

CHAPTER 7

FIRE SAFETY

EU Directive on Electromagnetic Compatibility (89/336/EEC, repealed by 2004/108/EC of 15 December 2004)

Electrical and electronic equipment that may either generate or be affected by electromagnetic disturbance shall meet the requirements of EU Directive 89/336/EEC, repealed by 2004/108/EC of 15 December 2004. Equipment complying with this directive should have an EC mark or CE marking in accordance with EU Directives 2004/108/EC of 15 December 2004 or 93/68/EEC (with Corrigendum dated 30 August 1993), as amended.

EU Directive on Electrical Equipment designed for use within certain voltage limits (73/23/EEC repealed by 2006/95/EC of 12 December 2006)

Electrical Equipment designed for use with a voltage rating of between 50 and 1000 volts for alternating current and between 75 and 1500 volts for direct current shall meet the requirements of EU Directive 73/23/EEC, repealed by 2006/95/EC of 12 December 2006, except for specialised electrical equipment, for use on ships, which comply with the safety provisions drawn up by international bodies in which the Member States participate.

PART A - GENERAL

7.1 General requirements

Refer to SOLAS amendments up to 2006, or as applicable to the vessels age.

Note that where there are references to SOLAS with an associated year of the amendments, this date refers to the date of adoption, not the entry into force date.

Although Emergency Evacuation breathing devices (EEBDs) do not apply to HSC, (as EEBDs are primarily intended to allow people to escape from a manned, smoke logged space and HSC do not generally have these spaces) it is recommended good practice that there is a vessel specific fire Training Manual, and that EEBDs are fitted in spaces which are not normally manned and which have only one exit.

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

- .1 maintenance of the main functions and safety systems of the craft, including propulsion and control, fire-detection, alarms and extinguishing capability of unaffected spaces, after fire in any one compartment on board;
- .2 division of the public spaces for category B craft, in such a way that the occupants of any compartment can escape to an alternative safe area or compartment in case of fire;
- .3 subdivision of the craft by fire-resisting boundaries;

- .4 restricted use of combustible materials and materials generating smoke and toxic gases in a fire;
- .5 detection, containment and extinction of any fire in the space of origin;
- .6 protection of means of escape and access for fire fighting; and
- .7 immediate availability of fire-extinguishing appliances.

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

- .1 Where a fire is detected, the crew immediately puts into action the fire-fighting procedures, informs the base port of the accident and prepares for the escape of passengers to alternative safe area or compartment, or, if necessary, for the evacuation of passengers.
- .2 The use of fuel with a flashpoint below 43°C is not recommended. However, fuel with a lower flashpoint, but not lower than 35°C, may be used in gas turbines only subject to compliance with the provisions specified in 7.5.1 to 7.5.6.
- .3 The repair and maintenance of the craft is carried out in accordance with the requirements given in chapters 18 and 19.
- .4 Enclosed spaces having reduced lighting, such as cinemas, discothèques, and similar spaces are not permitted.
- .5 Passenger access to special category spaces and open ro-ro spaces is prohibited during the voyage except when accompanied by a crew member responsible for fire safety. Only authorized crew members shall be permitted to enter cargo spaces at sea.

7.2 Definitions

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

- .1 They shall be constructed of non-combustible or fire-restricting materials which by insulation or inherent fire-resisting properties satisfy the requirements of 7.2.1.2 to 7.2.1.6.
- .2 They shall be suitably stiffened.
- .3 They shall be so constructed as to be capable of preventing the passage of smoke and flame up to the end of the appropriate fire protection time.
- .4 Where required they shall maintain load-carrying capabilities up to the end of the appropriate fire protection time.
- .5 They shall have thermal properties such that the average temperature on the unexposed side will not rise more than 140°C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than

180°C above the original temperature during the appropriate fire protection time.

- .6 A test of a prototype bulkhead or deck in accordance with the Fire Test Procedures Code shall be required to ensure that it meets the above requirements.

7.2.2 "Fire-restricting materials" are those materials which have properties complying with the Fire Test Procedures Code.

Refer to Part III of FTP Code

The appropriate test procedure and selection criteria can be found in ISO 9705 'Full Scale Room Fire Test' as applied by MSC 40 (64) as amended by MSC.90(71). See Annex 1.4 of the MSC Resolution, except in the case of small elements of construction which cannot be realistically tested in the full scale room test: such items, which include case furniture and seat frames, should be tested in accordance with ISO 5660 parts 1 and 2 and classified according to recommended criteria contained in FP 40/3/4. Materials tested to ISO 5660 parts 1 or 2 which do not satisfy all of the recommended criteria may be submitted to the responsible standards branch for consideration. It should be noted that the performance of fire restricting materials is related to their method of installation as well as their inherent material properties.

7.2.3 "Non-combustible material" is a material which neither burns nor gives off flammable vapours in sufficient quantity for self-ignition when heated to approximately 750°C, this being determined in accordance with the Fire Test Procedures Code.

7.2.4 "A standard fire test" is one in which specimens of the relevant bulkheads, decks or other constructions are exposed in a test furnace by a specified test method in accordance with the Fire Test Procedures Code.

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

7.2.6 "Low flame-spread" means that the surface thus described will adequately restrict the spread of flame, this being determined in accordance with the Fire Test Procedures Code.

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

7.3 Classification of space use

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

- .1 "Areas of major fire hazard", referred to in tables 7.4-1 and 7.4-2 by A, include the following spaces:
 - machinery spaces

- ro-ro spaces
 - spaces containing dangerous goods
 - special category spaces
 - store-rooms containing flammable liquids
 - galleys
 - sales shops having a deck area of 50 m² or greater and containing flammable liquids for sale
 - trunks in direct communication with the above spaces.
- .2 "Areas of moderate fire hazard", referred to in tables 7.4-1 and 7.4-2 by B, include the following spaces:
- auxiliary machinery spaces, as defined in 1.4.5
 - bond stores containing packaged beverages with alcohol content not exceeding 24% by volume
 - crew accommodation containing sleeping berths
 - service spaces
 - sales shops having a deck area of less than 50 m² containing a limited amount of flammable liquids for sale and where no dedicated store is provided separately
 - sales shops having a deck area of 50 m² or greater not containing flammable liquids
 - trunks in direct communication with the above spaces.
- .3 "Areas of minor fire hazard", referred to in tables 7.4-1 and 7.4-2 by C, include the following spaces:
- auxiliary machinery spaces, as defined in 1.4.6
 - cargo spaces
 - fuel tank compartments
 - public spaces
 - tanks, voids and areas of little or no fire risk
 - refreshment kiosks
 - sales shops other than those specified in 7.3.1.1 and 7.3.1.2

- corridors in passenger areas and stairway enclosures
 - crew accommodation other than that mentioned in 7.3.1.2
 - trunks in direct communication with the above spaces.
- .4 "Control stations", referred to in tables 7.4-1 and 7.4-2 by D, as defined in 1.4.15.

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

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

If a space is divided by partial bulkheads into two (or more) smaller areas such that they form enclosed spaces, then the enclosed spaces should be surrounded by bulkheads and decks in accordance with tables 7.4-1 and 7.4-2, as applicable. However, if the separating bulkheads of such spaces are at least 30% open, then the spaces may be considered as the same space. (MSC/Circ.911)

Cabinets having a deck area of less than 2 m² may be accepted as part of the space they serve provided they have open ventilation to the space and do not contain any material or equipment that could be a fire risk. (MSC/Circ.911)

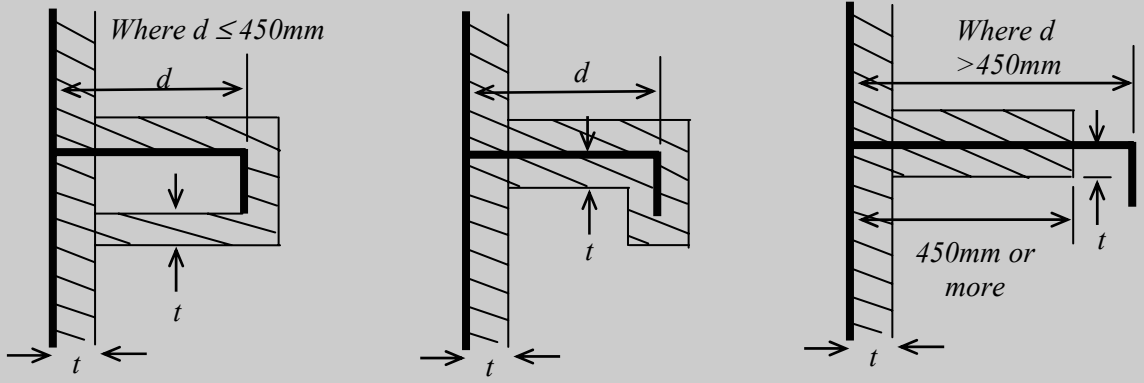
Where a space has the special characteristics of two or more space groupings, the structural fire protection time of the divisions should be the highest for the space groupings concerned. For example, the structural fire protection time of the divisions of emergency generator rooms should be the highest value for the space when the space is considered as being a control station (D) and a machinery space (A). (MSC/Circ.911)

7.3.2 In approving structural fire protection details, the Administration shall have regard to the risk of heat transmission at intersections and terminal points of required thermal barriers.

To prevent heat transmission at intersections and terminal points, the insulation of the deck or bulkhead should be carried past the intersection or terminal point for a distance of at least 450mm in the case of steel and aluminium structures. (Refer to figures 7.3-1 and 7.3-2). (MSC/Circ.911)

If a space is divided by a deck or bulkhead and the fire insulation required for each space is different, the insulation with the higher structural fire protection time should continue on the deck or bulkhead with the insulation of the lesser structural fire protection time for a distance of at least 450mm. (MSC/Circ.911)

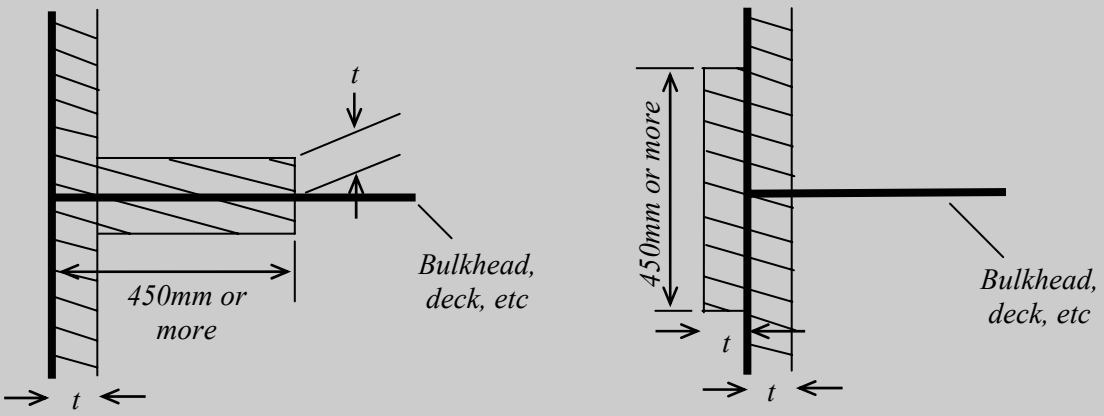
In the event the lower part of the fire insulation has to be cut for drainage, the construction should be in accordance with the structural details shown in figure 7.3-3. (MSC/Circ.911)



$t =$ thickness of insulation

$d =$ depth of stiffener or

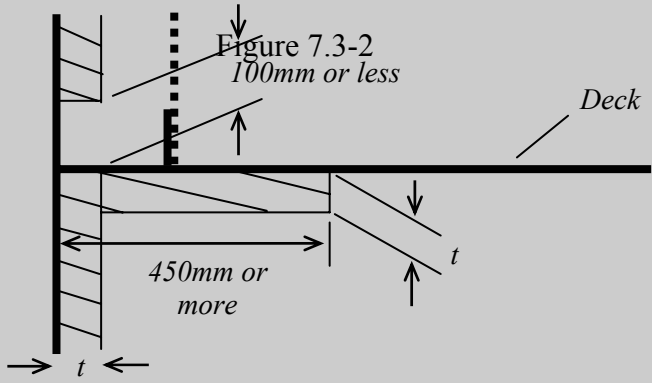
girder



Bulkhead,
deck, etc

Bulkhead,
deck, etc

$t =$ thickness of insulation



$t =$ thickness of insulation

Figure 7.3-3

7.4 Structural fire protection

7.4.1 Main structure

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

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

7.4.1.3 The hull, superstructure, structural bulkheads, decks, deckhouses and pillars shall be constructed of approved non-combustible materials having adequate structural properties. The use of other fire-restricting materials may be permitted provided the requirements of this chapter are complied with and the materials are in compliance with the Fire Test Procedures Code.

