.

Package means cargo container established by the IMDG Code.

7.2 SHIPS CARRYING PACKAGED DANGEROUS GOODS OR DANGEROUS GOODS IN BULK

7.2.1 The requirements of the present Chapter apply to the following types of ships and cargo spaces:

.1ships and cargo spaces not specially designed for the carriage of freight containers but intended for the carriage of packaged dangerous goods including goods in freight containers and portable tanks;

.2purpose-built container ships and cargo spaces intended for the carriage of

dangerous goods in freight containers and portable tanks (refer to 8.4.8, Part III "Equipment, Arrangements and Outfit");

.3ro-ro ships and ro-ro cargo spaces, spaces for vehicles and special category spaces intended for the carriage of dangerous goods. A ro-ro cargo space completely open from above and on both sides may be treated as the open deck;

.4 ships and cargo spaces intended for the car¬riage of dangerous goods in bulk;

.5ships and cargo spaces intended for the carriage of dangerous goods other than liquids and gases in bulk in shipbome barges.

7.2.2 Cargo and passenger ships shall comply with the following requirements.

7.2.2.1 Cargo and passenger ships including cargo and passenger ships of less than 500 gross tonnage intended for the carriage of packaged dangerous goods shall meet the requirements of this Chapter considering applicable provisions of IMO resolution MSC.269(85), Annex 2.

7.2.2.2 Cargo ships with cargo spaces intended for the carriage of dangerous goods in bulk shall meet the requirements of this Chapter; however, these re¬quirements for cargo ships of less than 500 gross tonnage may be reduced by the Register with an appropriate note in the Certificate of Compliance with the Special Requirements for Ship Carrying Dangerous Goods, issued by the Register.

7.**7.2.2.3**A fixed fire extinguishing system of the type agreed with the Register shall be provided in cargo spaces of the following ships engaged in the carriage of dangerous goods:

passenger ships constructed on or after 1 September 1984;

cargo ships of 500 gross tonnage and upwards constructed on or after 1 September 1984

7.2.3 In addition to the requirements of the present Chapter, the applicable provisions of the IMDG Code shall be complied with.

The carriage of dangerous goods on any ships not in compliance with the requirements of the IMDG Code shall be forbidden.

7.2.4 Depending on the modes of carriage of dangerous goods in ships and cargo spaces specified in 7.2.1 the requirements of Table 7.2.4-1 shah apply; depending on the class of dangerous goods carried in bulk the requirements of Table 7.2.4-2 shah apply; depending on the class of dangerous goods other than those carried in bulk the requirements of Table 7.2.4-3

Table 7.2.4.-1

Requirements of paragraphs	Ships and cargo spaces						
	Open deck of ships and cargo spaces listed in 7.2.1.1 to 7.2.1.5	Ships not specifically designed (refer to 7.2.1.1) (refer to 7.2.1.1)	Cargo spaces: (refer to 7.2.1.2)	Closed cargo Cargo spaces spaces as given in 1.5.4.3.1[1] (refer to 7.2.1.3)	Open cargo spaces as given in 1.5.4.3.2 (refer to 7.2.1.3)	Ships for the carriage carriage of solid dangerous goods in bulk (refer to 7.2.1.4)	Ship lamps (refer to 2.8.1.5)

7.2.5.1	+	+	+	+	+	Refer to Table 7.2.4-2 for application of requirements specified in 7.2 for different classes of dangerous goods	+
7.2.5.2	+	+	+	+	+		–
7.2.5.3	–	+	+	+	+		+
7.2.5.4	–	+	+	+	+		+
7.2.6	–	+	+	+	+		+[3]
7.2.7	–	+	+	+	–		+[3]
7.2.8.1	–	+	+[2]	+	–		+[3]
7.2.8.2	–	+	+[2]	+	–		+[3]
7.2.9	–	+	+	+	–		–
7.2.10.1	+	+	+	+	+		–
7.2.10.2	+	+	+	+	+		–
7.2.11	+	+	–	–	+		–
7.2.12	+	+	+[4]	+	+		–
7.2.13	–	–	–	+[5]	+		–
7.2.14	–	–	–	+	–		–
7.2.15	–	–	–	+	–		–

[1] During the carriage of dangerous goods, special category spaces shall be considered as closed spaces of ro-ro ships.

[2] This rule does not apply to the carriage of dangerous goods of classes 4 and 5.1 in closed containers. The ventilation rate can be reduced for the carriage of dangerous goods of classes 2, 3, 6.1 and 8, but not more than to two air exchanges per hour. The ventilation rate can be reduced for the carriage of liquids of classes 4 and 5.1, but not more than to two air exchanges per hour.

End of Table 7.2.4-1

For the purposes of this rule, a tank container is considered as a closed freight container.

[3] In special cases where the lamps are able to retain flammable vapours or the flammable vapours can be evacuated to a safe place outside the lamps mounting location through ducts attached to the lamps, these requirements can be derated or not used, subject to special consideration by the Register in each individual case.

[4] Used only during carriage on deck.

[5] Applies only to the carriage in enclosed cargo spaces specified in 1.5.4.3.1, which can not be tightly closed.

N o t e . Symbol + in the table means that the requirement applies to all classes of the dangerous goods listed in the corresponding row of Table 7.2.4-3, except for cases in the footnotes.

