

RULES FOR CLASSIFICATION

Ships

Edition July 2018
Amended February 2019

Part 6 Additional class notations

Chapter 5 Equipment and design features

The following section supersedes the July 2018 edition:

- Section 4 *Additional fire safety - F*

This document includes the amended section only.

For sections not listed above, the July 2018 edition is valid.

The content of this service document is the subject of intellectual property rights reserved by DNV GL AS ("DNV GL"). The user accepts that it is prohibited by anyone else but DNV GL and/or its licensees to offer and/or perform classification, certification and/or verification services, including the issuance of certificates and/or declarations of conformity, wholly or partly, on the basis of and/or pursuant to this document whether free of charge or chargeable, without DNV GL's prior written consent. DNV GL is not responsible for the consequences arising from any use of this document by others.

The electronic pdf version of this document, available free of charge
from <http://www.dnvgl.com>, is the officially binding version.



FOREWORD

DNV GL rules for classification contain procedural and technical requirements related to obtaining and retaining a class certificate. The rules represent all requirements adopted by the Society as basis for classification.

© DNV GL AS July 2018

Any comments may be sent by e-mail to rules@dnvgl.com

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of DNV GL, then DNV GL shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.

In this provision "DNV GL" shall mean DNV GL AS, its direct and indirect owners as well as all its affiliates, subsidiaries, directors, officers, employees, agents and any other acting on behalf of DNV GL.

CHANGES – CURRENT

This document supersedes the July 2018 edition of DNVGL-RU-SHIP Pt.6 Ch.5.

Changes in this document are highlighted in red colour. However, if the changes involve a whole chapter, section or subsection, normally only the title will be in red colour.

Amendments February 2019, entering into force 1 July 2019

<i>Topic</i>	<i>Reference</i>	<i>Description</i>
Developing new class notation for engine room fire prevention	Sec.4 [1.1]	Editorial.
	Sec.4 [1.2]	Editorial.
	Sec.4 [1.3]	Editorial.
	Sec.4 [1.4.3]	Added reference to requirements for F(M-P) .
	Sec.4 [1.4.5]	Added qualifier F(M-P) .
	Sec.4 [1.5.1]	Editorial.
	Sec.4 [1.5.4]	Editorial.
	Sec.4 [1.6]	Inserted terms and definitions used in Sec.4.
	Sec.4 [3.1.15]	Clarified SOLAS reference.
	Sec.4 [3.2]	Deleted definition due to inclusion in Sec.4 [1.6].
	Sec.4 [3.3.5]	Clarified that inspection needs to be documented.
	Sec.4 [3.3.6] Guidance note	Removed statement concerning positive overlap as this may be misconstrued to be acceptable for F(M-P) .
	Sec.4 [4]	Inserted full set of requirements for the qualifier F(M-P) .
	Sec.4 Table 1	Added new qualifier F(M-P) .
Sec.4 Table 2	Added documentation requirements for F(M-P) .	

Editorial corrections

In addition to the above stated changes, editorial corrections may have been made.

SECTION 4 ADDITIONAL FIRE SAFETY - F

1 General

1.1 Objective

The objective with the additional class notation, **F**, is to introduce measures aimed at preventing, detecting, containing and extinguishing fires in accommodation, machinery, deck and cargo spaces. The safety measures are supplementary to those given in SOLAS.

1.2 Scope

The scope of the class notation, **F**, is defined for the different qualifiers in [Table 1](#).

Table 1 Qualifier scope

<i>Additional class notation</i>	<i>Qualifier</i>	<i>Scope</i>
F	A	Additional fire protection in accommodation spaces
	M	Additional fire protection in machinery spaces
	M-P	Enhanced fire prevention measures for machinery spaces
	C	Additional fire protection in deck and cargo areas

1.3 Application

The additional class notation **F** applies to cargo ships or passenger ships that comply with the SOLAS Reg. II-2.

1.4 Class notations

1.4.1 Ships with accommodation built and equipped in accordance with the requirements in [\[1\]](#) and [\[2\]](#) will be given the additional class notation **F(A)**.

1.4.2 Ships with machinery spaces built and equipped in accordance with the requirements in [\[1\]](#) and [\[3\]](#) will be given the additional class notation **F(M)**.

1.4.3 Ships with machinery spaces built and operated in accordance with the requirements in [\[1\]](#) and [\[4\]](#) will be given the additional class notation **F(M-P)**.

1.4.4 Ships with deck and cargo areas built and equipped in accordance with the requirements in [\[1\]](#) and [\[5\]](#) will be given the additional class notation **F(C)**.

1.4.5 Ships built and equipped in accordance with all the requirements of this section will be given the additional class notation **F(A, M, M-P, C)**.

1.5 Documentation requirements

1.5.1 For qualifiers **A**, **M**, and **C**, compliance with the requirements in this section shall be shown in the documentation required by Pt.4 Ch.11 (using the entry for SOLAS ships where the Society is authorised to issue safety certificates). In addition, documentation as required by Table 2 shall be submitted for approval or incorporated into plans required by Pt.4 Ch.11.