Refer to Resolution MSC 40(64) on Standard for qualifying marine materials for high-speed craft as fire-restricting materials amended by MSC 90(71), and Resolution MSC. 45(65) on Test procedures for fire resisting divisions of high-speed craft, both in the FTP Code.

This paragraph is only intended to apply to the main structure of the craft. Appendages such as air propellers, air ducts to propellers, transmission shafts, rudders and other control surfaces, struts, spars, flexible skirts, etc., are not intended to be of fire restricting or non-combustible material, therefore, paragraph 7.4.1.3 should not apply to them.

(MSC/Circ.911)

Table 7.4-1

Structural fire protection times for separating bulkheads and decks of passenger craft

	A	B	C	D	E	F
Areas of major fire hazard A	60 1,2	60 1	60 1,8	60 1	60 1	60 1,7,9
Areas of moderate fire hazard B		30 2	30 8	60 3,4	30 3	3
Areas of minor fire hazard C			3	30 8,10	3	3
Control stations D				3,4	3,4	3
Evacuation stations And escape routes E					3	3
Open spaces F						-

Table 7.4-2

Structural fire protection times for separating bulkheads and decks of cargo craft

	A	B	C	D	E	F
Areas of major fire hazard A	60 1,2	60 1	60 1,8	60 1	60 1	60 1,7,9
Areas of moderate fire hazard B		2,6	6	60 3,4	6	3
Areas of minor fire hazard C			3	30 8	3	3
Control stations D				3,4	3,4	3
Evacuation stations And escape routes E					3	3
Open spaces F						-

NOTES:

The figures on either side of the diagonal line represent the required structural fire protection time for the protection system on the relevant side of the division. When steel construction is used and two different structural fire protection times are required for a division in the table, only the greater one need be applied.

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

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

- ⁷ Fire resisting divisions need not comply with 7.2.1.5.

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

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

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

- ⁹ The fire protection time may be reduced to 0 min for those parts of open ro-ro spaces which are not essential parts of the craft's main load bearing structure, where passengers have no access to them and the crew need not have access to them during any emergency.
- ¹⁰ On category A craft, this value may be reduced to 0 min where the craft is provided with only a single public space (excluding lavatories) protected by a sprinkler system and adjacent to the operating compartment.

7.4.2 Fire-resisting divisions

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

In general, divisions separating spaces used for unrelated purposes should not be omitted (eg. a bond store within a vehicle deck). However the structural fire protection times of tables 7.4-1 and 7.4-2 do not imply a requirement to enclose areas of major fire hazard, such as vehicle decks, where adjacent to the external boundaries of the craft, and clear of evacuation stations and external escape routes, provided it is shown that fire safety is not impaired and the general requirement stated in paragraph 1.2.8 is satisfied. Similarly there is no implied requirement to separate spaces used for similar purposes, such as machinery spaces, provided the general requirement of paragraph 1.4.16 is satisfied. For structure treated as in contact with water, lightweight condition in the displacement mode may be assumed, except in the case of amphibious craft which will not operate entirely over water. For non metallic structures, heat transfer capability must be demonstrated as sufficient to protect against the effects of fire.

*Structures in contact with seawater should be insulated to the required standard to a level 300mm below the waterline in the craft lightweight condition **in the displacement mode.***
(MSC/Circ.911)

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

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

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

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

7.4.2.5 If the structures specified in 7.4.2.3 are made of combustible material, their insulation shall be such that their temperatures will not rise to a level where deterioration of the construction will occur during the exposure to the standard fire test in accordance with the Fire Test Procedures Code to such an extent that the load-carrying capability, in accordance with the times in 7.4.1.1 and 7.4.2.3, will be impaired.

7.4.2.6 The construction of all doors, and door frames in fire-resisting divisions, with the means of securing them when closed, shall provide resistance to fire as well as to the

passage of smoke and flame equivalent to that of the bulkheads in which they are situated. Watertight doors of steel need not be insulated. Also, where a fire-resisting division is penetrated by pipes, ducts, electrical cables etc., arrangements shall be made to ensure that the fire-resisting integrity of the division is not impaired, and necessary testing shall be carried out in accordance with the Fire Test Procedures Code.

Where machinery shafts penetrate fire-resisting watertight divisions, arrangements shall be made to ensure that the required watertight and fire-resisting integrity of the division is not impaired.

Ventilation openings may be accepted in entrance doors to public toilets provided they are positioned in the lower portion of the door, and fitted with closable grilles operable from outside the space and made of non-combustible or fire-restricting material. (MSC/Circ.911)

7.4.3 Restricted use of combustible materials

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

7.4.3.2 Where insulation is installed in areas in which it could come into contact with any flammable fluids or their vapours, its surface shall be impermeable to such flammable fluids or vapours.

The fire insulation in such spaces may be covered by metal sheets (not perforated) or by vapour proof glass cloth accurately sealed at the joint. (MSC/Circ.911)

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

- .1 all case furniture is constructed entirely of approved non-combustible or fire-restricting materials, except that a combustible veneer with a calorific value not exceeding 45 MJ/m² may be used on the exposed surface of such articles;

Different possible types of case furniture are: desks, wardrobes, dressing tables, bureaux and dressers. (MSC/Circ.911)

- .2 all other furniture such as chairs, sofas and tables, is constructed with frames of non-combustible or fire-restricting materials;
- .3 all draperies, curtains and other suspended textile materials have qualities of resistance to the propagation of flame, this being determined in accordance with the Fire Test Procedures Code;
- .4 all upholstered furniture has qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the Fire Test Procedures Code;
- .5 all bedding components have qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the Fire Test Procedures Code; and

- .6 all deck finish materials comply with the Fire Test Procedures Code.

Fire test procedures referenced in the FTP Code (resolutions MSC.61(67), as amended by resolution MSC.101(73 and MSC.173(79)), and interpreted in MSC/Circ.916, 964, 1004, 1008, 1036 and 1120 are to be applied to items and materials covered by this paragraph as follows:

- .1 case furniture (FTP Code, annex 1, parts 1 and 10);*
- .2 frames of all other furniture (FTP Code, annex1, parts 1 and 10);*
- .3 draperies, textiles and other suspended textile materials (FTP Code, annex1, part 7);*
- .4 upholstered furniture, eg. passenger seating (FTP Code, annex 1, part 8);*
- .5 bedding components (FTP Code, annex 1, part 9); and*
- .6 deck finish materials (FTP Code, annex 1, parts 2 and 6).*

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

Low flame spread should be determined in accordance with the Fire Test Procedures Code. Exposed surfaces in corridors and stairway enclosures include deck finish materials. Surfaces of fire restricting materials, which have been satisfactorily tested as such with their surface decorative finish incorporated, need not be further tested to the Fire Test Procedures Code.

This paragraph does not apply to items and materials referred to in paragraph 7.4.3.3.

Consistent with paragraph 7.9.3.4 and clauses 1 and 5.1 of annex 2 to the FTP Code, partitions, windows and sidescuttles made of glass are considered to be non-combustible and to comply with the requirements for low-flame spread surfaces.

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

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

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

This paragraph applies to materials including the surface finishes specified in 7.4.3.4.1 and its interpretation. Surfaces of fire restricting materials, which have been satisfactorily tested

as such with their surface decorative finish incorporated, need not be further tested for smoke and toxic products of combustion.

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

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

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

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

They should be arranged such that hot gases do not:

- cross areas **which** passengers are likely to occupy,*
- enter any ventilation intakes,*
- enter any engine combustion air intakes.*

7.4.4 Arrangement

7.4.4.1 Internal stairways connecting only two decks need only be enclosed at one deck by means of divisions and self-closing doors having the structural fire protection time as required by tables 7.4-1 and 7.4-2 for divisions separating those areas which each stairway serves. Stairways may be fitted in the open in a public space, provided they lie wholly within such public space.

Where stairways are fitted in a public space consisting of only two decks, the following conditions should be met:

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

(MSC/Circ.911)

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

7.4.4.3 In public spaces, crew accommodation, service spaces, control stations, corridors and stairways, air spaces enclosed behind ceilings, panelling or linings shall be suitably divided by close-fitting draught stops not more than 14 m apart. On category A craft provided with only a single public space, draught stops need not be provided in such public space.

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

Draught stops are not required in public spaces with open ceilings (perforated ceilings) where the opening is 40% or more, and, the ceiling is arranged in such a way that a fire behind the ceiling can be easily seen and extinguished. (MSC/Circ.911)

7.5 Fuel and other flammable fluid tanks and systems

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

Loose tanks (those not forming part of the structure of the craft) should be fitted with save-alls.

7.5.2 Fuel oil tanks shall not be located in, or be formed by any part of the structural boundary of, areas of major fire hazard. However, flammable fluids of a flashpoint not less than 60°C may be located within such areas provided the tanks are made of steel or other equivalent material.

The use of aluminium in lubricating oil sump tanks for engines, or in lubricating oil filter housings fitted integral with the engines, is accepted. (MSC/Circ.911)

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

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

* Refer to the Guidelines for the application of plastic pipes on ships, adopted by the Organization by resolution A.753(18).

Flexible pipes of an approved fire resistant type should be fitted between fixed ship piping and flexibly mounted equipment. Refer to 10.2.4.9. See also below.

Main engines and auxiliary engines on vessels tend to be fitted with flexible mounts that require pipework to have a degree of flexibility. To avoid rigid pipework failing, short lengths of flexible pipework are introduced to permit flexibility between two rigid components. Flexible pipework on engines can carry fuel, Lubricating oils and hydraulic oils. All these products when released under high pressure can cause fire when coming into contact with a source of ignition.

The purpose of this note is to give guidance to MCA Surveyors to ensure consistency in applying standards. This guidance is for all passenger vessels, and all other vessels greater than 24m in length.

Flexible Pipe-work Standard

Flexible pipe-work is to be of type that has been approved by a recognised Classification Society or Nominated Body for the intended purpose. The pipework is to be constructed in accordance with the relevant Standard, taking into consideration the pressures in the system. The pipework approval is to incorporate fire testing to 800°C for 30 minutes which is normally incorporated in Class approvals and is identical to the fire test contained in the Passenger Ship Construction - Classes I, II & II(A) and Classes III to VI(A) Instructions to Surveyors. Where sleeves are used in conjunction with the pipes, the sleeve requires a similar fire test approval as stated above. Documentary evidence should be provided to ensure the pipework complies with the relevant standards.

Existing arrangements on board vessels shall be allowed to continue until the next renewal date of the pipe, as per the pipe manufacturer's instructions, but not more than 5 years. If there are no records available for the dates of last renewal, these pipes shall be renewed immediately and the new pipe or pipe / sleeve assembly shall meet the fire test requirements stated above.

Where hoses do not meet the above fire testing requirements due to some constraints, MCA may consider granting approval on a case to case basis, provided appropriate fire detection / fighting arrangements are in place.

Flexible Pipework Installation and Connections:

Flexible pipework is to be installed in accordance with the manufacturer's instruction and fully supported. The pipework is to be provided with sufficient free movement to accommodate vibration and to avoid contact with any structure. Where sleeves are fitted, the sleeve needs to extend beyond the length of the pipe, with appropriate leak proof end connections.

Flexible pipework tends to have a service life and should be replaced in accordance with the manufacturer's instructions, but the interval shall not exceed 5 years.