Table 7.2.4.-2

Requirements of paragraphs	Class of dangerous goods						
	4.1	4.2	4.3[1]	5.1	6.1	8	9
7.2.5.1	+	+	–	+	–	–	+
7.2.5.2	+	+	–	+	–	–	+

7.2.6	+	+[2]	+	+[3]	–	–	+[3]
7.2.8.1	–	+[2]	+	–	–	–	–
7.2.8.2	+[4]	+[2]	+	+[2, 4]	–	–	+[2, 4]
7.2.8.3	+	+	+	+	+	+	+
7.2.10	+	+	+	+	+	+	+
7.2.12	+	+	+	+[2]	–	–	+[5]

[1] Hazard of this class of substances that can be carried in bulk requires particular consideration of the design and equipment of a ship carrying such cargoes, in addition to the requirements listed in the this table.

[2] Applies only to the carriage of oil cake containing oil extracting solvents, ammonium nitrate and ammonium nitrate fertilizers.

[3] Applies only to the carriage of ammonium nitrate and ammonium nitrate fertilizers. However, in accordance with the standards contained in the publication 60079 "Electrical Apparatus for Explosive Gas Atmosphere" of the International Electrotechnical Commission, the degree of protection provided by enclosures for an explosive gas atmosphere is sufficient.

[4] Only suitable protective wire gauze shall be used.

[5] The IMSBC Code requirements are sufficient.

7.2.5 The following additional water supply arrangements shall be provided:

.1 The water fire main system shall ensure immediate supply of water at a required pressure by maintaining the mains pressure continuously or by remote starting of fire pumps from places specified in 3.2.3.9;

.2 The water fire main system shall ensure supply of water to any point of an empty cargo space, which is sufficient to operate four fire hose nozzles provided on board a ship at pressure specified in 3.2.1.1. Subject to approval by the Register this quantity of water can be supplied by equivalent means.

The number and arrangement of hydrants shall ensure that at least two out of four required water jets can be supplied by hoses of standard length to any part of an empty cargo space, and all four water jets can be supplied by hoses of standard length to any part of ro-ro space;

.3 Effective cooling of the cargo space by the water-spraying system with the intensity indicated in 3.4.2.1 or flooding of these spaces (refer to 3.6.4) shall be ensured.

Subject to approval by the Register, fire hoses ensuring the specified water discharge rate can be used in small spaces and in small areas of large cargo spaces.

However, the drainage and pumping arrangements shall be such as to prevent free surfaces as specified in 7.14.2, Part VIII "Systems and Piping".

If this is impossible, a calculation shall be made to prove that the ship with flooded cargo space meets the requirements of Sections 2 and 3, Part V "Subdivision".

Table 7.2.4.-3

Requirements of	Class of dangerous goods											
	1.1–1.6	1.4S	2.1	2.2	2.3		3		4.1	4.2	4.3	
					d)[7]	*f*)	*b*)	*c*)			*a*)	*d*)

para-graphs												
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
7.2.5.1	+	+	+	+	+	+	+	+	+	+	+	+
7.2.5.2	+	+	+	+	+	+	+	+	+	+	+	+
7.2.5.3	+	–	–	–	–	–	–	–	–	–	–	–
7.2.5.4	+	–	–	–	–	–	–	–	–	–	–	–
7.2.6	+	–	+	–	+	–	+	–	–	–	+[6]	–
7.2.7	+	+	+	+	–	+	+	+	+	+	+	+
7.2.8.1	–	–	+	–	–	+	+	–	+[1]	+[1]	+	+
7.2.8.2	–	–	+	–	–	–	+	–	–	–	–	–
7.2.9	–	–	–	–	–	–	+	–	–	–	–	–
7.2.10	–	–	+	+	+	+	+	+	+	+	+	+
7.2.11	–	–	–	–	–	–	+	+	+	+	+	+
7.2.12	+[3]	–	+	+	+	+	+	+	+	+	+	+
7.2.13	+	+	+	+	+	+	+	+	+	+	+	+
7.2.14	+	+	+	+	+	+	+	+	+	+	+	+
7.2.15	+	+	+	+	+	+	+	+	+	+	+	+

Table 7.2.4-3

Requirements of paragraphs	Class of dangerous goods										
	5.1	5.2[5]	6.1				8				9
			b)	*c*)	*a*)	*d*)	*b*)	*c*)	*a*)	*d*)	
1	14	15	16	17	18	19	20	21	22	23	24
7.2.5.1	+	+	+	+	+	+	+	+	+	+	+
7.2.5.2	+	+	+	+	+	+	+	+	+	+	–
7.2.5.3	–	–	–	–	–	–	–	–	–	–	–
7.2.5.4	–	–	–	–	–	–	–	–	–	–	–
7.2.6	–	–	+	–	–	–	+	–	–	–	+[8]
7.2.7	+	–	+	+	+	+	+	+	+	+	–
7.2.8.1	+[1]	–	+	+	–	+[1]	+	+	–	–	+[1]
7.2.8.2	–	–	+	–	–	–	+	–	–	–	+[8]
7.2.8.9	–	–	+	+	+	–	+	+[9]	+[9]	–	–
7.2.8.10	+	+	+	+	+	+	+	+	+	+	+[2]
7.2.8.11	+	–	+	+	–	–	+	+	–	–	–
7.2.8.12	+[4]	+	+	+	–	–	+	+	–	–	–
7.2.8.13	+	+	+	+	+	+	+	+	+	+	+
7.2.8.14	+	+	+	+	+	+	+	+	+	+	+
7.2.8.15	+	+	+	+	+	+	+	+	+	+	+

[1] If spaces with forced ventilation are required by the IMDG Code.