Table 2 Documentation requirements

<i>Object</i>	<i>Documentation type</i>	<i>Additional description</i>	<i>Info</i>
Additional class notation and qualifier F(A) :			
Accommodation spaces	M070 - List of combustible materials		AP
Additional class notation and qualifier F(M) :			
Fire observation television monitoring system	Z030 - Arrangement plan	Location of TV cameras	AP
Fire prevention arrangements	Z100 - Specification	Typical details and methods for shielding of couplings in oil piping systems	AP
Fire prevention arrangements	Z241 Measurement report	Infrared thermo-scanning report with corrective measures.	AP
Additional class notation and qualifier F(M-P) :			
Fuel and lubrication oil systems	S015 - Piping system schematic layout	<p>A diagrammatic drawing showing the oil piping system in Machinery Spaces of Category A, including:</p> <ul style="list-style-type: none"> — location of leakage points — location of control and monitoring equipment such as automatic oil leak detection <p>The diagram shall include oil piping systems in machinery spaces of category A, including on engines and boilers and other relevant components.</p>	AP

<i>Object</i>	<i>Documentation type</i>	<i>Additional description</i>	<i>Info</i>
Fuel and lubrication oil systems	G070 - Details of leakage points	An overview of leakage points defined in [1.6], i.e. points from which a flammable gas, vapour or liquid may be released into the atmosphere, including the following information: <ul style="list-style-type: none"> – physical location of source – identification of the physical item that may leak, e.g. a pipe flange, together with line number, tag number, etc. – types of flammable gas, vapour or liquid that may leak – possible leak rate (m³/h) in case of full fracture – details of solution to shield or contain the leak, see [4.4] for details – details of solution to detect the leak, where applicable, see [4.3] for details 	AP
Fuel and lubrication oil systems	I100 - System diagram	A schematic drawing showing the layout of the system including all instruments and control devices.	AP
Safety management	Z163 - Maintenance manual	A maintenance plan which shall be included in the vessel's planned maintenance system to be subject for audits and as a minimum shall include the following: <ul style="list-style-type: none"> – maintenance of automatic oil leak detection systems, see [4.3.1] for details – maintenance of oil piping shielding/containment, see [4.4.1.7] for details – maintenance of hot surface insulation and measurement equipment, see [4.5.3] for details – process for maintaining clean surfaces in the engine room to allow for efficient visual detection of leaks, see [4.3.2.2] for details. 	FI
Safety management	Z250 - Procedure	Procedure for maintenance of oil piping see [4.2.3] for details.	FI
Safety management	Z250 - Procedure	Manual inspection for oil leaks see [4.2.2.1] for details.	FI
Vibration	G150 - Vibration measurement protocol	See [4.2.1.1] for details.	FI
Fire prevention arrangements	Z255 - Measurement procedure	Thermoscanning report, see [4.5.3.2] for details.	FI
Safety management	G020 - Emergency and preparedness analysis	Emergency response procedure, see [4.3.3.1] and [4.5.4.1] for details.	FI

<i>Object</i>	<i>Documentation type</i>	<i>Additional description</i>	<i>Info</i>
Safety management	Z250 - Procedure	Continuous improvement process, see [4.2.4.1] for details.	FI
Fire observation television monitoring system	Z030 - Arrangement plan	Location of TV cameras covering critical oil leakage points, such as the engine fuel oil manifold cover and the engine fuel oil inlets and outlets.	AP
Additional class notation and qualifier F(C) :			
Cargo holds fire extinguishing system	G200 - Fixed fire extinguishing system documentation	For cargo holds, as installed	AP
Cargo tank deck fire extinguishing system	G200 - Fixed fire extinguishing system documentation	For cargo deck areas, as installed	AP
External surface protection water spraying system	G200 - Fixed fire extinguishing system documentation	Arrangement and capacity	AP
AP = For approval, FI = For information			

1.5.2 For general requirements to documentation, including definition of the info codes, see [Pt.1 Ch.3 Sec.2](#).

1.5.3 For a full definition of the documentation types, see [Pt.1 Ch.3 Sec.3](#).

1.5.4 On board documentation

The required documentation in this chapter along with manuals for the fire-extinguishing systems, fire-fighting appliances and fire detection and alarm systems shall be kept in one place e.g. in the wheelhouse or engine control room. The manuals shall include instructions for use of the systems, periodical maintenance, and specification of periodical tests.

1.6 Terms and definitions

Table 3 Terms and definitions

<i>Term</i>	<i>Definition</i>
Oil	In the context of this section "oil" refers to fuel oil, lubrication oil, thermal oil or hydraulic oil
Leakage point	those locations in the machinery spaces of category A, including on the engine, where oil leakage is most likely to occur during the lifetime of the ship and components, such as: <ul style="list-style-type: none"> — pipe connections, flanged, screwed or otherwise — sensors and any hoses or pipes connecting them to oil piping — oil pumps including connections, independent of the pressure produced or function served — flexible couplings — copper piping — oil filters — pressure dampers
Secondary containment	a system that will contain leaked oil close to the leakage point and prevent exposure to potential ignition sources

1.7 Firefighter's outfit

1.7.1 Ships with one or combinations of the additional class notations **F(A)**, **F(M)**, **F(C)** shall have at least 4 sets of firefighter's outfit as specified in Ch.3 of International Code for Fire Safety Systems (FSS Code). Additional requirements are given for some ship types under the **F(C)** notation in [5]. The firefighter's outfit defined in these rules need not be additional to those required by SOLAS Reg. II-2/A/17.

1.7.2 Each of the breathing apparatus shall be provided with cylinders of 1,800 litres capacity. The total weight of one apparatus (including cylinder filled with air, valves and mask) shall not exceed 12.0 kg. Two spare cylinders shall be provided for each apparatus. All cylinders, apparatus and valves shall be of the same type. Apparatus with less capacity and less weight may be accepted if deemed more suitable for the intended service and if more spares are provided.

1.7.3 The firefighter's outfit (protective clothing, boots, gloves, helmet and breathing apparatus) shall comply with the EN and ISO standards defined by the EU marine equipment directive (MED approved).

1.7.4 A high-pressure compressor suitable for filling of the cylinders for the breathing apparatus shall be installed. The compressor shall be driven by a separate diesel engine or from the emergency power plant and shall be placed in an easily accessible and safe place onboard. The capacity of the compressor shall be at least 75 litres/minute.

Guidance note:

When considering the compressor location it should be kept in mind that, when a fire has broken out onboard, the compressor should be operable and that the air to be compressed should be sufficiently clean for breathing purposes.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

1.7.5 The firefighter's outfits shall be divided between two fire stations placed at a safe distance from each other. The fire stations shall be clearly marked and shall have access from open deck. Both stations shall be readily accessible and located within the main accommodation block, preferably with one station on the port side and one on the starboard side. The stations shall have minimum A-0 fire integrity towards other spaces.