Fixed Pressure fuel injector pipes for diesel engines

From July 1 1998, all new vessels to which SOLAS, M.S. Passenger Ship Regulations or M.S. Cargo Ship Regulations apply are required to be fitted with jacketed H.P. fuel injection piping. This requirement is to be applied to existing vessels except that alternative arrangements may be made for engines having an output of 375 kW or less.

Reference Standards

BS 3832:1991 has been withdrawn and replaced by BS EN 853. Rubber covered wire braided reinforced hydraulic type.

BS 4586:1992 has been withdrawn and replaced by BS EN 856. Rubber-covered spiral wire reinforced hydraulic type.

BS 5345-1:1989 has been replaced by BS EN 60079-14 but remains current.

In addition to the above standards that refer to the construction and pressure testing of flexible hoses, fire testing of the hoses to the standards below can be accepted.

BS ISO 15540 with Corrigendum 1 - Fire resistance of hose assemblies - Test methods.

BS ISO 15541 - Fire resistance of hose assemblies - Requirements for the test bench.

7.5.5 Pipes, valves and couplings conveying flammable fluids shall be arranged as far from hot surfaces or air intakes of engine installations, electrical appliances and other potential sources of ignition as is practicable and be located or shielded so that the likelihood of fluid leakage coming into contact with such sources of ignition is kept to a minimum.

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

- .1 tanks for the storage of such fuel shall be located outside any machinery space and at a distance of not less than 760 mm inboard from the shell side and bottom plating, and from decks and bulkheads;
- .2 arrangements shall be made to prevent overpressure in any fuel tank or in any part of the oil fuel system, including the filling pipes. Any relief valves and air or overflow pipes shall discharge to a position which, in the opinion of the Administration, is safe;
- .3 the spaces in which fuel tanks are located shall be mechanically ventilated, using exhaust fans providing not less than six air changes per hour. The fans shall be such as to avoid the possibility of ignition of flammable gas-air mixtures. Suitable wire mesh guards shall be fitted over inlet and outlet ventilation openings. The outlets for such exhausts shall discharge to a position which, in the opinion of the Administration is safe. 'No Smoking' signs shall be posted at the entrance to such spaces;
- .4 earthed electrical distribution systems shall not be used, with the exception of earthed intrinsically safe circuits;
- .5 suitable certified safe type* electrical equipment be used in all spaces where fuel leakage could occur, including the ventilation system. Only electrical equipment and fittings essential for operational purposes shall be fitted in such spaces;

* Refer to the Recommendations published by the International Electrotechnical Commission and, in particular, publication 60092 – *Electrical Installations in Ships*.

- .6 a fixed vapour-detection system shall be installed in each space through which fuel lines pass, with alarms provided at the continuously manned control station;
- .7 every fuel tank shall, where necessary, be provided with "savealls" or gutters which would catch any fuel which may leak from such tank;

- .8 safe and efficient means of ascertaining the amount of fuel contained in any tank shall be provided. Sounding pipes shall not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise. In particular, they shall not terminate in passenger or crew spaces. The use of cylindrical gauge glasses is prohibited, except for cargo craft where the use of oil-level gauges with flat glasses and self-closing valves between the gauges and fuel tanks may be permitted by the Administration. Other means of ascertaining the amount of fuel contained in any tank may be permitted if such means do not require penetration below the top of the tank, and providing their failure or overfilling of the tank will not permit the release of fuel;
- .9 during bunkering operations, no passenger shall be on board the craft or in the vicinity of the bunkering station, and adequate 'No Smoking' and 'No Naked Lights' signs shall be posted. Vessel-to-shore fuel connections shall be of closed type and suitably grounded during bunkering operations;
- .10 the provision of fire detection and extinguishing systems in spaces where non-integral fuel tanks are located shall be in accordance with requirements of 7.7.1 to 7.7.3; and
- .11 refuelling of the craft shall be done at the approved refuelling facilities, detailed in the route operational manual, at which the following fire appliances are provided:
 - .11.1 a suitable foam applicator system consisting of monitors and foam-making branch pipes capable of delivering foam solution at a rate of not less than 500 l/min for not less than 10 min;
 - .11.2 dry powder extinguishers of a total capacity not less than 50 kg; and
 - .11.3 carbon dioxide extinguishers of a total capacity not less than 16 kg.

7.6 Ventilation

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

The controls should be easily accessible as well as prominently and permanently marked and should indicate whether the shut-off is open or closed. (MSC/Circ.911)

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

7.6.3 Areas of major fire hazard and spaces serving as assembly stations shall have independent ventilation systems and ventilation ducts. Ventilation ducts for areas of major fire hazard shall not pass through other spaces, unless they are contained within a trunk or in an extended machinery space or casing insulated in accordance with tables 7.4-1 and

7.4-2; ventilation ducts of other spaces shall not pass through areas of major fire hazard. Ventilation outlets from areas of major fire hazard shall not terminate within a distance of 1 m from any control station, evacuation station or external escape route. In addition, exhaust ducts from galley ranges shall be fitted with:

The term "independent ventilation systems" means systems that have no connection to any other system.

- .1 a grease trap readily removable for cleaning unless an alternative approved grease removal system is fitted;
- .2 a fire damper located in the lower end of the duct which is automatically and remotely operated, and in addition a remotely operated fire damper located in the upper end of the duct;

'Lower end of the duct' means a position at the junction between the duct and the galley range hood.

- .3 a fixed means for extinguishing a fire within the duct;
- .4 remote control arrangements for shutting off the exhaust fans and supply fans, for operating the fire dampers mentioned in .2 and for operating the fire-extinguishing system, which shall be placed in a position close to the entrance to the galley. Where a multi-branch system is installed, means shall be provided to close all branches exhausting through the same main duct before an extinguishing medium is released into the system; and

The means for closing the ends of multi-branch systems should be remote controlled from a position close to the remote controls listed in this regulation.

- .5 suitably located hatches for inspection and cleaning.

Location of hatches for inspection and cleaning in galley range ducts:

- One hatch should be provided close to the exhaust fan.
- In the galley exhaust duct the grease will accumulate more in the lower end. Therefore, hatches should be fitted also in this part of the duct. For interpretation of 'lower end' see that for 7.6.3.2.

7.6.4 Where a ventilation duct passes through a fire-resisting division, a fail safe automatic closing fire damper shall be fitted adjacent to the division. The duct between the division and the damper shall be of steel or other equivalent material and insulated to the same standard as required for the fire-resisting division. The fire damper may be omitted where ducts pass through spaces surrounded by fire-resisting divisions without serving those spaces providing that the duct has the same structural fire protection time as the divisions it penetrates. Where a ventilation duct passes through a smoke-tight division, a smoke damper shall be fitted at the penetration unless the duct which passes through the space does not serve that space.

Where a ventilation duct is permitted to pass through a fire resisting division, other than a smoke tight division fitted to satisfy paragraph 7.11.1, dampers may be omitted where the compensating provisions of SOLAS Chapter II-2 regulation 9.7.3.1.2 are adopted.

Fire and smoke dampers should be easily accessible. Where they are placed behind ceilings or linings, they should be provided with an inspection door on which a plate is fitted providing the identification number of the damper. Such plates with identification numbers should also be placed on any required remote controls. (MSC/Circ.911)

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

7.6.6 All dampers fitted on fire-resisting or smoke-tight divisions shall also be capable of being manually closed from each side of the division in which they are fitted, except for those dampers fitted on ducts serving spaces not normally manned such as stores and toilets that may be manually operated only from outside the served spaces. All dampers shall also be capable of being remotely closed from the continuously manned control station.

Manual closing may be achieved by mechanical means of release or by remote operation of the fire or smoke damper by means of a fail-safe electrical switch or pneumatic release (i.e. spring-loaded, etc.). (MSC/Circ.911)

7.6.7 Ducts shall be made of non-combustible or fire-restricting material. Short ducts, however, may be of combustible materials subject to the following conditions:

- .1 their cross-section does not exceed 0.02 m²;
- .2 their length does not exceed 2 m;
- .3 they may only be used at the terminal end of the ventilation system;
- .4 they shall not be situated less than 600 mm from an opening in a fire-resisting or fire-restricting division; and
- .5 their surfaces have low flame-spread characteristics.

7.7 Fire detection and extinguishing systems

Where a fixed fire-extinguishing system not required by paragraph 7.7 of the Code is installed, it should meet the requirements of this section. (MSC/Circ.911)

7.7.1 Fire detection systems

Areas of major and moderate fire hazard and other enclosed spaces not regularly occupied within public spaces and crew accommodation, such as toilets, stairway enclosures, corridors and escape routes shall be provided with an approved automatic smoke detection system and manually operated call points complying with the requirements of 7.7.1.1 and 7.7.1.3 to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations. Detectors operated by heat instead of smoke may be installed in galleys. Main propulsion machinery room(s) shall in addition have detectors sensing other than smoke and be supervised by TV cameras monitored from the operating compartment. Manually operated call points shall be installed throughout the public spaces, crew accommodation, corridors and stairway enclosures, service spaces and where

necessary control stations. One manually operated call point shall be located at each exit from these spaces and from areas of major fire hazard.

Control stations not normally occupied (e.g. emergency generator rooms) need not be provided with manually operated call points. (MSC/Circ.911)

For guidance on power supply of the television surveillance system refer to the guidance under 7.8.3.1.

7.7.1.1 General requirements

- .1 Any required fixed fire-detection and fire alarm system with manually operated call points shall be capable of immediate operation at all times.
- .2 Power supplies and electric circuits necessary for the operation of the system shall be monitored for loss of power or fault conditions as appropriate. Occurrence of a fault condition shall initiate a visual and audible fault signal at the control panel which shall be distinct from a fire signal.
- .3 There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fixed fire-detection and fire alarm system, one of which shall be an emergency source. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in or adjacent to the control panel for the fire-detection system.
- .4 Detectors and manually operated call points shall be grouped into sections. The activation of any detector or manually operated call point shall initiate a visual and audible fire signal at the control panel and indicating units. If the signals have not received attention within two minutes, an audible alarm shall be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces. There shall be no time delay for the audible alarms in crew accommodation areas when all the control stations are unattended. The alarm sounder system need not be an integral part of the detection system.

A section is a group of fire detectors and manually operated call points as displayed at the indicating unit(s) required by this paragraph. (MSC/Circ.911)

- .5 The control panel shall be located in the operating compartment or in the main fire control station.
- .6 Indicating units shall, as a minimum, denote the section in which a detector or manually operated call point has operated. At least one unit shall be so located that it is easily accessible to responsible members of the crew at all times, when at sea or in port, except when the craft is out of service. One indicating unit shall be located in the operating compartment if the control panel is located in the space other than the operating compartment.
- .7 Clear information shall be displayed on or adjacent to each indicating unit about the spaces covered and the location of the sections.

- .8 Where the fire-detection system does not include means of remotely identifying each detector individually, no section covering more than one deck within public spaces, crew accommodation, corridors, service spaces and control stations shall normally be permitted except a section which covers an enclosed stairway. In order to avoid delay in identifying the source of fire, the number of enclosed spaces included in each section shall be limited as determined by the Administration. In no case shall more than 50 enclosed spaces be permitted in any section. If the detection system is fitted with remotely and individually identifiable fire detectors, the sections may cover several decks and serve any number of enclosed spaces.
- .9 In passenger craft, if there is no fire-detection system capable of remotely and individually identifying each detector, a section of detectors shall not serve spaces on both sides of the craft nor on more than one deck and neither shall it be situated in more than one zone according to 7.11.1 except that the Administration, if it is satisfied that the protection of the craft against fire will not thereby be reduced, may permit such a section of detectors to serve both sides of the craft and more than one deck. In passenger craft fitted with individually identifiable fire detectors, a section may serve spaces on both sides of the craft and on several decks.

The arrangement of detectors and sections should allow the crew to be able to identify a fire within an auxiliary machinery space if it contains hydraulic equipment.

The same section of detectors may serve spaces on more than one deck if such spaces are located in the fore or aft end of the craft or they are so arranged that they constitute common spaces on different decks (e.g. fan rooms, galleys, public spaces, etc).

