The Swedish Transport Agency's Code of Statutes

TRANSPORT STYRELSEN

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MARITIME TRANSPORT

Regulations amending the Swedish Transport Agency's regulations and general advice (2009:98) on fire protection, fire detection and fire extinguishing on SOLAS ships constructed on 1 July 2002 or later;

adopted on [Select a date].

The Swedish Transport Agency prescribes[1] the following, pursuant to Chapter 2, Section 1 of the Ship Safety Ordinance (2003:438), as regards the Swedish Transport Agency's regulations and general advice (2009:98) on fire protection, fire detection and fire extinguishing on SOLAS ships constructed on 1 July 2002 or later,

that Annex 4 shall be deleted,

that Sections 2, 5 and 11, and Annexes 1 to 3 shall read as follows.

Application

Section 2. These regulations apply to SOLAS ships constructed on or after 1 July 2002.

Cargo ships converted into passenger ships shall comply with the requirements for passenger ships set out in these Regulations from the date of commencement of the conversion[2].

For ships constructed before 1 July 2002, the requirements of the Swedish Transport Agency's regulations and general advice (TSFS 2009:97) on fire protection, fire detection and firefighting on SOLAS ships constructed before 1 July 2002, shall apply.

All ships that are repaired, transformed, or modified so that the ship's dimensions or passenger cabins are substantially changed, or so that the service life of the ship is significantly extended, shall meet the requirements of these regulations to the extent that, according to the Swedish Transport Agency's assessment, this is reasonable and practicable[3].

[1] See Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.
[2] Equivalent to SOLAS 74, Chapter II-2, Regulation 1.1.2.3.
[3] Equivalent to SOLAS 74, Chapter II-2, Regulation 1.3.2.

Definitions

Section 5[4] For the purposes of these regulations, the following definitions shall apply:

all ships	ships constructed before, on or after 1 July 1998.
'A' class divisions	divisions formed by bulkheads and decks which comply with the following: 1. They are constructed of *steel or equivalent material*; 2. They are suitably stiffened; 3. They are insulated with an approved *non-combustible material* such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature, at any one point, including any joint, rise more than 180 °C above the original temperature, within the time listed below: class 'A-60' 60 min class 'A-30' 30 min class 'A-15' 15 min class 'A-0' 0 min 4. They are so constructed as to be capable of preventing the passage of smoke and flame to the end of the one-hour standard fire test; 5. A prototype of a bulkhead or deck is tested in accordance with *the FTP code* to ensure that it meets the integrity and temperature rise requirements of 1-4.
service spaces	spaces used as kitchens, kitchenettes equipped with galleys, pantries containing cooking appliances, lockers, mail and specie rooms, storerooms, workshops other than those forming part of the *machinery spaces*, and similar spaces and trunks to such spaces.
atriums	public spaces within a main vertical zone comprising three or more open decks.
sauna	a hot space with temperatures that normally range from 80 °C to 120 °C and which is heated by a hot surface (for example, an electrically heated sauna stoves); may also include the space where the stove is

[4] The amendment removes the definition of the BC Code.

	located and adjacent bathrooms.
BCH Code	(International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk) the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, applicable to *ships constructed* before 1 July 1986.
'B' class divisions	bulkheads, decks, ceilings or linings that meet the following criteria: 1. They are constructed of approved *non-combustible materials* and all materials entering into the construction and erection is non-combustible, with the exception that combustible veneers may be permitted provided they meet other requirements of these regulations. 2. They have an insulation value such that the average temperature of the unexposed side will not rise more than 140 °C above the original temperature, nor will the temperature at any one point, including any joint, rise more than 225 °C above the original temperature within the time listed below: class 'B-15' 15 min class 'B-0' 0 min 3. They are so constructed as to be capable of preventing the passage of flame to the end of the first half hour of a *standard fire test*. 4. A prototype of the division is tested in accordance with *the FTP code* to ensure that it meets the integrity and temperature rise requirements of 1-3.
vehicle carrier	*cargo ships* carrying cargo only in *ro-ro cargo spaces* or vehicle spaces, and designed for the carriage of cargo consisting of empty cars and lorries.
accommodation spaces	spaces used as *public spaces*, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobbies rooms, barber shops, pantries containing no cooking appliances and similar spaces.
fire control station	a *control station* with either centralised fire alarm equipment or centralised fire control equipment.
fire damper	in Annex 1, Regulation 9.7: a device which is installed in a ventilation duct and which is open under normal conditions, but which is closed in the event of

	a fire so as to limit the spread of fire; including: 1. automatic *fire damper*, which is self-closing when exposed to fire; 2. manual *fire damper*, which intended to be opened or closed by the crew by hand at the damper itself; and 3. remotely operated *fire damper*, which is closed by the crew through a control located at a distance from the damper.
combustible material	any material that is not *non-combustible material*.
oil fuel unit	equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine; includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0.18 N/mm^2.
central control station	*control station* with centralised control and indication functions for: 1. fixed fire detection and alarm systems; 2. automatic sprinklers, fire detection and alarm systems; 3. fire door indicator panels; 4. fire door closures; 5. watertight door indicator panels; 6. watertight door closures; 7. ventilation fans; 8. general/fire alarms; 9. communication systems including telephones; and 10. microphones to public address systems.
'C' class divisions	divisions constructed of approved *non-combustible materials*; these divisions need meet neither requirements relative to the passage of smoke and flame nor limitations relative to the temperature rise; combustible veneers are permitted provided they meet the requirements of these regulations.
deadweight	the difference in tonnes between the displacement of a ship in water of a specific gravity of 1.025 at the load waterline corresponding to the assigned summer freeboard and the lightweight of the ship.
dangerous goods	as defined in Section 5 of the Act (2006:263) on the

	carriage of dangerous goods.[5]
ship constructed	ships the keels of which have been laid or which are at a *similar stage of construction*[6]
flashpoint	the temperature in degrees Celsius (closed cup) at which a product will give off enough flammable vapour to be ignited, as determined by an approved flashpoint apparatus.
vehicle spaces	*cargo spaces* intended for the transport of motor vehicles with fuel in the tanks for their own propulsion.
FSS Code	'International Code for Fire Safety Systems' means the International Code for Fire Safety Systems.
FTP Code	'International Code for Application of Fire Test Procedures' means the International Code for the Application of Fire Test Procedures.
detailed requirements	the requirements for design characteristics, limited dimensions and fire safety systems laid down in Annex 1, Parts B, C, D, E and G.
gas carriers	a *tanker* constructed or adapted for and used for the carriage in bulk of liquefied gases or other flammable products listed in Chapter 19 of the *IGC Code*.
helicopter facility	*helideck* with bunkering device and a hangar.
helideck	a specially constructed helicopter landing area on the ship; includes all structural elements, all fire extinguishing devices and all other equipment required for the safe helicopter activities.
helicopter pick-up point	an area on the ship where helicopters can collect persons and equipment without landing.
helicopter landing site	an area on a ship, which is specifically intended for helicopter landings that occur occasionally or in emergency situations, but which is not designed for regular helicopter operation.
cabin balcony	open deck space intended solely for the person living in a particular cabin and has direct access from this cabin.
IBC Code	(International Code for the Construction and

[5] Equivalent to SOLAS 74, Chapter VII, Regulation 1.2.
[6] Equivalent to SOLAS 74, Chapter II-2, Regulation 1.1.2.1.

	Equipment of Ships Carrying Dangerous Chemicals in Bulk) the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, applicable to *ships constructed* on 1 July 1986 or later.
IGC Code	(International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk) the International Code for Ships Carrying Dangerous Chemicals in Bulk.
IMDG Code	(International Maritime Dangerous Goods Code) the International Code for the Maritime Carriage of Packaged Dangerous Goods.
IMSBC Code	(International Maritime Solid Bulk Cargoes Code) the International Code for the Maritime Carriage of Solid Cargoes in Bulk.
chemical tanker	*tanker* constructed or adapted for and used for the carriage in bulk of one or more of the readily flammable liquid products listed in Chapter 17 of the *IBC Code*.
combination carrier	*ship* designed to carry both oil and solid bulk cargoes.
control station	space that contains: 1. the ship's radio equipment, 2. the main navigation equipment of the ship, 3. an emergency source of power, 4. centralised fire alarm equipment, or 5. centralised fire control equipment.
cargo ship	a ship which is not a *passenger ship*.
cargo area	the part of the ship containing holds, cargo tanks, slop tanks and cargo pump rooms, including pump rooms, cofferdams, ballast spaces and empty spaces adjacent to cargo tanks, and deck surfaces throughout the length and width of the part of the ship situated above these spaces.
cargo spaces	spaces used for cargo, cargo oil tanks, tanks for other liquid cargoes, and trunks to such spaces.
lightweight	the displacement of the ship in tonnes without cargo, fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, and passengers and crew and their effects.

machinery spaces	machinery spaces of category 'A' and other spaces containing propelling machinery, boilers, *oil fuel units*, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.
machinery spaces of category 'A'	spaces and trunks to such spaces containing: 1. internal combustion used for main propulsion; 2. internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or 3. any oil-fired boiler or oil fuel unit, or any oil-fired equipment other than boilers, such as inert gas generators and incinerators.
dining room	a public space even if it contains only low-power electrical equipment, such as coffee machines, toasters, dishwashers, microwave ovens, electric kettles, induction hobs and similar equipment of a power not exceeding 5 kW per appliance; a dining room may also contain electric hotplates and hotplates for keeping food warm of a power not exceeding 2 kW per appliance and a surface temperature not exceeding 150 °C.
similar stage of construction	the stage at which: 1. the construction identifiable with a specific ship begins; and 2. assembly of the ship has commenced, comprising at least 50 tonnes or 1 % of the estimated weight of all construction material if this weight is less than 50 tonnes.[7]
non-combustible material	a material which neither burns nor gives off combustible vapours in sufficient quantity for self-ignition when heated to 750 °C, a characteristic determined in accordance with the *FTP code*.
passenger ship	ship that carries more than 12 passengers.
pantries containing no cooking appliances	any pantries containing low-power electrical equipment, such as coffee machines, toasters, dishwashers, microwave ovens, electric kettles, induction cooktops and similar appliances of a power

[7] Equivalent to SOLAS 74, Chapter II-2, Regulation 1.1.3.

	not exceeding 5 kW per appliance, and electric hotplates and hotplates for keeping food of a power not exceeding 2 kW per appliance and a surface temperature not exceeding 150 °C.
public spaces	the parts of the *accommodation spaces* used for halls, dining rooms, lounges and similar permanently enclosed spaces.
low flame spread	has a surface that can adequately restrict the spread of flame, determined according to the *FTP Code*.
ro-ro cargo spaces	space for cargo and vehicles, which can be loaded and unloaded by other vehicles or their own propulsion, normally in a horizontal direction.
ro-ro passenger ship	*passenger ships* with *ro-ro cargo spaces* or *special category spaces*.
rooms containing furniture and furnishings of restricted fire risk	for the purposes of Regulation 9: cabins, *public spaces*, offices and other *accommodation spaces* in which: 1. all case furniture such as desks, wardrobes, dressing tables, bureaux, dressers and kitchen cabinets, is constructed entirely of approved *non-combustible materials*, except that a combustible veneer not exceeding 2 mm may be used on the working surface of such articles; 2. all free-standing furniture such as chairs, sofas, tables, is constructed with frames of non-combustible materials; 3. draperies, curtains and other suspended textile materials have qualities of resistance to the propagation of flame equivalent to that of wool weighing 0.8 kg/m^2, in accordance to the *FTP Code*; 4. floor coverings have *a low propensity for flame spread*; 5. exposed surfaces of bulkheads, linings and ceilings have low flame-spread characteristics; 6. upholstered furniture has qualities of resistance to the ignition and propagation of flame in accordance with *the FTP code*; and 7. bedding components have qualities of resistance to the ignition and propagation of flame, this being determined in accordance with the *FTP code.*
crude oil	oil that occurs naturally, whether or not it has been treated to be suitable for transport; includes crude oil

	from which certain distillation fractions may have been removed or crude oil to which certain distillation fractions may have been added.
smoke dampers	in Annex 1, Regulation 9.7: a device installed in a ventilation duct, which is open under normal conditions, and which is closed in the event of a fire, so as to limit the spread of smoke and hot gases, and which cannot be expected to contribute to the integrity of a fire class division through which a ventilation channel passes; includes: 1. automatic *smoke damper*, which is self-closing when exposed to smoke or hot gases; 2. manual *smoke damper*, which is intended to be opened or closed by the crew by hand at the damper itself; and 3. remotely operated *smoke dampers*, which are closed by the crew through a control located at a distance from the damper.
safe area	(safe area) an area: – where it is safe to stay when an accident has occurred; – which does not become flooded or which is located outside the main fire zone(s) where a fire has occurred; and – which can safely accommodate all people on board so as to ensure life, health and basic services.
safety centre	(safety centre) a *control station* specifically designated for emergency management, where the operation and monitoring of the ship's safety system is an essential part.
Continuous 'B' class ceilings or linings	the ceilings or linings which terminate only at an 'A' or 'B' class division;
bulkhead deck	the uppermost deck up to which the transverse watertight bulkheads are carried.
closed vehicle spaces	*vehicle spaces* which are neither *open vehicle spaces* nor *weather decks*.
closed ro-ro cargo spaces	*ro-ro cargo spaces* which are neither *open ro-ro cargo spaces* nor *weather decks*.
SOLAS 74	(International Convention for the Safety of Life at Sea, 1974) the 1974 International Convention for the

	Safety of Life at Sea.
SOLAS ship	a ship covered by *SOLAS 74*
standard fire test	a test in which specimens of the relevant bulkheads or decks are exposed in a test furnace to temperatures corresponding approximately to the standard time-temperature curve, in accordance with the test method specified in the *FTP Code*;
steel or equivalent material	*non-combustible materials* which, by themselves or through their insulation, have strength and integrity characteristics equivalent to those of steel after having been subjected to appropriate exposure according to *the standard fire test* (e.g. suitably insulated aluminium alloys).
continuously manned central control station	*central control station* which is continuously manned by a responsible member of the crew.
tanker	*cargo ship* constructed or adapted for the carriage in bulk of liquid flammable products.
special category spaces	*enclosed vehicle spaces* above and below *the bulkhead deck*, into and from which vehicles can be driven and to which passengers have access; may occupy more than one deck provided that the total overall clear height for vehicles does not exceed 10 metres.
main vertical zones	those sections into which the hull, superstructure and deckhouses are divided by 'A' class divisions, the mean length and width of which on any deck does not in general exceed 40 m.
winching area	an area of a ship intended for the collection or delivery of personnel or material by a helicopter hovering above the deck.
weather deck	a deck fully exposed to the elements from above and from at least two sides.
open vehicle spaces	those vehicle spaces either open at both ends or having an opening at one end and being provided with adequate natural ventilation over the entire space through permanent openings distributed in the side plating or deckhead or from above, having a total area of at least 10 % of the total area of the space sides.

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open ro-ro cargo spaces	ro-ro cargo spaces either open at both ends, or open at one end and provided with adequate natural ventilation over the entire space through permanent openings distributed in the side plating or deckhead or from above, having a total area of at least 10 % of the total area of the space sides.

Equivalence

Section 11[8] Where these regulations require specific accessories, materials, devices, or equipment, the Swedish Transport Agency can allow other accessories, materials, devices, or equipment if they provide an equivalent level of safety.

Where the Swedish Transport Agency permits the use of plastic pipes on board ships, the requirements of Resolution A.753(18), as amended by Resolution MSC.313(88) and MSC.399(95), shall apply.

General advice

An equivalent level of safety should be demonstrated by a risk management process in accordance with the methodology in MSC.1/Circ.1455.

This statute enters into force on XX XX 2025.

On behalf of the Swedish Transport Agency

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[8] Corresponds to SOLAS 74, Chapter I, Regulation 5.

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Annex 1[9]

Regulation 4

Probability of ignition

1 Purpose

The purpose of this Regulation is to prevent the ignition of combustible materials or combustible liquids. For this purpose, the following functional requirements shall be met:

1 means shall be provided to control leaks of flammable liquids;

2 means shall be provided to limit the accumulation of flammable vapours;

3 the ignitability of combustible materials shall be restricted;

4 ignition sources shall be restricted;

5 ignition sources shall be separated from combustible materials and combustible liquids;

6 The atmosphere in cargo tanks shall be maintained outside the explosion area.

General advice
When using materials other than steel on engines, turbines and gearing, as well as for arrangements for fixed gas detection in double hulls and double-bottom spaces in tankers, the guidelines in MSC.1/Circ.1527 should be followed.

2 Oil fuels, lubricating oils and other readily flammable oils

2.1 *Restrictions on the use of readily flammable oils as fuel*

The following restrictions shall apply to the use of oil as a fuel:

[9] Annex 1 corresponds to SOLAS 74, Chapter II-2 in the wording up to and including the 2021 amendments.

1 Oil fuel with a flashpoint lower than 60 °C shall not be used, unless otherwise provided for in this Regulation.

2 In emergency generators, oil fuel with a flash point of not less than 43 °C may be used.

3 Oil fuel having a flashpoint of 60 °C or less, but not less than 43 °C may be used, e.g., for the emergency fire pump's engines and the auxiliary engines which are not located in the machinery spaces of category 'A', provided that:

3.1 Oil fuel tanks except those arranged in double bottom compartments are located outside of machinery spaces of category 'A';

3.2 devices for the metering oil temperature are provided on the suction side of the pump;

3.3 isolating valves and/or cocks are provided on the inlet side and outlet side of the oil fuel strainers and;

3.4 welded tube fittings or fittings of conical or spherical type are used as much as possible.

4 In cargo ships not covered by the Swedish Transport Agency's regulations and general advice (TSFS 2017:89) on safety on SOLAS ships using gases or other fuels with a low flashpoint (IGF Code), oil fuel, such as crude oil, with a lower flashpoint than that specified in 2.1.1 may be used provided that such oil fuel is not stored in any machinery space and that the installation as a whole is approved by the Swedish Transport Agency.

5 In ships covered by the Swedish Transport Agency's regulations and general advice (TSFS 2017:89) on safety on SOLAS ships using gases or other fuels with a low flashpoint (IGF Code), oil fuel with a lower flashpoint than that otherwise specified in 2.1.1 may be used.

General advice
Guidelines on how to prevent the illegal or unintentional use of oil fuel with a flashpoint lower than 60 °C in accordance with 2.1.1 are set out in Resolution A.565(14).

An approved facility as referred to in 2.1.4 should comply with the requirements of 2.1.3.3.2 to 2.1.3.3.4.

2.4 *Other combustible oils*

Facilities for the storage, distribution and use of other pressurised flammable oils used in power transmission facilities, control and regulation systems and heating shall be designed to ensure the safety of the ship and the persons on board. Appropriate arrangements for collecting oil leakages shall be

arranged under hydraulic valves and cylinders. In spaces where ignition sources are present, these collection arrangements shall at least meet the requirements of 2.2.3.3, 2.2.3.5, 2.2.5.3 and 2.2.6, and the requirements of 2.2.4 and 2.2.5.1 on strength and construction.

Provisions on heating installations (thermal oil installations) can be found in the Swedish Maritime Administration's notice (SJÖFS 1997:15) with provisions on thermal oil installations in ships.

2.5 Arrangements for oil in periodically unattended machinery spaces

The oil fuel and lubricating oil systems in periodically unattended machinery spaces shall, in addition to the requirements of 2.1 to 2.4, comply with the following:

1 Where daily service oil fuel tanks are filled automatically, or by remote control, means shall be provided to prevent overflow spillages. Other equipment which treats combustible liquids automatically, e.g. oil fuel purifiers, shall also have protection against overflow. Such other equipment shall, where practicable, be installed in a special space reserved for purifiers and heaters.

2 Where daily service oil fuel tanks and settling tanks are fitted with heating arrangements, a high temperature alarm shall be provided if the flashpoint of the oil fuel can be exceeded.

3 Gaseous fuel

Where gaseous fuel is used on board, the devices must be approved by the Swedish Transport Agency. Provisions on pressurised equipment is available in the Swedish Work Environment Authority's Regulations and general advice (AFS 2023:11) on work equipment and personal protective equipment – safe use.

Gas bottles shall be stored on the open deck or in a well ventilated space which opens only to the open deck.

General advice

The location of gas bottles on the open deck should follow the guidelines in MSC/Circ.1276.

4 Miscellaneous ignition sources and ignitability

4.1 Electric heating units

Electrical heating units shall be fixed and designed in such a way as to minimise the risk of fire. All parts of the heating units shall be so protected

that clothing, curtains or similar materials cannot be scorched or ignited by the heat.

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5 Cargo area of tankers

5.1.2 Main cargo control stations, control stations, accommodation spaces and service spaces, except separated cargo handling equipment lockers, shall be located abaft cargo tanks, slop tanks and spaces separating cargo or slop tanks from machinery spaces, but not necessarily abaft oil fuel bunker tanks and ballast tanks. Main cargo control stations, control stations, accommodation spaces and service spaces, except separated cargo handling equipment lockers, shall be arranged in such a way that a single failure in a bulkhead or deck does not cause gas or vapour from the cargo tanks to enter any of these spaces. Such a recess as is permitted under 5.1.1 need not be taken into account when determining the location of these spaces.