1.7.6 The arrangement of the fire stations shall be such that all the equipment has its own place and is easily accessible and ready for immediate use. There shall be arrangements for hanging up protective clothing and other equipment, which should be stored in a suspended position.

2 Accommodation - F(A)

2.1 General

2.1.1 Purpose

The purpose of the requirements for fire technical subdivision of the accommodation is:

- to prevent a fire in any other part of the ship from spreading to the accommodation
- to prevent a fire in the accommodation from spreading to other parts of the accommodation (within the time limits established for the concerned material's fire-technical class)
- to reduce the use of combustible material
- to provide rapid detection and safe escape from the cabins and corridors.

2.1.2 Application

Passenger ships having the **F(A)** notation need only comply with:

- [2.2] *Restricted use of combustible materials*
- [2.5] *Ventilation*

— [2.9] *Other items.*

Cargo ships having the **F(A)** notation shall comply with all subsections.

2.2 Restricted use of combustible materials

2.2.1 Curtains and other suspended textile materials shall have resistance to flame as given in Part 7 of the International Code for Application of Fire Test Procedures (FTP Code).

2.2.2 Furniture and other items in stairways and corridors shall only be accepted when fixed to the ship's structure, does not obstruct the escape ways and complies with FTP Code, Part 8.

2.2.3 Bedding components shall comply with FTP Code, Part 9.

2.3 Emergency escape

2.3.1 Dead end corridors are prohibited. Recesses are accepted where the depth does not exceed the width.

2.3.2 Spaces exceeding 30 m² shall be provided with at least two independent escape routes. The primary escape route shall be a door directly to a corridor or an open deck. Windows that are of adequate size and provided with ladders may be used as the second means of escape for spaces between 30 m² and 50 m², whereas the secondary means of escape for spaces above 50 m² shall consist of doors, corridors and stairways being independent of the primary escape.

2.4 Structural fire protection

2.4.1 Construction method IC shall be used, see SOLAS Reg. II-2/9.2.3.2.

2.4.2 Corridors in the accommodation shall be divided by self-closing class B-15 doors at a maximum distance of 20 m from each other. When transverse corridors and longitudinal corridors are connected to each other, self-closing class B-15 doors are also to be provided if the total corridor length exceeds 20 m.

2.4.3 All doors fitted in corridors serving cabins and/or public spaces shall be of self-closing type. Service hatches need not to comply with this requirement.

2.4.4 If a door required to be self-closing is equipped with an approved hold back device, this shall automatically release the door when the fire alarm is sounded.

2.4.5 All decks in the accommodation spaces, including corridors, shall be of minimum class A-0.

2.4.6 All bulkheads and decks separating the accommodation from all machinery spaces (fire category 6 and 7), cargo holds and ballast and cargo pump rooms, as applicable, shall be of class A-60. This requirement does not apply to fire category 7 spaces located within the accommodation unit and only serving accommodation and service spaces (examples are air condition machinery spaces and service trunks serving only cabins and similar spaces).

2.4.7 All bulkhead and decks enclosing the drying rooms and laundries shall be of minimum class A-0. The doors, ventilation system and other penetrations shall be of A-class standard. The exhaust ducts shall have service hatches for cleaning and serve no other spaces but can be connected to the common accommodation air condition unit.

2.4.8 All divisional bulkheads, linings, deckhead in accommodation spaces, service spaces and control stations shall be of at least class B-15. The sanitary unit can be accepted as part of the cabin. Divisions of minimum A-0 class will in this context be considered to be equivalent to B-15.

2.5 Ventilation

2.5.1 On cargo vessel corridors serving cabins and/or public spaces and stairway enclosures shall be served by an independent ventilation fan and duct system (exhaust and supply) which shall not serve any other spaces. This corridor and stairway ventilation system shall be designed to provide a slight overpressure in the corridors and stairways compared with other spaces. Louvers in doors are accepted to balance the overpressure in the system. The nominal air flow shall be balanced so that normally there should be no net air flow through these louvers.

2.5.2 On passenger vessels corridors shall be served by an independent ventilation fan and duct system (exhaust and supply) which shall not serve any other spaces in the ventilation systems. The ventilation system shall provide overpressure in the corridors (typically 50 Pa) compared to other spaces in the accommodation, except stairways. Please observe also the SOLAS requirement for an independent system for staircases (SOLAS Reg. II-2/9.7).

2.5.3 For all vessel the corridor ventilation system shall be designed as a passive smoke extraction system with supply on a low level and at a low velocity (typically < 1.0 m per second) whereas exhaust shall be provided at ceiling level. Other designs are accepted when documented safe by calculations (standard fire load and awareness time 120 seconds).

2.5.4 The smoke control systems for corridors and staircases are intended to run in a fire until all persons have escaped the area (this is an operation procedure and does not place additional requirements on the components of the ventilation systems).

2.6 Fire detection and alarm system

2.6.1 General

In all accommodation, service spaces and control stations, an approved automatic fire detection and alarm system of addressable type shall be installed in accordance with Pt.4 Ch.9. Optical smoke detectors shall be used, except that heat detectors shall be installed in refrigerated chambers and in any saunas. Galleys shall be provided with smoke detectors in preparation parts and heat detectors above deep fat fryers, steam baths, ovens and similar equipment.

2.6.2 The fire detection system shall be of the addressable type.

2.6.3 Detectors fitted in cabins, when activated, shall also be capable of emitting, or cause to be emitted, an audible alarm within the space where they are located. The alarm shall be immediate and local for the cabin in question. PA/alarm system for a larger area shall not be used unless alarm can be routed to a single cabin whereas designs extending alarms to a suitable number of adjacent cabins and/or corridor outside cabin affected will be accepted.

2.7 Portable fire extinguishers

2.7.1 Number and location

The required extinguishers shall be 12 kg powder or 9 litre foam portable extinguishers of an approved type.