(MSC/Circ.911)

- .10 A section of fire detectors which covers a control station, a service space, a public space, crew accommodation, corridor or stairway enclosure shall not include a machinery space of major fire hazard.

For fire detection systems with remotely and individually identifiable fire detectors, the requirement set out in this section is considered met when a loop covering accommodation spaces, service spaces, and control stations, does not include machinery spaces of a major fire hazard.

(MSC/Circ.911)

- .11 Detectors shall be operated by heat, smoke or other products of combustion, flame, or any combination of these factors. Detectors operated by other factors indicative of incipient fires may be considered by the Administration provided that they are no less sensitive than such detectors. Flame detectors shall only be used in addition to smoke or heat detectors.
- .12 Suitable instructions and component spares for testing and maintenance shall be provided.
- .13 The function of the detection system shall be periodically tested by means of equipment producing hot air at the appropriate temperature, or smoke or aerosol particles having the appropriate range of density or particle size, or other phenomena associated with incipient fires to which the detector is designed to respond. All detectors shall be of a type such that they can be

tested for correct operation and restored to normal surveillance without the renewal of any component.

- .14 The fire-detection system shall not be used for any other purpose, except that closing of fire doors and similar functions may be permitted at the control panel.

The following activating arrangement may be acceptable:

- to activate a paging system;
- to activate the fan stops;
- to activate the closure of fire doors;
- to activate the closure of fire and smoke dampers;
- to activate the sprinkler system.

(MSC/Circ.911)

- .15 Fire-detection systems with a zone address identification capability shall be so arranged that:

A loop should not pass through a space twice. Where this is not practical, (e.g. for large public spaces) the part of the loop which by necessity passes through the space for a second time should be installed at the maximum possible distance from the other parts of the loop.

Definitions:

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

Zone address identification capability: a system with individually identifiable fire detectors.

(MSC/Circ.911)

- .1 a loop cannot be damaged at more than one point by a fire;
- .2 means are provided to ensure that any fault (e.g., power break; short circuit; earth) occurring in the loop shall not render the whole loop ineffective;
- .3 all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (electrical, electronic, informatic); and
- .4 the first initiated fire alarm shall not prevent any other detector to initiate further fire alarms.

The fire detection system in vehicle deck spaces, excluding manual call points, may be switched off with a timer during loading/unloading of vehicles.

7.7.1.2 Installation requirements

- .1 In addition to 7.7.1, manually operated call points shall be readily accessible in the corridors of each deck such that no part of the corridor is more than 20 m from a manually operated call point.
- .2 Where a fixed fire-detection and fire alarm system is required for the protection of spaces other than stairways, corridors and escape routes, at least one detector complying with 7.7.1.1.11 shall be installed in each such space.
- .3 Detectors shall be located for optimum performance. Positions near beams and ventilation ducts or other positions where patterns of air flow could adversely affect performance and positions where impact or physical damage is likely shall be avoided. In general, detectors which are located on the overhead shall be a minimum distance of 0.5 m away from bulkheads.

Distances smaller than 0.5 m from bulkheads may be accepted in corridors, lockers and stairways. (MSC/Circ.911)

- .4 The maximum spacing of detectors shall be in accordance with the table below:

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

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

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

A section is defined as a group of detectors and manually operated call points as reported in the required indicating unit(s).

A detector loop is defined as an electrical circuit linking detectors of various sections in a sequence and connected (input and output) to the indicating unit(s). Zone address identification capability is a system with individually identifiable fire detectors.

Acceptable activating arrangements; the fire control panel may be permitted to:

- .1 activate a paging system;*
- .2 activate the fan stops;*

.3 activate the closure of fire doors;

.4 activate the closure of fire dampers;

.5 activate the sprinkler system;

.6 activate the smoke extraction system; and

.7 activate the low-location lighting system.

.6 and .7 are in addition to the MSC Circ guidance. See 7.7.1.1.14 above.

Fire detection systems with a zone address identification capability. Shall comply with:

.1 Detectors installed within cold spaces such as refrigerated compartments should be tested according to IEC 60068-2-1 - Section one - Test Aa. The temperature of operation of heat detectors in spaces covered by this Regulation may be 130°C, in saunas up to 140°C.

Cargo spaces

.1 All spaces in a passenger ship except cargo spaces, baggage and store rooms may, as a general rule, be regarded as accessible to the fire patrol. In ships engaged on voyages not exceeding 10 hours, if the cargo holds are opened within that time to discharge or receive cargo etc. the holds may be deemed accessible to the patrol and an automatic fire detecting system need not be fitted. Applications for exemption should be submitted to MCA Headquarters in writing giving reasons why it would be unreasonable to comply with the requirements.

.2 Where a fire detecting system of the sample extraction smoke detection type is combined with a fixed gas fire extinguishing system, the arrangement should be such that gas cannot be admitted to the detecting cabinet.

Fire detectors

.1 All fire detectors must be of approved types for the area in which they are to be used. In general the functional performance and sensitivity of detectors should be in accordance with the appropriate parts of BS EN 54.

Control and indicating units

.1 In general, control and indicating units should be designed and constructed in accordance with BS EN 54-4, but full compliance with the detail of that Standard is not necessary provided the equipment carries out the functions specified satisfactorily. A second battery reserved solely for fire detection purposes need not be provided if a second satisfactory source of power is available. However where such a second battery is provided its capacity should be sufficient for the maximum load of the system for the period stipulated for the emergency source of power on the ship.

Ancillary equipment

.1 Ancillary equipment such as manual call points, sounders and power packs should, in general, be designed and constructed to the relevant British Standard where one is published. Where no relevant standard exists each case will be assessed individually on its merits.

Environmental tests

.1 Environmental tests as specified in the various relevant standards are not adequate to prove equipment is suitable for use in the marine environment. In order to be considered suitable for this use the type approval certificate should specify that the appropriate tests have been carried out.

Sample extraction smoke detection systems.

.1 Sequential scanning intervals, the interval (I) should depend on the number of scanning points (N) and the overall response time (T) of the fans. With a 20 per cent allowance:

$$I = 1.2 \times T \times N$$

However, the maximum allowable interval should not exceed 120 sec ($I_{max} = 120$ s) the maximum response time for the fans should be around 15 sec.

Smoke detectors above ceilings – spacing

.1 The spacing of smoke detectors above ceilings should be in accordance with the table as follows (paragraph 2(e) of Schedule 5 of MSN 1666(M)) unless the presence of draught stops requires closer spacing.

(MCA Guidance on Ch II-2 of SOLAS)

7.7.1.3 Design requirements

- .1 The system and equipment shall be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships.
- .2 Smoke detectors shall be certified to operate before the smoke density exceeds 12.5 % obscuration per metre, but not until the smoke density exceeds 2% obscuration per metre. Smoke detectors to be installed in other spaces shall operate within sensitivity limits to the satisfaction of the Administration having regard to the avoidance of detector insensitivity or over-sensitivity.
- .3 Heat detectors shall be certified to operate before the temperature exceeds 78°C but not until the temperature exceeds 54°C, when the temperature is raised to those limits at a rate less than 1°C per minute. At higher rates of temperature rise, the heat detector shall operate within temperature limits having regard to the avoidance to detector insensitivity or over-sensitivity.
- .4 At the discretion of the Administration, the permissible temperature of operation of heat detectors may be increased to 30°C above the maximum deckhead temperature in drying rooms and similar spaces of a normal high ambient temperature.
- .5 Flame detectors corresponding to 7.7.1.1.11 shall have a sensitivity sufficient to determine flame against an illuminated space background and a false signal identification system.

7.7.2 Fire detection for periodically unattended machinery spaces

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

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

The use of atmosphere oil mist detectors in machinery spaces, in addition to the required detectors, should be encouraged as they can give advanced warning of a potential fire.

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

7.7.3 Fixed fire-extinguishing systems

The system should be remotely controlled in such a way that it is fully serviceable from the operating compartment without any intervention of personnel outside that space in normal conditions. (MSC/Circ1102)

A fixed fire fighting system (eg. a CO₂ system) which has its actuating method from main engine control start air is unsuitable, whether this is dried and filtered or not. This can seize the pneumatic control valve due to wet air being in the system. Individual nitrogen charges are more suitable.

7.7.3.1 Areas of major fire hazard shall be protected by an approved fixed fire-extinguishing system operable from the control position which is adequate for the fire hazard that may exist. The system shall comply with 7.7.3.2 and 7.7.3.3 or with alternative arrangements approved by the Administration taking into account the recommendations and guidelines developed by the Organization* and be capable of local manual control and remote control from the continuously manned control stations.

* Refer to MSC/Circ.668 – Alternative arrangements for halon fire-extinguishing systems in machinery spaces and pump-rooms, and amendments thereto contained in MSC/Circ.728 – Revised test method for equivalent water-based fire-extinguishing systems for machinery spaces of category A and cargo pump-rooms contained in MSC/Circ.668; and to MSC/Circ.848 – Revised guidelines for approval of equivalent fixed gas fire-extinguishing systems, as referred to in SOLAS 74, for machinery spaces and cargo pump-rooms.

7.7.3.2 General requirements

- .1 In all craft where gas is used as the extinguishing medium, the quantity of gas shall be sufficient to provide two independent discharges. The second discharge into the space shall only be activated manually from a position outside the space being protected. Where the space has a local fire-suppression system installed, based on the guidelines developed by the Organization*, to protect fuel oil, lubricating oil and hydraulic oil located near exhaust manifolds, turbo chargers or similar heated surfaces on main and

auxiliary internal combustion engines, a second discharge need not be required.

* Refer to the Guidelines for the approval of water-based local application of fixed fire-suppression systems, to be developed by the Organization.

Refer to MSC/Circ.913, and the associated interpretations of MSC/Circ.1082.

- .2 The use of a fire-extinguishing medium which, in the opinion of the Administration, either by itself or under expected conditions of use will adversely affect the earth's ozone layer and/or gives off toxic gases in such quantities as to endanger persons shall not be permitted.
- .3 The necessary pipes for conveying fire-extinguishing medium into protected spaces shall be provided with control valves so marked as to indicate clearly the spaces to which the pipes are led. Non-return valves shall be installed in discharge lines between cylinders and manifolds. Suitable provision shall be made to prevent inadvertent admission of the medium to any space.

Pipelines may pass through accommodation spaces provided they are of substantial thickness and that their tightness is verified with a pressure test, after their installation, at a pressure head not less than 5 N/mm². In addition, pipelines passing through accommodation areas should only be joined by welding and should not be fitted with drains or other openings within such spaces. Pipelines should not pass through refrigerated spaces. (MSC/Circ.911)

- .4 The piping for the distribution of fire-extinguishing medium shall be arranged and discharge nozzles so positioned that a uniform distribution of medium is obtained.
- .5 Means shall be provided to close all openings which may admit air to, or allow gas to escape from, a protected space.

Openings that may admit air to, or allow gas to escape from, a protected space should be capable of being closed from outside the protected space. (MSC/Circ.911)

- .6 Where the volume of free air contained in air receivers in any space is such that, if released in such space in the event of fire, such release of air within that space would seriously affect the efficiency of the fixed fire-extinguishing system, the Administration shall require the provision of an additional quantity of fire-extinguishing medium.

The volume of starting air receivers, converted to free air volume, should be added to the gross volume of the machinery space when calculating the necessary quantity of extinguishing medium. Alternatively, a discharge pipe connected to a safety valve may be fitted provided it leads directly to the open air. (MSC/Circ.911)

- .7 Means shall be provided for automatically giving audible warning of the release of fire-extinguishing medium into any space in which personnel normally work or to which they have access. The alarm shall operate for a suitable period before the medium is released, but not less than 20 s. Visible alarm shall be arranged in addition to the audible alarm*.

The suitable period for which the alarm must sound shall be determined by the minimum time required for personnel to evacuate the space when undertaking their assigned duties.

Ro-ro spaces and other spaces where personnel can be expected to enter, and where the access is facilitated by doors or hatches, should be provided with an automatic warning for the release of the extinguishing medium.

The pre-discharge alarm should be automatically activated, e.g. by opening of the release cabinet door.

* Refer to the Code on Alarms and Indicators, 1995 (resolution A.830(19)).