[2] Depending on the goods being carried.

[3] Cargoes shall always be placed 3 m horizontally apart from the machinery space boundaries.

[4] Refer to IMDG Code.

[5]Stowage of elass 5.2 dangerous goods under deck or in enclosed ro-ro spaces is prohibited.

[6]Applicable only to cargoes specified in IMDG Code and having a flash point lower than 23 °C.

[7]According to provisions of IMDG Code, stowage of class 2.3 cargoes featuring additional dangerous properties of class 2.1 goods under deck or in enclosed ro-ro spaces is prohibited.

[8] Applicable only to cargoes specified in IMDG Code and releasing flammable vapours.

[9]Applicable only to cargoes featoring additional dangerous properties of class 6.1 goods.

S y m b o l s : *a*) – liquids

b) – liquids (t < 23°C);

c) – liquids (t < 60°C);

d) –solids.

e) –flammable substances.

f) –incombustible material..

.4 A high expansion foam systems in accordance with 3.7.3 with the same feed rate and operation duration as for machinery spaces as per Table 3.7.1.3, or other appropriate special extinguishing media can be used instead of compliance with the requirements of 7.2.5.3;

.5 the total required amount of water shall meet the requirements of 7.2.5.2 and 7.2.5.3, if applied, and calculated for the largest cargo space intended for the carriage. The 7.2.5.2 requirement shall be fulfilled based on the total necessary capacity of the main fire pumps, discarding the emergency fire pump capacity, if installed. Where a drenching system is used to meet the requirements of 6.4.6.2, its pump delivery should also be taken into account when calculating the total required amount of water;

.6 The water spray system required in paragraphs 9.2, 9.3 and 9.4 of IMO MSC/Circ.608/Rev.l – "Interim guidelines for open-top container ships" – will also satisfy the requirement for dangerous goods. At that the amount of water required for fire-fighting purposes in the largest cargo space should allow simultaneous use of the water spray system plus four jets of water from hose nozzles.

7.2.6 The electrical equipment shall comply with the requirements of 2.9.3, 2.9.9, 2.9.10, 2.9.12, 16.8.1.6, 16.8.4.5, 16.8.6.1 and 19.11 of Part XI "Electrical Equipment".

Any other equipment that may ignite flammable gases, vapours and explosive dust shall not be allowed for use in cargo spaces.

7.2.7 A fixed fire detection and fire alarm system meeting the requirements of 4.2.1 shall be installed in ro-ro cargo spaces.

Any other cargo spaces shall be equipped either with a fixed fire detection and fire alarm system meeting the requirements of 4.2.1 or a sample extraction smoke detection system meeting the requirements of 4.2.1.6.

If a sample extraction smoke detection system is fitted, particular attention shall be given to the requirements of 4.2.1.6.3 to prevent leakage of toxic smoke into areas where people stay.

7.2.8 Ventilation of machinery spaces shall comply with the requirements of Part VIII "Systems and Piping".

1. arrangement of the ventilation system, with the requirements of 12.1.7, 12.1.8, 12.7.1, 12.7.3 and 12.7.5. For bulk cargoes of class 4.3 and oil-cake containing oil

extracting solvents, additionally with the requirements of 12.7.7;

.2 construction of ventilation fans, with the requirements of 12.7.4;

.3 natural ventilation system in compliance with the requirements of 12.7.2 shall be provided in enclosed cargo spaces intended for the carriage of dangerous goods in bulk unless not fitted with mechanical ventilation.

7.2.9 The bilge system of cargo spaces shall comply with the requirements of 7.14.1, 7.14.4 − 7.14.9 Part VIII "Systems and Piping".

7.2.10 Ships shall be provided with the following outfit:

.1four full sets protective clothing resistant to chemical exposure and intended for use in emergency situations.

The protective clothing shall cover all skin so that no part of the body is unprotected and, subject to cargo characteristics, shall meet the recommendations of IMDG Code or BC Code;

.2at least two self-contained breathing apparatus in addition to those required by item 10 of Table 5.1.2. Table 10 5.1.2. Two spare charges suitable for the use with the breathing apparatus shall be provided for each apparatus in addition to those required for the fireman's outfit (refer to 5.1.15.2). 5.1.15.2).

7.2.11 Portable fire extinguishers with a total capacity of at least 12 kg of dry powder or equivalent shall be provided for cargo spaces. These extinguishers shall be in addition to any portable fire extinguishers required by the present Part.

7.2.12 Bulkheads forming boundaries between cargo spaces and machinery spaces of category A shall be of "A-60" class, unless dangerous goods are stowed at least 3 m horizontally away from such bulkheads. Other boundaries between such spaces shall be of "A-60" class.

When a cargo space is partially located above the machinery space of category A and bounding structures do not have the required insulation, such cargo space is unfit for carriage of dangerous goods. The same refers to areas of bare weather deck located above the machinery space of category A.

7.2.13 Each open ro-ro space having a deck above it and each space considered to be a closed ro-ro space not capable of being sealed shall be fitted with an approved manually operated fixed pressure waterspraying system which shall protect all parts of any deck and vehicle platform in such space.

The Register may permit he use of any other fixed fire extinguishing system that has been shown by full-scale tests to be not less effective (refer to 1.3.3).

However, the drainage and pumping arrangements shall be such as to prevent free surfaces as specified in 7.14.2, Part VIII "Systems and Piping". If this is impossible, a calculation shall be made to prove that the ship with flooded cargo space meets the requirements of Sections 2 and 3, Part V "Subdivision".