2.7.2 Two portable extinguishers shall be provided in corridors or stairways at each deck. In addition, at least one such extinguisher shall be installed in all pantries, laundries, crew day rooms and similar spaces. At least two extinguishers of suitable type for deep fat fryers shall be provided for the galley.

2.8 Fire water system

2.8.1 When planning location of fire hydrants, the fact that the fire shall be fought from the outside shall be considered. Hydrants and hose equipment are shall be located outside the entrance doors to the accommodation. Size of fire hoses shall in general be 38 mm but other sizes ,may be approved on a case-by-case basis considering locations, spaces served and the number of fire fighters dedicated to this task.

2.9 Other items

2.9.1 The electric power supply to deep fat fryers within the galley shall be disconnected when the fixed fire extinguishing system protecting this item is release, see SOLAS Reg. II-2/10.6.4. This disconnection shall not be automatically reset when the fixed fire extinguishing system is turned off, a manual action is required for this purpose.

3 Machinery spaces - F(M)

3.1 General

3.1.1 Emergency escape and access

At least one of the escape routes from the engine control room shall be independent of the engine room.

3.1.2 Other machinery spaces (fire category 7) and workshops not being part of engine room (fire category 9) on cargo ships and similar spaces on passenger ships shall have minimum one escape route being independent of machinery spaces of category A.

3.1.3 Ventilation

At least one of the machinery space fans shall in addition to the main power supply also have a supply from the emergency source of power in order to purge the machinery spaces after a fire incident. This fan shall be of the reversible type.

Guidance note:

Hold time after a fire will depend on type of extinguishing media and how long the space has been on fire. In case only a gas fire extinguishing system has been used, typical hold time will be several hours.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3.1.4 All ventilation and air inlets shall be fitted with dampers or other closing arrangements, which can be secured in a closed position. Indicators showing the open or closed position of the dampers shall be fitted adjacent to the controls. The dampers shall be manoeuvrable from open deck or any space separated from the space served by A-60 and with access directly from open deck. For passenger ships, this will be in addition to the controls arranged at the safety centre if arranged below weather deck. The hand lever of dampers is not to be located more than two (2) m above the deck.

Guidance note:

The aim of these requirements is to isolate a fire to the space it originated and to prevent supply of oxygen.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3.1.5 All dampers and fire dampers enclosing the engine room shall be made of a material that is corrosion resistant in the marine environment, without the need for coatings or galvanizing, such as stainless steel of a type suitable for the marine environment.

3.1.6 Centralised fire control station

Controls for release of the local extinguishing system, stop of fuel pumps and ventilation fans shall be located in a manned station (typically 16 hours a day). This station can be the engine control room or a manned safety centre. The stations shall be separated from the engine room with minimum smoke tight divisions with access and escape being independent of the engine room.

3.1.7 The CCTV system required by these rules and a fire detection slave panel station shall be located in this station, in the vicinity of the controls installed in the station specified in [3.1.6].

3.1.8 Controls for release main extinguishing system and closing of oil fuel valves shall be readily accessible but can be located outside the centralised fire control station.

3.1.9 Ships accepted to operate with unmanned engine room shall in addition to the above have controls for release of the local extinguishing system also in the wheelhouse.

3.1.10 In cases where the division between engine control room and engine room is of A-class, the above requirement can be combined with the control positions required by SOLAS, as applicable.

3.1.11 Emergency fire pump and fire hoses

The emergency fire pump shall have a capacity of not less than 72 m³/hour. If the emergency fire pump serves other critical safety consumers, the capacity shall be increased accordingly. The pump shall provide a minimum pressure of 5.0 bar for the hydrants in the vicinity of machinery spaces with two water jets in operation.

3.1.12 The space containing the emergency fire pump and its mover shall be well ventilated and provided with emergency light. The pump's prime mover shall be provided with heating unless the space in which it is located has adequate heating facilities.

The emergency fire pump shall be tested with power served only from the emergency generator. The pump shall be started and run up to full flow with all other required consumers being connected to the emergency generator.

3.1.13 During start of the fire pump, it has to be ensured that voltage and frequency variations are kept within the limits given in Pt.4 Ch.8 Sec.2 [1.2.4]. Special considerations should be made when the motor driving the emergency fire pump has a power rating exceeding 30% of the rating of the emergency generator. Means to limit voltage peaks when starting the pump may be required.

3.1.14 The size of fire hoses intended for use in machinery spaces shall be chosen based on the number of fire fighters dedicated to this task (38 mm hoses are recommended).

3.1.15 Protection of engine room casings, passenger ships

Casings on passenger ship carrying more than 36 passengers shall be assigned category 11 as defined in SOLAS Reg. II-2 if separated from the engine rooms.

3.1.16 Where multiple plastic pipes are installed within casings on passenger ship carrying more than 36 passengers, these plastic pipes shall be covered with a fire retardant material. The surface of the plastic pipes with the cover material shall be of low flame spread type according to a relevant standard (FTP Code Pt. 5 or ASTM D3806 or DIN 4102, B2 or any equivalent standard).

3.2 Oil systems

3.2.1 The arrangement of oil tanks, pipelines for oil under pressure, oil processing machinery, etc. shall be such that the danger of leakage and ignition is reduced to a minimum.

3.2.2 Separation of risk objects

The following installations shall be located in space separated from the spaces containing combustion engines and oil fired boilers:

- oil fired thermal oil heaters
- fuel oil purifiers
- incinerators.

3.2.3 The above rooms shall be provided with fixed main fire extinguishing system as per [3.6.1] and a local extinguishing system as per [3.5.1].

3.2.4 Hydraulic power aggregates, regardless of size, accepted within the engine room shall be provided with shielding plates where facing major ignition hazards, such as combustion engines (less than ten (10) m away) and electric motors and similar (less than three (3) m away).