5.1.3 The Swedish Transport Agency may permit main cargo control stations, control stations, accommodation spaces and service spaces to be located forward of the cargo tanks, slop tanks and spaces separating cargo and slop tanks from machinery spaces, but not necessarily forward of oil fuel bunker tanks or ballast tanks.

It is permissible to place machinery spaces other than machinery spaces of category ‘A’ forward of layering tanks and slop tanks provided that they are separated from the layering tanks and slop tanks through cofferdams, cargo pump rooms, oil fuel bunker tanks or ballast tanks, and have at least one hand fire extinguisher. Where those machinery spaces contain internal combustion engines, there shall be, in addition to a hand fire extinguisher, at least one foam fire extinguisher of a capacity of at least 45 litres, or equivalent. If it is impracticable to use a portable fire extinguisher, it may be replaced by two hand fire extinguishers.

Main cargo control stations, control stations, accommodation spaces and service spaces shall be arranged in such a way that a single failure in a bulkhead or deck does not cause gas or vapours from the cargo tanks to enter any of these spaces. Where deemed necessary for the safety of the ship or for the navigation of the ship, the Swedish Transport Agency may allow machinery spaces with internal combustion engines that are not main propulsion machinery and that have a power greater than 375 kW to be forward of the cargo area provided that the arrangements meet the requirements of this paragraph.

5.1.4 The following only applies to combination carriers:

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1 Slop tanks shall be encircled by cofferdams, except where the boundaries of the slop tanks are formed by the hull, main cargo deck, cargo pump space bulkheads or oil fuel bunker tanks. These cofferdams shall not be open to the double bottom, pipe tunnel, pump room or other enclosed space. They shall not be used for cargo or ballast and shall not be connected to the oil cargo or ballast piping systems. Provision shall be made for water filling and drainage of the cofferdams. Where the boundary of a slop tank is the cargo pump room bulkhead, the pump room shall not be open to the double bottom, pipe tunnel or other enclosed space. However, openings with gastight bolted hatches may be permitted.

5.3.2. Ventilation devices

5.3.2.1 The ventilation devices for each cargo tank may be independent of or combined with other cargo tanks and may be included in the inert gas pipelines.

5.3.2.2 Where the devices are combined with other cargo tanks, either isolating valves or other acceptable devices must be provided to separate each cargo tank. Where isolating valves are used, they shall be fitted with locking devices for which the responsible officer is responsible. There shall be a clear visual indication of the operating status of the valves or the other devices. Where tanks have been isolated, it shall be ensured that the isolation valves are opened prior to loading, ballasting or emptying the tanks. The isolation of a cargo tank must not affect the venting required by Regulation 11.6.1.1 (the flow caused by temperature variations in a cargo tank).

For tankers constructed on or after 1 January 2017, any means of isolation shall continue to be able to permit the passage of large quantities of vapours, air or inert gas mixtures during loading, ballasting or unloading in accordance with Regulation 11.6.1.2.

5.3.2.3. If a cargo tank or group of cargo tanks isolated from the general venting system is to be loaded, ballasted or emptied, the cargo tank or group of cargo tanks shall be fitted with a means of protecting against overpressure or under-pressure in accordance with the requirements of Regulation 11.6.3.2.

5.4.2 Ventilation on combination carriers

In combination ships, all cargo spaces and all enclosed spaces adjacent to cargo spaces shall be provided with mechanical ventilation. This mechanical ventilation may be carried out with transportable fans. There must be an approved fixed gas warning system capable of detecting combustible gases in cargo pump rooms and pipe tunnels as well as in the cofferdams (referred

to in 5.1.4) adjacent to slop tanks. Arrangements shall be in place to facilitate the measurement of combustible gases in all other spaces within the cargo area. It shall be possible to take these measurements from open deck or easily accessible locations.

5.5 Inert gas system

5.5.1 Application

5.5.1.1 For tankers with a deadweight of 20 000 tonnes or more, constructed after 1 July 2002 but before 1 January 2016, the cargo tanks shall be protected by a fixed inert gas system meeting the requirements of the FSS Code, as adopted by Resolution MSC.98(73). The Swedish Transport Agency may allow other equivalent systems or arrangements in accordance with 5.5.4.

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specified style in *Annex 1* document.

5.5.1.2 When tankers with a dead weight of 8 000 tonnes or more, constructed on or after 1 January 2016, transport such cargo as described in Section 3, the cargo tanks shall be protected by a fixed inert gas system that meets the requirements of Annex 2, which correspond to the FSS Code. The Swedish Transport Agency may allow other equivalent systems or arrangements in accordance with 5.5.4.

5.5.1.3 Tankers on which crude oil flushing is used for cleaning cargo tanks shall have fixed tank washing machines and an inert gas system complying with the requirements of Annex 2, which correspond to the FSS Code. However, inert gas systems fitted to tankers constructed on or after 1 July 2002 but before 1 January 2016 shall comply with the requirements of the FSS Code as adopted by Resolution MSC.98(73).

5.5.1.4 Tankers to be equipped with inert gas systems shall comply with the following requirements:

.1 Spaces located in double hulls shall be provided with appropriate connections for the supply of inert gas.

.2 If the hull spaces are connected to a permanently installed inert gas system, it shall be possible to prevent hydrocarbon gases from the cargo tanks from entering the spaces in double hulls via the system.

.3 If such spaces are not permanently connected to an inert gas system, it shall be possible to establish a connection to the inert gas main pipeline by appropriate means.

General advice
Guidelines on how the provisions concerning inert gas supply to double hull spaces should be applied are set out in MSC.1/Circ.1555.

5.5.2 Inert gas systems on chemical tankers and gas carriers

5.5.2.1 The requirements of the FSS Code relating to inert gas systems need not apply to chemical tankers constructed before 1 January 2016, including chemical tankers constructed before 1 July 2012, nor to gas carriers, in the following situations:

.1 When carrying cargo as described in the first paragraph of Section 3, provided that the ship complies with the requirements for inert gas systems on chemical tankers in Resolution A.567(14);

.2 When transporting inflammable products other than crude oil or petroleum products, such as the types of cargo listed in Chapters 17 and 18 of the Annex to the Swedish Transport Agency's regulations (TSFS 2014:136) on the maritime transport of harmful liquid chemicals in bulk (IBC Code), provided that:

– the tank capacity of the cargo tanks used to transport this load does not exceed 3,000 m^3;

– each of the nozzles of tank washers has a capacity not exceeding 17.5 m^3 per hour; and

– the total combined throughput of the number of machines used in a cargo tank at any given time does not exceed 110 m^3 per hour.

5.5.3 General requirements for inert gas systems

5.5.3.1 The inert gas system shall be of sufficient capacity to inert, exhaust and render gas-free empty tanks and to maintain the required oxygen concentration in the tanks.

5.5.3.2 Tankers equipped with a fixed inert gas system shall have a closed tank gauging system (‘ullage system’).

5.5.4 Requirements for equivalent systems

5.5.4.1 The Swedish Transport Agency may, after taking into account the ship’s devices and equipment, in accordance with Article 11 and 5.5.4.3, permit other fixed installations.

5.5.4.2 Instead of fixed installations in accordance with the requirements of 5.5.4.1, the Swedish Transport Agency may, for tankers with a deadweight of 8 000 tonnes or more but less than 20 000 tonnes, constructed on or after 1 January 2016, allow equivalent devices or protective systems in accordance with Section 11 and 5.5.4.3.

5.5.4.3 Equivalent systems or devices shall:

.1 in normal operation, throughout the ballast journey and during necessary work inside the tanks, be capable of preventing dangerous accumulations of explosive mixtures in undamaged cargo tanks; and

.2 be so designed as to minimise the risk of ignition from static electricity generated by the system or device.

5.6 *Devices for inerting, venting and rendering gas-free*

5.6.1 Devices for venting and/or rendering gas-free shall be such as to minimise the risks arising from the spread of flammable gases into the atmosphere and from flammable gas mixtures in a cargo tank.

5.6.2 The procedure for venting and rendering gas-free in regulation 16.3.2 shall be followed.

5.6.3 The devices for inerting tanks, venting empty tanks and rendering gas-free in accordance with 5.5.3.1 shall be approved by the Swedish

Transport Agency. They shall also be designed so that as little hydrocarbon gas as possible is collected in pockets in the inner structural parts of the tanks and so that:

1. gas discharge pipes in individual cargo tanks, if any, are located as far as practicable from the inert gas/air inlet and in accordance with the provisions of 5.3 and Regulation 11.6 (the inlet of such outlet pipes may be located either at deck level or not more than 1 m above the tank bottom);

2. the cross-sectional area of the discharge pipes referred to in 5.6.3.1 is not less than that an emission rate of at least 20 m/s can be maintained when any three tanks are simultaneously supplied with inert gas (the outlet of the pipes shall be placed at least 2 m above the deck level)

3. the gas discharge pipes referred to in 5.6.3.2 are fitted with appropriate blind flange devices.

5.7 *Gas measurement*

5.7.1 Portable instruments

Tankers shall be equipped with at least one portable instrument for measuring oxygen and one for measuring the concentration of flammable gases, together with a sufficiently large set of spare parts. Appropriate equipment shall be available for the calibration of such instruments.

General advice
Guidelines on how the provision on portable instruments should be applied are provided in MSC.1/Circ.1456/Rev.1.

5.7.2 Arrangements for gas measurement in double hull and double bottom compartments

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Regulation 5
Fire growth potential

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2 Control of air supply and combustible liquids to the compartment

2.1 *Control of air supply and stopping devices of ventilation*

2.1.2 The mechanical ventilation of accommodation spaces, service spaces, cargo spaces, control stations and machinery spaces shall be capable of being stopped from an easily accessible position outside the space it serves. This location shall not be easily cut-off in the event of a fire in the space.

2.1.3 On passenger ships carrying more than 36 passengers, the means of control for the mechanical ventilation, with the exception of ventilation for machinery and cargo spaces and any alternative system which may be required under Regulation 8.2, shall be grouped so that all fans can be stopped from two separate places. These locations shall be located as far from each other as possible. Fans serving the mechanical ventilation system of cargo spaces shall be capable of being stopped from a safe position outside the cargo spaces.

General advice
Guidelines on how the provisions on air supply control and stopping devices of ventilation in 2.1.2 and 2.1.3 should be applied are set out in MSC.1/Circ.1555.

2.2 *Control devices in machinery spaces*

2.2.1 Means of control shall be provided for the opening and closure of skylights, for the closure of openings in funnels which normally allow exhaust ventilation, and for the closure of ventilator dampers.

Part C

Fire fighting

Regulation 7
Detection and alarms

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4 Fire detection in machinery spaces

4.1 *Installation*

A fire alarm system shall be installed in the following spaces:

1 in periodically unattended machinery spaces;

2 in machinery spaces where:

2.1 the installation of automatic and remote control systems and equipment has been approved in lieu of continuous manning;

2.2 the main propulsion and associated machinery including the main source of power are provided with various degrees of automatic or remote control and are under continuous manned supervision from a manned control room;

2010 amendments for ships constructed on or after 1 July 2012

4.1 *Installation*

A fire alarm system shall be installed in the following spaces:

1 in periodically unattended machinery spaces;

2 in machinery spaces where:

2.1 the installation of automatic and remote-controlled systems and equipment has been approved as a replacement for permanent manning;

2.2 the propulsion machinery and associated machinery including the main power source are equipped with varying degrees of automatic or remote control and are under continuous supervision from a manned control room;

3 and enclosed spaces for incinerators.

4.2 *Design of the system*

The fire alarm system required by 4.1.1 shall be so designed and the detectors so positioned as to rapidly detect a fire in any part of these spaces under all normal operating conditions of the machinery and variations of ventilation as required by the possible ambient temperatures. Systems using only thermal detectors are only permitted in spaces of restricted height or where they are particularly suitable. The system shall trigger acoustic and optical alarm signals, both of which shall clearly deviate from alarms from any other system not indicating fire. The alarm shall be triggered at such

places as are necessary to ensure that the alarm is heard and observed both on the navigating bridge and by a responsible engineer officer. When the navigating bridge is unmanned, the alarm shall sound in a place where a responsible crew member is on duty.

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5 Fire detection in accommodation spaces, service spaces and control stations

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5.5 *Cargo ships*

On cargo ships, accommodation and service spaces and control stations shall be protected by a fire alarm system and/or an automatic sprinkler and fire alarm system as specified below, depending on which of the methods in Regulation 9.2.3.1 is used.

> ***General advice***
> *Guidelines on how the provisions of 5.5 should be applied to control stations are provided in MSC.1/Circ.1456/Rev.1.*

5.5.1*IC Method:* A fire alarm system with smoke detectors shall be installed in all corridors, stairwell enclosures and escape routes within accommodation spaces.

5.5.2 *IIC Method:* An automatic sprinkler and fire alarm system complying with the requirements of the FSS Code shall be installed in all accommodation and service spaces, except in spaces with low or non-existent fire risk, such as in empty spaces and sanitary spaces. In addition, a fire alarm system with smoke detectors must be installed in all corridors, stairwell enclosures and escape routes within accommodation spaces.

5.5.3 *IIIC Method:* A fire alarm system that detects any fire in all accommodation and service spaces shall be installed, except in spaces with low or non-existent fire risk, such as in empty spaces and sanitary spaces. In corridors, stairwell enclosures and escape routes in accommodation spaces, detection shall be carried out with smoke detectors.

6 Fire detection in cargo spaces on passenger ships

A fire alarm system or smoke detection system with extraction test complying with the requirements of the FSS Code shall be provided in each cargo space to which access is not possible. The Swedish Transport Agency

may grant exemptions for ships used on voyages that are so short that it would be unreasonable to apply this provision.

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9 Additional requirements for fire alarm systems on passenger ships

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9.2 The means of operation for the fire alarm system shall have a fail-safe design (i.e. an open detector circuit shall cause an alarm condition).

9.3 On passenger ships carrying more than 36 passengers, the alarms for the system required by 5.2 shall be located in a continuously manned central control station. Controls for the remote closure of the fire doors and for shutting off of the ventilation fans shall also be provided at this location. The ventilation fans shall be capable of being started again by the crew from the continuously manned control station.

The control panels in the central control station shall indicate whether the fire doors are open or closed and whether detectors, alarms and fans are switched off. The control panel shall have continuous power supply from the main source of electrical power or emergency source of power unless the regulations permit other devices. The control panel shall also be equipped with an automatic changeover switch to a backup power source in the event of loss of regular power.

General advice

Guidance on how the provision on control of air supply and stopping devices for ventilation should be applied are set out in MSC.1/Circ.1555.

9.4 There shall be a special alarm to summon the crew, which can be triggered from the navigating bridge or fire control station. This alarm may be part of the ship's general emergency alarm system, but shall be capable of being emitted independently of the alarm to the passenger spaces.

Regulation 8
Smoke spread

1 Purpose

The purpose of this Regulation is to control the spread of smoke in order to minimize the risks from smoke. For this purpose smoke control systems

shall be provided in atriums, control stations, machinery spaces and enclosed spaces.

General advice
In the application of the provisions on smoke management systems, the guidelines in MSC.1/Circ.1514 should be followed.

2 Smoke control in control stations outside of machinery spaces

For control stations outside machinery spaces, practical arrangements shall be made to ensure that ventilation, visibility and no smoke can be maintained so that machinery and associated equipment can be monitored and continue to function effectively in the event of a fire.

Regulation 9

Fire divisions

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1 Purpose

It shall be possible to contain a fire in the space in which it occurs. In order to achieve this, the following functional requirements shall be met:

1 The ship shall be divided by thermal and structural divisions.

2 The thermal insulation of the divisions shall have due regard to the fire risk of the spaces it separates.

3 Fire integrity shall be maintained at openings and penetrations.

General advice

MSC.1/Circ.1555 provides guidelines on how the provisions of Regulation 9 should be applied to toilets located in a wheelhouse.

2 Divisions

General advice
MSC.1/Circ.1616 provides guidelines on how the provisions should be applied with regard to urea tanks and solutions of sodium hydroxide.

2.1 *Thermal and structural divisions*

Ships shall be divided into thermal and structural divisions which shall have due regard to the fire risk of the spaces. The fire insulation shall be mounted on the side for which the insulation is tested in accordance with the Act (2016:768) on marine equipment, and regulations issued in connection with the Act.

2.2 *Passenger ships*

2.2.1 Fire zone division

2.2.4.2.2 When determining the fire integrity of bulkheads and decks, the spaces separating them shall be classified into categories 1 to 11 below. If the category to which a space belongs is uncertain, it shall be deemed to belong to the category which imposes the most stringent fire integrity requirements. Smaller spaces located within larger spaces shall be considered as separate spaces if the opening between the spaces is less than 30 % of the area of the boundary. In this case, the fire integrity of the bulkheads and decks of the smaller spaces shall be determined in accordance with Tables 9.3 and 9.4. The categories are intended to be typical rather than restrictive. The numbers in brackets before each category refer to the rows and columns in the tables.

(1) Control stations

- Spaces containing emergency sources of power and lighting;
- Wheelhouse and chartroom;
- Spaces containing the ship’s radio equipment;
- Fire control station;
- Control room for propulsion machinery when located outside the machinery space;
- Spaces containing a centralised fire alarm equipment.

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(11) Special category spaces and ro-ro cargo spaces

- Spaces; see definition.

- Weather decks used for loads that do not have a low fire risk.

General advice
When evaluating fire risks, account should be taken of the guidelines contained in MSC.1/Circ.1274. The guidelines do not apply to external spaces where cargo and/or vehicles are stored.

MSC.1/Circ.1581 provides guidelines on how the provisions on chartrooms should be applied.

Table 9.3. Bulkheads not bounding either main vertical zones or horizontal zones (passenger ships carrying not more than 36 passengers)

2.3 *Fire integrity of bulkheads and decks on cargo ships other than tankers*

2.3.3.1 In addition to the specific provisions for fire integrity of bulkheads and decks prescribed elsewhere in these Regulations, the fire integrity of all bulkheads and decks shall be at least as specified in tables 9.5 and 9.6.

2.3.3.2.1 Tables 9.5 and 9.6 shall be applied to bulkheads and decks separating adjacent spaces, respectively.

General advice

Guidelines on how Tables 9.5 and 9.6 should be applied are provided in MSC.1/Circ. 1511.
MSC.1/Circ.1581 provides guidelines on how the provisions on chartrooms should be applied.

2.3.3.2.2 When determining the fire integrity of bulkheads and decks, the spaces separating them shall be classified into categories 1 to 11 below. If the category to which a compartment belongs is uncertain, it shall be deemed to belong to the category which imposes the most stringent fire integrity requirements. Smaller spaces located within larger spaces shall be considered as separate spaces if the opening between the spaces is less than 30 % of the area of the boundary. In this case, the fire integrity of the bulkheads and decks of the smaller spaces shall be determined in accordance with Tables 9.5 and 9.6. The categories are intended to be typical rather than restrictive. The numbers in brackets before each category refer to the rows and columns in the tables.

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2.4 *Tankers*

2.4.1 On tankers only Method IC according to 2.3.1.1 may be used.

2.4.2 Fire integrity of bulkheads and decks

2.4.2.1 In addition to complying with the specific requirements on fire integrity of bulkheads and decks for tankers in these Regulations, the fire integrity of all bulkheads and decks shall be at least as specified in Tables 9.7 and 9.8.

2.4.2.2.1 Table 9.7 shall be applied to bulkheads separating adjacent spaces. Table 9.8 shall apply to decks separating adjacent spaces.

> ***General advice***
> *MSC.1/Circ.1581 provides guidelines on how the provisions on chartrooms should be applied.*

2.4.2.2.2 When determining the fire integrity of bulkheads and decks, the spaces separated by them shall be classified into categories 1 to 10 below. If the category to which a compartment belongs is uncertain, it shall be deemed to belong to the category which imposes the most stringent fire integrity requirements. Smaller spaces located within larger spaces shall be considered as separate spaces if the opening between the spaces is less than 30 % of the area of the boundary. In this case, the fire integrity of the bulkheads and decks of the smaller spaces shall be determined in accordance with Tables 9.7 and 9.8. The categories are intended to be typical rather than restrictive. The numbers in brackets before each category refer to the rows and columns in the tables.

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3 Penetrations through fire bulkheads and limitation of heat dissipation

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3.3 Non-insulated metallic pipes passing through ‘A’ or ‘B’ class divisions shall be made of materials having a melting point exceeding 950 °C for ‘A-0’ and 850 °C for ‘B-0’ divisions.

3.4 When designing the structural fire protection, the risk of heat dissipation at intersections and terminal points of the prescribed divisions shall be regarded. The insulation of a deck or bulkhead shall continue, for steel or aluminium structures, at least 450 mm past all penetrations, intersections or terminal points. If a Class ‘A’ deck or bulkhead shall have different insulation values in different spaces, the insulation with the higher value shall continue at least 450 mm above the part which shall have the lower value.

General advice
MSC/Circ.1120 and MSC.1/Circ.1510 contain guidelines on how the provisions on preventing heat spreading should be applied.