7.2.14 In ships having ro-ro spaces, subdivision shall be provided between a closed ro-ro space and an adjacent open ro-ro space.

The subdivision shall be such as to minimize the passage of dangerous vapours and liquids between such spaces.

Alternatively, such subdivision need not be provided if the ro-ro space is considered to be a closed cargo space over its entire length and shall fully comply with the relevant special requirements of

the present Chapter.

7.2.15 In ships having ro-ro spaces, subdivision shall be provided between a closed ro-ro space and the adjacent weather deck. The subdivision shall be such as to minimize the passage of dangerous vapours and liquids between such spaces.

Alternatively, such subdivision need not be provided if the arrangements of the closed ro-ro spaces are in accordance with the requirements for the carriage of dangerous goods on the adjacent weather deck.

7.2.16 Cargo spaces in ships other than ro-ro ships shall not be adjacent to accommodation and service spaces, except service spaces of low fire risk referred to in 1.5.3.2.3.

7.2.17 Hatch covers of dry-cargo holds shall comply with the requirements of Part III "Equipment, Arrangements and Outfit".

7.3 SHIPS CARRYING PACKAGED IRRADIATED NUCLEAR FUEL, PLUTONIUM AND HIGH-LEVEL RADIOACTIVE WASTES (INF CARGO)

7.3.1 The requirements of the present Chapter are based on the provisions of the INF Code and apply to all ships regardless of their date of build and size, including cargo ships of less than 500 gross tonnage, engaged in the carriage of INF cargo.

7.3.2 For the purpose of the present Chapter, ships carrying INF cargo are assigned to the following three classes, depending on the total activity of INF cargo which is carried on board.

Class INF1 ship **is** a ship, having certificate to carry INF cargo with an aggregate activity less than 4000 TBq.

Class **INF2** ship is a ship, having certificate to carry irradiated nuclear fuel or high-level radioactive wastes with an aggregate activity less than 2 10^6TBq and ship which is certified to carry plutonium with an aggregate activity less than 2 10^5TBq.

Class **INF3** ship is a ship, having certificate to carry irradiated nuclear fuel or high-level radioactive wastes and ship which is certified to carry plutonium with no restriction of the maximum aggregate activity of the materials.

The compliance of the ship with the requirements of this Chapter shall be certified by the appropriate distinguishing mark(**INF**) added to the class notation in accordance with 2.2.13, Part I "Classification" and by the International Certificate of Fitness for Carriage of INF Cargo issued by the Register.

7.3.3 In addition to the requirements of the present Chapter, the applicable provisions of the IMDG Code shall be complied with.

7.3.4 The INF cargo which is required to be carried on Class **INF3** ships shall not be carried on passenger ships.

7.3.5 The damage trim and stability shall comply with the requirements of 3.4.9, Part V "Subdivision".

7.3.6 In addition to the requirements of the present Part, the ship shall be fitted with a fixed pressure water-spraying system to protect cargo spaces which shall ensure the rate of water discharge as indicated in 3.4.2.1.

In Class **INF1** ships the pressure waterspraying system need not be installed provided the requirements of 7.2.5.1 and 1.2.52 are complied with.

7.3.7 In Class **INF3** ships accom-

modation spaces, service spaces, control stations and machinery spaces of category A shall be fitted forward or aft of the cargo spaces, due regard being paid to the overall safety of the ship.

7.3.8 The cargo spaces of the ship shah be fitted with temperature control systems complying with the requirements of 12.7.8, Part VIII "Systems and Piping".

7.3.9 The ship hull structure shall comply with the requirements of Part II "Hull".

7.3.10 Permanent devices shall be provided to secure packages of INF cargo within the cargo spaces. The devices shall meet the requirements of the Guidelines for the Development of the Cargo Securing Manual.

7.3.11 The electrical equipment of systems and arrangements referred to in 7.3.6 and 7.3.8 shall comply with the requirements of Part XI "Electrical Equipment".

The requirements for the emergency source of electrical power to supply these systems are set forth in Section 9, Part XI "Electrical Equipment". 9, Part XI "Electrical Equipment".

7.3.12 Depending upon the characteristics of the INF cargo to be carried and upon the design of the ship, additional arrangements and equipment for radiological protection meeting the requirements of the competent state authorities on radiological safety shall, if necessary, be provided.

7.3.13 Every ship shall carry on board an approved shipboard emergency plan based on the Guidelines for Developing Shipboard Emergency Plans for Ships Carrying Materials Subject to the INF Code adopted by IMO resolution A.854(20).

7.3.14 Every ship shall carry on board equipment (individual personnel protection outfit, apparatus, etc.) for use in emergency.

The type and amount of such equipment depend upon the INF cargo to be carried and is specified by the shipboard emergency plan referred to in 7.3.13.

8. REQUIREMENTS FOR FIRE PROTECTION OF CARGO SHIPS OF LESS THAN 500 GROSS TONNAGE

8.1 GENERAL, DEFINITIONS AND APPLICATION

8.1.1 The requirements of the present Section are aimed at ensuring the safety of cargo ships of less than 500 gross tonnage (except fishing vessels, chemical tankers and gas carriers) as regards their fire protection.

8.1.2 The following definition has been adopted in the present Section.

Gross tonnage is as defined in IMO resolution A.493(XII), calculated in accordance with the International Convention on Tonnage Measurement of Ships, 1969.