3.2.5 Shielding of oil piping within machinery spaces of category A

- 1) All flanges and couplings shall be provided with steel sheet screens, with small diameter bore at bottom to indicate leaks and divert leakage to safe area. The requirement does not apply to flanges and coupling effectively screened from ignition sources by other means, for instance tight floor plating.

Guidance note:

Certified tape is not accepted as an equivalent.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

- 2) Oil piping located within a machinery space of category A shall not be laid above or adjacent to potential ignition points unless arranged in double wall piping with safe drain from the annular space.

3.2.6 Visual inspection of oil leaks

The tank top or floor plating below oil piping located within a machinery space of category A shall be painted white or with a light color to ensure easy visual detection.

3.3 Hot surfaces

3.3.1 Infrared scanning

All engines, exhaust ducts, steam ducts (if any) and similar equipment, where hot surfaces above 220 °C may be expected, shall be examined by an infrared scanning camera during normal operation of the machinery (minimum 85 % load).

3.3.2 A report shall be issued to the plan approval centre and the local surveyor, identifying all items with temperatures above 220° C. The infrared scanning shall be carried out by certified personnel or in co-operation with a surveyor. The calibration of equipment to be documented and the chosen emissivity factor shall be justified.

3.3.3 Corrective actions shall be taken for all surfaces with temperatures above 220 °C. Such actions may include improved insulation or improved heat dissipation (cooling ribs and or similar).

3.3.4 The corrective actions may be verified by manual equipment.

3.3.5 The infrared scanning shall be repeated and documented on an annual basis when the ship is in operation.

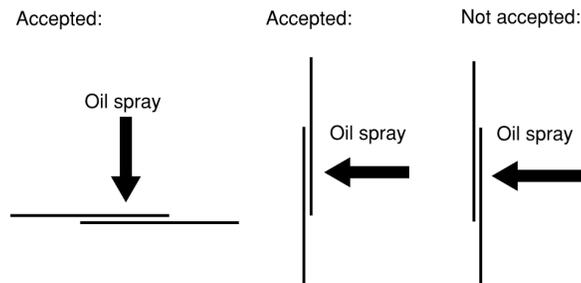
3.3.6 Insulation of hot surfaces

- 1) All insulation shall be made of non-combustible insulation protected by steel sheet cladding, or equivalent solution.

- 2) The cladding shall be easy to dismantle and assemble wherever inspection of the protected equipment is necessary.
- 3) The intersection between the ducting system and complex geometries can be accepted with foiled faced insulation provided that these areas are limited. For steam systems the steel sheet cladding shall only be required for areas where oil leakage can be expected.
- 4) The protective plating, and foiled faced insulation when applicable, shall be designed to prevent any oil on its surface reaching the underlying insulation and potential ignition points.

Guidance note:

Examples of accepted and not accepted connection points in hot surface insulation.



---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t---

3.4 Fire detection and alarm system

3.4.1 Fire detection

The requirements in SOLAS and [Ch.2 Sec.2 \[3.6\]](#) for ships with periodically unattended machinery space shall be complied with for all ships with **F(M)** class.

3.4.2 Both machinery spaces of category A (fire category 6) and other machinery spaces (fire category 7) shall be covered by a detection system. For passenger ships, auxiliary machinery spaces (fire category 10 and 11) shall also be covered by the detection system.

3.4.3 Fire detectors of more than one type shall be used for machinery spaces of category A. Smoke detectors shall be provided throughout the space as per FSS Code. In addition, flame detectors shall cover all engines, heated fuel oil separators, oil fired boilers and similar equipment.

Each flame detector shall cover maximum two adjacent engines and in no case a larger coverage area than that approved for the detector in question. Only approved flame detectors of infrared type shall be used (UV is not considered to be equivalent).

The response time (central unit scanning time) from when any detector(s) initiates an alarm, to this alarm condition is reported at the central unit, shall not exceed five (5) seconds.

Casings on passenger ship carrying more than 36 passengers shall be protected by IR flame detectors covering scrubbers and areas containing plastic pipes whereas optical smoke detectors with smoke collection plates, minimum 500 mm in diameter, shall cover as a minimum every second deck. The smoke detectors shall have spacing and coverage area in accordance with the FSS Code.

The above applies also to casings being separated from the engine room.

3.4.4 Any workshop shall be provided smoke detectors connected to a timer function that will automatically reset after not more than 20 minutes. In addition, heat detector(s) not connected to this timer shall be provided at suitable locations.

3.4.5 TV monitoring system

A colour TV monitoring system shall cover all engines with rated power above 375 kW, heated fuel oil separators, oil fired boilers and all oil fired equipment, except for the emergency generator which need not to be provided with this system. Monitors shall be available in a manned control station or in an engine control room.

The casing shall be covered by the CCTV system on passenger ships carrying more than 36 passengers. This also applies to casings being separated from the engine room.

3.5 Fixed local application fire extinguishing system

3.5.1 General

A local application system in accordance with SOLAS Reg. II-2/10.5.6 and IMO MSC/Circ.1387 shall be installed. Spaces identified in [3.2.2] shall also be protected.

3.5.2 The local application system and the main fire extinguishing system shall in addition to the specific rules applicable to each system comply with the following requirements:

- the local application system and the main fire extinguishing system shall be independent of each other and not have common components, and
- at least one of the systems shall be fully operable even in a situation where all power supply from the space on fire is not available and the emergency power system is out of operation.

3.5.3 The requirement addressed in [3.5.2] shall be met by accumulators having the extinguishing media stored under sufficient pressure at all times. These accumulators shall be provided in addition to the pump serving the fire extinguishing system under normal conditions.

An arrangement where pumps driven by dedicated diesel engines or vessels having two independent power systems in addition to the emergency generator (for example vessels with additional class notation for redundant propulsion, **RP**, may be accepted as equivalent to the accumulator solution if the arrangement is considered by the Society to be robust, reliable and quick acting.