4 Openings in fire divisions

4.1 *Passenger ships*

4.1.3 Windows and sidescuttles

4.1.3.3 Windows facing life-saving equipment, embarkation and assembly stations, external stairs or open decks used for escape routes, and windows located below liferaft or escape slide embarkation areas shall have fire integrity as specified in Table 9.1. Windows sprayed with their own automatic sprinkler nozzles need to be of Class 'A-0' only if any of the following requirements are met:

1 There is a separate sprinkler nozzle above the window in addition to other required sprinklers.

2 The prescribed sprinkler nozzles are fitted so that the windows are covered by an average of at least 5 litres/m^2 per minute and the area of the windows is included in the surface to be covered by the sprinkler.

3 On ships constructed on or after 1 July 2010: There are water mist nozzles that have been tested and approved in accordance with the FSS Code.

Windows located below the lifeboat embarkation area shall have fire integrity of at least Class 'A-0'.

4.1.3.4 Notwithstanding 4.1.3.3, the requirements of 4.1.3.5 and 4.1.3.6 shall apply to ships constructed on or after 1 January 2020.

4.1.3.5 On ships carrying more than 36 passengers, windows facing survival craft, embarkation and assembly stations, external stairways and open decks used for escape routes, as well as windows located below life-raft and escape slide embarkation areas, shall have fire integrity in accordance with Table 9.1. Windows sprayed with their own automatic sprinkler nozzles need to be of Class 'A-0' if any of the following requirements are met:

1 There are separate sprinkler nozzles above windows in addition to the other required sprinklers.

2 The prescribed sprinkler nozzles are fitted so that the windows are covered by an average of at least 5 litres/m^2 per minute and the area of the windows is included in the surface to be covered by the sprinkler.

3 Water mist nozzles have been tested and approved in accordance with the instructions in Resolution A.800(19).

Windows located below the lifeboat embarkation area shall have fire integrity of at least Class 'A-0'.

4.1.3.6 On ships carrying not more than 36 passengers, windows facing survival craft, escape slides, embarkation areas and windows situated below such areas, shall have fire integrity of at least class 'A-0'.

4.2 *Fire bulkhead doors on cargo ships*

4.2.1 The fire integrity of doors must be as high as the integrity of the bulkheads they are installed in. This must be displayed in accordance with the FTP Code. Doors and frames in class 'A' divisions shall be of steel. Doors in class 'B' divisions shall be non-combustible. Doors in boundary bulkheads of category 'A' machinery spaces shall be sufficiently gas-tight and self-closing.

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7 Structural protection of ventilation systems

2008 amendments for ships constructed on or after 1 July 2010

7.5.2.1 Where the exhaust air ducts from galley ranges, frying tables and deep fryers pass through accommodation spaces or spaces containing combustible material, the ventilation ducts shall be of fire resistance class 'A'. The ducts shall be provided with:

1 a grease filter that can be easily disassembled for cleaning;

2 a fire damper located at the lower end and a damper located at the upper end of the duct;

3 shut-off devices for exhaust fans located in the kitchen;

4 a fixed fire extinguishing system for fire inside the duct that meets the requirements of the Swedish Maritime Administration's regulations and general advice (2001:6) on the installation of CO_2 installations in kitchen ventilation or other equivalent fire-extinguishing system.

7.6 *Main laundry room ventilation systems on passenger ships constructed on or after 1 July 2010 carrying more than 36 passengers*

Exhaust ducts from main laundry rooms shall be provided with:

1 filters that can be easily disassembled for cleaning;

2 an automatically and remotely controlled fire damper located at the lower end of the duct;

3 remote control devices for shutting off exhaust fans and supply fans from inside the main laundry room and for triggering the fire damper referred to in 7.6.2; and

4 suitably placed hatches for inspection and cleaning.

2014 amendments for ships constructed on or after 1 January 2016

7.1 ***General***

7.1.1 Ventilation ducts, whether single or double walled, shall be of steel or equivalent material, except for short flexible bellows not exceeding 600 mm used for connecting fans to the ducts in air-conditioning rooms. Unless expressly provided otherwise in subparagraph 7.1.6, any other material used for the construction of ducts, including insulation, shall also be non-combustible material. However, short ducts, which are usually not more than 2 m long and whose free cross-sectional area, calculated on the basis of the internal dimensions of the duct, is not greater than 0.02 $m^{2,}$ need not be of steel or equivalent material if the following conditions are met:

1 The ducts are made of non-combustible materials, which may be faced both internally and externally with surfaces having low flame-spread characteristics and a calorific value for the inside and outside, respectively, not exceeding 45 MJ/m² for the thickness used.

General advice

In order to determine the calorific value, the guidelines in ISO 1716:2002 should be followed.

2 The ducts are used only at the end of the ventilation system.

3 The ducts are not placed closer than 600 mm, measured along the duct, from an opening in a class 'A' or class 'B' division or a continuous class 'B' ceiling.

General advice

MSC.1/Circ.1480 provides guidelines on how the provisions should be applied. MSC.1/Circ.1527 provides guidelines on how the provisions should be applied to the use of materials other than steel in ventilation ducts.

7.1.2 The following shall be tested in accordance with the FTP Code:

1 Fire dampers including their controls; however, this test is not necessary for dampers located at the lower end of the duct in exhaust air ducts from galley ranges, since such dampers must be of steel and be capable of stopping the draught in the duct.

2 Duct penetrations through class 'A' divisions, except where steel sleeves are directly connected to the ventilation duct by means of riveted or screwed flange joints or by welding.

7.1.3. The fire dampers shall be readily accessible. If the fire dampers are located behind ceilings or linings, these ceilings or linings shall be fitted with an inspection hatch on which the identification number of the fire damper is indicated. The identification of the fire damper shall also be indicated on any remote control devices.

7.1.4 Ventilation ducts shall be equipped with hatches for inspection and cleaning. The hatches shall be located close to the fire dampers.

7.1.5 The main inlets and outlets of the ventilation systems shall be capable of being closed from outside of the spaces they serve. The means of closing must be easily accessible, marked in a visible and durable manner and bear an mark indicating whether it is open or closed.

7.1.6 Combustible gaskets in the flange joints of ventilation ducts shall not be present within 600 mm of openings in Class 'A' or 'B' divisions, and not in ducts that have to be of Class 'A' fire integrity.

7.1.7 There shall be no ventilation openings or equalisation channels between two enclosed spaces, except where permitted in accordance with 4.1.2.1 and 4.2.3.

7.2 Design of ducts

7.2.1 The ventilation system for machinery spaces of category 'A', vehicle spaces, ro-ro cargo spaces, galleys, special category spaces and cargo spaces shall, as a general rule, be separated from each other and from ventilation systems serving other spaces. On cargo ships of less than 4 000 gross tonnage and on passenger ships carrying not more than 36 passengers, the galley ventilation need not be completely separated, but may be connected by separate ventilation ducts to a ventilation unit serving other spaces. If this is the case, an automatic fire damper shall be inserted into the ventilation channel of the galley near the ventilation unit.

7.2.2 Ventilation ducts serving machinery spaces of category 'A', galleys, vehicle spaces, ro-ro cargo spaces or special category spaces shall not pass through accommodation spaces, service spaces or control stations if the ducts do not meet the conditions in 7.2.4.

7.2.3 Ventilation ducts serving accommodation spaces, service spaces or control stations shall not pass through machinery spaces of category 'A', kitchens, vehicle spaces, ro-ro cargo spaces or special category spaces if the ducts do not meet the conditions specified in paragraph 7.2.4.

7.2.4 As permitted in subparagraphs 7.2.2 and 7.2.3, the ducts shall be either:

.1.1 constructed of steel of a thickness of at least 3 mm for ducts with a free cross-section area of less than 0.075 m^2; at least 4 mm for ducts with a free cross-section area between 0.075 m^2 and 0.45 m^2; and at least 5 mm for ducts with a free cross-section area greater than 0.45 m^2;

.1.2 suitably supported and reinforced;

.1.3 fitted with automatic fire dampers near the divisions through which they pass; and

.1.4 insulated to class 'A-60' from the division of the spaces they serve and to a point at least 5 m beyond each fire damper;

or

.2.1 constructed of steel in accordance with 7.2.4.1.1 and 7.2.4.1.2; and

.2.2 insulated to class 'A-60' throughout the spaces through which they pass, with the exception of ducts passing through spaces of category (9) or (10) as defined in subparagraph 2.2.3.2.2.

7.2.5 For the purposes of 7.2.4.1.4 and 7.2.4.2.2, the ducts must be insulated over the entire external surface surrounding its cross-section. Ducts that are located outside but adjacent to the designated space, and which share one or more surfaces with this space, shall be considered to pass through the specified space and shall be insulated on the surface that it shares with this space, as well as an additional distance of 450 mm outside the divided surface.

7.2.6 If a ventilation channel has to pass through a main vertical zone, an automatic fire damper shall be inserted adjacent to the division. The damper shall also be capable of being closed manually from both sides of the division. The position from which the damper is operated shall be easily accessible and marked in a clear and conspicuous manner. The duct between the division and the damper shall be constructed of steel in accordance with 7.2.4.1.1 and 7.2.4.1.2 and insulated to at least the same fire integrity class as the division it passes through. The damper shall, on at least one side of the division, be fitted with a visible indicator showing whether the damper is open or closed.

7.3 Fire dampers and ventilation duct penetrations

7.3.1 Ducts passing through 'A' class divisions shall meet the following requirements:

.1 Where a thin sheet metal-coated ventilation duct with a free cross-section area of 0.02 m^2 or less passes through 'A' class divisions, the opening shall be fitted with a steel sleeve. The sleeves shall have a thickness of at least 3 mm and a length of at least 200 mm. The length of the sleeve should be divided so as to be 100 mm on either side of the bulkhead, but if the duct has been pulled through a deck, the entire length of the sleeve should be on the underside of the deck through which the duct passes.

.2 If ventilation ducts with a free cross-sectional area exceeding 0.02 m^2, but not exceeding 0.075 m^2, pass through 'A' class divisions, the openings shall be lined with steel sleeves. The ducts and sleeves shall have a thickness of at least 3 mm and a length of at least 900 mm. If they pass through bulkheads, this length should be divided so as to be 450 mm on each side of the bulkhead. These ducts, or the sleeves with which the ducts are lined, shall be provided with fire insulation. The insulation shall have at least the same fire integrity as the division through which the duct passes.

.3 Automatic fire dampers shall be mounted in all ducts having a free cross-sectional area exceeding 0.075 m^2 and passing through 'A' class divisions. Each damper shall be mounted close to the division through which the duct passes, and between the damper and this division the duct shall be constructed of steel in accordance with 7.2.4.2.1 and 7.2.4.2.2. The fire damper shall operate automatically, but shall also be capable of being closed manually from both sides of the division. The damper shall be fitted with a visible indicator showing whether the damper is open or closed. However, fire dampers are not required where ducts pass through spaces bounded by 'A' class divisions without serving those spaces, provided that the ducts in question have the same fire integrity as the divisions through which they pass. A channel with a cross-sectional area above 0.075 m^2 shall not be divided into smaller ducts where it passes through an 'A' class division and is then reassembled into the original duct on the other side of the division in order to avoid the installation of the damper prescribed by this provision.

7.3.2 Ventilation ducts with a free cross-sectional area exceeding 0.02 m^2, passing through bulkheads of class 'B', shall be lined with steel sleeves of a length of 900 mm, which should be divided so that there is 450 mm on each side of the bulkheads, unless this part of the duct is made of steel.

7.3.3 All fire dampers shall be capable of manual operation. The dampers shall have a direct mechanical closing device or shall be closed electrically, hydraulically or by compressed air. All dampers shall be manually operable from both sides of the division. Automatic fire dampers, including those that can be remotely controlled, shall have a fail-safe mechanism that will close the damper in case of fire if the electricity is interrupted or if there is a loss of pressure in the hydraulic or compressed air system. Remotely operated fire dampers shall be capable of being opened manually at the damper.

7.4 Ventilation systems for passenger ships carrying more than 36 passengers

7.4.1 In addition to the requirements of 7.1, 7.2 and 7.3, the ventilation system on a passenger ship carrying more than 36 passengers shall comply with the requirements of 7.4.2 to 7.4.5.

7.4.2 The ventilation fans shall normally be positioned in such a way that the ducts lie within the same main vertical zone as the spaces they serve.

7.4.3 Stairwell enclosures must be served by an independent fan and ventilation duct system (exhaust and supply air) which may not serve any other spaces in the ventilation systems.

7.4.4 A duct, regardless of its cross-sectional area, serving more than one intermediate deck containing accommodation spaces, work spaces or a control station shall be provided, near the points where it passes through the decks of each of these spaces, with an automatic smoke damper which shall also be capable of being manually closed from the protected deck above the damper. Where a fan serves more than one space on between-decks through separate ducts within the same main vertical zone and each duct is intended for one of these spaces on the between-deck, each duct shall be equipped with a manually controlled smoke damper which shall be located close to the fan.

7.4.5 Vertical ducts shall, if necessary, be insulated in accordance with the requirements of Tables 9.1 and 9.2. The ducts shall be insulated as required for the decks between the space served by the ducts and the space through which the ducts pass, as applicable to these ducts.

7.5 Exhaust ducts from galley ranges, frying tables and deep fryers

General advice

MSC.1/Circ.1616 provides guidelines on how the provisions of 7.5 should be applied.

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7.5.1 Requirements for passenger ships carrying more than 36 passengers

7.5.1.1 In addition to the requirements of 7.1, 7.2 and 7.3, exhaust ducts from galley ranges, frying tables and deep fryers shall be constructed in accordance with 7.2.4.2.1 and 7.2.4.2.2 and insulated to Class 'A-60' throughout the accommodation spaces, service spaces or control stations through which they pass. They shall also bear the following:

.1 A grease filter that can be easily detached for cleaning, unless an alternative approved grease removal system is installed;

.2 A fire damper located in the lower part of the duct at the junction between the duct and the cowl of the galley range, frying pan or deep fryer, operated automatically and remotely, and a remotely operated fire damper located in the upper part of the duct near its outlet;

.3 A fixed fire-extinguishing system for fire inside the duct.

General advice

MSC.1/Circ.1616 provides guidelines on how the provisions should be applied.

.4 Means for remotely shutting off the exhaust and supply fans, and for controlling the fire dampers mentioned in 7.5.1.1.2 and the fire-extinguishing system. These devices shall be located outside the galley, but close to its entrance. If a system with several branched ducts is installed, it shall be possible by means of remote control to close all branches connected in the exhaust duct as described above before the extinguishing system is triggered.

.5 Suitably placed inspection and cleaning hatches, one of which shall be located close to the exhaust fan and one in the lower part of the duct, where grease accumulates.

7.5.1.2 Exhaust ducts from galley ranges, frying tables and deep fryers installed on open decks shall comply, mutatis mutandis, with the requirements of 7.5.1.1 if they pass through accommodation spaces or spaces containing combustible materials.

7.5.2 Requirements for cargo ships and passenger ships carrying not more than 36 passengers

Exhaust air ducts from galley ranges, frying tables and deep fryers shall be designed in accordance with 7.2.4.1.1 and 7.2.4.1.2 if they pass through accommodation spaces or spaces in which combustible materials are present. Each exhaust duct shall be provided with the following:

.1 A grease filter that can be easily detached for cleaning;

.2 A fire damper located in the lower part of the duct at the junction between the duct and the cowl of the galley range, frying pan or deep fryer, operated automatically and remotely, and a remotely operated fire damper located in the upper part of the duct near its outlet;

.3 Arrangements, operable from within the galley, for shutting off the exhaust and supply fans;

. 4 A fixed fire extinguishing system for fire inside the duct that meets the requirements of the Swedish Maritime Administration's regulations and general advice (2001:6) on the installation of CO_2 installations in kitchen ventilation or other equivalent fire-extinguishing system.

7.6 Ventilation rooms serving category 'A' machinery spaces containing internal combustion engines

7.6.1 If a ventilation room serves only such an adjacent machinery space and there is no fire division between the ventilation room and the machinery room, then the device for closing the ventilation duct(s) serving the machinery room should be located outside of the ventilation room and the machinery room.

7.6.2 If a ventilation room serves both such a machinery space and other spaces, and is separated from the machinery space by a Class 'A-0' division, including penetrations, the means of closing the ventilation duct(s) of the machinery space concerned may be located in the ventilation room.

7.7 Ventilation systems for laundry rooms on passenger ships carrying more than 36 passengers

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Exhaust ducts from laundry and drying rooms of category 13, as defined in 2.2.3.2.2, shall be provided with:

.1 filters which can be easily removed for cleaning,

.2 an automatic and remotely operated fire damper, located in the lower part of the duct,

.3 remote operating devices for shutting off the exhaust fans and supply fans from within the main laundry room, and for remotely operating the fire damper mentioned in 7.7.2, and

.4 suitably positioned hatches for inspection and cleaning.

Regulation 10

Fire fighting

1 Purpose

1.1 The purpose of this regulation, with the exception of 1.2, is to limit and quickly extinguish a fire in the space in which it has occurred. For this purpose, the following functional requirements are to be met:

.1 Fixed fire-extinguishing systems shall be installed taking into account potential fire growth in the protected spaces.

.2 Fire-extinguishing equipment shall be readily available.

1.2 In the case of open cargo holds for containers and for cargo spaces on deck for containers, on ships designed for stowage of containers on or above weather decks, constructed on or after 1 January 2016, there shall be fire protection devices intended to limit a fire to the space or area in which it has occurred, and to cool adjacent areas to prevent fire spread and structural damage.

2 Firewater systems

Ships shall have a firewater system consisting of fire pumps, fire mains, hydrants, hoses and nozzles.

2.1 *Fire mains and hydrants*

2.1.1 General

The fire main and hydrants shall be made of a material which is not destroyed or rendered unusable when exposed to high temperatures, or shall be adequately protected. The firewater system shall be designed so that it does not freeze. The fire main shall have drainage arrangements. All ducts connected to the firewater system, which are used for tasks other than fire extinguishing shall be fitted with isolating valves at the fire main. Fire mains and hydrants shall be so placed that they are always readily accessible and so that fire hoses can be easily connected to them. On ships that are capable of carrying deck cargo, the fire pipes shall be positioned so as to minimise the risk of damage by the cargo.

2.1.2 Rapid access to water

The firewater system on passenger ships shall be designed as follows:

1.1 On passenger ships of at least 1 000 gross tonnage, it shall be possible to obtain immediately at least one jet of water from any of the hydrants in the accommodation and service spaces and in periodically unattended machinery spaces. One of the ship's fire pumps shall be started automatically to provide continuous water supply.

1.2 On passenger ships with a gross tonnage of less than 1 000, at least one fire pump shall be started automatically or be capable of starting from the navigating bridge. The bottom valve of the fire pump shall always be kept open if the fire pump is started automatically or if it cannot be opened from the place where the pump is started.

1.3 On passenger ships that have periodically unattended machinery spaces in accordance with Chapter 31, Section 1 of the Swedish Transport Agency's Regulations and General Advice (TSFS 2019:4) on machinery installation, electrical installation and periodically unattended machinery spaces, shall comply with the requirements of 1.1 or 1.2.

The firewater system on cargo ships shall be designed as follows:

2.1 Means for remote starting of the fire pumps shall be provided on the navigating bridge, at a fire control station and in the machinery control room.

2.1.3 Diameter of the fire mains

Fire pipes shall be dimensioned to withstand the maximum flow from two fire pumps operating at the same time. On cargo ships other than those covered by 7.3.2, the mains are not required to withstand a flow greater than 140 m^3/h.

General advice

The fire mains should have a diameter according to the table below.

Ship length (m)	***Diameter (mm)***
less than 50	*75*
at least 50 but not 100	*100*
at least 100 but not 200	*125*
at least 200 but not 300	*150*
at least 300 or more	*larger than 150*

Fire pipes other than fire mains should have a diameter of at least 60 mm. Short branch lines for only one hydrant should have a diameter of at least 50 mm.

MSC.1/Circ.1550 provides guidelines on how the provision should be applied.

2.1.4 Isolating and relief valves

2.1.4.1 The part of the fire main passing through the space in which the fire main pump is located shall be capable of being separated from the rest of the fire main by isolating valves. These valves shall be placed in an easily accessible and safe place outside the space. When the valves are closed, all hydrants (except those in the space containing the main fire pump) shall be provided with water from the emergency fire pump or another fire pump. The emergency fire pump and its source of power, sea connection, pipes and isolating valves shall not be located in the same space as the main fire pumps or power sources. If this is not feasible, the sea water inlet and as short a part of the inlet line as possible may be placed in this space. The isolating valve to the sea water inlet shall then be operable from the area where the emergency fire pump is located. Short lengths of suction or discharge piping may be allowed to pass through the machinery space if they are enclosed in a strong steel housing or insulated to 'A-60' class. These pipes shall have a wall thickness of at least 11 mm and shall be

welded. However, the connection to the sea water inlet must be a flanged connection.

> ***General advice***
> *MSC.1/Circ.1456/Rev.1 provides guidelines on how the provision should be applied.*

2.1.4.2 Each fire hydrant shall be fitted with an isolating valve so that fire hoses can be disconnected when the fire line is pressurised.