(MSC/Circ.911)

- .8 The means of control of any fixed gas fire-extinguishing system shall be readily accessible and simple to operate and shall be grouped together in as few locations as possible at positions not likely to be cut off by a fire in a protected space. At each location there shall be clear instructions relating to the operation of the system, having regard to the safety of personnel.
- .9 Automatic release of fire-extinguishing medium shall not be permitted.
- .10 Where the quantity of extinguishing medium is required to protect more than one space, the quantity of medium available need not be more than the largest quantity required for any one space so protected.

Two spaces can be considered as separated spaces where divisions comply with tables 7.4-1 and 7.4-2, as appropriate, or the divisions are of steel construction. (MSC/Circ.911)

- .11 Pressure containers required for the storage of fire-extinguishing medium shall be located outside protected spaces in accordance with 7.7.3.2.14. Pressure containers may be located inside the space to be protected if in the event of accidental release persons will not be endangered.
- .12 Means shall be provided for the crew to safely check the quantity of medium in the containers.

Means for checking the quantity of medium in containers should be so arranged that it is not necessary to move the containers completely from their fixing position. This may be achieved for instance by providing hanging bars above each bottle row for a weighing device or by using suitable surface indicators.

Surface indicators containing radioactive material should be of a type accepted by the Administration. (MSC/Circ.911)

- .13 Containers for the storage of fire-extinguishing medium and associated pressure components shall be designed having regard to their locations and maximum ambient temperatures expected in service.
- .14 When the fire-extinguishing medium is stored outside a protected space, it shall be stored in a room which shall be situated in a safe and readily accessible position and shall be effectively ventilated. Any entrance to such a storage room shall preferably be from the open deck and in any case shall be independent of the protected space. Access doors shall open outwards, and bulkheads and decks including doors and other means of closing any opening

therein, which form the boundaries between such rooms and adjoining enclosed spaces, shall be gas tight. Such storage rooms shall be treated as control rooms.

Spaces for storage of the cylinders or tanks for extinguishing gas should not be used for other purposes. Access to these spaces should be possible from the open deck; spaces situated below the deck should be directly accessible by a stairway or ladder from the open deck. The space should be located no more than one deck below the open deck. Spaces where the entrance from the open deck is not provided, or which are located below the deck, are to be fitted with mechanical ventilation. The exhaust duct (suction) should lead to the bottom of the space. Such spaces should be ventilated with at least 6 air changes per hour. (MSC/Circ.991)

- .15 Spare parts for the system shall be stored on board or at a base port.
- .16 If the release of a fire extinguishing medium produces significant over or under pressurisation in the protected space, means shall be provided to limit the induced pressures to acceptable limits to avoid structural damage.

7.7.3.3 Carbon dioxide systems

- .1 For cargo spaces, the quantity of carbon dioxide available shall, unless otherwise provided, be sufficient to give a minimum volume of free gas equal to 30% of the gross volume of the largest cargo space so protected in the craft.
- .2 For machinery spaces, the quantity of carbon dioxide carried shall be sufficient to give a minimum volume of free gas equal to the larger of the following volumes, either:
 - .2.1 40% of the gross volume of the largest machinery space so protected, the volume to exclude that part of the casing above the level at which the horizontal area of the casing is 40% or less of the horizontal area of the space concerned taken midway between the tank top and the lowest part of the casing; or
 - .2.2 35% of the gross volume of the largest machinery space protected, including the casing, provided that the above-mentioned percentages may be reduced to 35% and 30% respectively for cargo craft of less than 2,000 gross tonnage; provided also that if two or more machinery spaces are not entirely separate they shall be considered as forming one space.
- .3 For the purpose of this paragraph the volume of free carbon dioxide shall be calculated at 0.56 m³/kg.
- .4 For machinery spaces, the fixed piping system shall be such that 85% of the gas can be discharged into the space within 2 min.
- .5 Two separate controls shall be provided for releasing carbon dioxide into a protected space and to ensure the activation of the alarm. One control shall be used to discharge the gas from its storage containers. A second control

shall be used for opening the valve of the piping which conveys the gas into the protected spaces.

- .6 The two controls shall be located inside a release box clearly identified for the particular space. If the box containing the controls is to be locked, a key to the box shall be in a break-glass type enclosure conspicuously located adjacent to the box.

Means should be provided for the removal of released carbon dioxide gas from the space. This could take the form of:

- a portable fan and trunking,*
- low level trunking connected to reversible space ventilation fan(s).*

Note should also be taken of comments under 7.7.3.

7.7.4 Portable fire extinguishers

Control stations, public spaces, crew accommodation, corridors and service spaces shall be provided with portable fire extinguishers of approved type and design. At least five portable extinguishers shall be provided, and so positioned, as to be readily available for immediate use. In addition, at least one extinguisher suitable for machinery space fires shall be positioned outside each machinery space entrance.

Refer to IMO resolution A.951(23) entitled "Improved Guidelines for marine portable fire extinguishers". (MSC/Circ.911)

Refer to ISO 7165 – Fire protection equipment – Portable fire extinguishers – Performance and construction. Note that ISO 7165 currently has two amendments.

The mass of portable fire extinguishers should not exceed 23 kg.

Each powder or carbon dioxide extinguisher should have a capacity of at least 5kg, and each foam extinguisher a capacity of at least 9 litres.

For Equivalents of portable fire extinguishers reference should be made to ISO/DIS 7156 - Fire protection equipment - Portable fire extinguishers - Performance and construction.

Examination and testing of portable fire extinguishers:

- Fire extinguishers should be examined annually by a competent person.*
- Each fire extinguisher should be provided with a sign indicating that it has been examined.*
- Fire extinguisher cylinders and propellant bottles should be hydraulic pressure tested every 10 years.*

Carbon dioxide fire extinguishers should not be placed in accommodation spaces. In control stations and other spaces containing electrical or electronic equipment or appliances necessary for the safety of the craft, fire extinguishers should be provided with extinguishing media which are neither electrically conductive nor harmful to the equipment and appliances.

Fire extinguishers should be ready for use and located in easily visible places such that they can be reached quickly and easily at any time in the event of a fire. In addition, the fire extinguisher should be located such that their serviceability is not impaired by the weather,

vibration or other external factors. Portable fire extinguishers should be provided with devices to identify whether they have been used.

See MGN 276 Fire Protection – Maintenance of Portable Fire Extinguishers.

For Equivalents of portable fire extinguishers reference should be made to ISO/DIS 7165 - Fire protection equipment - Portable fire extinguishers - Performance and construction, which currently has two amendments.

7.7.5 Fire pumps, fire mains, hydrants and hoses

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

- .1 At least two independently driven pumps shall be arranged. Each pump shall have at least two-thirds the capacity of a bilge pump as determined by 10.3.5 and 10.3.6 but not less than 25 m³/h. Each fire pump shall be able to deliver sufficient quantity and pressure of water to simultaneously operate the hydrants as required by .4.

Independently driven pumps are pumps powered by independent sources of power. (MSC/Circ.911)

This is intended to mean the prime-movers as opposed to the main and emergency sources of power. (MSC/Circ.1102)

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

Where for craft of not more than 21.34m in length (and not on international voyages) it is considered impractical to fit two 25m³/h capacity pumps, such as amphibious hovercraft that operate for part of the time not over water, then a system giving an equivalent level of safety such as the following could be considered:

- one 10 m³/h capacity fire pump
- hoses with a 10mm diameter nozzle capable of producing a throw of not less than 6m which can be directed to any part of the craft
- two fire hydrants positioned either forward and aft or port and starboard
- a dual two shot water fog system with a minimum of 4 minutes operation for each shot
- additional portable fire extinguishers in the engine space or in the lobby access to that space

- .3 Isolating valves to separate the section of the fire main within the machinery space containing the main fire pump or pumps from the rest of the fire main shall be fitted in an easily accessible and tenable position outside the machinery spaces. The fire main shall be so arranged that when the isolating valves are shut all the hydrants on the craft, except those in the machinery space referred to above, can be supplied with water by a fire pump not located in this machinery space through pipes which do not enter this space. The spindles of manually operated valves shall be easily accessible and all valves shall be clearly marked.

Fire mains should be capable of being drained. Valves should be installed in the main so that fire main branches can be isolated when the main is used for purposes other than fire-fighting.
(MSC/Circ.911)

- .4 Hydrants shall be arranged so that any location on the craft can be reached by the water jets from two fire hoses from two different hydrants, one of the jets being from a single length of hose. Ro-ro spaces hydrants shall be located so that any location within the space can be reached by two water jets from two different hydrants, each jet being supplied from a single length of hose.

One hydrant should be located in the vicinity of and outside each entrance to a machinery space.
(MSC/Circ.911)

- .5 Each fire hose shall be of non-perishable material and have a maximum length approved by the Administration. Fire hoses, together with any necessary fittings and tools, shall be kept ready for use in conspicuous positions near the hydrants. All fire hoses in interior locations shall be connected to the hydrants at all times. One fire hose shall be provided for each hydrant as required by .4.

Fire hoses should have a length of:

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

(MSC/Circ.911)

Ships carrying dangerous goods should be provided with 3 additional hoses and 3 additional nozzles.
(MSC/Circ.911)

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

7.7.6 Protection of deep-fat cooking equipment

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

- .1 an automatic or manual fixed extinguishing system tested to an appropriate standard acceptable to the Organization*;

* Refer to ISO 15371 - Ships and marine technology – Fire-extinguishing systems for protection of galley deep-fat cooking equipment – Fire tests.

- .2 a primary and back up thermostat with an alarm to alert the operator in the event of failure of either thermostat;
- .3 arrangements for automatically shutting off the electrical power to the deep-fat cooking equipment upon activation of the extinguishing system;
- .4 an alarm for indicating operation of the extinguishing system in the galley where the equipment is installed; and

- .5 controls for manual operation of the extinguishing system which are clearly labelled for ready use by the crew.

7.8 Protection of special category spaces and ro-ro spaces

7.8.1 Structural protection

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

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

Vehicle decks located totally within ro-ro spaces may be accepted without structural fire protection provided these decks are not part of or do not provide support to the craft's main load-carrying structure, and provided satisfactory measures are taken to ensure that the safety of the craft, including fire-fighting abilities, integrity of fire resisting divisions and means of evacuation, is not affected by a partial or total collapse of these internal decks.
(MSC/Circ.911)

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

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

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

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

7.8.2 Fixed fire-extinguishing system

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

*Refer to IMO resolution A.123(V). **Recommendation on fixed fire extinguishing systems for special category spaces.***

The pumps should be capable of maintaining:

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

Fixed fire extinguishing systems should fulfil the following requirements:

- *the valve manifold should be provided with a pressure gauge and each of the valves should be marked;*
 - *instructions for maintenance and operation of the installation should be set up in the room where the valves are located; and*
 - *the piping system should be provided with a sufficient number of drainage valves.*
- (MSC/Circ.911)*

7.8.3 Patrols and detection

7.8.3.1 A continuous fire patrol shall be maintained in special category spaces and ro-ro spaces unless a fixed fire detection and fire alarm system, complying with the requirements of 7.7.1, and a television surveillance system are provided. The fixed fire detection system shall be capable of rapidly detecting the onset of fire. The spacing and location of detectors shall be tested taking into account the effects of ventilation and other relevant factors.

The fire detection system, excluding manual call points, may be switched off with a timer during loading/unloading of vehicles to avoid "false" alarms. (MSC/Circ.911)

The power supply of the television surveillance system for the operating spaces and ro-ro doors should be supplied in such a way as to ensure that fire damage to one camera does not affect the signal from the other cameras which are still to be received in the operating compartment / bridge console. Refer also to 7.7.1 and 2.2.5.2.

7.8.3.2 Manually operated call points shall be provided as necessary throughout the special category spaces and ro-ro spaces and one shall be placed close to each exit from such spaces. Manually operated call points shall be spaced so that no part of the space shall be more than 20 m from a manually operated call point.