Guidance note:

Examples of acceptable systems are:

- 1) CO₂ or equivalent gas system for main fire extinguishing system and a local application system with supply from main and emergency power supply.
- 2) Water based main fire extinguishing system and a local application system with a pump for continues supply and back-up of 20 minutes water supply (and foam supply, if applicable) from a dedicated pressure vessel.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3.5.4 Arrangement

The local application system shall be type approved by the Society in accordance with IMO MSC/Circ.1387.

3.5.5 The system shall be provided with both main and emergency power supply. Systems being served by an accumulator (for instance as a means to comply with the requirement in [3.5.2]) shall also be provided with a water pump complying with all parts of this section. Installation consisting of pumps moved directly by a dedicated diesel engine shall be capable of delivering water at full pressure within 20 seconds (measured from stand-by condition).

3.5.6 The system shall discharge freshwater of potable quality. Foam additives are accepted, whereas use of seawater is prohibited for the first 20 minutes of the discharge. The pump shall be able to operate under

all conditions without the use of any self-priming system. The pump and its mover shall be provided with heating unless the space in which they are located has adequate heating facilities.

3.5.7 Separation of the system into sections shall be approved in each separate case. In any case, pump capacity shall be designed to simultaneously cover risk objects less than 3m apart, also when arranged as separate sections. In addition, the water supply shall be designed to cover all auxiliary engines within a space or the main engine, whichever demands the largest water supply. For other multi-engine arrangements, the system shall cover more than half the engines within an engine room.

3.5.8 The spray head arrangement shall be according to the IMO MSC.1/Circ.1387 requirements and the conditions specified in the Society's type approval certificate, with the additional requirement that fuel oil installations attached to the engines shall also be protected.

Turbo charger and other turbo machinery shall be protected. The spray heads shall be installed at a minimum of 1.0 m away from such equipment.

Discharge of water directly into electric generators and engine air intakes shall be avoided.

3.5.9 A test and drain valve shall be provided. The valve shall be provided with means to secure it in a closed position after use, whereas any isolation valve shall be secured in the open position. The valves may be located upstream or downstream of the section valves, but shall in any case be installed close to the section valve(s). No other in-line components (check valves, etc.) shall be accepted on the dry pipe side.

3.5.10 It shall be possible to manually operate the section valves via a direct manual operation on the stem. Where this is not possible (for instance valves operated on pilot pressure) a manual by pass valve, complying with 3.9.5, shall be provided in parallel with the section valve. A signboard identifying the valve and its operation shall be posted adjacent to the bypass valve.

3.5.11 The section valves, test and drain valves, any accumulators, pump unit and its power supply and control equipment shall be readily accessible and shall be located outside the protected spaces (this being defined as outside a boundary being of A-class standard).

3.5.12 Automatic release shall be provided for the local application system. This shall be operational even when the vessel is without main power, but not necessarily in the dead ship condition where manual release from a readily accessible position is acceptable.

A suitable combination of flame detectors of infrared type and smoke detectors shall be arranged. Discharge of water shall be arranged upon signal from not more than two detectors whereas not less than three detectors shall be provided for each section. All detectors shall be of approved type.

The response time (central unit scanning time) from when any detector(s) initiates an alarm, to this alarm condition is reported at the central unit, shall not exceed five (5) seconds.

3.5.13 The following procedures shall be stored in the engine control room:

- description of the operation of the system
- how many sections that can be released simultaneously, based on available pump or accumulator capacity
- recommendations for stop of ventilation
- guidelines for when and how to use the main firefighting system in case the local application system does not extinguish the fire.

Guidance note:

When considering ventilation philosophy, note that some small droplet water mist system may be sensitive with respect to performance in well ventilated spaces, especially when distance from protected object to hazard is large. Risk of reduced propulsion or power supply in case of erroneously release of the local extinguishing system should also be taken into consideration.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3.6 Main extinguishing systems

3.6.1 General

Machinery spaces of category A shall be protected by one of the following fixed fire extinguishing systems:

- a high pressure CO₂ total flooding system as described in [3.6.6]
- a low pressure CO₂ total flooding system as described in [3.6.13]
- a water mist system as described in [3.6.18]
- a high expansion foam or inside air foam system as described in [3.6.22]
- an equivalent gaseous agent as described in [3.6.25].

3.6.2 The main fire extinguishing system shall in addition to these specific rules applicable to each system, comply with the functional requirements of [3.5.2] and [3.5.3].

3.6.3 The following spaces shall be covered by a fixed fire extinguishing system:

- spaces containing main electric propulsion systems (if fitted). This includes electrical motors if inside hull, switchboards and transformers serving such motors
- spaces containing the main switchboards (of any size) and switch boards with capacity exceeding 1000 kW for cargo handling systems (cargo pumps or cargo compressors)
- engine control room
- casings on passenger ships carrying more than 36 passengers (including casings being separated from the engine room).

The system may be omitted for bow thruster rooms if these spaces contain no other fire risks; such as combustion machinery, fuel systems and similar equipment.

The switchboard rooms and similar spaces covered by this requirement shall have a fire extinguishing system suitable for use on high voltage equipment. This will in general imply use of a gas based fire extinguishing system unless that it can be documented that other systems (water mist based on potable water) has equivalent firefighting performance (small fires/enclosed cabinets) and do not damage the electrical equipment.

The water mist protection of casings on passenger ships carrying more than 36 passengers shall be designed as a total flooding system based on IMO MSC/Circ.1165 as amended, and shall consider the chimney effect expected for the casings in question. As a minimum, water mist nozzles shall be located on every second deck and additional nozzles shall be provided for areas containing scrubbers and multiple plastic pipes.

3.6.4 The main fire extinguishing system shall be type approved by the Society according to the IMO standard applicable to the type of system.

3.6.5 If different types of main fire extinguishing systems (e.g. gas and foam) are used onboard, the protected spaces shall be divided by minimum A-0 divisions.

3.6.6 Fixed high-pressure CO₂ total flooding system

Any high-pressure CO₂ total flooding system for the machinery spaces category A shall comply with FSS Code Ch. 5 and the requirements of [3.6.7] through [3.6.12].