2.1.4.3 Relief valves shall be installed in the vicinity of the fire pumps if the maximum pressure from the pumps can exceed the allowed pressure in pipes, hydrants or fire hoses.

2.1.4.4 In tankers, isolating valves shall be installed on the fire mains in a sheltered position at the front edge of the deck house and every 40 metres on the tank deck.

> ***General advice***
> *MSC.1/Circ.1456/Rev.1 provides guidelines on how the provision should be applied. MSC.1/Circ.1492 provides guidelines on how the provision on the location of isolating valves should be applied.*

2.1.5 Number and position of fire hydrants

2.2 *Fire pumps*

2.2.3.2.1 Location of the space

Emergency fire pumps shall not be located in spaces adjacent to machinery spaces of category 'A' or spaces containing main fire pumps. If this is not practicable, the bulkhead between the spaces shall be insulated in accordance with the provisions for an inspection station.

2.2.3.2.2 Access to emergency fire pumps

The space for the emergency fire pump and its power source shall have an access route that does not pass through the machinery space. If there is also a connection to the machinery space, it must be designed in accordance with one of the following options:

– An airlock with self-closing, reasonably gas-tight doors without any means to keep the doors open. The door in the machinery space bulkhead shall be of class 'A-60' and the other door shall be a steel door.

– A watertight door capable of being operated from a space which is not affected by a fire in the space for the emergency fire pump or machinery space.

General advice
An example of a reasonably gas-tight door is a steel door with gasket that can be tightly sealed.

2.2.3.2.3 Ventilation of the space

The ventilation of the space where the power source of the emergency fire pump is located shall be designed so that smoke from a machine-room fire cannot be sucked into that space.

2.2.4 Fire pump capacity

2.2.4.1 The total capacity of the fire pumps

2.2.4.1.1 The fire pumps for passenger ships shall be capable of jointly discharging a quantity of water that is at least two thirds of the quantity the bilge pumps are capable of discharging when used for bilge pumping. This quantity shall be capable of being released at the pressure prescribed in 2.1.6.

2.2.4.1.2 Fire pumps on cargo ships, other than any emergency fire pump, shall together be capable of discharging a quantity of water equal to at least four thirds of the quantity that each bilge pump of a passenger ship of the same size can discharge when used for bilge pumping, provided that the total required capacity of any cargo ship, other than those covered by 7.3.2, need not exceed 180 m^3 per hour.

General advice
MSC.1/Circ.1550 provides guidelines on how the provision should be applied.

2.2.4.2 The capacity of each fire pump

Each of the fire pumps, except for any emergency fire pump, shall have a capacity as follows:

1 at least 80 % of the prescribed total capacity divided by the number of pumps;

2 at least 25 m^3/h;

3 being capable of discharging water to the water jets provided for in 2.1.5.1.

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5 Fire-extinguishing arrangements in machinery spaces

5.1 *Machinery spaces*
containing oil boilers or oil-fuel units

5.1.2.1 In each boiler room there shall be at least one transportable foam applicator. The applicator shall comply with the requirements of the FSS code. It should be stored in the boiler room or near an entrance to the boiler room.

5.1.2.2 At each firing point in every boiler room and in any space in which any part of the oil fuel system is located, there shall be at least two hand fire-extinguishers of the foam extinguishing type or of class '233B C'. In every boiler room in which the boiler power is 175 kW or higher, there shall be at least one approved fire extinguisher of the foam extinguishing type with a capacity of at least 135 litres or another equivalent fire extinguisher. These fire extinguishers shall be fitted with hoses on rollers. The hoses should be long enough to reach every part of the boiler room.

In the case of boilers in ships constructed before 1 January 2020 which are not used for the propulsion of the ship and which have a power of less than 175 kW, or boilers protected by fixed water-based local point protection systems in accordance with 5.6, an approved foam-extinguishing type fire-extinguisher with a capacity of at least 135 litres is not required.

General advice
Equivalent extinguishers according to 5.1.2.2 may be powder extinguishing units with at least 50 kg of fire-extinguishing medium.

5.1.2.3 At each firing location there shall be

- either a container with at least 0.1 m^3 of sand, soda-treated sawdust or other approved dry matter and a shovel, or
- a portable fire extinguisher of class '233B C'.

5.3 *Machinery spaces*
containing steam turbines or enclosed steam engines

5.3.2 Other fire-extinguishing arrangements

5.3.2.1 In machinery spaces where there are steam turbines or enclosed steam engines, there shall be:

- either as many foam fire extinguishers with a capacity of at least 45 litres so that foam can be spread to each part of the lubricating oil pressure systems, each part of casings that includes pressure-

lubricated parts of the turbines, machinery or associated gears and other flammable devices;

- or equivalent fire extinguishers;
- or one of the fixed fire-extinguishing systems specified in 4.1.

General advice
Equivalent fire extinguishers in accordance with 5.3.2.1 may be hand fire extinguishers of class '233B C'.

5.3.2.2 In machinery spaces with steam turbines or enclosed steam engines, there shall also be sufficient portable foam extinguishers or equivalent fire extinguishers to allow a walking distance of not more than 10 m from any position in the space to an extinguisher. However, there must not be fewer than two fire extinguishers in each space. The fire extinguishers required by paragraph 5.1.2.2 may be credited to meet the requirements of this Regulation.

General advice
Equivalent fire extinguishers in accordance with 5.3.2.2 may be class '233B C' fire extinguishers.

5.4 *Other machinery spaces*

In ships constructed on or after 1 September 2008, fixed fire-extinguishing systems shall be provided in other machinery spaces, except for the spaces specified in category 10 of Regulation 9.2.2.3.2.2. Exceptions may be made for spaces where the risk of fire spreading to adjacent spaces is low, e.g. bow propeller rooms.

At main and emergency electrical switchboard, there shall be as many hand fire extinguishers of type '55B' as the Swedish Transport Agency deems necessary. In any other spaces not mentioned in 5.1 to 5.3 there shall be as many hand fire extinguishers as specified in the guidelines of MSC.1/Circ.1275.

5.5 *Water mist pipes in machinery spaces on passenger ships*

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7 Fire protection arrangements for cargo spaces

7.1 *Fixed gas-extinguishing systems for cargo spaces other than ro-ro cargo spaces and vehicle spaces*

7.1.2 The Swedish Transport Agency may grant exemptions from the requirements of 7.1.1 for cargo spaces on ships of less than 1 000 gross tonnage and cargo spaces on passenger ships on short voyages, provided that the cargo spaces are equipped with steel shutters and effective means of closure for closing all ventilation and other openings leading to the cargo spaces.

7.1.3 Cargo spaces on cargo ships of at least 2 000 gross tonnage shall be protected with either a gas-extinguishing system or a fire-extinguishing system that provides equivalent safety. The gas systems shall comply with the requirements of the FSS Code.

> ***General advice***
> *MSC.1/Circ.1456/Rev.1 provides guidelines on how the provision should be applied to the transport of solid goods in bulk.*

7.1.4 For cargo spaces on cargo ships that are designed and exclusively intended for the transport of ores, coal, grain, undried timber and non-combustible loads or other loads with low fire risk in accordance with the list in MSC.1/Circ.1395/Rev.4 the Swedish Transport Agency may grant exemptions from the requirements of 7.1.3 and 7.2. This applies provided that the ship is equipped with steel hatch covers and effective means of closure for all ventilation openings and other openings leading to the cargo spaces.

7.2 *Fixed gas-extinguishing systems for ships carrying dangerous goods*

Ships carrying dangerous goods shall be provided in each cargo space with a fixed carbon dioxide fire-extinguishing system or an inert gas fire-extinguishing system or a fire extinguishing system that provides equivalent safety. The gas systems shall comply with the requirements of the FSS Code. Provisions for the transport of dangerous goods are laid down in Regulation 19.

> ***General advice***
> *MSC.1/Circ.1456/Rev.1 provides guidelines on how the provision should be applied to the transport of solid goods in bulk.*

7.3 *Firefighting on ships constructed on or after 1 January 2016 designed for the transport of containers on or above weather decks*

7.3.1 Ships shall, in addition to the equipment and devices provided for in 10.7.1 and 10.7.2, carry at least one water mist lance.

7.3.1.1 The water mist lance shall be a tube with a nozzle capable of penetrating a container wall and producing water mist inside a closed compartment (container or similar) when connected to the fire main.

7.3.2 Ships designed to carry containers stacked in five planes or more on or above weather decks shall, in addition to the provisions of paragraph 7.3.1, carry portable water cannons as follows:

.1 ships with a width of less than 30 m: at least two portable water cannons;

.2 ships with a width of 30 m or more: at least four portable water cannons.

General advice
For the portable water cannons, the guidelines of MSC.1/Circ.1472 should be applied.

7.3.2.1 The portable water cannons, all necessary hoses, couplings and necessary fittings for mounting shall be ready for use and stored in a location outside the cargo area which is unlikely to be cut off by fire in the cargo spaces.

7.3.2.2 There shall be so many fire hydrants that:

.1 all portable water cannons present can be used simultaneously to provide effective water barriers to and abaft of each transverse row of containers;

.2 the two water jets provided for in 2.1.5.1 can be delivered at the pressure provided for in 2.1.6; and

.3 each of the portable water cannons can be supplied with water from a separate fire hydrant at the pressure required to reach the top container plane on deck.

7.3.2.3 The portable water cannons may be supplied with water from the fire main, provided that the capacity of the fire pumps and the diameter of the fire main are sufficient to serve the portable water cannons while producing two jets of water from the fire hoses at the prescribed pressure. If the ship is carrying dangerous goods, the capacity of the fire pumps and the diameter of the fire main shall also comply with the requirements of Regulation 19.3.1.5, in so far as these are applicable to deck cargo areas.

General advice

MSC.1/Circ.1550 provides guidelines on how the provision should be applied.

7.3.2.4 The performance of each portable water cannon shall be tested during the first inspection of the ship, the result of the test shall be accepted by the Swedish Transport Agency. The test shall demonstrate that:

.1 the portable water cannon may be mounted on the structure of the ship so that it is firmly placed, thereby ensuring safe and effective use, and

.2 the jet of the portable water cannon reaches the highest container plane during the simultaneous use of all prescribed cannons and water jets from fire hoses.

8 Fire protection arrangements for cargo tanks

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10 Firefighter's outfits

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10.3 *Storage of firefighter'soutfits*

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10.3.2 On passenger ships at least two firefighter's outfits and at least one set of personal protective equipment shall be provided at each stowage point.

2012 amendments for ships constructed on or after 1 July 2014

10.4. *Communication opportunities for firefighters*

On board ships constructed on or after 1 July 2014, there shall be at least two two-way portable radiotelephone apparatus for each fire group, intended for firefighters' communication. These two two-way portable radiotelephone apparatus shall be of explosion-proof or intrinsically safe type. Ships constructed before 1 July 2014 shall comply with the requirements of this paragraph by the time of the first survey after 1 July 2018 at the latest.

General advice

A two-way radiotelephone apparatus should meet the criteria set out in the guidelines of MSC.1/Circ.1616.

2012 amendments for ships constructed on or after 1 July 2014

10.4. *Communication opportunities for firefighters*

Regulation 11

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6 Measures against overpressure or underpressure in tanks on tankers

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6.1 *General*

The venting devices shall be designed and operated in such a way that neither excess pressure nor underpressure in cargo tanks exceeds the design values. They shall be designed to allow for:

1 the flow of small amounts of vapours, air or inert gas mixtures caused by temperature variations in a cargo tank (this shall always be done through pressure/vacuum valves);

2 the passage of large quantities of vapours, air or inert gas mixtures during loading and ballasting or during unloading.

6.2 *Openings for small flows caused by thermal fluctuations*

The pressure relief openings prescribed above shall:

1 be positioned as high as practicable but never less than 2 m above the cargo tank deck in order to achieve maximum distribution of flammable gases;

2 be located at the greatest practical distance, but not closer than 5 m, from the nearest air intakes and openings to enclosed spaces containing sources of ignition and from deck machinery and equipment which may pose a risk of ignition, such as anchor windlasses and openings to chain lockers.

For tankers constructed on or after 1 January 2017, the openings shall be arranged in accordance with Regulation 4.5.3.4.1.

6.3 *Safety measures on cargo tanks*

6.3.1 Safety measures for preventing liquid from rising in the venting system

Measures shall be taken to prevent liquid from rising higher in the venting system than the height for which the tanks are designed. This shall be achieved by means of high level alarms or devices to prevent overfilling or other equivalent measures. In addition, there shall be independent measuring devices and documented procedures for filling the cargo tanks. For the purposes of this Regulation, spillage valves are not considered equivalent to an overfill system.

6.3.2 Secondary overpressure or underpressure equalisation system

A secondary system allowing full flow emission of vapours, air and inert gas mixtures shall be provided to prevent overpressure and underpressure in the event of failure of the arrangement in 6.1.2.

In addition, for tankers constructed on or after 1 January 2017, the secondary system shall be capable of preventing overpressure or underpressure if the separation system prescribed in Regulation 4.5.3.2.2 is damaged or unintentionally closed.

Alternatively, pressure sensors may be installed in each tank with protection that meets the requirements of 6.1.2 with a monitoring system in the cargo control room of the ship or at the location where cargo operations are normally carried out. This monitoring equipment shall have an alarm function that is activated in the event of overpressure or underpressure inside the tank.

6.3.3 Bypass in main venting pipes

Part D

Escape

Regulation 13

1 Purpose

The purpose of this Regulation is to ensure that persons on board can safely and quickly reach lifeboat and life-raft embarkation decks. To this end, the following functional requirements must be met:

1 There must be safe escape routes.

2 The escape routes shall be kept in a safe condition, free from obstructions.

3 Additional evacuation aid shall be provided, where necessary, to ensure accessibility, clear marking and appropriate design for emergency situations.

General advice
MSC.1/Circ.1456/Rev.1 provides guidelines on how the provisions of this regulation should be applied.

2 General requirements

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3 Escape routes in accommodation spaces, service spaces and control stations

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3.2 *Passenger ships*[10]

3.2.1 Spaces under bulkhead decks

3.2.1.1 Below the bulkhead deck there shall be two escape routes for each watertight compartment or similarly delimited space or group of spaces. At least one of these shall be independent of watertight doors. For crew spaces that are only used occasionally, the Swedish Transport Agency may grant exemptions from one of these escape routes if the only escape route is independent of watertight doors.

3.2.6 Normally locked doors in escape routes

3.2.6.2 Escape doors from public spaces that are normally locked shall be equipped with a quick-release opening mechanism (panic catch) consisting

[10] The amendment means that the general advice is removed.

of a locking mechanism and a device which releases the door locking under load in the flow direction of the escape route.
The construction and installation of the panic catch must meet the following requirements:

1 The panic catch shall consist of a transverse switch or door opening panel which shall extend over at least half of the width of the door blade and be located at a height of at least 760 mm but not more than 1,120 mm above the deck.

2 The panic catch shall open when loaded with a force not exceeding 67 N.

3 The panic catch shall not be equipped with any locking device, stop screw or other arrangement that prevents the release of the locking mechanism when the trigger mechanism is loaded.

3.2.7 Evacuation analysis for passenger ships

General advice

An evacuation analysis in accordance with the instructions in MSC.1/Circ.1533 should be performed on passenger ships.

3.2.7.1 Escape routes shall be evaluated by an evacuation analysis according to the instructions in Annex 3 at an early stage of the process of designing a ship. The analysis shall be carried out on:

.1 ro-ro passenger ships constructed on or after 1 July 1999; and

.2 other passenger ships constructed on or after 1 January 2020, carrying more than 36 passengers.

3.2.7.2 The analysis shall identify and, as far as possible, eliminate congestion which, when a ship is to be abandoned, may result from the normal movement of passengers and crew along the escape routes, including the possibility that the crew may need to move along those routes in the opposite direction to the passengers. In addition, the analysis shall demonstrate that the evacuation arrangements are sufficiently flexible in cases where certain evacuation routes, assembly stations, embarkation stations or rescue craft may not be accessible as a result of an accident.

3.3 *Cargo ships*

3.3.1 General

At all levels of accommodation there shall be at least two means of escape from a restricted space or group of spaces located far from each other.

3.3.2 Evacuation from spaces below the lowest open deck

From spaces below the lowest open deck, the main escape route shall be a stairway. The other evacuation route may be a trunk or a staircase.

General advice
MSC.1/Circ.1511 provides guidelines on how the 'minimum open deck' rule should be applied.

3.3.3 Evacuation from spaces above the lowest open deck

From spaces above the lowest open deck, escape routes shall consist of stairways or doors leading to the open deck or a combination thereof.

General advice
MSC.1/Circ.1511 provides guidelines on how the 'minimum open deck' rule should be applied.

3.3.4 Dead-end corridors

Dead-end corridors may not exceed 7 m in length.

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4. Escape routes from machinery spaces

4.1 *Passenger ships*

General advice
MSC.1/Circ.1511/Rev.1 provides guidelines on how the provisions of 4.1 should be applied, inter alia, with regard to the interpretation of the concepts of 'safe place' and 'inclined ladders and stairways'.

4.1.1 Spaces under bulkhead decks

If the space is below the bulkhead deck, the two evacuation routes shall be designed according to one of the following options:

1 Two sets of steel ladders, placed as far apart as possible, leading to doors located in the upper part of the space. The doors shall also be spaced as far apart as possible and shall lead to appropriate lifeboat and life-raft embarkation decks. One of the steel ladders shall be located inside a protective enclosure having the fire integrity required by Regulation 9.2.2.3 category 2 or 9.2.2.4 category 4 towards the machinery space. The enclosure shall extend from the

lower part of the machinery space to a safe location outside of that space and have self-closing fire doors of the same integrity. The ladder shall be fixed in such a way that heat cannot pass through uninsulated attachment points. This enclosure shall be at least 800 × 800 mm on the inside and shall be equipped with emergency lighting.

2 A steel ladder leading to a door in the upper part of the space from which access is provided to the embarkation deck, and in addition a steel door in the lower part of the space, well separated from the ladder. The steel door shall be operable from both sides and shall provide access to a safe escape route to the embarkation deck.

4.1.4 Machine control room

Two escape routes shall be provided from the machinery control rooms located within the machinery space. At least one of these shall provide continuous protection from smoke and flames to a safe location outside the machinery space.

4.1.5 Inclined ladders and stairways

On ships constructed on or after 1 January 2016, any inclined ladders or open-step stairways arranged in machinery spaces in accordance with paragraph 4.1.1, which form part of or give access to escape routes but are not located in protected enclosures, shall be made of steel. Such ladders and stairways shall have steel shielding sheets attached to the underside, so that crew members on the way out receive protection against heat and flames coming from below.

4.1.6 Means of escape from main workshops located within machinery spaces

On ships constructed on or after 1 January 2016, there shall be two escape routes from the main workshop within a machinery space. At least one of these escape routes shall provide contiguous fire shelter to a safe position outside the machinery space.

4.2 *Cargo ships*

General advice
MSC.1/Circ.1511/Rev.1 provides guidelines on how the provisions of 4.2 should be applied, inter alia, with regard to the interpretation of the concepts of 'safe place' and 'inclined ladders and stairways'.

4.2.3 Other machinery spaces

There shall be two escape routes from machinery spaces other than machinery spaces of category 'A', with the exception of spaces used only temporarily and spaces where the walking distance to a door is a maximum of 5 m.

4.2.4 Inclined ladders and stairways

In ships constructed on or after 1 January 2016, any inclined ladders and open-step stairways arranged in machinery spaces in accordance with 4.2.1, which form part of or provide access to escape routes but are not located in protected enclosures, shall be made of steel. Such ladders and stairways shall have steel shielding sheets attached to the underside so that crew members on the way out receive protection against heat and flames coming from below.

4.2.5 Means of escape from machinery control rooms in machinery spaces of category 'A'

On ships constructed on or after 1 January 2016, there shall be two escape routes from machinery control rooms located in machinery spaces. At least one of these escape routes shall provide contiguous fire shelter to a safe position outside the machinery space.

4.2.6 Means of escape from main workshops in machinery spaces of category 'A'

On ships constructed on or after 1 January 2016, there shall be two escape routes from the main workshop within a machinery space. At least one of these escape routes shall provide contiguous fire shelter to a safe position outside the machinery space.

4.3 *Emergency escape breathing devices*

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6 Means of escape from ro-ro cargo spaces

In ro-ro cargo spaces where the crew is normally employed, there shall be two escape routes. The escape routes shall constitute a safe escape to the lifeboat and life-raft embarkation decks. They shall be located in the forward and aft parts of the space.

General advice
MSC.1/Circ.1505 provides guidelines on how the provisions on escape routes from ro-ro cargo spaces should be applied.

7 Additional requirements for escape routes on ro-ro passenger ships[11]

7.1 *General*

7.1.1 There shall be escape routes, that lead to an assembly station, from each space on a ship where persons are normally present. The escape routes shall be designed so that they are the most direct connection to the assembly station and shall be marked with symbols in accordance with Resolution A.760(18), as amended by Resolution A.1116(30).

7.1.2 Escape routes from cabins to stairwell enclosures shall be as direct as possible and change direction as few times as possible. It shall not be necessary to move from one side of the ship to the other in order to get to an escape route. It shall also not be necessary to climb or descend more than two decks from a passenger compartment in order to reach an assembly station or an open deck.