8.1.3 The requirements of the present Section are intended to apply to new and — as far as reasonable and practicable, — to existing cargo ships of less than 500 gross tonnage.

8.1.3.1 For ships of restricted service, the Register may reconsider the requirements specified in the present Section taking into account the service con-

ditions of the ship and the measures for its fire safety stipulated by the ship designer on agreement with the customer.

8.1.3.2 As to fire protection documentation, requirements of the present Rules shall be complied with considering the provisions of 8.1.3.1.

8.2 FIRE CONTROL PLANS

8.2.1 At the main fire control station, wheelhouse or in conspicuous positions in corridors and lobbies of any ship, there shall be exhibited general arrangement plans clearly showing the following for each deck: The symbols for items listed in 1.4.1 shall be in agreement with IMO resolution A.952(23) "Graphical Symbols for Fire Control Plans".

plans clearly showing the following for each deck:

.1 location of control stations;

.2 arrangement of fire-resisting and fire-retarding divisions;

.3 spaces protected by the fire detection and alarm system;

.4 spaces protected by fixed fire extinguishing systems with indication of the location of instruments and fittings for their control and also the disposition of fire hydrants;

.5 means of access to different compartments, decks etc., with indication of escape routes, corridors and doors;

.6 location and arrangement of fire-fighting outfit, including locations for fireman's sets;

.7 location and arrangement of the emergency stop controls for fuel pumps and drives for fast-closing (shut-off) valves of the fuel system;

.8 ventilation system including the controls of fans and showing the disposition of dampers and the identification numbers of the fans serving the groups of spaces, fenced off by fire-resistant boundaries;

8.2.2 Alternatively, the details required by 8.2.1 may be set out in a booklet, a copy of which shall be supplied to each officer, and one copy is at all times to be available on board in an accessible position.

8.2.3 All alterations in the fire protection of a ship shall be entered in the ship's documents stated in 1.4.8 and 1.4.2.

8.2.4 In all cargo ships greater than or equal to 150 gross tonnage, a duplicate set of general arrangement plans shall be permanently stored, and the booklet containing such plans shall be kept in a weathertight enclosure outside the deckhouse, painted red in accordance with the applicable requirements of 1.4.3.

In ships of less than 150 gross tonnage, the duplicate set of the plans or the booklet may be omitted and the position of the booklet for the assistance of shoreside fire-fighting personnel shall be agreed with the Register.

8.2.5 Description in general arrangement plans and booklets shall be in the official language of the flag state and in the language as shown below.

For ships engaged in domestic service only, the plans and booklets may not be translated into English.

The graphical symbols shall be coloured.

8.2.6 In all ships in addition to the above general arrangement plans and booklets the instructions concerning the maintenance and operation of all the equipment and installations on board for the fighting and containment of fire shall be kept under one cover, readily available

in an accessible position.

Such instructions may be executed as a single document.

8.3 ALTERNATIVE DESIGN AND ARRANGEMENTS

8.3.1 Alternative design and arrangements which may be applied on ships shall comply with provisions of 1.7 (except 1.7.2.1.4) considering the requirements of 8.3.2 and 8.3.3.

8.3.2 The required fire safety performance criteria for the ship or the space(s) concerned shall:

.1be based on fire safety objectives and the functional requirements of the present Section;

.2 provide a degree of safety not less than that achieved when using the prescribed requirements;

.3 be quantifiable and measurable.

8.3.3 The engineering analysis of alternative design and arrangements shall be evaluated and approved by the Register.

A copy of the Register-approved documentation shah be carried on board the ship.

8.4 STRUCTURAL FIRE PROTECTION

8.4.1 The minimum fire integrity of bulkheads and decks separating adjacent spaces shall meet the requirements of Table 8.4.1.

8.4.1.1 Divisions used to separate spaces not mentioned in Table 8.4.1 shall be of non-combustible material.

In ships of less than 500 gross tonnage it is allowed to install non-combustible bulkheads, linings and ceilings with combustible covering at most 2 mm thick except corridors, stairway enclosures as well as control stations where thickness of covering shall not exceed 1,5 mm.

8.4.1.2 he hull, superstructures, structural bulkheads decks and deckhouses shall be manufactured of steel or other equivalent material.

For the purpose of applying the definition of steel or other equivalent material, the applicable fire exposure shall be one hour.

Ships built of materials other than steel shall be specially considered.

8.4.1.3 Stairways shall be enclosed, at least at one level, by divisions and self-closing doors or hatches.

Table 21.2. 1

No. No.	Space	sepa rated	from space
1	Machinery space category	A-60	1. accommodation spaces
			2. control stations
			3.corridors
			4.stairways
			5. service spaces ofi high fire risk
			6. ro-ro spaces
			7.vehicle spaces
2	Machinery space category	A-0	Other than above (item 1)
3	Galley	A-0	Unless specified otherwise
4	Service spaces ofi high fire risk	B-15	Unless specified above (item 1)

5	Corridor. Staircase	B-0	Unless specified above (item 1)
6	Cargo spaces (other than ro-ro spaces and vehicle spaces)	A-0	Unless specified above (item 1)
7	Ro-ro spaces and vehicle spaces (except weather deck)	A-60	1. control stations
			2. machinery spaces of category A:
8	Ro-ro spaces and vehicle spaces (except weather deck)	A-0	Unless specified above (item 1)

8.4.1.4 Stairways serving machinery spaces, accommodation spaces, service spaces or control stations shall be of steel or other equivalent material.