7.8.4 Fire-extinguishing equipment

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

- .1 at least three water fog applicators;

A water fog applicator may consist of a metal L-shaped pipe, the long limb being approximately 2 m in length and capable of being fitted to a fire hose, and the short limb being approximately 250 mm in length and fitted with a fixed water fog nozzle or capable of being fitted with a water spray nozzle. (MSC/Circ.911)

- .2 one portable foam applicator unit consisting of an air foam nozzle of an inductor type capable of being connected to the fire main by a fire hose, together with a portable tank containing 20 l of foam-making liquid and one spare tank. The nozzle shall be capable of producing effective foam suitable for extinguishing an oil fire of at least 1.5 m³/min. At least two portable foam applicator units shall be available in the craft for use in such space; and
- .3 portable fire extinguishers of approved type and design shall be located so that no point in the space is more than approximately 15 m walking distance from an extinguisher, provided that at least one portable extinguisher is located at each access to such space.

Fire extinguishers in special-category spaces should be suitable for A and B class fires. The extinguishers should have a capacity of 12 kg dry powder or equivalent.

Refer also to the guidance to paragraph 7.7.4.

7.8.5 Ventilation system

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

Refer to MSC/Circ.729 - Design guidelines and operational recommendations for ventilation systems in ro-ro cargo spaces. (MSC/Circ.911)

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

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

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

7.8.5.5 Ventilation ducts, including dampers, shall be made of steel or other equivalent material. Ducts lying inside the served space may be made of non-combustible or fire-restricting material.

This paragraph need not be applied to trunking at the terminal ends of a ventilation system under the conditions specified in SOLAS Chapter II-2 regulation 9.7.1.1.

7.8.6 Scuppers, bilge pumping and drainage

In view of the serious loss of stability which could arise due to large quantities of water accumulating on the deck or decks consequent to the operation of the fixed pressure water-spraying system, scuppers shall be fitted so as to ensure that such water is rapidly discharged directly overboard. Alternatively, pumping and drainage facility shall be provided additional to the requirements of chapter 10. When it is required to maintain watertight or weathertight integrity, as appropriate, the scuppers shall be arranged so that they can be operated from outside the space protected.

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

Sizing of pumping and drainage arrangements:

Pumping and drainage arrangements should be such as to prevent the accumulation of water on any such decks.

In respect of scuppers and drainage pumps, the following should be complied with:

- (a) when calculating the amount of water the capacity of both the water spraying system pumps and required number of fire hose nozzles should be taken into account,*
- (b) the drainage system should have a capacity of not less than 125% of the capacity specified in (a);*
- (c) bilge wells should be of sufficient holding capacity and should be arranged at the side shell of the ship at a distance from each other of not more than 40m in each watertight compartment.*

(MSC/Circ. 911/Add. 1)

Sizing of scuppers and drainage pumps

For the sizing of scuppers and drainage pumps the capacity of both the water spraying system pumps and the water discharge from the required number of fire hose nozzles specified in paragraph 7.7.5.4, as applicable, should be taken into account.

(MSC/Circ. 911/Add. 1)

7.8.7 Precautions against ignition of flammable vapours or liquids

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

For equipment above a height of 450 mm above the deck:

The degree of protection for electrical equipment required by this section should have an enclosure having an ingress protection of at least IP 55 as defined in IEC Publication 529 - Classification of Degree of Protection provided by Enclosures, or by apparatus for use in zone 2 areas as defined in IEC Publication 60079 - Electrical Apparatus for Explosive Gas Atmospheres (Temperature Class T3).

For equipment at or below a height of 450 mm above deck:

The electrical equipment referred to in this section should be certified "safe type" and wiring, if fitted, should be suitable for use in zone 1 areas as defined in IEC Publication 79 - Electrical Apparatus for Explosive Gas Atmospheres - (Gas Group II A and Temperature Class T 3).

(MSC/Circ.911)

7.8.7.2 Electrical equipment and wiring, if installed in an exhaust ventilation duct, shall be of a type approved for use in explosive mixtures of petrol and air and the outlet from any

exhaust duct shall be sited in a safe position, having regard to other possible sources of ignition.

The electrical equipment referred to in these regulations should be certified "safe type" (refer to publication IEC 60092) and wiring, if fitted, should be suitable for use in zone 1 areas as defined in IEC Publication 60079 - Electrical Apparatus for Explosive Gas Atmospheres (Gas Group II A and Temperature Class T 3. (MSC/Circ.911)

Exhaust fans should be of a non-sparking type in accordance with IACS Unified Requirement F 29, as revised. (MSC/Circ.1102)

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

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

7.8.8 Open ro-ro spaces

7.8.8.1 Open ro-ro spaces shall comply with the requirements set out in 7.8.1.1, 7.8.2, 7.8.3, 7.8.4 and 7.8.6.

Vehicle decks located totally within ro-ro spaces may be accepted without structural fire protection provided these decks are not part of the vessel's main load-carrying structure and provided satisfactory measures are taken to ensure that the safety of the craft, including fire fighting abilities and integrity of fire resisting divisions, are not affected by a partial or total collapse of these internal decks.

7.8.8.2 For those parts of a ro-ro space which are completely open from above, the requirements set out in 7.8.2, 7.8.3.1 and 7.8.6 need not be complied with. However, a continuous fire patrol or a television surveillance system shall be maintained.

7.9 Miscellaneous

7.9.1 There shall be permanently exhibited, for the guidance of the master and officers of the craft, fire control plans showing clearly for each deck the following positions: the control stations, the sections of the craft which are enclosed by fire-resisting divisions together with particulars of the fire alarms, fire detection systems, the sprinkler installations, the fixed and portable fire-extinguishing appliances, the means of access to the various compartments and decks in the craft, the ventilating system (including particulars of the master fan controls, the positions of dampers and identification numbers of the ventilating fans serving each section of the craft), the location of the international shore connection, if fitted, and the position of all means of control referred to in 7.5.3, 7.6.2, 7.7.1 and 7.7.3.1. The text of such plans* shall be in the official language of the flag State. However, if the language is not English, French or Spanish, a translation into one of those languages shall be included.

* Refer to Graphical symbols for fire control plans, adopted by the Organization by resolution A.654(16)

Note that A.654(16) is revised by A.952(23), and the ISO standard BS ISO 17631 with Corrigendum 1 - Shipboard plans for fire protection, life-saving appliances and means of escape is currently under amendment for HSC.

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

7.9.3 Openings in fire-resisting divisions

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

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

7.9.3.3 Fire doors bounding areas of major fire hazard and stairway enclosures shall satisfy the following requirements:

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

- .1 The doors shall be self-closing and be capable of closing with an angle of inclination of up to 3.5° opposing closure. The approximate time of closure for hinged fire doors shall be no more than 40 s and no less than 10 s from the beginning of their movement with the craft in the upright position. The approximate uniform rate of closure for sliding fire doors shall be of no more than 0.2 m/s and no less than 0.1 m/s with the craft in the upright position.
- .2 Remote released sliding or power-operated doors shall be equipped with an alarm that sounds at least 5 s but no more than 10 s after the door is released from the continuously manned control station and before the door begins to move and continue sounding until the door is completely closed. Doors designed to re-open upon contacting an object in their paths shall re-open no more than 1 m from the point of contact.
- .3 All doors shall be capable of remote release from a continuously manned central control station, either simultaneously or in groups, and shall be capable of release also individually from a position at both sides of the door. Indication shall be provided at the fire door indicator panel in the continuously manned control station whether each of the remote released doors is closed. The release mechanism shall be so designed that the door will automatically close in the event of disruption of the control system or main source of electrical power. Release switches shall have an on-off function to prevent automatic resetting of the system. Hold-back hooks not subject to continuously manned control station release shall be prohibited.
- .4 A door closed remotely from the continuously manned control station shall be capable of being re-opened at both sides of the door by local control. After such local opening, the door shall automatically close again.
- .5 Local power accumulators for power-operated doors shall be provided in the immediate vicinity of the doors to enable the doors to be operated after

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

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

- .6 Disruption at one door of the control system or main source of electric power shall not impair the safe functioning of the other doors.
- .7 Double-leaf doors equipped with a latch necessary to their fire integrity shall have a latch that is automatically activated by the operation of the doors when released by the system.
- .8 Doors giving direct access to special category spaces which are power-operated and automatically closed need not be equipped with alarms and remote-release mechanisms required in .2 and .3.
- .9 The components of the local control system shall be accessible for maintenance and adjusting.
- .10 Power operated doors shall be provided with a control system of an approved type which shall be able to operate in case of fire, this being determined in accordance with the Fire Test Procedures Code. This system shall satisfy the following requirements:
 - .1 the control system shall be able to operate at a temperature of at least 200°C for at least 60 min, served by the power supply;
 - .2 the power supply for all other doors not subject to fire shall not be impaired; and
 - .3 at temperatures exceeding 200°C the control system shall be automatically isolated from the power supply and shall be capable of keeping the door closed up to at least 945°C.

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

"Open spaces" as referred to in paragraph 7.9.3.4 of the Code is interpreted as excluding grouping E in tables 7.4-1 and 7.4-2. (MSC/Circ.911)

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

7.10 Firefighter's outfits

7.10.1 All craft other than category A passenger craft shall carry at least two firefighter's outfits complying with the requirements of 7.10.3.

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

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

A water fog applicator might consist of a metal L-shaped pipe, the long limb being approximately 2 m in length and capable of being fitted to a fire hose, and the short limb being approximately 250 mm in length fitted with a fixed water fog nozzle or capable of being fitted with a water spray nozzle. (MSC/Circ.911)

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

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

The storage of firefighter's outfits and personal equipment should be permanently and clearly marked. (MSC/Circ.911)

7.10.3 A firefighter's outfit shall consist of:

- .1 Personal equipment comprising:
 - .1.1 protective clothing of material to protect the skin from the heat radiating from the fire and from burns and scalding by steam or gases. The outer surface shall be water-resistant;

Refer to ISO 6942 – Protective clothing - Protection against heat and fire - evaluation of materials and material assemblies when exposed to source of radiant heat. (MSC/Circ.911)

Refer to S.I. 1999 No 1957 The Merchant Shipping (Marine Equipment) Regulations 1999, as amended, and the MED, item A.1/3.3 (Appendix A of this document).

- .1.2 boots and gloves of rubber or other electrically non-conductive material;

Refer to IEC 903 - 1988 - Specification for gloves and mitts of insulating material for live working. (MSC/Circ.911)

SOLAS 1974 Amendments 2000 and the FSS Code no longer refer to rubber gloves and are not considered to be required by the UK Administration.

- .1.3 a rigid helmet providing effective protection against impact;
- .1.4 an electric safety lamp (hand lantern) of an approved type with a minimum burning period of 3 h; and

Electric safety lamps intended to be used in hazardous areas should be of an explosion proof type. Reference is made to IEC Publication 7979 - Electrical Apparatus for Explosive Gas Atmospheres (Gas Group II A and Temperature Class T 3). (MSC/Circ.911)

- .1.5 an axe.

The handle of the axe should be provided with high-voltage insulation. (MSC/Circ.911)

- .2 A breathing apparatus of an approved type which may be either:

- .2.1 a smoke helmet or smoke mast, which shall be provided with a suitable air pump and a length of air hose sufficient to reach from the open deck, well clear of hatch or doorway, to any part of the holds or machinery spaces. If, in order to comply with this subparagraph, an air hose exceeding 36 m in length would be necessary, a self-contained breathing apparatus shall be substituted or provided in addition, as determined by the Administration; or

SOLAS 2000 Amendments and the FSS Code Chapter 3 no longer allow this type of breathing apparatus and they should now only be of a self-contained compressed air breathing apparatus type.

- .2.2 a self-contained compressed-air-operated breathing apparatus, the volume of air contained in the cylinders of which shall be at least 1,200 l, or other self-contained breathing apparatus, which shall be capable of functioning for at least 30 min. A number of spare charges, suitable for use with the apparatus provided, shall be available on board.

Two spare charges suitable for use with the apparatus should be provided for each required apparatus. (MSC/Circ.911)

- .3 For each breathing apparatus a fireproof lifeline of sufficient length and strength shall be provided capable of being attached by means of a snaphook to the harness of the apparatus or to a separate belt in order to prevent the breathing apparatus becoming detached when the lifeline is operated.