3.6.7 The quantity of CO₂ gas shall be sufficient for a minimum volume of 40% of the complete protected space, including any casing.

3.6.8 CO₂ section valve shall be designed to avoid any corrosion problems. The moving parts of the valve shall be made of corrosion resistant materials (stainless steel or equivalent), and there shall not be metal to metal contact between the main moving part (e.g. ball) and the valve housing.

3.6.9 The CO₂ valve shall also be designed for manual operation. For this purpose an extended lever shall be provided for each type of valves with dimension exceeding DN25 (corresponding to pipe with 25 mm diameter).

3.6.10 Piping system upstream of section valves shall be presented to the Society's surveyor prior to installation of section valves to verify that these pipes are clean.

3.6.11 Slow leak valves shall be provided for the pneumatic release lines to evacuate minor leakages, whereas a pressure gauge shall be fitted to the each enclosed manifold.

3.6.12 The release station(s) shall be clearly marked. A principal diagram of the protected spaces shall be provided at each release station if the CO₂ system has more than one section valve.

3.6.13 Fixed low pressure CO₂ total flooding system

Any low pressure CO₂ total flooding system shall comply with FSS Code Ch. 5 and the requirements of [3.6.14] through [3.6.17].

3.6.14 The CO₂ tank shall be provided with an external connection (vertical pipe or multiple level drainage valves) for determining liquid level. Float indicators are not considered as being equivalent to the external pipe and shall not be accepted as single means of liquid indication.

3.6.15 The main tank valve and each section valve (timer operated valve) shall be provided with a manual by pass valve. This valve shall be operated manually in case the primary valves fail to operate. A signboard stating required opening time shall be posted adjacent to the bypass valve.

3.6.16 The tank and associated piping system upstream of section valves shall be presented to the Society's surveyor prior to filling the tank, this in order to ensure that these components are clean.

3.6.17 The release station(s) shall be clearly marked. A principal diagram of the protected spaces shall be provided at each release station if the CO₂ system has more than one section valve.

3.6.18 Water mist system

Any water mist system shall comply with SOLAS and the requirements of [3.6.19] through [3.6.21].

Guidance note:

See IMO MSC/Circ. 1165, as amended.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3.6.19 Arrangement and dimensioning of the system shall be approved in each case, taking into consideration the volume of protected space, capacity, location of nozzles, location of pump units and power source.

3.6.20 Foam injection pumps, if fitted, shall be duplicated. The backup pumps shall be installed in a manner that minimises the risk of both pumps being stuck by foam concentrate, or any other means of being put out of operation. One acceptable solution is keep the valves to one foam pump closed after flushing, while the other is in open standby mode.

3.6.21 It shall be possible to manually operate the section valves via a direct manual operation on the stem. Where this is not possible (for instance valves operated on pilot pressure) a manual by pass valve, complying with the above, shall be provided in parallel with the section valve. A signboard identifying the valve and its operation shall be posted adjacent to the bypass valve.

3.6.22 High expansion and inside air foam system

All foam systems shall comply with FSS Code Ch. 6 and the requirements of [3.6.23] and [3.6.24].

3.6.23 Foam injection pumps, if fitted, shall be duplicated. The backup pumps shall be installed in a manner that minimises the risk of both pumps being stuck by foam concentrate or any other means of being put out of operation. One acceptable solution is keep the valves to one foam pump closed after flushing, while the other is in open standby mode.

3.6.24 It shall be possible to operate the foam system and the exhaust fan defined in [3.1.3] simultaneously.

3.6.25 Equivalent gaseous agent

Any equivalent gaseous agent for the machinery spaces category A shall comply with IMO MSC/Circ. 848 as amended.

3.7 Portable fire extinguishers

3.7.1 Number and location

Only approved 12 kg powder or 9 litre foam portable extinguishers shall be installed in the category A machinery spaces.

3.7.2 The numbers of portable extinguishers shall comply with SOLAS. In addition the following minimum numbers shall be provided at readily accessible positions:

- four (4) at the lower level and four (4) at the platform level for each main engine (extinguisher can be combined if there are several main engines in one space)
- one (1) near each auxiliary engine (three (3) required for three (3) auxiliary engines)
- one (1) at the entrance to and one (1) inside the spaces defined under [3.2.2].

Guidance note:

The required location of the extinguishers is general, and efforts should be made to place these in the vicinity of the installations representing the greatest risk of fire. When installations are placed in separate rooms of limited size, some or all of the required extinguishers can be placed immediately outside the doors leading into these rooms.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

4 Machinery spaces, prevention - F(M-P)

4.1 General

4.1.1 Objective

The objective of class notation **F(M-P)** is to improve the strength and integrity of the following main safety barriers that prevent fire in machinery spaces:

- Prevention of oil leakage
- detection of oil leakage and shutdown system
- containment oil leakage
- prevention of ignition.

4.1.2 Application

The requirements apply to the design and operation of pressurized oil systems and other systems that are critical with regards to fire prevention in machinery spaces of cat. A, as defined by SOLAS Reg. II-2/3.

4.1.3 On board documentation

All required documentation for **F(M-P)** class notation as listed in [1.5] shall be kept onboard the vessel to be used as support during surveys and audits.

4.2 Prevention of oil leakage

4.2.1 Vibration control

4.2.1.1 The vessel shall have a procedure for vibration control of critical systems for fire prevention, as a minimum those mentioned in [4.2.1.2] The procedure shall be included in the vessel safety management system and/or planned maintenance system and shall as a minimum include the following:

- a vibration measurement protocol to record measurements
- a list of the precise positions where the vibration levels shall be measured
- vibration acceptance levels for these positions, see [4.2.1.3] for details
- measurement intervals, see [4.2.1.4] for details
- relevant reference values such as engine running conditions and fuel type
- requirements for preparations and execution
- procedure and guidance for reporting, analysis and follow-up, see [4.2.1.5] for details.