8.4.1.5 Openings in "A" class divisions shall be provided with means of closing which shall be at least as effective for resisting fires as the divisions in which they are fitted which is determined in accordance with the Fire Test Procedures Code.

8.4.1.6 In "A" class divisions, arrangements shall be made to prevent the transmission of heat to uninsulated boundaries at the intersections and terminal points of other structural members and penetrations by insulating the horizontal and vertical boundaries or penetrations for a distance of 450 mm either side.

8.4.1.7 Doors shall be self-closing in way of machinery spaces of category A and galleys, except where they are normally kept closed.

8.4.1.8 In cargo ships of less than 300 gross tonnage, storerooms for flammable materials and substances may be arranged in way of accommodation spaces, but not adjacent thereto. Where a separate storeroom for flammable liquids is impeded, it is permissible to store them in steel ventilated lockers or cases. Such lockers or cases shall not be adjacent to the accommodation spaces and their doors shall open outwards.

All electrical equipment shall be intrinsically safe.

8.5 REQUIREMENTS TO MATERIALS

8.5.1 Except in cargo spaces or refrigerated compartments of service spaces, insulating materials shall be non-combustible.

8.5.2 Insulating materials shall not contain asbestos.

8.5.3 In spaces where penetration of oil products is possible, the surface of the insulation shall be impervious to oil or oil vapours.

8.5.4 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.

8.5.5 Paints, varnishes and other finishes used on exposed interior surfaces shall comply with the requirements of 2.1.1.7, 2.1.1.8.2.1, 2.1.8.2.2 and 2.1.1.8.3 accordingly as regards producing excessive quantities of smoke, toxic gases or vapours and shall be of the low flame spread type in accordance with the Fire Test Procedures Code.

8.5.6 Pipes conveying oil or combustible liquids through accommodations and service spaces shall be of steel or other approved materials having regard to the fire risk.

8.5.7 Where pipes penetrate "A" or "B" class divisions, the pipes or their penetration pieces shall be of steel or other approved materials.

8.5.8 Primary deck coverings within accommodation spaces, service spaces and control stations shall be of an approved material which will not readily ignite or give rise to toxic or explosive hazards at elevated temperatures, as defined by the Fire Test Procedures Code.

8.5.9 Materials readily rendered ineffective by heat shall not be used for overboard scuppers, sanitary discharges and other outlets where the failure of the material would give rise to the danger of flooding.

8.6 FIRE-FIGHTING EQUIPMENT AND SYSTEMS

8.6.1 Fixed fire extinguishing systems where required, shall meet the requirements of the Fire Safety Systems Code.

8.6.2 Machinery spaces of category A on ships with gross tonnage greater than or equal to 150 and operating in unrestricted or restricted waters, except ships for port, roadstead and coastal navigation shall be provided with an approved fixed fire extinguishing system, as specified in 8.6.1.

8.6.3 Fixed fire extinguishing systems not mandatory under the requirements of the present Section, but installed on board ships of less than 500 gross tonnage shall be of an approved type.

8.6.4 Protection of paint lockers and flammable liquid lockers shall be agreed with the Register.

8.6.5 Spare parts and instruments for fixed fire extinguishing systems shall be available on board.

The number of spare parts and instruments shall be determined and agreed with the Register.

8.6.6 In ships of less than 150 gross tonnage where arranging a fire extinction station outside the protected spaces is hardly feasible, as well as in special cases, on ships of less than 500 gross tonnage where the volume of individual protected spaces does not exceed 100 m3, cylinders containing the fire extinguishing medium may be fitted within the protected space on condition that such stations are provided with efficient remote control for immediately starting the system from outside the protected space. The remote starting control position shall be distinctly indicated and lighted both from the main and emergency sources of electrical power.

3.2 WATER FIRE MAIN SYSTEM

8.7.1 Fire pumps, pipelines, hydrants and hoses required by the present Section shall be provided in all ships.

3.2.2 Number and capacity of fire pumps

8.7.2.1 One main fixed fire pump with an independent power source and one portable fire pump shall be provided, and the latter shall be located considering the requirements of 8.7.2.7.1.

For ice class ships the main fixed fire pump with an independent power source and the fire pump shall be provided, and the latter shall be fixed in compliance with the requirements of 8.7.2.7.

8.7.2.2 The total capacity of the main fixed fire pump, in m3/h, shall not be less than

$$Q = (0{,}145\sqrt{L(B+D)} + 2{,}17)^2 \quad (8.7.2.2)$$

$$m = L(B+D)$$

where L= length of ship (refer to 1.1.3, Part II "Hull"), in m;

B = greatest moulded breadth of ship, in m;

D = moulded depth to bulkhead deck amidships, in m;

The main fixed fire pump capacity need not exceed 25 m3/h.

Relief valves shall be provided in conjunction with main fixed fire pump if the pump is capable of developing a pressure exceeding the design pressure of the water service pipes, hydrants and hoses.

A pressure gauge shall be fitted on the discharge end of the main fixed fire pump.

Sanitary, ballast, bilge or general service pumps may be accepted as fire pumps, provided that they are not normally used for pumping fuel oil.