Each breathing apparatus should be provided with a flexible fireproof lifeline approximately 30 m in length. The lifeline should be subjected to a test by static load of 3.5 kN for 5 min. (MSC/Circ.911)

PART B - REQUIREMENTS FOR PASSENGER CRAFT

7.11 Arrangement

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

- .1 The craft shall be divided into at least two zones. The mean length of each zone shall not exceed 40 m.
- .2 For the occupants of each zone there shall be an alternative safe area to which it is possible to escape in case of fire. The alternative safe area shall be separated from other passenger zones by smoke-tight divisions of non-combustible materials or fire-restricting materials extending from deck to deck. The alternative safe area can be another passenger zone. Alternative safe areas shall be dimensioned on the basis of one person per seat and 0.35 m² per person of the net remaining area, based on the maximum number of persons they are called to accommodate in an emergency.
- .3 The alternative safe area shall, as far as practicable, be located adjacent to the passenger zone it is intended to serve. There shall be at least two exits from each passenger zone, located as far away from each other as possible, leading to the alternative safe area. Escape routes shall be provided to enable all passengers and crew to be safely evacuated from the alternative safe area.

Safe evacuation from the alternative safe area should be completed within the structural fire protection time for areas of major fire hazard. (MSC/Circ.911)

7.11.2 Category A craft need not be divided into zones.

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

7.12 Ventilation

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

7.13 Fixed sprinkler system

7.13.1 Public spaces and service spaces, crew accommodation areas where sleeping berths are provided, storage rooms other than those containing flammable liquids, and similar spaces shall be protected by a fixed sprinkler system based on the standards developed by the Organization*. Manually operated sprinkler systems shall be divided into sections of appropriate size and the valves for each section, start of sprinkler pump(s) and alarms shall be capable of being operated from two spaces separated as widely as possible, one of which shall be a continuously manned control station. In category B craft, no section of the system shall serve more than one of the zones required in 7.11.

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

A stairway open at one deck should be considered part of the space to which it is open, and consequently, should be protected by a sprinkler system, if provided. (MSC/Circ.911)

The SOLAS sprinkler system is specified in the FSS Code Chapter 8. The A.800(19) standard, Revised Guidelines for Approval of Sprinkler Systems Equivalent to that Referred to in SOLAS Regulation II-2/12, is also reproduced in the FSS Code. These standards are both acceptable alternatives to MSC.44(65).

In the case where a manual sprinkler system is fitted, special consideration should be given to the location of the second manually operated switch or break glass station (one being installed in a continuously manned control station). This second switch should be located in a position such that it is readily accessible to crew members but protected from inadvertent actuation by passengers. (MSC/Circ 912)

Hydro-pneumatic tanks need not be provided for manual sprinkler systems. (MSC/Circ 912)

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

7.13.3 Category A craft need not comply with the requirements of 7.13.1 and 7.13.2 providing that:

- smoking is not permitted;
- sales shops, galleys, service spaces, ro-ro spaces and cargo spaces are not fitted;
- the maximum number of passengers carried does not exceed 200; and
- the voyage duration at operational speed from departure port to destination when fully laden does not exceed 2 h.

This new provision has been incorporated since the 1994 Code to remove the weight impact of sprinkler systems on craft where the fire risk is considered to be modest.

PART C - REQUIREMENTS FOR CARGO CRAFT

7.14 Control stations

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

7.15 Cargo spaces

Cargo spaces, except open deck areas or refrigerated holds, shall be provided with an approved automatic smoke-detection system complying with 7.7.1 to indicate at the control station the location of outbreak of a fire in all normal operating conditions of the installations and shall be protected by an approved fixed quick-acting fire-extinguishing system complying with 7.7.3.2 operable from the control station.

7.16 Fixed sprinkler system

7.16.1 Crew accommodation where sleeping berths are provided, having a total deck area greater than 50 m² (including corridors serving such accommodation), shall be protected by a fixed sprinkler system based on the standards developed by the Organization*.

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

In the case where a manual sprinkler system is fitted, special consideration should be given to the location of the second manually operated switch or break glass station (one being installed in a continuously manned control station). This second switch should be located in a position such that it is readily accessible to crew members but protected from inadvertent actuation by passengers. (MSC/Circ 912)

Hydro-pneumatic tanks need not be provided for manual sprinkler systems. (MSC/Circ 912)

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

PART D - REQUIREMENTS FOR CRAFT AND CARGO SPACES INTENDED FOR THE CARRIAGE OF DANGEROUS GOODS*

* Refer to the International Maritime Dangerous Goods Code (IMDG Code), adopted by the Organization by resolution A.716(17), as amended, and the Code of Safe Practice for Solid Bulk Cargoes, adopted by resolution A.434(XI), as amended.

This section is a complete new addition since the 1994 Code.

7.17 General

7.17.1 In addition to complying with the requirements of 7.15 for cargo craft and with the requirements of 7.8 for both passenger and cargo craft as appropriate, craft types and cargo spaces referred to in 7.17.2 intended for the carriage of dangerous goods shall comply with the requirements of this paragraph, as appropriate, except when carrying dangerous goods in limited quantities[†], unless such requirements have already been met by compliance with the requirements elsewhere in this chapter. The types of craft and modes of carriage of dangerous goods are referred to in 7.17.2 and in table 7.17-1, where the numbers appearing in 7.17.2 are referred to in the top line. Cargo craft of less than 500 gross tonnage constructed on or after 1 July 2002 shall comply with this paragraph, but the Administration of the State whose flag the craft is entitled to fly may, in consultation with the port State, reduce the requirements and such reduced requirements shall be recorded in the document of compliance referred to in 7.17.4.

[†] Refer to chapter 3.4 of the International Maritime Dangerous Goods Code (IMDG Code) for the provisions on the carriage of "limited quantities".

References to the IMDG Code, General Introduction

Refer to section 17 of the International Maritime Dangerous Goods Code (IMDG Code) for operational measures in association with the requirements of this regulation.

7.17.2 Application of tables 7.17-1 and 7.17-2

The following craft types and cargo spaces shall govern the application of tables 7.17-1 and 7.17-2:

- .1 craft and cargo spaces not specifically designed for the carriage of freight containers but intended for the carriage of dangerous goods in packaged form including goods in freight containers and portable tanks;
- .2 purpose-built container craft and cargo spaces intended for the carriage of dangerous goods in freight containers and portable tanks;

A purpose built container space is a cargo space fitted with cell guides for stowage securing of containers.

- .3 craft and ro-ro spaces intended for the carriage of dangerous goods; and

Ro-ro cargo spaces include special category spaces and vehicle deck spaces.

- .4 craft and cargo spaces intended for the carriage of solid dangerous goods in bulk.

7.17.3 Requirements

Unless otherwise specified, the following requirements shall govern the application of tables 7.17-1, 7.17-2 and 7.17-3 to both "on deck" and "under deck" stowage of dangerous goods. The numbers of the following sub-sections are indicated in the first column of the above-mentioned tables.

For the purpose of this section, "on deck" shall be taken to mean spaces on the weather deck.

**Table 7.17-1
Application of the requirements of 7.17.3 to different modes of carriage of dangerous goods in craft and cargo spaces**

Section 7.17.2 Section 7.17.3	Weather decks (7.17.2.1 to 7.17.2.4 inclusive)	7.17.2.1	7.17.2.2	7.17.2.3		7.17.2.4
		Not specifically designed	Container cargo spaces	Ro-ro spaces	Open ro-ro spaces	Solid dangerous goods in bulk
7.17.3.1.1	x	x	x	x	x	For application of requirements of Part D to different classes of dangerous goods, see table 7.17-2
7.17.3.1.2	x	x	x	x	x	
7.17.3.1.3	-	x	x	x	x	
7.17.3.1.4	-	x	x	x	x	
7.17.3.2	-	x	x	x	x	
7.17.3.3	-	x	x	x	-	
7.17.3.4.1	-	x	x ¹	x	-	
7.17.3.4.2	-	x	x ¹	x	-	
7.17.3.5	-	x	x	x	-	
7.17.3.6.1	x	x	x	x	x	
7.17.3.6.2	x	x	x	x	x	
7.17.3.7	x	x	-	-	x	
7.17.3.8.1	-	x	x	x	-	
7.17.3.8.2	-	-	-	x ²	x	
7.17.3.9	-	-	-	x	x	
7.17.3.10	x	-	-	x	x	

NOTES:

¹ For classes 4 and 5.1 not applicable to closed freight containers.

For classes 2, 3, 6.1 and 8 when carried in closed freight containers the ventilation rate may be reduced to not less than two air changes. For the purpose of this requirement a portable tank is a closed freight container.

² Applies only to ro-ro spaces, not capable of being sealed.

x Wherever "x" appears in the table it means that this requirement is applicable to all classes of dangerous goods as given in the appropriate line of table 7.17-3, except as indicated by the notes.

Table 7.17-2

Application of the requirements of 7.17.3 to different classes of dangerous goods for craft and cargo spaces carrying solid dangerous goods in bulk

Class							
Section	4.1	4.2	4.3³	5.1	6.1	8	9
7.17.3.1.1	X	X	-	X	-	-	X
7.17.3.1.2	X	X	-	X	-	-	X
7.17.3.2	X	X ⁴	X	X ⁵	-	-	X ⁵
7.17.3.4.1	-	X ⁴	X	-	-	-	-
7.17.3.4.2	X ⁶	X ⁴	X	X ^{4,6}	-	-	X ^{4,6}
7.17.3.4.3	X	X	X	X	X	X	X
7.17.3.6	X	X	X	X	X	X	X

NOTES:

- ³ The hazards of substances in this Class which may be carried in bulk are such that special consideration must be given by the Administration to the construction and equipment of the craft involved in addition to meeting the requirements enumerated in this table.
- ⁴ Only applicable to Seedcake containing solvent extractions, to Ammonium nitrate and to Ammonium nitrate fertilizers.
- ⁵ Only applicable to Ammonium nitrate and to Ammonium nitrate fertilizers. However, a degree of protection in accordance with standards contained in the "International Electrotechnical Commission, publication 79 - Electrical Apparatus for Explosive Gas Atmospheres", is sufficient.
- ⁶ Only suitable wire mesh guards are required.

The terminology "solid dangerous goods in bulk" covers only those cargoes listed in Appendix B of the Bulk Cargo Code except cargoes of Materials Hazardous in Bulk. Other solid dangerous goods in bulk may only be permitted subject to acceptance by the Administrations involved.

The term "Class" refers to the classification of dangerous goods as specified in the IMDG Code.

Table 7.17-3

Application of the requirements of section 7.17.3 to different classes of dangerous goods except solid dangerous goods in bulk

Class Section	1.1- 1.6 ⁸	1.4S	2.1	2.2	2.3	3.1 3.2 liquids ≤ 23°C ¹¹	3.3 liquids >23°C ¹ 1 ≤ 61°C	4.1	4.2	4.3	5.1 ⁹	5.2	6.1 liquids	6.1 liquids ≤ 23°C ¹¹	6.1 liquids >23°C ¹¹ ≤ 61°C	6.1 solids	8 liquids	8 liquids ≤ 23°C ¹¹	8 liquids >23°C ¹¹ ≤ 61°C	8 solids	9
7.17.3.1.1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7.17.3.1.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	-
7.17.3.1.3	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.17.3.1.4	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.17.3.2	x	-	x	-	-	x	-	-	-	-	-	-	-	x	-	-	-	x	-	-	-
7.17.3.3	x	x	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x	x	x	-
7.17.3.4.1	-	-	x	-	x	x	-	x ⁷	x ⁷	x	x ⁷	-	-	x	x	x ⁷	-	x	x	-	x ⁷
7.17.3.4.2	-	-	x	-	-	x	-	-	-	-	-	-	-	x	x	-	-	x	x	-	-
7.17.3.5	-	-	-	-	-	x	-	-	-	-	-	-	x	x	x	-	-	x	-	-	-
7.17.3.6	-	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x ¹⁰
7.17.3.7	-	-	-	-	-	x	x	x	x	x	x	-	-	x	x	-	-	x	x	-	-
7.17.3.8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7.17.3.9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
7.17.3.10	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

NOTES:

- ⁷ When "mechanically-ventilated spaces" are required by the International Maritime Dangerous Goods Code (IMDG Code), as amended.
- ⁸ Stow 3 m horizontally away from the machinery space boundaries in all cases.
- ⁹ Refer to the International Maritime Dangerous Goods Code.
- ¹⁰ As appropriate to the goods being carried.
- ¹¹ Refer to flashpoint.