7.1.3 There shall be external connections from the open decks mentioned in 7.1.2 to the survival craft embarkation stations.

7.1.4 Where enclosed spaces are adjacent to the open deck, openings from the enclosed space to the open deck shall, where practicable, be capable of being used as emergency exits.

Part E

Operational requirements

Regulation 14

[11] The amendment deletes 7.4.

2 General requirements

2.2 *Maintenance, functional tests and inspections*

2.2.1 Maintenance, tests and inspections shall be carried out in accordance with the instructions in MSC.1/Circ.1432, as amended by MSC.1/Circ.1516, and in such a way as to ensure the reliability of the fire-fighting systems and equipment.

2.2.2 There shall be a maintenance plan on board the ship, which shall be available for inspection.

Regulation 15

2 General requirements

2.2 *On-board training and drills*

2.2.5 Fire drills shall be carried out and documented in accordance with the requirements of Regulations 19.3 and 19.5 of the Swedish Transport Agency's Regulations and general advice (TSFS 2009:93) on life-saving equipment and arrangements on ships covered by the International Convention for the Safety of Life at Sea, 1974.

2012 amendments for ships constructed on or after 1 July 2014

2.2.6. On-board ships there shall be facilities for loading compressed air containers used in drills, or an appropriate number of such to replace those that have been used.

General advice
MSC.1/Circ.1555 provides guidelines on how the provision should be applied.

2.3 *Training manuals*

Regulation 16

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2 Fire safety instruction manual

2.1 The fire safety instruction manual shall provide information and instructions on how to handle the ship and cargo from a fire safety point of view. The instruction manual shall contain information on the crew's responsibility for the fire safety on the ship during loading and unloading and while the ship is underway. It shall also explain the necessary fire safety measures in the handling of break bulk cargo. On ships carrying dangerous goods and flammable bulk cargo, the instruction manual shall include references to the relevant fire-fighting and cargo handling instructions in the following international documents:

– IMSBC code
– IBC code
– IGC Code
– IMDG Code

2008 amendments for ships constructed on or after 1 January 2011

2.1 The fire safety instruction manual shall provide information and instructions on how to handle the ship and cargo from a fire safety point of view. The instruction manual shall contain information on the crew's responsibility for the fire safety on the ship during loading and unloading and while the ship is underway. It shall also explain the necessary fire safety measures in the handling of break bulk cargo. On ships carrying dangerous goods and flammable bulk cargo, the instruction manual shall include references to the relevant fire-fighting and cargo handling instructions in the following international documents:

- IBC Code
- IGC Code
- IMDG Code
- IMSBC code

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3 Additional requirements for tankers

3.2.4 When the hydrocarbon concentration at the openings has been reduced to 30 % of the lower flammability threshold, work to render the tank gas-free may continue on the cargo tank deck.

3.3 Operation of the inert gas system

3.3.1 The inert gas system for tankers as provided for in Regulation 4.5.5.1 shall be operated in such a way as to generate and maintain a non-flammable atmosphere in the cargo tanks, except where it is stipulated that these tanks shall be gas-free.

3.3.2 Notwithstanding the above, on chemical tankers, the cargo tank may have inert gas added after the cargo tank has been loaded, but before unloading begins. The supply of inert gas shall continue until all flammable gases have been vented from the cargo tank. After that, the tank can be rendered gas-free. Only nitrogen may be used as inert gas in accordance with this provision.

3.3.3. For ships constructed on or after 1 January 2016, if the oxygen content of the inert gas exceeds 5 % by volume, immediate measures shall be taken to improve the quality of the gas. If the gas quality does not improve, the cargo operation in the cargo tanks supplied with inert gas shall be stopped in order to avoid air being drawn into the cargo tanks. Furthermore, the gas control valve, if one exists, shall be closed, and gas not in conformity with the specifications shall be released into the atmosphere.

3.3.4 Where the inert gas system cannot comply with the requirements of 3.3.1 and repair has been deemed impractical, unloading of the cargo and cleaning of the cargo tanks for which inertion is prescribed shall only be resumed when appropriate emergency procedures have been followed, taking into account MSC/Circ.485 and MSC/Circ.353.

General advice
MSC.1/Circ.1501 provides guidelines on how the provisions of 3.3.2 and 3.3.3 should be applied.

Part F

Alternative design of fire protection

Regulation 17

3 Fire resistance analysis

A fire resistance analysis shall be prepared in accordance with Annex 3. The analysis shall be sent to the Swedish Transport Agency and shall contain at least the following:

1 A definition of the type of ship and the spaces concerned;

2 A determination of the rules in Parts B, C, D, E and G that will not be complied with;

3 An evaluation of the fire and explosion risks to the ship or affected spaces, including:
- **3.1** possible ignition sources;
- **3.2.** the fire load in all relevant spaces;
- **3.3** possible production of smoke and toxic gases;
- **3.4** possible spread of fire, smoke and toxic gases.

4 A determination of the functional requirements and design values to be met; The design values shall:
- **4.1** be based on the purpose and functional requirements of these regulations;
- **4.2.** ensure that the same level of safety is achieved as if the detailed requirements had been complied with;
- **4.3** be quantifiable and measurable;

5 A detailed description of the alternative design and the conditions on which the analysis was based, including restrictions on the operation of the ship;

6 A technical analysis showing that the alternative design meets the stipulated functional requirements and design values.

General advice
MSC.1/Circ.1574 and MSC.1/Circ.1574/Corr.1 provide guidelines on how the provisions on fire resistance analysis should be applied when using fibre-reinforced plastics (FRP) as a construction material.

4 Evaluation of alternative design

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Part G

Specific requirements for helidecks, transport of dangerous goods, vehicle spaces, special category spaces and ro-ro cargo spaces

Regulation 18
Specific requirements for helicopter facilities

1 Purpose

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2 Application

2.1 In addition to the applicable requirements in Parts B, C, D, and E of these Regulations, ships fitted with helidecks shall comply with the requirements of this Regulation.

2.2 If helicopters only land or hoist occasionally or in emergency situations on ships that do not have helidecks, fire-fighting equipment as required by Part C shall be used. Such equipment shall be easily accessible and usable immediately and be located in the vicinity of helicopter landing sites or winching areas.

2.3 Notwithstanding 2.2, ships constructed on or after 1 January 2020 that have a helicopter landing site shall be equipped with foam extinguishing equipment, which shall comply with the relevant provisions of Annex 2, Chapter 17.

2.4 Notwithstanding 2.2 or 2.3, ro-ro passenger ships without helidecks copter decks shall comply with the requirements of Regulation 28 of the Swedish Transport Agency's Regulations and general advice (TSFS 2009:93) on life-saving equipment and arrangements on ships covered by the International Convention for the Safety of Life at Sea, 1974.

3 Structural requirements

3.1 *Structures of steel or equivalent material*

3.2 *Structures of aluminium or other metals with a low melting point*

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4 Escape

Helidecks shall be provided with both a main and an emergency escape route and access for fire and rescue personnel. These shall be positioned as far from each other as possible, preferably on either side of the helideck.

5 Firefighting arrangements

5.1 There shall be the following fire-fighting equipment in the vicinity of the helideck and near the access routes to the helideck:

1 at least two powder fire extinguishers with a total capacity of at least 45 kg;

2 carbon dioxide fire extinguishers with a total capacity of at least 18 kg, or equivalent fire extinguishers;

3 a suitable foam extinguishing system consisting of foam cannons or foam pipes that may spray all parts of the helideck with foam in all weather conditions in which helicopters can be used (the system shall be capable of delivering the flow specified in Table 18.1 for at least 5 min).

General advice
The foam extinguishing system should meet the requirements of MSC.1/Circ.1431.

Table 18.1. Foam flow

Category	*Total length of the helicopter*	*Foam fluid flow, litres/min*
H1	less than 15 m	250
H2	at least 15 m but less than 24 m	500
H3	at least 24 m but less than 35 m	800

4 foam fluid suitable for use in salt water and meeting at least the requirements of ICAO Doc 9137-AN/898 Part 1;

5 at least two combination spray nozzles of jet/mist type with sufficiently long fire hoses so that all parts of the helicopter deck can be reached;

6 instead of the requirements in 5.1.3 to 5.1.5, on ships constructed on or after 1 January 2020 that have helidecks, foam extinguishing equipment which complies with the provisions in Annex 2, Chapter 17;

7 two fire-fighter's outfits in addition to those required by Regulation 10.10;

8 the following equipment, which shall be stored in an easily accessible and weather-protected manner:

- adjustable spanner;
- fire blanket;
- bolt cutter 60 cm;
- grip or rescue hook;
- heavy-duty hacksaw with six additional blades;
- ladder;
- lifting line, 5 mm in diameter and 15 m long;
- side cutting pliers;
- a set of various screwdrivers;
- a belt knife (a knife with a protected edge) with a sheath.

6 Drainage

The drainage system from the helideck shall be made of steel and shall lead directly overboard. It shall be completely independent from other systems and be designed so that the waste water does not fall on any part of the ship.

7 Refuelling and hangar facilities

If there are refuelling devices or hangars on the ship, the following conditions must be complied with:

1 There shall be a special place intended for the storage of fuel tanks, which shall be:

1.1 located as far as possible from accommodation spaces, escape routes and embarkation stations

1.2 separated from areas containing sources of ignition.

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13 Electrical equipment in enclosed hangars or enclosed spaces containing refuelling facilities shall comply with the requirements in Regulations 20.3.2, 20.3.3 and 20.3.4.

8 Safety manual and operating procedures

8.1 Each helicopter facility shall have a user manual that contains a description and a checklist of safety measures, procedures and equipment requirements. This manual may be part of the ship's safety manual.

8.2 The procedures and precautions followed during refuelling shall be in accordance with accepted safety practices and shall be included in the user manual.

8.5 Refresher training shall be provided on board the ship. Additional fire extinguishing medium shall be provided to allow for training and testing of the equipment.

Regulation 19

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3 Special requirements

Unless otherwise specified, the following provisions shall govern the application of Tables 19.1, 19.2 and 19.3, both for goods stowed on deck and for goods stowed under deck. The number of the provisions is given in the left-hand column of the tables.

3.1 *Firewater supply*

> ***General advice***
> *MSC.1/Circ.1550 provides guidelines on how the provisions of 3.1 should be applied.*

3.1.1. Direct access to water from the fire main shall be provided either by permanent pressure maintenance or by suitably located remote start devices for the fire pumps.

3.1.5 The water supply to the water-spraying system and the firewater system shall be sufficient to enable the requirements of 3.1.2 and 3.1.3 to be met simultaneously for the largest load compartment. The prescribed capacity of the firewater system must be able to be delivered by the fire pumps, without taking into account any emergency fire pump. If the water spraying system is equipped with a separate pump, that capacity shall be taken into account in the calculation of the total capacity.

3.2 *Ignition sources*

Only electrical equipment deemed necessary by the Swedish Transport Agency for the operation of the ship may be installed in enclosed cargo spaces or in vehicle spaces. If electrical equipment is installed in such spaces, the equipment shall comply with the requirements of IEC 60092 or be completely isolated from the rest of the electrical system, for example by removing links other than fuses or using isolators located outside the space in which the dangerous goods are transported. Such isolation, together with information on the classes of dangerous goods and cargo spaces, shall be indicated in the document of conformity.

Cable penetrations through decks or bulkheads shall be sealed in such a way that gas or vapours do not pass through. Cables passing through the spaces and cables within the cargo spaces shall be protected against external damage. No other equipment capable of igniting flammable gas shall be present in the cargo spaces.

General advice

A detailed list of the electrical equipment to be isolated and instructions on how the isolation is carried out should be included in the document of compliance. The information may be set out in an annex to the document. In the case of removal of links, other than fuses, these should be indicated in a drawing attached to and referenced in the document of compliance. In the case of isolation by isolators, the list should specify its identification and location. The isolator should be clearly marked so that its function in the transport of dangerous goods is clear.

MSC.1/Circ.1555 provides guidelines on how the provision on ignition sources should be applied.

3.3 *Fire detection systems*

3.4 *Ventilation systems*

3.4.1[12] Enclosed cargo spaces shall be provided with mechanical ventilation having a capacity of at least 6 air changes/h in the void spaces. The extraction air shall be taken from the upper or lower part of the cargo space depending on the type of dangerous goods being transported.

3.4.2 The ventilation fans shall be so designed that flammable gas/air mixtures cannot be ignited. The inlets and outlets of the ventilation openings shall be provided with appropriate metal safety nets.

[12] The amendment deletes the general advice.

General advice
For the purposes of 3.4.2, the net meshes over fans should not exceed 13 × 13 mm. Fans should be designed in accordance with the instructions in IACS UR F29.

3.10.2 Where an enclosed ro-ro cargo space has an opening to weather deck, this opening shall be provided with a separation (a port, for example) which prevents the spread of dangerous gases or liquids between these spaces. Such separation need not be provided if the enclosed ro-ro cargo space meets the requirements of an enclosed space that contains the dangerous goods that are on adjacent weather decks.

4 Dangerous goods certificate

A ship carrying dangerous goods shall carry a dangerous goods certificate drawn up in accordance with MSC.1/Circ.1266 showing that its construction and equipment comply with the requirements of this Regulation. This documentation does not need to be carried when transporting dangerous goods of Class 6.2 or 7 (except when dangerous goods of Class 6.2 or 7 are transported in bulk in solid form). Even in the case of the transport of dangerous goods in small quantities, this documentation does not need to be carried.

2008 amendments for ships constructed on or after 1 January 2011

4 Dangerous goods certificate

A ship carrying dangerous goods shall carry a dangerous goods certificate drawn up in accordance with MSC.1/Circ.1266 showing that its construction and equipment comply with the requirements of this Regulation. This documentation does not need to be carried when transporting dangerous goods of Class 6.2 or 7 (except when dangerous goods of Class 6.2 or 7 are transported in bulk in solid form). In the case of transport of dangerous goods in small quantities or reduced quantities, this documentation is also not required.

Table 19.1. Provisions applicable to the transport of dangerous goods in different ships and cargo spaces

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Table 19.2. Applicable provisions for different classes of dangerous goods on ships and in cargo spaces for solid dangerous goods in bulk

Class Regulation 19	4.1.	4.2.	4.3.[6]	5.1.	6.1.	8.	9.
3.1.1.	X	X	–	X	–	–	X
3.1.2.	X	X	–	X	–	–	X
3.2.	X	X[7]	X	X[8]	–	–	X[8]
3.4.1.	–	X[7]	X	–	–	–	–
3.4.2.	X[9]	X[7]	X	X[7, 9]	–	–	X[7, 9]
3.4.3.	X	X	X	X	X	X	X
3.6.	X	X	X	X	X	X	X
3.8.	X	X	X	X[7]	–	–	X[10]

Comments:

6 Substances in this class that may be transported in bulk present such risks that special attention shall be paid to the design and equipment of the ships concerned, in addition to compliance with the provisions listed in this table.

7 Only applicable to seedcakes containing soluble products, to ammonium nitrate and to ammonium nitrate fertilisers.

8 Only applicable to ammonium nitrate and ammonium nitrate fertilisers. A level of protection in accordance with SS-EN 60079, Electrical equipment for areas with explosive gas atmospheres, is sufficient.

9 Only suitable steel wire mesh is required.

10 The requirements of the IMSBC Code are adequate.

Table 19.3. Applicable provisions for different classes of dangerous goods on ships, except solid dangerous goods in bulk

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Regulation 20

Special requirements for vehicle spaces, special category spaces and ro-ro cargo spaces

1 Purpose

Ships having vehicle spaces, special category spaces or ro-ro cargo spaces shall apply the additional fire safety measures described in this Regulation.

These measures shall lead to the fulfilment of the following functional requirements:

1 Fire safety systems shall be installed to minimise the risks arising from vehicle spaces, special category spaces and ro-ro cargo spaces.

2 Ignition sources shall be separated from vehicle spaces, special category spaces and ro-ro cargo spaces.

3 Vehicle spaces, special category spaces and ro-ro cargo spaces shall be provided with adequate ventilation.

General advice
When applying Regulation 20, the guidelines set out in MSC.1/Circ.1615 should be followed in order to minimise the occurrence and consequences of fires in ro-ro cargo spaces and special category spaces in passenger ships.

2 General requirements

2014 Amendments for all ships

General advice
For the transport of vehicles powered by hydrogen or compressed natural gas (CNG), specific guidelines are provided in MSC.1/Circ.1471.

***2.1** Application*

2.1.1 In addition to the applicable requirements of Parts B, C, D and E of this Annex, vehicle spaces, special category spaces and ro-ro cargo spaces shall comply with the requirements of this Regulation.

2.1.2 On all ships, vehicles with fuel for their own propulsion in their tanks may be carried in cargo spaces other than vehicle spaces, special category spaces or ro-ro cargo spaces, provided that all of the following conditions are met:

.1 The vehicles do not use their own propulsion inside the cargo spaces.

.2 The cargo spaces meet the applicable requirements of Regulation 19.

.3 The vehicles are transported in accordance with the Swedish Transport Agency's Regulations and general advice (TSFS 2022:52) on the carriage by sea of dangerous goods in packaged form (IMDG code).

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2.2 *General principles for passenger ships*

3 Measures to prevent the ignition of flammable gases in enclosed vehicle spaces, enclosed ro-ro cargo spaces and special category spaces

3.1 *Ventilation systems*

3.1.1. A mechanical ventilation system shall be provided which shall provide at least the following capacities:

Ship type	*Space*	*Air changes/h*
Passenger ships	Special category spaces	10
Passenger ships which carries more than 36 passengers	Enclosed ro-ro and vehicle spaces except special category spaces	10
Passenger ships which carries a maximum of 36 passengers	Enclosed ro-ro and vehicle spaces except special category spaces	6*
Cargo ships	Enclosed ro-ro and vehicle spaces	6*

* See Regulation 20.3.2.2.

It shall be possible to increase the number of air changes per hour when vehicles are loaded onto or off the ship.

General advice

When applying the provision, the guidelines for the design of ventilation systems in ro-ro cargo spaces in MSC.1/Circ.1515 should be followed.

3.1.2 Design of ventilation systems

3.1.2.1. On passenger ships, the mechanical ventilation system shall be separated from other ventilation systems. The mechanical ventilation system shall provide at least the number of air changes prescribed in paragraph 3.1.1 whenever there are vehicles in such spaces, except where there is a demand-driven ventilation system in accordance with 3.1.2.4. Ventilation ducts serving such cargo spaces that can be closed shall be separate for each such space. The system shall be operable from a position outside such spaces.

3.1.2.2 On cargo ships, when vehicles are on board, ventilation fans shall normally be in service at all times and provide at least the number of air changes prescribed in 3.1.1, except where a demand-driven ventilation system is in place in accordance with 3.1.2.4. If this is not feasible, the ventilation fans shall be in operation for a limited period daily when weather permits and, under any conditions, for a sufficient period of time before unloading, after which the ro-ro or vehicle space shall be determined to be gas-free. At least one portable instrument for measuring the concentration of flammable gases must be on board for this purpose. The system shall be completely separated from other ventilation systems. Ventilation ducts serving ro-ro cargo or vehicle spaces shall be capable of being effectively closed against any such cargo space. The system shall be operable from a position outside such spaces.

3.1.2.3. The ventilation system shall be designed in such a way as to prevent air stratification and the formation of air pockets.

3.1.2.4 On all ships where a demand-driven ventilation system has been installed in accordance with the guidelines of MSC.1/Circ.1515, the number of air changes may be reduced. Such reduction does not apply to spaces where paragraph 3.1.2.2 of this Regulation requires at least ten air changes per hour, or spaces covered by Regulation 19.3.4.1 and Regulation 20-1.

3.1.3 Control systems

3.1.4 Closing devices and ventilation ducts

3.1.4.1 The ventilation system shall be capable of being closed quickly and efficiently from a place outside the space, regardless of weather and sea conditions.

3.1.4.2. Ventilation ducts and dampers within a horizontal zone shall be made of steel. On passenger ships, ventilation ducts passing through

horizontal zones or machinery spaces shall be ‘A-60’ isolated steel ducts which shall be constructed in accordance with Regulations 9.7.2.1.1 and 9.7.2.1.2. On ships constructed on or after 1 January 2016, they shall be constructed in accordance with Regulation 9.7.2.4.1.1 and 9.7.2.4.1.2.

3.1.5 Permanent openings

3.2 *Electrical equipment and cables*

3.2.1. All electrical equipment and cables in enclosed ro-ro cargo spaces, enclosed vehicle spaces and special category spaces shall be suitable for use in an explosive petrol/air mixture, except as permitted in 3.2.2.

General advice
Electrical equipment and cables in enclosed ro-ro and vehicle spaces and special category spaces should meet the requirements of SS-IEC 60079. Electrical equipment and cables should be approved for use in zone 1 and be of at least explosion group IIA and temperature class T3.

3.2.2 Other electrical equipment and other cables may be used in special category spaces above the bulkhead deck, in closed ro-ro spaces, and in closed vehicle spaces if all of the following conditions are met:

– The equipment and cables shall be of a type which is enclosed and protected such that spark potential is prevented, which means that they shall be at least protection class IP 55 and be approved for use in zone 2.