Portable fire pumps shall comply with the following requirements:

.1 the pump shall be self-priming;

.2 the pump shall be capable of maintaining a pressure sufficient to produce a jet throw of at least 12 m, or that required to enable a jet of water to be directed on any part of the engine room, whichever is the greater;

.3 arrangements shall be provided to secure the pump at its anticipated operating position;

.4 the pump set shall be stored in a secure, safe and enclosed space, accessible from open deck and clear of the machinery space of category A. The room where the pump set is stored shall be illuminated from the emergency source of electrical power;

The room where the pump set is stored shall be illuminated from the emergency source of electrical power;

.5 the pump set shall be easily moved and operated by two persons and be readily available for immediate use;

.6 the pump set shall operate the pump for at least three hours.

For electric pumps, their batteries shall have sufficient capacity for three hours.

If the fuel type used for the pump set has a flash point below 60 °C, further consideration to the fire safety aspects of fuel oil storage on board shall be given.

A diesel motor pump may be used as the pump set.

The power source for the pump shall be capable of being readily started in its cold condition by hand (manual) cranking or by special heating arrangements.

The diesel motor pump shall comply with the requirements of 5.1.17 (except 5.1.17.2);

.7 the overboard suction hose shall be non-collapsible and of sufficient length, to ensure suction under all operating conditions. A suitable strainer shall be fitted at the inlet end of the hose.

In ships of less than 150 gross tonnage fitted with a fixed fire extinguishing system in the engine room, portable pumps may be omitted.

8.7.2.7 Alternatively to portable fire pumps (refer to Alternatively to portable fire pumps (refer to 8.7.2.5), fixed fire pumps may be fitted, which shall comply with the following requirements:

.1 the pump, its source of power and sea connection shall be located in accessible positions, outside the compartment

housing the main fixed fire pump required by 8.7.2.1;

.2 the sea valve shall be capable of being operated from a position near the pump and be fitted below the lightship waterline;

.3 the pressure of water delivered by the pump shall be sufficient to produce a jet of water of not less than 12 m in length, at any hose nozzle of 12, 16 and 19 mm size or as near thereto as possible.

For ships of less than 150 gross tonnage, the jet of water shall be agreed with the Register in each particular case;

.4 pump is required to supply water for the fire extinguishing system in the space where the main fixed fire pump is situated, it shall be capable of simultaneously supplying water to this system and the fire main at the required rates;

.5 the pump may also be used for other suitable purposes on agreement with the Register;

.6 the room where the fire pump prime mover is located shall be iliuminated from the emergency source of electrical power, and shah be well ventilated.

8.7.3 Fire hoses and nozzles.

8.7.3.1 For fire hoses, the nozzle sizes shall be 12, 16 or 19 mm or as near thereto as possible.

8.7.3.2 For accommodations and service spaces, the nozzle size need not exceed 12 mm.

8.7.3.3 The size of nozzles used in conjunction with a portable fire pump need not exceed 12 mm.

8.7.3.4 All nozzles shall be of an approved type incorporating a shut-off. Plastic fire hose nozzles may be used in accordance with 5.1.5.

8.7.4 Fire main.

8.7.4.1 The diameter of the fire main shall be based on the required capacity of the main fixed fire pump and the diameter of the water service pipes shall be sufficient to ensure an adequate supply of water for the operation of at least one fire hose.

8.7.4.2 Pipes of the water fire main system shall comply with all the requirements of 3.2.5.2.

8.7.4.3 The valves of water fire main pipes shall be located where they will not be damaged by cargo.

8.7.4.4 Where a fixed fire pump is fitted outside the engine room, in accordance with 8.7.2.7:

.1 an isolating valve shall be fitted on the fire main so that at all the hydrants in the ship, except that or those in the machinery space of category A, can be supplied with water;

.2 the isolating valve shall be located in an easily accessible position outside the machinery space of category A.

8.7.5 Pressure in the fire main.

8.7.5.1 When the main fixed fire pump or the fixed fire pump specified in 8.7.2.7 is delivering water through the fire main, fire hoses and nozzles specified in 8.7.3, the pressure maintained at any hydrant shall be sufficient to produce a jet throw at any nozzle of not less than 12 m in length.

8.7.6 Number and position of fire hydrants.

8.7.6.1 For ships equal to or greater than 150 gross tonnage the number and position of hydrants shall be such that at least two jets of water not emanating from the same hydrant, one of which shall be from a single length of hose, as specified in 5.1.4.1, may reach any part of the ship normally accessible to the crew while the ship is being navigated and any

part of any cargo space when empty.

Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.

8.7.6.2 For ships less than 150 gross tonnage the number and position of the hydrants shall be such that at least one jet of water from a single length of hose, as specified in 5.1.4.1, may reach any part normally accessible to the crew, while the ship is being navigated and any part of any cargo space when empty.

Furthermore, such hydrants shall be positioned near the accesses to the protected spaces.

8.7.6.3 At least one hydrant shall be provided in each machinery space of category A.

8.7.6.4 An isolating valve and a standard quickacting coupling shall be fitted at each fire hydrant.

8.7.6.5 All exposed hydrants shall comply with the requirements of 3.2.6.1 and 3.2.6.5.

8.7.6.6 The hydrants shall be so placed that the fire hoses may be easily coupled to them.

8.7.6.7 All the hydrants shall be painted red.

8.7.7 Fire hoses.

8.7.7.1 Fire hoses shall be of approved non-perishable material resistant to destruction by microorganisms (rotting).

8.7.7.2 The hoses shall be sufficient in length to project a jet of water to any of the spaces, but their length, in general, shall not exceed 18 m.

8.7.7.3 Fire hoses in assembly with nozzles shall be stowed at hydrants or in conspicuous positions on reels or in baskets.