The term "Class" refers to the classification of dangerous goods as specified in the IMDG Code.

7.17.3.1 Water supplies

Water supplies for open-top container cargo spaces in ships:

The water spray system required by paragraphs 9.2, 9.3 and 9.4 of MSC/Circ.608/Rev.1 on Interim guidelines for open-top container ships, will also satisfy the requirement for dangerous goods.

The amount of water required for fire-fighting purposes in the largest hold should allow simultaneous use of the water spray system plus four jets of water from hose nozzles.

(MSC/Circ.608/Rev.1).

7.17.3.1.1 Arrangements shall be made to ensure immediate availability of a supply of water from the fire main at the required pressure either by permanent pressurization or by suitably placed remote starting arrangements for the fire pumps.

Amphibious hovercraft that may operate over other surfaces than water should not be required to have any special arrangements to satisfy this requirement. Only the provision of fire pumps and sea inlets that are in the water when the craft is operating over water and off cushion need to be provided.

7.17.3.1.2 The quantity of water delivered shall be capable of supplying four nozzles of a size and at a pressure as specified in 7.7.5, capable of being trained on any part of the cargo space when empty. This amount of water may be applied by equivalent means to the satisfaction of the Administration.

The total required capacity of the water supply should satisfy SOLAS (Amendments 2000) regulations II-2/19.3.1.2 and 19.3.1.3 (if applicable), simultaneously calculated for the largest designated cargo space. The capacity requirement for SOLAS (Amendments 2000) regulation II-2/19.3.1.2 should be met by the total capacity of the main fire pump(s) not including the capacity of the emergency fire pump, if fitted. If a drencher system is used to satisfy SOLAS (Amendments 2000) regulation II-2/19.3.1.3, then the drencher pump should also be taken into account in this total capacity calculation.

7.17.3.1.3 Means of effectively cooling the designated under deck cargo-space by copious quantities of water, either by a fixed arrangement of spraying nozzles, or flooding the space with water, shall be provided. Hoses may be used for this purpose in small cargo spaces and in small areas of larger cargo-spaces at the discretion of the Administration. In any event, the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. If this is not possible, the adverse effect upon stability of the added weight and free surface of water shall be taken into account.

Size of pumping and drainage arrangements:

Refer to IMO resolution A.123(V).- Recommendation on fixed fire-extinguishing systems for special category spaces.

With respect to drainage and pumping arrangements, reference is made to the interpretations of SOLAS Amendments 2000 regulation II-2/20.6.1.4.1.3 and to SOLAS Regulation II-2.6.1.5 (scupper grids). (MSC/Circ.1102 and MSC84 report)

Refer also to MSC.1/Circ.1234, Drainage of fire-fighting water from closed vehicle and ro ro spaces and special category spaces for passenger and cargo ships.

7.17.3.1.4 Provision to flood a designated under deck cargo-space with suitable specified media may be substituted for the requirements in 7.17.3.1.3 above.

A high expansion foam system, complying with SOLAS (Amendments 2000) regulation II-2/10.4.1.1.2, is acceptable except if cargoes react dangerously with water (see the IMDG Code).

7.17.3.2 Sources of ignition

Electrical equipment and wiring shall not be fitted in enclosed cargo spaces, unless it is essential for operational purposes. However, if electrical equipment is fitted in such spaces, it shall be of a certified safe type* for use in the dangerous environments to which it may be exposed unless it is possible to completely isolate the electrical system (by removal of links in the system, other than fuses). Cable penetrations of the decks and bulkheads shall be sealed against the passage of gas or vapour. Through runs of cables and cables within the cargo spaces shall be protected against damage from impact. Any other equipment which may constitute a source of ignition of flammable vapour shall not be permitted.

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

The IEC numbering has now changed to IEC60092-506.

7.17.3.3 Detection system

Enclosed cargo spaces shall be provided with an approved automatic smoke detection system complying with 7.7.1 or with a detection system which, in the opinion of the Administration gives equivalent protection.

7.17.3.4 Ventilation

Ventilation requirements for individual cargoes and open-top container cargo holds:

If adjacent spaces are not separated from cargo spaces by gastight bulkheads or decks, ventilation requirements should apply as for the cargo space itself, required under SOLAS (Amendments 2000) regulation II-2/19.3.4.2 and its interpretations. (MSC/Circ.1102)

Requirements for Individual Cargoes

Cargoes liable to give off vapours or gases which can form an explosive mixture with air (see the BC Code, Appendix B, e.g. IMO Class 4.3 materials): Two separate fans should be permanently fitted or being of a portable type adapted for being permanently fitted prior to loading and during voyage. The fans should be either explosion proof or arranged such that the escaping gas flow is separated from electrical cables and components. The total ventilation should be at least six air changes per hour, based upon the empty space. Ventilation should be such that any escaping gases cannot reach living spaces on or under deck. (MSC/Circ.1102)

Cargoes liable to spontaneous combustion (only applicable to Seed Cake (b) and (c)): Two separate fans should be permanently fitted or being of a portable type adapted for being permanently fitted prior to loading and during voyage. The fans should be either explosion proof or arranged such that the escaping gas flow is separated from electrical cables and components. The total ventilation should be at least six air changes per hour, based upon the empty space. Ventilation should be such that any escaping gases cannot reach living spaces on or under deck (MSC/Circ.1102)

For open-top container ships: Power ventilation should be required only for the lower part of the cargo hold for which purpose ducting is required. The ventilation capacity should be at least two air changes per hour based on the empty hold volume below weather deck.

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

7.17.3.4.2 The fans shall be such as to avoid the possibility of ignition of flammable gas air mixtures. Suitable wire mesh guards shall be fitted over inlet and outlet ventilation openings.

Exhaust fans should be of non-sparking type in accordance with IACS Requirement F 29, as revised.

The purpose of "suitable wire mesh guards" is to prevent foreign objects from entering into the fan casing. The standard wire mesh guards should have a size of 13mm x 13mm.

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

7.17.3.5 Bilge pumping

Where it is intended to carry flammable or toxic liquids in enclosed spaces, the bilge pumping system shall be designed to ensure against inadvertent pumping of such liquids through machinery space piping or pumps. Where large quantities of such liquids are carried, consideration shall be given to the provision of additional means of draining those spaces.

Arrangements of bilge drainage systems for cargo spaces:

If the bilge drainage system for cargo spaces is additional to the system served by pumps in the machinery space, the capacity of the system should be not less than 10 m³/h per cargo space served. If the additional system is a common system, the capacity need not exceed 25 m³/h. The additional bilge system need not be arranged with redundancy. Whenever flammable or toxic liquids are carried, the bilge line into the machinery space should be isolated either by fitting a blank flange or by a closed lockable valve.

If bilge drainage of cargo spaces is arranged by gravity drainage, the drainage should be either lead directly overboard or to a closed drain tank located outside the machinery spaces. The tank should be provided with vent pipe to a safe location on the open deck.

Enclosed spaces outside machinery spaces containing bilge pumps serving cargo spaces intended for carriage of flammable or toxic liquids should be fitted with separate mechanical ventilation giving at least 6 air changes per hour. Electrical equipment in the space should comply with the IACS Unified interpretation SC 79. If the space has access from another enclosed space, the door should be self-closing. Refer to Special features – Ships carrying dangerous goods and materials hazardous only in bulk (IEC 60092-506).

Drainage from a cargo space into bilge wells in a lower space is only permitted if that space satisfies the same requirements as the cargo space above.

7.17.3.6 Personnel protection

7.17.3.6.1 Four sets of full protective clothing resistant to chemical attack shall be provided in addition to the firefighter's outfits required by 7.10. The protective clothing shall cover all skin, so that no part of the body is unprotected.

When selecting the protective clothing the danger of the chemicals according to the class and liquid or gaseous state should be taken into account.

The required protective clothing is for emergency purposes.

For solid bulk cargoes the protective clothing should satisfy the equipment requirements specified in Appendix E of the BC Code for the individual substances. For packaged goods the protective clothing should satisfy the equipment requirements specified in emergency procedures (EmS) of the Supplement to IMDG Code for the individual substances.

7.17.3.6.2 At least two self-contained breathing apparatus additional to those required by 7.10 shall be provided.

Spare charges for the breathing apparatus should be provided as required in SOLAS (Amendments 2000) regulation II-2/10.10.2.5 and its interpretations.

7.17.3.7 Portable fire extinguishers

Portable fire extinguishers with a total capacity of at least 12 kg of dry powder or equivalent shall be provided for the cargo spaces. These extinguishers shall be in addition to any portable fire extinguishers required elsewhere in this chapter.

7.17.3.8 Fixed fire extinguishing system

Reference is made to IMO resolution A.123(V) - Recommendation on fixed fire-extinguishing systems for special category spaces. (IMO/Circ.1102)

With respect to pumping and drainage arrangement, reference is made to the interpretations of SOLAS (Amendments 2000) regulations II-2/20.6.1.4 and 20.6.1.4.1.3. (IMO/Circ.1102)

7.17.3.8.1 Cargo spaces, except for open decks, shall be provided with an approved fixed fire extinguishing system complying with the provisions of 7.7.3 or with a fire extinguishing system which, in the opinion of the Administration, gives equivalent protection for the cargo carried.*

* For cargoes for which a fixed gas fire-extinguishing system is ineffective, refer to the list of cargoes in table 2 of MSC/Circ.671.

Note that MSC/Circ.671 has been superseded by MSC/Circ.1146.

7.17.3.8.2 Each open ro-ro space having a deck above it and each ro-ro space not capable of being sealed shall be fitted with an approved fixed pressure water-spraying system for manual operation which shall protect all parts of any deck and vehicle platform in such space, except that the Administration may permit the use of any other fixed fire-extinguishing system that has been shown by full-scale test to be no less effective. In any event the drainage and pumping arrangements shall be such as to prevent the build-up of free surfaces. If this is not possible the adverse effect upon stability of the added weight and free surface of water shall be taken into account to the extent deemed necessary by the Administration in its approval of the stability information.

Refer to Recommendation on fixed fire-extinguishing systems for special category spaces (resolution A.123(V)).

Refer to relevant provisions of regulation II-2/20.6.1.4 of the Convention.

7.17.3.9 Separation between ro-ro spaces and open ro-ro spaces

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

7.17.3.10 Separation between ro-ro spaces and weather decks

A separation shall be provided between a ro-ro space and the adjacent weather deck. The separation shall be such as to minimize the passage of dangerous vapours and liquids between such spaces. Alternatively, a separation need not be provided if the ro-ro space fully complies with the requirements for ro-ro spaces in Part D. However, a separation is still required when dangerous goods carried shall be loaded on the weather deck only.

7.17.4 Document of compliance

The Administration shall provide the craft with an appropriate document as evidence of compliance of construction and equipment with the requirements of this Part D.

Refer to "Standard Format for Document of Compliance . Special requirements for craft carrying dangerous goods". in Annex 1, and MSC/Circ.1148 -. Issuing and renewal of document of compliance with the special requirements applicable to ships carrying dangerous goods.

The terminology "solid dangerous goods in bulk" covers only those cargoes listed in Appendix B of the Bulk Cargo Code except cargoes of Materials Hazardous in Bulk. Other solid dangerous goods in bulk may only be permitted subject to acceptance by the Administrations involved. (IMO/Circ.1102)

There are no special requirements in the above-mentioned SOLAS regulation II-2/19 for the carriage of dangerous goods of classes 6.2 and 7, or for the carriage of dangerous goods in limited quantities, as required in Chapter 3.4 of the IMDG Code. (IMO/Circ.1102)