– The equipment and cables shall only be installed at least 450 mm above deck or at least 450 mm above a vehicle platform if the platform does not have sufficiently large openings downwards to ensure that petrol vapour does not accumulate on the platform.

– The space shall be equipped with a ventilation system that provides continuous ventilation with a capacity of at least 10 air exchanges per hour.

– The ventilation system shall always be in operation when there are vehicles on board.

3.3 *Electrical equipment and cables in ventilation ducts*

Regulation 20-1

Requirements for vehicle carriers carrying motor vehicles as cargo, the tanks of which contain compressed gaseous hydrogen or compressed natural gas for their own propulsion

1 Aim

The requirements of this Regulation apply in addition to Regulation 20 and aim to address the fire safety objectives of these Regulations for vehicle carriers with vehicle spaces and ro-ro cargo spaces intended for cargo of motor vehicles, the tanks of which contain compressed gaseous hydrogen or compressed natural gas for their own propulsion.

General advice
For the purposes of Regulation 20-1, entities should follow the guidelines set out in MSC.1/Circ.1471 concerning vehicle carriers with vehicle spaces and ro-ro cargo spaces intended for cargo of motor vehicles, the tanks of which contain compressed gaseous hydrogen or compressed natural gas for their own propulsion.

2 Application

2.1 Vehicle carriers constructed on or after 1 January 2016 and intended for cargo of motor vehicles, the tanks of which contain compressed gaseous hydrogen or compressed natural gas for their own propulsion, shall, in addition to complying with the relevant requirements of Regulation 20, also comply with the requirements of this Regulation.

2.2 Vehicle carriers constructed before 1 January 2016, including those constructed before 1 July 2012, shall, in addition to the relevant requirements of Regulation 20, also comply with the requirements of paragraph 5 on detection in this Regulation.

3 Requirements for spaces intended for cargo of motor vehicles, the tanks of which contain compressed gaseous hydrogen or compressed natural gas for their own propulsion

3.1 Electrical equipment and cables

Electrical equipment and cables shall be approved for use in an explosive methane and air mixture.

General advice

In the application of 3.1, the guidelines of IEC 60079 should be followed.

3.2 *Ventilation systems*

3.2.1 Electrical equipment and cables installed in ventilation ducts shall be approved for use in explosive mixtures of methane and air.

3.2.2 The fans shall be such that mixtures of methane and air are not liable to ignite. The inlets and outlets of the ventilation openings shall be provided with appropriate metal flame netting.

3.3 Other sources of ignition

Other equipment which may constitute a source of ignition for the mixtures of methane and air is not permitted.

4 Requirements for spaces intended for cargo of motor vehicles, the tanks of which contain compressed gaseous hydrogen for their own propulsion

4.1 Electrical equipment and cables

Electrical equipment and cables shall be approved for use in explosive mixtures of hydrogen and air.

General advice

In the application of 4.1, the guidelines of IEC 60079 should be followed.

4.2 Ventilation systems

4.2.1 Electrical equipment and cables installed in ventilation ducts shall be approved for use in explosive mixtures of hydrogen and air, and the outlet from exhaust air ducts shall be safely located, taking into account other possible sources of ignition.

4.2.2 The fans shall be such that mixtures of hydrogen and air are not liable to ignite. The inlets and outlets of the ventilation openings shall be provided with appropriate metal flame netting.

4.3 Other sources of ignition

Other equipment which may constitute a source of ignition for the mixtures of hydrogen and air is not permitted.

5 Detection

Vehicle carriers carrying cargo of one or more motor vehicles, the tanks of which contain either compressed gaseous hydrogen or compressed natural gas for their own propulsion, shall carry on board at least two portable gas detectors. The detectors must be suitable for the detection of the relevant gases and be of a type approved for use in the explosive gas and air mixture.

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Annex 2[13]

Chapter 1

General

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2 Definitions

2.1 The *Convention* means the 1974 International Convention for the Safety of Life at Sea. Chapter II-2 of the Convention is contained in Sections 1 to 7, Section 11 and Annex 1 to these Regulations.

2.2 **For the** purposes of this Annex, the definitions in Section 5 shall apply.

3 Use of equivalent solutions and modern technology

The Swedish Transport Agency may allow the use of modern technology and the development of fire safety systems that are not covered by the FSS Code, provided that the requirements of Annex 1, Regulation 17 are met.

4 Use of toxic fire extinguishing mediums

The use of fire extinguishing mediums which are capable of emitting – when not in use or during use – toxic gases, liquids or other substances in such quantities as to cause injury to persons, shall be prohibited.

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[13] Annex 2 corresponds to Chapters 1 to 17 of the FSS Code.

Chapter 3

Personal protective equipment

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2 Technical requirements

2.1.2 Breathing apparatus

The breathing apparatus shall be either a self-contained unit of compressed air type, the tanks of which shall contain at least 1 200 litres of air, or other self-contained breathing apparatus which can be used for at least 30 minutes. All air tanks for the breathing apparatus shall be interchangeable.

2012 amendments for ships constructed on or after 1 July 2014

2.1.2. Breathing apparatus

2.1.2.1 The breathing apparatus shall be a self-contained compressed air type, the tanks of which shall contain at least 1 200 litres of air, or another type of self-contained breathing apparatus which can be used for at least 30 minutes. All air tanks for breathing apparatus shall be interchangeable.
2.1.2.2 Breathing apparatus of compressed air type shall be fitted with an acoustic alarm and a device which visually or otherwise alerts the user before the air in the container has been reduced to a volume of 200 litres.

> ***General advice***
> *MSC.1/Circ.1499 provides guidelines on how the provision 2.1.2.2 on devices warning the user acoustically and visually should be applied.*

2.1.3 Lifeline

A fireproof lifeline of at least 30 m in length shall be provided for each breathing apparatus. The lifeline shall be approved for a static load of 3.5 kN for 5 minutes. The line shall be capable of being attached by means of a snaphook to the harness of the apparatus or to a special belt in such a

way that the breathing apparatus is not detached when the lifeline is operated.

Chapter 5

Fixed fire-extinguishing systems with gas

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2 Technical requirements

2.1 *General*

2.1.1.3. Means shall be provided to enable the crew to safely check the amount of fire-extinguishing medium in the containers.

2.1.1.4 Storage containers for fire extinguishing medium and associated pressure components must meet the requirements of the Swedish Work Environment Authority's regulations (AFS 2023:5) on products - pressure equipment. Account shall be taken of the location of the storage containers, piping, and pressure components, and the maximum ambient operating temperature.

2.1.2 System requirements

2.1.3.2 Acoustic alarm signals shall be given automatically when the fire extinguishing medium is discharged into a space that personnel normally work in or have access to. The alarm shall be activated automatically, for example when the door to the release cabinet is opened. The alarm shall sound for at least as long as it takes to evacuate the space, but not less than 20 seconds before the fire extinguishing medium is released

Ordinary cargo spaces and small spaces (e.g. compressor rooms, colour stores and the like) where the fire extinguishing medium can only be triggered on-site need not have such an alarm.

General advice
MSC.1/Circ.1456/Rev.1 and MSC/Circ.1487 contain guidelines on how the provision should be applied.

2.1.3.3 Operating controls for a fixed gas extinguishing system shall be easily accessible and easy to operate. They shall be grouped together in as few locations places as possible and in spots which are not likely to be cut off in the event of fire in any of the spaces they protect. At each location there shall be clear instructions on how to operate the gas extinguishing system with regard to the safety of personnel.

2.2 *Carbon dioxide system*

2.2.2 Control devices

1 Carbon dioxide systems shall have two separate control devices for releasing the gas in the protected space and ensuring that the alarm is activated. One control device shall open the valve to the piping that leads the gas to the space and the other shall release the gas from the storage containers.

2 The two control devices shall be located inside a release cabinet clearly marked for each compartment. If the cabinet can be locked, there shall be a key in a box with easily breakable glass in an obvious spot next to the cabinet.

General advice
MSC.1/Circ.1456/Rev.1 provides guidelines on how the provisions should be applied.

2.3 *Steam system*

Boilers shall have a capacity of at least 1 kg steam/h for each 0.75 m^3 of the gross volume of the largest of the protected spaces. The design of steam systems shall be approved by the Swedish Transport Agency.

2006 amendments for ships constructed on or after 1 July 2010

Chapter 5

Fixed fire-extinguishing systems with gas

2.1.1.3. Means shall be provided to enable the crew to safely check the amount of fire extinguishing medium in the containers.

2.1.1.4 Storage containers for fire extinguishing medium, piping, and associated pressure components must meet the requirements of the Swedish

Work Environment Authority's regulations (AFS 2023:5) on products - pressure equipment. Account shall be taken of the location of the storage containers, piping, and pressure components, and the maximum ambient operating temperature.

2.1.2 System requirements

2012 amendments for ships constructed on or after 1 July 2014

Chapter 5
Fixed fire-extinguishing systems with gas

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2. Technical requirements

2.1. *General*

2.1.1.3 Means shall be provided to enable the crew to safely check the amount of fire extinguishing medium in the containers. It shall not be necessary to move the containers completely from their mounts point for this purpose. For CO_2 systems, there must be either bars intended to attach a weighing instrument to, suspended above each row of cylinders, or other instrumentality. For other types of fire extinguishing medium, suitable level sensors may be used

2.1.1.4 Storage containers for fire extinguishing medium, piping, and associated pressure components must meet the requirements of the Swedish Work Environment Authority's regulations (AFS 2023:5) on products - pressure equipment. Account shall be taken of the location of the storage containers, piping, and pressure components, and the maximum ambient operating temperature.

2.1.2 System requirements

2.2. *Carbon dioxide systems*

2.2.1. Quantity of fire extinguishing medium

2.2.1.6 In machinery spaces, the fixed pipe system shall be designed such that 85 % of the gas is released into the space within 2 minutes.

2.2.1.7 For container spaces and general cargo spaces (primarily intended for different types of cargo that are separately lashed or packed), the fixed piping system shall be such that at least two thirds of the gas can be released into the space within 10 minutes. For spaces intended for solid bulk loads, the piping system shall be such that at least two thirds of the gas can be released into the space within 20 minutes. The control device of the system must allow one-third, two-thirds or the entire amount of gas to be let in, depending on the loading conditions.

General advice
MSC.1/Circ.1528 provides guidelines on how the provision on carbon dioxide systems should be applied.

2.2.2 Control devices

2.2.4 Low pressure systems with carbon dioxide

2.2.4.10 In all pipe sections which can be separated by valves and where the pressure may exceed the design pressure of the components, there shall be safety
valves.

2.2.4.11 Acoustic and optical alarm signals shall be given in a central control station or in accordance with Chapter 31 of the Swedish Transport Agency's regulations and general advice (TSFS 2019:4) on machinery installations, electrical installations, and periodically unattended machinery spaces, if there is no central control station in the following situations:

1. when the pressure in the ship(s) is equal to the lowest or highest value specified in 2.2.4.2.;
2. in the event of the failure of any of the refrigeration installations; or
3. when the ships have the lowest permissible fluid level.

2.2.4.12 If the low pressure CO2 system serves more than one compartment, it shall be possible to check with, for example, an automatic timer or a high accuracy level meter how much CO2 is emitted at the control position(s).

Chapter 6

Fixed foam extinguishing systems

2012 amendments for ships constructed on or after 1 January 2014

Chapter 6

Fixed foam extinguishing systems

1. Application

3. Fixed fire-extinguishing systems with lightweight foam

3.1. *System requirements*

3.1.19 The quantity of foam liquid available shall be the greater of the following: sufficient to produce a foam volume equal to at least five times the volume of the largest protected space enclosed by steel bulkheads, with the nominal foam number, or sufficient for 30 minutes of full operation in the largest protected space.

3.1.20 Machinery spaces, cargo pump rooms, vehicle spaces, ro-ro spaces and special category spaces shall be provided with alarms which, by audible and visual signals in the protected space, indicate that the system has been triggered. The alarm signals shall be given for as long as necessary to evacuate the space, but never for less than 20 seconds.

3.2. *Systems where the inside air is utilised for the production of lightweight foam*

3.2.1. Systems for the protection of machinery spaces and cargo pump rooms.

3.2.1.1 The system shall be supplied by both main and emergency sources of power. The emergency power supply shall be provided from outside the protected space.

3.2.1.2 There must be sufficient foam-generating capacity to ensure that the lowest permissible design output speed of the system is not undercut, and further to allow the largest protected space to be fully filled within 10 minutes.

General advice

MSC.1/Circ.1528 provides guidelines on how the provision should be applied.

3.2.1.3 The arrangement of foam generators shall, as a rule, be modelled on the results of the test acceptance. At least two generators shall be installed in each compartment containing internal combustion engines, boilers, separators and similar equipment. For small workshops and similar spaces, one foam generator is sufficient.

3.3. *Systems where the outside air is utilised for the production of lightweight foam*

3.3.1. Systems for the protection of machinery spaces and cargo pump rooms.

3.3.1.1 The system shall be supplied by both main and emergency sources of power. The emergency power supply shall be provided from outside the protected space.

3.3.1.2 There must be sufficient foam-generating capacity to ensure that the lowest permissible design output speed of the system is not undercut, and further to allow the largest protected space to be fully filled within 10 minutes.

General advice

MSC.1/Circ.1528 provides guidelines on how the provision should be applied.

3.3.1.3. The arrangement of the foam supply ducts shall, as a general rule, be based on the result of the test approval. The number of ducts does not have to be the same as in the approval, but the system must have the lowest permissible design output speed as determined in the approval. At least two ducts shall be installed in each compartment containing internal combustion engines, boilers, separators and similar equipment. For small workshops and similar spaces, one foam duct is sufficient.

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Chapter 7

Fixed fire-extinguishing systems for water distribution and water mist

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2006 amendments for ships constructed on or after 1 September 2008

2 Technical requirements for ships

2.1 *Fixed water-spraying systems*

Fixed fire-extinguishing systems with water distribution in machinery spaces and cargo pump rooms shall meet the requirements of MSC/Circ.1165, MSC/Circ.1237 and MSC/Circ.1269 or equivalent standard.

2.2 *Equivalent fire extinguishing systems with water mist*

Water-mist fire-extinguishing systems in machinery spaces and cargo pump rooms shall comply with the requirements of MSC/Circ.1165, MSC/Circ.1237, MSC/Circ.1269, MSC.1/1385 and MSC.1/1386 or equivalent standard.

General advice

MSC.1/Circ.1458 provides guidelines on how the requirements of MSC/Circ.1165 should be applied.

2.3 *Fixed water spray systems on cabin balconies*

Fixed water spraying systems on cabin balconies shall meet the requirements of MSC.1/Circ.1268.

2012 amendments for ships constructed on or after 1 July 2014

2.4. *Fixed water-based fire-extinguishing systems for ro-ro spaces, vehicle spaces and special category spaces*

Fixed water-based fire extinguishing systems for ro-ro spaces, vehicle spaces and special category spaces shall meet the requirements of MSC.1/Circ.1430. Installations made on or after 1 January 2021 shall comply with the requirements of MSC.1/Circ.1430/Rev.2.

2023 amendments for ships constructed on or after 1 January 2024
2.4. *Fixed water-based fire-extinguishing systems for ro-ro spaces, vehicle spaces and special category spaces* Fixed water-based fire extinguishing systems for ro-ro spaces, vehicle spaces and special category spaces shall meet the requirements of MSC.1/Circ.1430/Rev3.

Chapter 8

Automatic sprinkler, fire detection, and fire alarm systems

1 Application

This chapter specifies the requirements for the automatic sprinkler, fire detection, and fire alarm systems stipulated in the Convention.

A sprinkler system is defined as an automatic sprinkler, fire detection and fire alarm system.

> ***General advice***
> *MSC.1/Circ.1556 provides guidelines on how the provisions of Chapter 8 should be applied.*

2 Technical requirements

2.4 *Installation requirements*

2.4.1 General

2.4.1.1 Any part of the system which may be subjected during operation to temperatures below the freezing point shall be protected against freezing.

2.4.1.2 The system manufacturer's water quality specifications shall be taken into particular consideration in order to avoid internal corrosion and internal clogging due to rust flakes or mineral deposits in the sprinkler system.

2.4.2 Piping configuration

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Chapter 9

Fixed fire detection and fire alarm systems

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2 Technical requirements

2.5 *Control devices*

2.5.1 Acoustic and optical fire alarm signals

The acoustic and optical fire alarm signals required by this chapter shall comply with the requirements of Resolution A.830 (19).

2.5.1.1 When a detector or manually operated alarm button is activated, a visual and audible fire detection alarm shall start at the control panel and indicating units. If the alarm signals have not received attention within two minutes, an audible fire alarm shall automatically be triggered in all crew spaces, service spaces, control stations and machinery spaces of category 'A'. This audible alarm system need not form an integral part of the fire alarm system.

General advice

MSC/Circ.1487 provides guidelines on how the provision should be applied.

2.5.1.2 The fire alarm control panel shall be located on the navigating bridge or in the continuously manned central control station.

2010 amendments for ships constructed on or after 1 July 2012

Chapter 9

Fixed fire detection and alarm systems

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2 Technical specifications

2.2 *Power supply*

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2.2.2 Sufficient power shall be available to maintain the system in continued operation with all detectors activated. However, if the total number of detectors exceeds 100, no more than 100 detectors need to be kept activated.

2.2.3 The emergency power source specified in 2.2.1 shall be sufficient to maintain the operation of the fire detection and fire alarm system during the periods required by Chapters 18 to 20 of the Swedish Transport Agency's Regulations and general advice (TSFS 2019:4) on machinery installations, electrical installations and periodically unattended machinery spaces. At the end of one such period, the emergency power source shall have the capacity to operate all connected visual and audible fire alarm signals for at least 30 minutes.

2.3 *Component requirements*

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2.5 *Control devices*

2.5.1 Visual and audible fire alarm signals

The visual and audible fire alarm signals required by this chapter shall comply with the requirements of Resolution A.1021(26).

2.5.1.1 When a detector or manually operated alarm button is activated, a visual and audible fire detection alarm shall start at the control panel and indicating units. If the alarm signals have not received attention within 2 minutes, an audible fire alarm shall automatically be triggered in all crew spaces, service spaces, control stations and machinery spaces of category 'A'. This audible alarm system need not form an integral part of the fire alarm system.

General advice

MSC/Circ.1487 provides guidelines on how the provision should be applied.

2.5.1.2 On passenger ships, the control panel shall be located in the on-board safety centre. On cargo ships, the control panel shall be located on the navigation bridge or at the fire control station.

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2012 amendments for ships constructed on or after 1 July 2014

Chapter 9

Fixed fire detection and fire alarm systems

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2. Technical specifications

2.1. *General requirement*

2.1.7 On passenger ships, the fixed fire detection and fire alarm system shall be capable of remote identification of individual detectors and manually operated alarm buttons. Fire detectors fitted in passenger ship cabins shall, when activated, also be capable of emitting or producing an audible alarm in the space in which they are located. On cargo ships and on cabin balconies on passenger ships, the fixed fire detection and alarm system must as a minimum be capable of identifying individual sections.

2.1.8 Notwithstanding the provisions of paragraph 2.1.6.1, in cargo ships and on cabin balconies of passenger ships, where a fixed fire detection and fire alarm system capable of remote identification of individual detectors is installed, short circuit protection need not be provided in each fire detector if the system is arranged in such a way that the number and location of the individually identifiable fire detectors lost due to a fault are not more than or cover a larger area than a corresponding whole section of a section-identifier system, configured in accordance with paragraph 2.4.1.

2.2. *Power supply*

2.2.3 Sufficient power shall be available to maintain the system in continued operation with all detectors activated. However, if the total number of detectors exceeds 100, no more than 100 detectors need to be kept activated.

2.2.4 The emergency source of power specified in 2.2.1 above may be supplied by accumulator batteries or from the emergency switchboard. The power source shall be sufficient to maintain the operation of the fire detection and fire alarm system as long as provided for in Chapters 18 to 20 of the Swedish Transport Agency's regulations and general advice (TSFS 2019:4) on machinery installations, electrical installations, and periodically unattended machinery spaces. At the end of such period, the emergency power source shall have the capacity to operate all connected visual and acoustic fire alarm signals for at least 30 minutes.

General advice

MSC.1/Circ.1554 provides guidelines on how the provision should be applied.

2.2.5 On ships constructed on or after 1 July 2014 where the system is supplied with accumulator batteries, those batteries shall be located in or in the immediate vicinity of the fire detection system control panel, or at any other location suitable for use in an emergency. The capacity of the battery charging unit shall be sufficient to maintain the normal power supply to the fire detection system and at the same time charge discharged batteries.

2.5. *Control devices*

2.5.1 Visual and audible fire alarm signals

The visual and audible fire alarm signals required by this chapter shall comply with the requirements of Resolution A.1021(26).

2.5.1.1 When a detector or manually operated alarm button is activated, a visual and audible fire detection alarm shall start at the control panel and indicating units. If the alarm signals have not received attention within 2 minutes, an audible fire alarm shall automatically be triggered in all crew spaces, service spaces, control stations and machinery spaces of category 'A'. This audible alarm system need not form an integral part of the fire alarm system.