8.7.7.4 Ships equal to or greater than 150 gross tonnage shall be provided with fire hoses the number of which shall be one for each 30 m length of the ship and one spare, but in no case less than three in all.

8.7.7.4 For ships less than 150 gross tonnage, one hose shall be provided for each hydrant.

In addition, one spare hose shall be provided on board.

8.7.7.6 Unless one hose and nozzle is provided for each hydrant in the ship, there shall be complete interchangeability of hose couplings and nozzles.

8.8 FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS

8.8.1 An approved fixed fire detection and fire alarm system shall be installed in all machinery spaces of category A and cargo pump rooms.

8.8.2 On agreement with the Register, buttons of manual fire alarms may be provided on board.

8.9 FIRE-FIGHTING OUTFIT

8.9.1 Portable fire extinguishers.

8.9.1.1 All fire extinguishers shall be of type approved by the Register and shall comply with the requirements of 5.1.9, except 5.1.9.3 and 5.1.9.4.

8.9.1.2 The extinguishing media employed shall be suitable for extinguishing fires in the compartments in which they are intended to be used.

8.9.1.3 The extinguishers required for use in machinery spaces shall be of a type discharging foam, carbon dioxide gas, dry powder or other approved media suitable for extinguishing oil fires.

8.9.1.4 The number of portable fire extinguishers and spaces where they shall

be stowed is determined as follows:

.1 accommodations and service spaces of ships greater than or equal to 150 gross tonnage — not less than 3 (three) fire extinguishers;

.2 accommodations and service spaces of ships less than 150 gross tonnage — not less than 1 (one) fire extinguisher considering the applicable requirements of 8.9.1.5;

.3 machinery spaces — 1 (one) fire extinguisher per every 375 kW of internal combustion engine power; however, their number shall be not less than 2 (two) and not more than 6 (six).

8.9.1.5 Accommodation spaces, service spaces and control stations shall be provided with a sufficient number of portable fire extinguishers to ensure that at least 1 (one) extinguisher will be readily available for use in every compartment of the crew spaces.

In any case, on ships greater than or equal to 150 gross tonnage their number shall be not less than 3 (three), except where this is impractical for very small ships. In which case 1 (one) extinguisher shall be available at each deck having accommodation or service spaces, or control stations.

8.9.1.6 The extinguishers shall be stowed in readily accessible positions and shall be spread as widely as possible and not be grouped.

8.9.1.7 One ofthe portable fire extinguishers intended for use in any space shall be stowed near the entrance to that space.

8.9.1.8 A spare charge shall be provided for each required portable fire extinguisher that can be readily recharged on board.

If this cannot be done, the same number of duplicate (additional) extinguishers of the same capacity, type and fire extinguishing capability shall be provided.

8.9.21 (one) fire blanket complying with the requirements of 5.1.13 shall be provided.

8.9.3 All ships greater than or equal to 150 gross tonnage shall carry at least one firefighter's outfit consisting of a set of personal equipment, breathing apparatus and lifeline complying with the requirements of IMO resolution MSC.98(73).

8.10 ADDITIONAL FIRE SAFETY MEASURES FOR OIL TANKERS

1.1.1 Requirements for structural fire protection, fire protection systems and equipment, fire detection and alarm system, and fire-protection systems for tankers carrying crude oil and oil products with a flashpoint of 60 °C and below (as tested in a closed crucible) specified by the device of an approved type and with vapour according to Reid below the atmospheric pressure or other liquid products that are similar in terms of fire safety specified in Section II-2 of SOLAS-74 Convention as amended.

8.10.2 Oil tankers carrying petroleum products having a flash point exceeding 60 °C shall comply with the requirements of 6.3, except 6.3.1.1, and of 8.10.3 and 8.10.4.

The flash point shall be determined by a closed cup test using an approved flash point apparatus.

8.10.3 Cargo area deck protection shall be carried out considering the following:

.1 at least one approved mobile foam appliance shall be provided for use on the

cargo tank deck including the cargo manifolds.

The appliance shall have a foam solution capacity of at least 136 1.

Where the appliance is of the inductor type it shall comply with the requirements of 5.1.8 for a portable foam applicator unit connected to the fire main;

.2 use shall be made of foam concentrate of types approved by the Register considering the requirements of 3.7.1.2.

8.10.4 The type of foam used shall be suitable for the cargoes to be carried.

8.11 SHIPS NOT FITTED WITH PROPELLING MACHINERY

8.11.1 Arrangements for fire protection, detection and extinction in ships not fitted with propelling machinery shall be specially considered by the Register in each case and shall depend on the size and purpose of the ship and the presence of accommodation spaces, machinery and combustible materials on board.

8.12 SHIPS CARRYING PACKAGED DANGEROUS GOODS OR DANGEROUS GOODS IN BULK

8.12.1 Ships carrying packaged dangerous goods or dangerous goods in bulk shall comply with the requirements of 7.2.

8.12.2 Ships carrying packaged irradiated nuclear fuel, plutonium and high-level radioactive wastes (INF cargo) shall comply with the requirements of 7.3.

8.13OIL RECOVERY SHIPS AND BILGE WATER REMOVING SHIPS

8.13.1 The fire protection of oil recovery ships and bilge water removing ships shall comply with the requirements of 6.4, except the requirements for fitting of fixed deck foam fire extinguishing system, and of 8.10.2 to 8.10.4.

19.4 SPECIAL PURPOSE SHIPS

8.14.1 The fire protection of special purpose ships shall be in compliance with the requirements of 6.2.