General advice

MSC/Circ.1487 provides guidelines on how the provision should be applied.

2.5.1.2 On passenger ships, the control panel shall be located in the on-board safety centre. On cargo ships, the control panel shall be located on the navigation bridge or at the fire control station.

2.5.1.3 On passenger ships, an indicating device capable of individually identifying all detectors that have been activated or manually operated alarm buttons that have been used, shall be located on the navigating bridge. On cargo ships, an indicating unit shall be located on the navigation bridge. On cargo ships, an indicating unit shall be located on the navigation bridge. On ships with cargo control rooms constructed on or after 1 July 2014, there shall be an additional indicating unit in the cargo control room. On cargo ships and on the balconies of passenger cabins, the indicating devices shall indicate at least the section where a detector has been activated or where a manually operated alarm button has been used.

General advice

MSC.1/Circ.1528 provides guidelines on how the provision should be applied.

2.5.1.4 Clear information about the spaces covered and the location of the sections shall be displayed on or in the immediate vicinity of each indicating unit.

Chapter 10

Smoke detection system with extraction test

2 Technical requirements

2.4 System requirements

2.4.1 Acoustic and optical fire alarm signals

2.4.1.1 The control panel shall be located on the bridge or in the continuously manned central control station.

2.4.1.2 The control panel shall be located on the navigation bridge or in the fire control station. If the control panel is located in the fire control station, there shall be an indication device on the navigating bridge.

General advice
MSC.1/Circ.1456/Rev.1 provides guidelines on how the provision should be applied.

2.4.1.3 When smoke or other combustion products are detected, acoustic and optical alarm signals shall be triggered at the control panel and on the navigating bridge or in the continuously manned central control station.

Chapter 12

Fixed emergency fire pumps

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2 Technical requirements

2.2 *Component requirements*

2.2.1 Emergency fire pumps

The pump capacity shall be at least 40 % of the total capacity of the fire pumps required by Regulation 10.2.2.4.1 of the Convention. However, the capacity of the pump shall be at least:

1. for passenger ships of less than 1 000 gross tonnage and for cargo ships of 2 000 gross tonnage and upwards: 25 m^3/h

2. for cargo ships of less than 2 000 gross tonnage: 15 m^3/h.

General advice
The capacity of the emergency fire pumps should comply with the guidelines in MSC.1/Circ.1314 and MSC.1/Circ.1550.

2.2.1.2 Fire hydrant pressure

When the pump delivers the required water quantity according to 2.2.1.1, the pressure at each fire hydrant shall be the minimum as required by the Convention.

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Chapter 13

Escape configurations

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2 Passenger ships

2.1 *Stairway width*

2.1.2 Calculation method for stairway widths

2.1.2.2.2 Personnel density

2.1.2.2.2.1 The escape routes, i.e. the stairs, doors, corridors and stairwells, shall be dimensioned according to the number of persons expected to use them; see Figure 3. The dimensions shall be calculated for two cases. The dimension of each individual part of the escape route shall be taken from the case which provides the highest value:

Case 1	Passengers are in the cabins and all berths are in use. The crew is located partly in the cabins, where 2⁄3 of the berths are used, and partly in the working spaces, where 1⁄3 of the crew is located.
Case 2	Passengers are accommodated in public spaces that are filled to 3⁄4 of their maximum capacity, with 1⁄3 of the crew dispersed in the public spaces; service spaces filled with 1⁄3 of the crew; and crew accommodation spaces filled with 1⁄3 of the crew.

2.1.2.2.2.2 The maximum number of persons in a main vertical zone, including persons connecting to stairways from another main vertical zone, shall be assumed, in the calculations of the width of the stairway, not to be greater than the maximum number of persons the ship may carry.

Chapter 14

Fixed deck foam systems

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2 Technical requirements

2.3 Installation requirements

2.3.2.2 The distance from the foam cannon to the outermost boundary of the protected area in front of any foam cannon shall not exceed 75 % of the foam cannon's spray distance in calm weather.

2.3.2.3 There must be a foam cannon and a hose coupling for foam lines on both the port and starboard sides. These shall be placed either at the forward bulkhead of the poop deck or at the accommodation spaces facing the cargo tank deck.

Tankers with a deadweight of less than 4 000 shall have a hose coupling for foam lines on both the port and starboard sides. These shall be placed either at the forward bulkhead of the poop deck or at the accommodation spaces facing the cargo tank deck.

> ***General advice***
> *MSC.1/Circ.1491 provides guidelines on how the provisions on the location of foam cannons should be applied.*

2.3.3 Foam lines

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2012 amendments for ships constructed on or after 1 July 2014

Chapter 14

Fixed deck foam systems

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2. Technological requirements

2.3. *Installation requirements*

2.3.2. Foam cannons

2.3.2.1 The number and location of the foam cannon devices shall comply with the requirements of 2.1.1.

2.3.2.2. The distance from the foam cannon to the most remote boundary of the protected area in front of the foam cannon shall not be more than 75 % of the foam cannon's spray distance in still winds.

2.3.2.3 A foam cannon and a hose coupling for a foam line shall be located both on the port and starboard sides at the forward bulkhead of the poop deck or of the accommodation spaces facing the cargo tank deck. The foam cannons and hose couplings shall be located aft of any cargo tanks but may be located in the cargo area above pump rooms, cofferdams, ballast tanks and void spaces adjacent to cargo tanks if they can protect the deck below and aft of each other. In tankers with a deadweight of less than 4 000 tonnes, there shall be a hose coupling for a foam line both on the port and starboard sides at the forward bulkhead of the poop deck or of the accommodation spaces facing the load tank deck.

General advice

MSC.1/Circ.1491 provides guidelines on how the provisions on the location of foam cannons should be applied.

2.3.3. Foam lines

Chapter 15

Inert gas system

1 Application

This Chapter specifies the requirements for inert gas systems resulting from these regulations.

2 Technical requirements

2.1 Definitions

For the purposes of this Chapter, the following definitions shall apply.

2.1.1 *cargo tanks* shall mean those tanks, including slop tanks, in which loads or cargo residues are carried with a flashpoint not exceeding 60°C;

2.1.2 *inert gas systems* means systems using flue gas, inert gas generators and nitrogen generators; includes the inert gas installation and distribution including devices to prevent cargo vapours from migrating towards the direction of flow of inert gas into machinery spaces and fixed and portable measuring instruments and control and regulating equipment;

2.1.3 *gas-proof space* means a space where flammability or toxicity hazards arise from the penetration of gases;

2.1.4 *gas-free* a condition in a tank when
– the concentration of the hydrocarbon or any other flammable gas is less than 1 % of the lower flammable limit (LFL);
– the oxygen concentration is at least 21 %; and
– there are no toxic gases in the tank.

General advice
When accessing enclosed spaces, the recommendations of Resolution A.1050(27) on access to enclosed spaces should be followed.

2.2 *Requirements for all systems*

2.2.1 General

2.2.1.1 The inert gas system referred to in Annex 1 shall be designed, constructed and tested in accordance with these Regulations. It shall be

designed to create and maintain a non-flammable atmosphere in the tanks in question.

2.2.1.2 The system shall have the capacity:

.1 To inert empty cargo tanks and, in port and at sea, to maintain, in all parts of the tank, an oxygen concentration not exceeding 8 % by volume and an overpressure, except where it is necessary that the tank in question is gas-free.

.2 To eliminate the need to release air into the tank during normal operation, except where it is necessary for the tank in question to be gas-free.

.3 To vent hydrocarbon gases or other flammable gases from empty cargo tanks, so that subsequent work to make the tanks gas-free can under no circumstances create a flammable atmosphere inside the tank.

.4 To supply cargo tanks with inert gas of a capacity equal to at least 125 % by volume of the ship's maximum loading capacity, expressed as volume. For chemical tankers and chemical and product tankers, the Swedish Transport Agency may accept inert gas systems with lower capacity to supply, provided that the maximum capacity to discharge cargo from cargo tanks protected by the system is limited to a maximum of 80 % of the inert gas capacity.

.5 To supply inert gas with an oxygen concentration not exceeding five % by volume to the cargo tanks with the required flow capacity.

2.2.1.3 The materials used in inert gas systems shall be suitable for their purpose. In particular, the components on which the gases and/or liquids may have a corrosive effect shall be either constructed of corrosion-resistant materials or lined with rubber, glass-fibre reinforced epoxy plastics or an equivalent coating.

2.2.1.4 the inert gas may consist of

.1 treated flue gas from main or auxiliary boilers;

.2 gas from an oil- or gas-fired gas generator; or

.3 gas from nitrogen gas generators.

The Swedish Transport Agency may accept systems using inert gases from one or more separate gas generators or other sources or

combinations thereof, provided that an equivalent level of safety is achieved. Such systems shall, as far as practicable, comply with the requirements of this chapter. Systems that use stored carbon dioxide shall not be used unless the Swedish Transport Agency considers that the risk of ignition through static electricity generated in the system is limited to a minimum.

2.2.2 Safeguards

2.2.2.1 The inert gas system shall be so designed that the maximum pressure exerted by the system in a cargo tank does not exceed the pressure under which it was tested.

2.2.2.2 Automatic shutdown of the inert gas system and its components shall occur when the established thresholds are reached, taking into account the provisions of sub-paragraphs 2.2.4, 2.3.2 and 2.4.2.

2.2.2.3 The outlet of each inert gas generator shall be fitted with an appropriate isolation device.

2.2.2.4 The system shall be designed so that the inert gas is automatically vented into the atmosphere if the oxygen concentration exceeds 5 % by volume.

2.2.2.5 Means shall be provided to stabilise the inert gas system before the start of unloading. If fans are used to make the tanks gas-free, means shall be provided to segregate their air intakes.

2.2.2.6 If a double-sealing valve with drainage is installed, the system shall ensure that the double sealing valves are automatically closed and that the drainage valve automatically opens in the event of power failure.

2.2.3 System components

2.2.3.1 One-way devices

2.2.3.1.1 There shall be at least two one-way devices to prevent gas and liquids from flowing back to the inert gas installation, or to any gas-safe space.

2.2.3.1.2 The first of these one-way devices, placed on the deck, shall be of a wet, semi-wet or dry type, or a double-sealing valve with drainage. Two isolating valves in series with one drainage valve between, are acceptable provided that:

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.1 the valve is operated automatically; opening and closing signals shall come directly from the process, e.g. from inert gas flow or differential pressure; and

.2 there is a malfunction alarm; for example, operating conditions such as a fan stop and an open inlet valve shall initiate an alarm.

2.2.3.1.3 The second of these one-way devices shall be a non-return valve or equivalent device capable of preventing the return of gas and fluids. It shall be located between the water seal (or equivalent device) on deck and the first connection of the inert gas main to a cargo tank. It shall have a positive closing device. As an alternative to a positive closing device, an additional valve with such a closing device may be fitted between the non-return valve and the first connection to the cargo tanks to separate the water trap, or equivalent device, on deck from the inert gas main line to the cargo tanks.

2.2.3.1.4 If there is a water seal installed, it must be capable of being fed by two separate pumps, each of which must be able to provide sufficient and continuous water supply. The audible and visual alarm indicating a low water level in the water seal shall always be in operation.

2.2.3.1.5 The configuration of the water seal or equivalent device and related parts shall be capable of preventing the flow of gases and liquids back and ensure the correct functioning of the device during operation.

2.2.3.1.6 The water seal must be protected against freezing in such a way that its integrity is not impaired by overheating.

2.2.3.1.7 There shall be a water seal or other approved device on all water supply and drainage lines and on all piping or pressure sensing lines leading to gas-safe spaces. Devices shall be provided to prevent the emptying of such water seals due to the negative pressure.

2.2.3.1.8 All water seals or equivalent devices shall prevent gases and fluids from flowing back to the inert gas installation at the pressure applied to the loading tanks in a pressure test.

2.2.3.1.9 The one-way devices shall be positioned on the deck within the load area.

2.2.3.2 Inert gas lines

2.2.3.2.1 The main inert gas line may be divided into two or more branch lines downstream of the one-way devices provided for in subparagraph 2.2.3.1.

2.2.3.2.2 The inert gas main line shall have branch lines to the cargo tank. The branch lines shall have either isolating valves or equivalent control devices to separate each tank. isolating valves shall be equipped with locking devices. The control system shall provide unambiguous information on the operational status of these valves, at least to the control panel prescribed in paragraph 2.2.4.

2.2.3.2.3 Cargo tanks that are not inert shall be able to be separated from the main inert gas line by

.1 removing pipe joints, valves or other pipe sections and the blind flange of the pipe ends;

.2 an arrangement of two spectacle flanges in series, with the possibility of detecting leakage into the line between the two spectacle flanges; or

.3 equivalent arrangements that are acceptable to the Swedish Transport Agency and that provide at least the same level of safety.

2.2.3.2.4 When the cargo tanks are separated from the main inert gas lines, means shall be provided to protect the cargo tanks against overpressure or negative pressure due to temperature variations and/or cargo operations.

2.2.3.2.5 Piping systems shall be designed in such a way that, under normal conditions, cargo or water will not get stuck or remain standing in the pipes.

2.2.3.2.6 Means shall be provided to allow the external supply of inert gas to the inert gas main line. The devices shall consist of a 250 mm bolted pipe flange separated from the main inert gas pipe by a valve located downstream of the non-return valve. The design of the flange shall be in accordance with the standard used for the design of other external connections of the ship's piping system used in cargo handling.

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2.2.3.2.7 If there is a connection between the inert gas main and the load oil piping system, devices shall be provided to effectively separate the two systems, taking into account the large pressure difference that may exist between the systems. The separation shall consist of two isolating valves with a device that permits safe purging of the space between the valves or a device consisting of a pipe joint with the associated blank flanges.

2.2.3.2.8 The valve separating the main inert gas pipe from the main load line and located on the side of the main load line shall be a non-return valve with a positive closing device.

2.2.3.2.9 Inert gas lines shall not pass through accommodation spaces, service spaces or control stations.

2.2.3.2.10 On combination carriers, the device separating slop tanks with oil or oil residues from other tanks shall consist of blank flanges which shall always be in place when loads other than oil are transported. This applies with the exception of the relevant sections of MSC/Circ.353, as amended by MSC/Circ.387.

2.2.4 Alarm and indications

2.2.4.1 The operating status of the inert gas system shall be indicated on a control panel.

2.2.4.2 There shall be instrumentation which, when inert gas is supplied, continuously shows and permanently records:

1. the pressure in the inert gas main duct downstream of the one-way devices, and

2. the oxygen concentration of the inert gas.

2.2.4.3 The indicating and recording devices shall be located in the load control room, if there is such. If there is no load control room, they shall be easily accessible to the officer responsible for cargo handling.

2.2.4.4 In addition, instruments shall be provided:

.1 on the navigating bridge: for continuous indication of the pressure referred to in 2.2.4.2.1 and of the pressure in the slop tanks of combination carriers where these tanks are separated from the main inert gas line, and

.2 in the manned machinery space or in the machinery space: for the indication of the oxygen concentration in the inert gas according to 2.2.4.2.2.

2.2.4.5 Audible and visual alarms

2.2.4.5.1 Audible and visual alarms, based on the design of the system, shall be provided to indicate:

.1 Oxygen concentration exceeding 5 %;

.2 Failure of the power supply to the instrumentation referred to in 2.2.4.2;

.3 Gas pressure falling below 100 mm of water column. The alarm device shall be designed so that the pressure in the slop tanks of combination carriers can be read continuously.

.4 High gas pressure.

.5 Failure of the power supply to the automatic control system.

2.2.4.5.2 The alarms prescribed in subparagraphs 2.2.4.5.1.1, 2.2.4.5.1.3 and 2.2.4.5.1.5 shall be installed in the machinery space and the load control room, if there is such. In either case, the alarm shall be installed at such a location that the alarm signals are immediately received by the responsible crew members.

2.2.4.5.3 There shall be either an audible alarm system that is independent of the alarm device stipulated in subparagraph 2.2.4.5.1.3, or a device that automatically stops the load pumps. The alarm or device shall be activated at predetermined low pressure thresholds in the main inert gas line.

General advice
MSC.1/Circ.1582/Rev.1 provides guidelines on how the provision should be applied.

2.2.4.5.4 Two sensors for measuring oxygen concentration shall be installed at appropriate locations in the compartment(s) where the inert gas system is located. If the oxygen concentration falls below 19 %, these sensors shall trigger alarm signals that shall be both visible and audible inside and outside the space(s), and shall be located in such a place that they are immediately perceived by the responsible crew members.

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2.2.5 Manuals

There shall be detailed manuals on board covering the use, safety and maintenance requirements and occupational safety and health risks associated with the inert gas system and its impact on the cargo tank system. The manuals shall contain instructions on how to proceed in the event of failure or breakdown of the inert gas system.

2.3 Requirements for flue gas and inert gas generator systems

For inert gas systems using flue gas or inert gas generators, the provisions of this section shall apply, in addition to the provisions of paragraph 2.2.

2.3.1 System requirements

2.3.1.1 Inert gas generators

2.3.1.1.1 The inert gas generator shall have two oil fuel pumps. Suitable fuel shall be available in sufficient quantity for the inert gas generators.

2.3.1.1.2 The inert gas generators shall be located outside the cargo area. Spaces containing inert gas generators shall not have direct access to accommodation spaces, service spaces or control stations, but may be located in machinery spaces. If a space containing inert gas generators is not located in a machinery space, it shall be separated from accommodation spaces, service spaces and control stations by a gas-tight steel bulkhead and/or deck. There shall be adequate mechanical ventilation of the overpressure type in adjacent accommodation spaces, service spaces or control stations.

2.3.1.2 Gas control valves

2.3.1.2.1 There shall be a gas control valve in the main inert gas line. This valve shall close automatically, in accordance with subparagraph 2.2.2.2. It shall also be able to regulate the flow of inert gas to the cargo tanks automatically, unless there is automatic regulation of the flow of inert gas.

2.3.1.2.2 The gas control valve shall be located at the forward bulkhead delineating the furthers forward solid gas-proof space through which the main inert gas line passes.

2.3.1.3 Cooling and scrubbing devices

2.3.1.3.1 A device shall be provided for the effective cooling of the amount of gas specified in 2.2.1.2 and for the removal of combustion products in the form of particulate matter and sulphur. The cooling water supply shall be such that there is always sufficient water without disturbing the essential functions of the ship. There must also be an alternative cooling water supply device.

2.3.1.3.2 Filters or equivalent devices shall be provided to minimise the amount of water that gets to the inert gas fans.

2.3.1.4 Fans

2.3.1.4.1 There shall be at least two inert gas fans which together shall be capable of delivering at least the volume of gas to the cargo tanks prescribed in 2.2.1.2. The Swedish Transport Agency may allow only one fan to be used in a system with inert gas generators if the system can deliver the quantity of gas to the cargo tanks as prescribed in 2.2.1.2, provided that there are sufficient spare parts on board for the fan and its motor, so that the ship's crew can repair all types of breakdowns of the fan and its motor.

2.3.1.4.2 If the inert gas generators are served by positive displacement blowers, a pressure-relief device shall be provided to prevent the build-up of a harmful pressure on the fan's outlet side.

2.3.1.4.3 When there are two fans, the total prescribed capacity of the inert gas system shall be evenly divided between them, and in no case shall any of the fans have a capacity of less than 1/3 of the total prescribed capacity.

2.3.1.5 Inert gas isolating valves

In installations using flue gas, there shall be isolating valves in the main inert gas line between the boilers and the scrubber. These valves shall have devices to indicate whether they are open or closed. Preventive measures shall be taken to keep the valves gas-tight and the contact surfaces free of soot. There shall be devices which ensure that the boiler soot-blowing systems cannot be used when the corresponding flue gas valve is open.

2.3.1.6 Protection against flue gas leakage

2.3.1.6.1 Particular attention shall be paid to the design and location of scrubbers and fans with associated lines and devices, in order to prevent flue gases from leaking into enclosed spaces.

2.3.1.6.2 In order for maintenance to be carried out safely, an additional water seal or other effective device preventing flue gas leakage shall be

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installed between the isolating valves and the scrubber or shall be constructed into the gas inlet of the scrubber.

2.3.2 Alarm and indications

2.3.2.1 In addition to the provisions of subparagraph 2.2.4.2, devices shall be provided which, when the system is in operation, continuously indicate the inert gas temperature at the outlet side of the system.

2.3.2.2. In addition to the requirements of 2.2.4.5, audible and visual alarms shall be provided indicating

.1 insufficient supply of oil fuel to the oil-fired inert gas generator,

.2 failure of the power supply to the inert gas generator,

.3 low water pressure or flow to the cooling and scrubbing devices,

.4 high water level in the cooling and scrubbing devices,

.5 high gas temperature,

.6 malfunctions of the inert gas fans, and

.7 low water level in the water seal.

2.4 Requirements on nitrogen-gas generator systems

In addition to the provisions of 2.2, nitrogen gas generating systems shall comply with the requirements of this section.

2.4.1 System requirements

2.4.1.1 the system shall have one or more compressors capable of generating sufficient pressure to deliver the volume of gas prescribed in 2.2.1.2.

2.4.1.2 An air treatment system for the feed air shall be installed to remove moisture, particulates and oil residues from the compressed air.

2.4.1.3 The air compressor and the nitrogen generator may be installed in machinery spaces or in a separate space. Such a separate space and the equipment installed there shall be considered as other machinery spaces for the purposes of fire protection. If the nitrogen generator is installed in a separate compartment, this compartment shall be provided with a separate

extraction type ventilation system providing six air changes per hour. The compartment shall not have direct access to accommodation spaces, service spaces or control stations.

2.4.1.4 If a nitrogen tank or a buffer tank is installed, it may be installed in a space specifically intended for this purpose, in a separate space where the air compressor and generator are located, in machinery spaces or in the cargo area. If the nitrogen tank or buffer tank is installed in an enclosed space, access to it shall be possible only from the open deck, and the door shall open outwards. There shall be adequate separate mechanical exhaust ventilation in such a space.

2.4.2 Alarm and indications

2.4.2.1 In addition to the provisions of 2.2.4.2, instrumentation shall be provided to continuously indicate the air temperature and air pressure at the intake side of the nitrogen gas generator.

2.4.2.2. In addition to the requirements of 2.2.4.5, audible and visual alarms shall be provided indicating

.1 failure of the electric heater, if any;

.2 low pressure or flow of feed air from the compressor;

.3 high air temperature; and

.4 high level of condensation at the automatic drainage valve of the water separator.

Chapter 17
Fire-fighting systems with foam for helicopter facilities

1 Application

This chapter describes in detail fire-fighting systems with foam for the protection of helidecks and helicopter landing sites in accordance with these Regulations.

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2 Definitions

2.1 *D-value* refers to the largest dimension of the helicopter when the rotors are in motion. This defines the area for which the foam extinguishing system shall be dimensioned.

2.2 *In-deck foam nozzles* are foam nozzles that are recessed or mounted on the edge of the helideck.

2.3 *Foam lines* are tubular nozzles of the ejector type for air/foam which produce and emit foam, usually only in a straight stream.

2.4 *Helicopter landing location* is such an area on a ship which is specifically intended for occasional or emergency helicopter landings but is not designed for regular helicopter operations.

2.5 *Helideck* means a custom-constructed helicopter landing area on the ship; includes all structural elements, all fire-extinguishing installations, and all other equipment necessary for safe helicopter operations.

2.6 *Foaming station with hose reel* refers to a hose reel with foam line and semi-rigid hose, together with fixed foam injector and fixed foam tank, all mounted on a common frame.

2.7 *Foam cannon station* refers to a foam cannon, either self-dosing or with a separate fixed foam injector and fixed foam tank, all mounted on a common frame.

2.8 *Clearway* refers to the take-off and approach sector, which covers the entire safe landing site and extends over a sector of at least 210º, and within which only specified obstacles are permitted.

2.9 *Sector with obstacle limitation* refers to a sector of 150º which is outside the take-off and approach sector, which extends outwards from a helideck, and within which objects of a limited height are permitted.

3 Technical requirements for helidecks and helicopter landing sites

3.1 The system shall be capable of being triggered manually and may have automatic triggering devices.

3.2 On helidecks, the foam system shall include at least two fixed foam cannons or in-deck foam nozzles. In addition, there shall be at least two hose rolls fitted with foam lines and semi-rigid hoses reaching each part of the

helideck. The minimum outlet flow rate of the foam system is determined by multiplying the area of the D value by 6 l/min/m2. The minimum allowable foam system discharge rate for in-deck foam nozzle systems is determined by multiplying the total area of the helideck by 6 l/min/m2. Each foam cannon shall have the capacity to discharge foam equivalent to at least 50 % of the minimum allowable foam system discharge rate, but not less than 500 l/min. The minimum permissible discharge flow rate from each of the hose rolls shall be 400 l/min. The quantity of foam fluid shall be such that all connections can be used for at least 5 minutes.

3.3 The distance from a foam cannon to the farthest limit of the protected area may not exceed 75 % of the foam spray distance in still winds.

3.4 There shall be at least two portable foam application units for a helicopter landing site in accordance with the table.

Category	The length of the helicopter (D value)	Minimum specified foam discharge (l/min)
H1	Less than 15 m	250
H2	15 m or more, but less than 24 m	500
H3	24 m or more, but less than 35 m	800

The quantity of foam fluid shall be dimensioned such that all connections users can be used for at least 10 minutes. In the case of tankers with deck foam systems, the Swedish Transport Agency may approve alternative arrangements, taking into account the type of foam liquid to be used.

3.5 Manually triggered stations where the necessary pumps can be started and the required valves – including those in the fire main if used for water supply – can be opened, shall be provided at each foam cannon and hose reel.
In addition, there shall be a central manually triggered station in a protected location. The foam system shall be designed to release foam with nominal flow at design pressure from all connections within 30 seconds after activation.

3.6 Activation of a manually triggered station shall initiate the flow of foam mixture to all connected hose rolls, foam cannons and in-deck foam nozzles.

3.7 The system and its components shall be designed to withstand ambient temperature changes, vibrations, moisture, shocks and corrosion occurring normally on the open deck. The system and its components shall also be

manufactured and tested in a manner accepted by the Swedish Transport Agency.

3.8 The nozzles on all hose rolls and foam cannons that release foam at the same time, shall have a minimum permissible spray distance of at least 15 m. In-deck foam nozzle outlet pressure, flow and spray pattern shall be accepted by the Swedish Transport Agency based on tests showing the nozzle ability to extinguish fire in a helicopter of the largest size for which the helideck tyre is designed.

3.9 Foam cannons, foam lines, in-deck foam nozzles and couplings shall be made of brass, bronze or stainless steel. Piping, couplings and related components, excluding gaskets, shall be designed to withstand 925 °C.

3.10 The foam fluid shall be shown to be effective for extinguishing fires in aviation fuel spills and shall comply with performance standards at least equivalent to those laid down in MSC.1/Circ.1312. If the foam liquid storage tank is exposed on deck, the foam fluid used shall be frost-proof, if necessary in the area in which the ship operates.

3.11 No foam system equipment installed within the clearway may have a height exceeding 0.25 m. No foam system equipment installed in the clearway may be higher than the maximum height for objects in that area.

3.12 All manually triggered discharge stations, foam cannon stations, foam hose reel stations, hose reels and foam cannon stations shall be accessible without the need to cross any part of the helideck or helicopter landing site.

3.13 If oscillating foam cannons are used, they shall be pre-set to emit foam in a spray pattern and shall have a device for disengaging the oscillating mechanism so that they can be quickly switched to manual operation.

3.14 If a foam cannon capable of emitting a flow of up to 1000 l/min is installed, it must be equipped with a nozzle of the ejector type for air/foam. If an in-deck nozzle system is installed, the hose reels must be equipped with ejector type foam lines for air/foam. The use of nozzles that are not of the ejector type for air/foam is only permitted, on both foam cannons and hose rolls, if foam cannons that discharge above 1000 l/min are installed. If only portable foam spreading units are available, they must be equipped with foam lines of the ejector type for air/foam.

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Annex 3

Annex 3.

Instructions for alternative design of fire protection

Appendix A. Guidelines for the selection of performance criteria for the safety of human life

1 Application

The purpose of these guidelines is to provide a methodology for the selection of the criteria referred to in 6.3.4.1 of this Annex used to assess the survivability of persons on board exposed to heat, smoke, toxic substances and reduced visibility. The guidelines are intended to support the preparation and evaluation of alternative fire protection designs in accordance with Annex 1, Regulation 17, in order to meet the objective of Section 1(2) to '*minimise the risk of personal injury*'. The Swedish Transport Agency may require a more comprehensive analysis if the arrangements of the space are complex or unusual.

2 Definitions

Evacuation time refers to the time it takes for all persons in the affected space to move from the place where they are located when a fire message is issued and get to a safe place outside the affected space, either in an enclosed stairwell or in another main vertical zone.

Minimum visibility refers to the lowest visibility condition required for occupants attempting to evacuate to move at normal walking speed through spaces where visibility is obscured by smoke.

Available safe egress time, ASET, is available time during critical conditions in affected spaces.

Required safe egress time, RSET, is necessary time for evacuation of affected spaces.

3 General

Annex 3 provides a method for verifying alternative designs in accordance with Annex 1, Regulation 17. The principle behind this method of analysis is to demonstrate that the alternative design provides a level of safety, which is at least equivalent to the performance criteria for the safety of human life described in Section 4.2 below, or to the level of safety of a comparable design in accordance with the detailed requirements of these Regulations, depending on which of them provides the highest level of safety. The assessment of which method provides the highest level of safety is preferably done by means of probabilistic analysis. This is usually done using computer-based simulations of designed fire scenarios. The scenarios show how a fire growth is expected to develop, and what consequences such development will have in the affected space. The effects of the fire over time are usually used in conjunction with an evacuation analysis to demonstrate that all persons on board can safely exit the affected compartment(s) before the fire can adversely affect the evacuation. In cases where the time available for safe evacuation is not relevant for the alternative design, the Swedish Transport Agency assesses how the performance criteria for safety of life are applied.

The method in Annex 3 for verifying the conformity of alternative designs with Annex 1, Regulation 17, is contingent upon the development of one or more design fire scenarios. The scenarios define a set of conditions for the fire development and spread of the fire through the affected ship spaces. The design fire scenarios are based on a review of the current alternative design, type and quantity of combustible materials that can be expected to be present in the affected spaces, and possible ignition sources. The alternative design is then exposed to the design fire scenarios using suitable computer-based fire modelling. In order to demonstrate that a level of safety equivalent to the purposes and functional requirements set out in these Regulations has been achieved, quantitative performance criteria should be considered for assessing the exposure of persons on board to heat and smoke. Criteria for damage to the ship and the environment should also be considered.

Specific performance criteria for safety of life should be developed for each proposed alternative design, taking into account the type of fire hazards present in the spaces concerned, the expected fuel sources, fire extinguishing and fire detection systems and the category of persons on board. These performance criteria for the safety of human life should be expressed in quantitative terms chosen to demonstrate that the alternative design corresponds to the purpose and functional requirements of the Regulations, with sufficient certainty that the alternative design corresponds to the level of safety achieved by the detailed requirements of the Regulation.

As a minimum, the effects of exposure to radiant heat, air temperature, carbon monoxide concentration and reduced visibility should be included in technical fire analyses prepared in accordance with Annex 1, Regulation 17.

Depending on the specific type of the alternative design, the Swedish Transport Agency should consider whether additional performance criteria may be necessary, such as toxicity of other gases, irritant substances and movement patterns of persons on board.

An important part of the overall technical analysis used to determine the suitability of the alternative design is the quantitative analysis. As the description in the Annex above shows, a quantitative analysis should be carried out evaluating the design fire scenarios against the performance criteria for the safety of human life (4.3.5 and 6). It should also be noted that risk can play an important role in this process (6.1.2). When evaluating probabilistic scenarios, care must be taken to use relevant fire protection engineering approaches, and other literature as referenced in this section and Appendix D of the Annex (Section 1.3), to ensure that there is a good understanding of these risks and that they are explained.

More information on the selection of the safety of life performance criteria can be found below and in Appendix D:

- SFPE Engineering Guide to Performance-Based Fire Protection, Society of Fire Protection Engineers and National Fire Protection Association, Second Edition, 2007;
- ISO 19706:2011, Guidelines for assessing the fire threat to people;
- ISO 13571:2012, Life-threatening components of fire – Guidelines for the estimation of time to compromised tenability in fires; and
- ISO 13344:2015 Estimation of the lethal toxic potency of fire effluents.

4 Method

Advanced simulation tools should be used to evaluate the fire safety performance of the alternative design in the affected spaces.

When evaluating the evacuation time, advanced simulation tools for evacuation should be used to establish the time needed to evacuate the affected spaces. Such tools can use different assumptions and algorithms to simulate the walking speeds and movement patterns of passengers. The advanced method described in Annex 3 to *Revised guidelines on evacuation analysis for new and existing passenger ships* (MSC.1/Circ.1533) includes information on the recommended characteristics of the simulation tools used in evacuation analyses.

Similarly, when evaluating design fires, in order to determine the time that elapses before the effects of fire and smoke directly affect the ability of the occupants to survive, appropriate software for computational fluid dynamics (CFD) that can be accepted by the Swedish Transport Agency should be used (Sections 3.1, 6.2.1, 6.2.3 and Appendix D).

4.1 Analysis of available safe egress time (ASET) and required safe egress time (RSET)

Normally, an analysis of the Available safe egress time (ASET) and the required safe egress time (RSET) as set out below should be used to assess the possibility of safe evacuation of all persons, or to determine the number of persons affected within the space.

4.1.1 Determination of required safe egress time (RSET)

Determine, using an appropriate method, the maximum required safe egress time (RSET) for the total evacuation of the space, with the daytime or nighttime response time, applicable in the spaces concerned, and based on occupancy assumptions in accordance with Annex 2, Chapter 13. If the simulation is carried out in accordance with the advanced method in MSC.1/Circ.1533, the safety factor 1,25, set out in Annex 3, 1.2, should be applied.

4.1.2 Determination of available safe egress time (ASET)

The available safe egress time (ASET) is the time available from the occurrence of the fire until the threshold levels of the performance criteria (as specified in section 4.2 below) are exceeded within the range of 0 to 2 metres above deck in public spaces and 0 to 1.8 metres in other spaces. In spaces that include multiple open decks (e.g. atriums), each individual deck normally accessible to persons on board should be assessed at the same time. These performance criteria are not intended to evaluate the area in the immediate vicinity of the fire (if this were the case, all designs would quickly fail). Instead, the evaluation aims to determine where affected persons can be expected to be (at a time corresponding to the required safe egress time (RSET) in a given space) and to evaluate their exposure to the immediate (e.g. thermal radiation and temperature) and long-term (e.g. visibility and toxic environment) effects of fire.

4.2 Performance criteria for the safety of human life

4.2.1 The following criteria for the safety of human life should be used in the evaluation of the available safe egress time (ASET) in Section 4.1 above:

Criteria for assessing alternative designs

Maximum air temperature	60 °C
Maximum radiant heat	2.5 kW/m^2
Minimum visibility	10 m; or 5 m in spaces ≤ 100 m^2
Maximum carbon monoxide	– 1 200 ppm (in case of

Maximum air temperature	60 °C
concentration	instantaneous exposure) – 500 ppm (at 20 min cumulative exposure)

These four criteria are considered sufficient when assessing alternative designs in terms of configuration, physical dimensions or safety systems. For other types of alternative designs, particularly related to changes in combustible materials, ventilation, etc., specific criteria for other toxic gases or irritants (e.g. HCN, HCI) may be appropriate.

4.2.2 If in all cases the available safe egress time (ASET) exceeds the required safe egress time (RSET), no further analysis is needed. The Swedish Transport Agency can accept that solutions such as smoke control systems are used to achieve this.

4.2.3 If any of the thresholds in point 4.2.1 are exceeded during evacuation (available time (ASET) < necessary time (RSET)), at least a calculation of the fractional effective dose (FED – thermal dose and/or dose of nitrogen gases depending on the results) should be carried out in accordance with the standard ISO 13571:2012 in order to demonstrate that a threshold of 0.3 will not be exceeded before reaching the required safe egress time (RSET) (note that visibility may be the limiting factor). The Swedish Transport Agency may also approve alternative methods where, for example, criteria from MSC-MEPC.2/Circ.12/Rev.2 can be used.

4.2.4 The Swedish Transport Agency should only approve alternative designs and arrangements after comprehensive technical analysis, including, where relevant, a probabilistic analysis demonstrating an acceptable level of performance based on the application of the safety-of-life criteria listed in 4.2 above.

Appendix B. Report on the Approval of Alternative Design and Arrangements for Fire Safety

The Government of …… has approved on …… an alternative design and arrangement in accordance with provisions of regulation II-2/17.5 of the International Convention for Safety of Life at Sea (SOLAS), 1974, as amended, as described below:

Name of ship …….

Port of registry …….

Ship type …….

IMO Number …….

1 Scope of the analysis or design, including the critical design assumptions and critical design features:

2 Description of the alternative design and arrangements:

3 Conditions of approval, if any:

4 Listing of affected SOLAS chapter II-2 regulations:

5 Summary of the result of the engineering analysis and basis for approval, including performance criteria and design fire scenarios:

6 Test, inspection and maintenance requirements:

Appendix C. Document of Approval of Alternative Design and Arrangements for Fire Safety

Issued in accordance with provisions of regulation II-2/17.4 of the International Convention for Safety of Life at Sea (SOLAS), 1974, as amended, under the authority of the government of

…………………………………… by ……………………………………
(name of State) (person or organization authorized)

Name of ship ………………………………………………………….

Port of registry ………………………………………………………….

Ship type ………………………………………………………….

IMO Number ………………………………………………………….

This is to certify that the following alternative design and arrangement applied to the above ship has been approved under the provisions of SOLAS regulation II-2/17.

1 Scope of the analysis or design, including the critical design assumptions and critical design features:

2 Description of the alternative design and arrangements:

3 Conditions of approval, if any:

4 Listing of affected SOLAS chapter II-2 regulations:

5 Summary of the result of the engineering analysis and basis for approval, including performance criteria and design fire scenarios:

6 Test, inspection and maintenance requirements:

7 Drawings and specifications of the alternative design and arrangement:

Issued at ……………………………… on ………………………………
(signature of authorized official issuing the certificate)

(Seal or stamp of issuing authority, as appropriate)

Appendix D. Technical reference literature

1 Section 3 of these instructions states that the fire technical analysis should "follow an established fire protection design approach. This approach should be based on fire science and technical experience including generally accepted methods, empirical data, calculations, relationships and computer models found in technical manuals and technical literature". There are lots of technical reference literature that can be useful in designing fire protection. It is therefore very important that fire engineers and others in the design group establish that the reference literature and the methods used are accepted in the application in question.

2 When assessing the applicability of the reference literature, it is very helpful to know how the document was drafted, reviewed and approved. For example, many codes and standards have been developed in a transparent process that works to achieve consensus solutions, involving recognised professional organisations, standardisation bodies or government agencies. Other technical reference literature has been reviewed by specialists, as is the case in many technical journals. Technical manuals and technical literature often contain generally accepted and well-substantiated data and calculation methods.

3 Further advice on the selection of technical reference literature and lists of subject-specific literature can be found in the following publications:

1 SFPE Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings, Society of Fire Protection Engineers and National Fire Protection Association, 1999.

2 ISO/TR 13387-1 till 13387-8, Fire safety engineering, International Organisation for Standardization, 1999.

4 Other important reference literature:

.1 Custer, R.L.P. and Meacham, B.J., "Introduction to Performance-Based Fire Safety", Society of Fire Protection Engineers, USA, 1997;

.2 Engineering Guide to Assessing Flame Radiation to External Targets from Liquid Pool Fires, Society of Fire Protection Engineers, Bethesda, MD, 1999;

.3 Engineering Guide to Predicting 1st and 2nd degree Skin Burns, Society of Fire Protection Engineers, Bethesda, MD, 1999;

.4 Fire Protection Handbook, 20th Edition, A. E. Cote, ed., National Fire Protection Association, Quincy, MA, 2008;

.5 Hadjisophocleous, G. and Benechou, N., ‘Performance criteria used in performance-based Design’, Automation in Construction, 8 (489-501), 1999;

.6 Hurley, M.J. and Bukowski, R.W., ‘Fire hazard analysis and techniques’, NFPA Fire Protection Handbook 20th Ed., Sec. 3 Ch. 7, 2008;

.7 ISO 13344:2015, Estimation of the lethal toxic potency of fire effluents;

.8 ISO 13571:2012, Life-threatening components of fire – Guidelines for the estimation of time to compromised tenability in fires;

.9 ISO 13943:2008, Fire safety – Vocabulary;

.10 ISO 19706:2011, Guidelines for assessing the fire threat to people;

.11 Jin, T., ‘Studies of Emotional Instability in Smoke from Fires’, Journal of Fire and Flammability, Vol. 12 (130-142), 1981;

.12 Klote, J.H. and Milke, J.A., ‘Principles of Smoke Management’, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA, 2002;

.13 Milke, J.A. et al., ‘Tenability Analyses in Performance-Based Design’, Fire Protection Engineering, 2005;

.14 NFPA 550, ‘Guide to the Use of the Fire Safety Concepts Tree’, National Fire Protection Association, 1995;

.15 Purser, D.A., ‘Assessment of Hazards to Occupants from Smoke, Toxic Gases, and Heat’, The SFPE Handbook of Fire Protection Engineering, 4th Edition, National Fire Protection Association, Quincy, MA, 2002;

.16 SFPE Engineering Guide to Performance-Based Fire Protection, Society of Fire Protection Engineers and National Fire Protection Association, 2nd Edition, 2007;

.17 SFPE Handbook of Fire Protection Engineering, 4th Edition,

P. J. DiNenno, ed., The Society of Fire Protection Engineers, Boston, MA, 2008; and

.18 Wade, C. et al., 'Developing Fire Performance Criteria for New Zealand's Performance Based Building Code', Presented at the Fire Safety Engineering International Seminar, Paris, France, April, 2007.'