4.2.1.2 Vibration control shall as a minimum be performed on the following components:

- oil piping in category A machinery spaces, including on engines
- engines
- turbochargers
- electric motors, separators and motor driven hydraulic pumps in oil systems in category A machinery spaces.

4.2.1.3 Levels of vibrations on the components shall either comply with the principles and criteria as given for the class notation **VIBR Ch.8 Sec.2** or with maker's recommendations.

4.2.1.4 The vibration measurements shall initially be performed at newbuilding delivery. In operation, the vibration measurements shall be performed at a minimum after every main periodical overhaul of an engine or as recommended by the maker.

4.2.1.5

The vibration levels shall be recorded in a way that allows for detection of abnormalities, data capture and fleet-wide trending over time.

4.2.2 Early manual detection of failure

4.2.2.1 A procedure for manual detection of failure shall be included in the vessel's safety management system and/or planned maintenance system for periodical inspections of category A machinery spaces which as a minimum shall include the following:

- requirements for preparations and execution
- safety precautions
- inspection intervals
- procedure and guidance for reporting, analysis and follow-up, see [4.2.2.2] for details
- rating and assessment criteria
- areas of attention for inspection such as:
 - loose connection points that are identified by e.g. offset white markers on bolt and pipe, see [4.2.3.2] for details
 - damaged or missing secondary containment, see [4.4.1] for details
 - abnormal vibrations
 - damaged or missing pipe supports
 - oil spills

- damaged or missing hot surface insulation.

4.2.2.2 The findings from the periodical inspections shall be recorded in a way that allows for detection of abnormalities, data capture and fleetwide trending over time.

4.2.3 Maintenance of critical components

4.2.3.1 Procedures for maintenance of oil piping components in category A machinery spaces shall be included in the vessel's planned maintenance system and/or safety management system and shall as minimum include the following:

- Overview of critical oil piping which may be determined based on e.g. probability of oil leak, vibration exposure and vicinity of potential ignition points.
- Common briefing and review of maintenance prior to commencing task, including safety precautions.
- Quality checks, such as two-person checks or two-person tightening.
- Installation of secondary containment, see [4.4.1] for details.
- Testing prior to start-up.
- Debriefing after maintenance.
- Vibration measurements, if applicable, see [4.2.1] for details.
- Monitoring of components and systems in critical phase just after maintenance.

4.2.3.2 A procedure shall be in place for using white markers on bolts and nuts for early detection of loosening connections, especially critical connections that are subject to vibrations because of their vicinity to engines. Equivalent solutions may be accepted. This shall be included in the maintenance procedure required in [4.2.3.1].

4.2.4 Continuous improvement by data analytics

4.2.4.1 A procedure to ensure continuous improvement of the safety barrier integrity shall be included in the safety management system and/or planned maintenance system.

Data captured should allow for fleetwide analytics and safety management and should at least contain data from the following sources:

- Manually reported oil leaks: the incident reporting system should capture necessary details such as exact location of leak, details of the component where the leak occurred, type of fuel, engine load, assumed cause of leak and rating of severity.
- Sensor data from automatic rapid oil leak detection systems, see [4.3] for details.
- Sensor data from regular automatic oil leak detection, which is typically a level switch capturing leaks in the fuel oil manifold cover or from double walled high-pressure oil piping.
- Vibration measurements, see for details [4.2.1].

4.3 Detection of oil leakage and shutdown system

4.3.1 Rapid oil leak detection system

4.3.1.1 The critical leakage points in oil piping systems shall be covered by a rapid oil leakage detection system. This may be exempted provided that the requirements in [4.3.1.2] are met.

Guidance note:

A critical leakage point is defined as any leakage point on engine mounted oil piping systems and the oil piping connections between the engine and the vessel mounted oil piping systems. These leakage points are defined as critical due to their exposure to vibrations and their vicinity of potential ignition points. However, the definition of critical leakage points and thereby the requirement for rapid oil leakage detection system may be reconsidered if a study is presented that clearly indicates an acceptably low risk of oil leakage.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

Guidance note:

Acceptable detection times for a rapid oil leak detection system are the best practices for detection of oil leaks in e.g. high pressure double walled oil pipes or detection times for major fuel leaks in alternative fuel systems.

Examples of rapid oil leak detection systems are:

- atmospheric hydrocarbon detection
- laser hydrocarbon leak detection
- pressure monitoring of annular space of double walled flexible hoses
- automatic oil leak detection by video analytics
- level switches, as typically used on high pressure oil pipes.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

4.3.1.2 The requirement of [4.3.1.1] to install rapid oil leak detection systems on critical oil leakage points may be exempted if the following conditions are in place:

- The leakage point is covered by a secondary containment which is in compliance with all requirements in [4.4.1].
- The leakage point is given additional attention through the following procedures:
 - procedure for maintenance of oil piping, see [4.2.3] for details
 - procedure for manual inspection of oil leaks, see [4.2.2.1] for details
 - vibration measurement protocol, see [4.2.1.1] for details
 - procedure for continuous improvement process by data analytics, see [4.2.4.1] for details.

4.3.1.3 The automatic rapid oil leak detection system shall be connected to the vessel's control and monitoring system and as a minimum trigger a visual and audible alarm both in the space where the leakage has occurred and in the engine control room.

4.3.1.4 Maintenance of the rapid oil leak detection system shall be covered in the required maintenance procedure as mentioned in [1.5]

4.3.2 Manual detection of oil leaks

4.3.2.1 The secondary containment of leakage points in category A machinery spaces, as described in [4.4.1], that are not covered by a rapid oil leak detection system, shall be designed in such a way that a leakage can easily be detected by manual inspection. Manual leakage detection shall be possible without removing the secondary containment by the following or equivalent solutions:

- The oil leakage points shall, if practically possible, be contained within transparent shielding solutions such as plexiglass or similar. Such solutions may typically be applicable for duplex filters, booster units, valves and to other flange connections that are not a part of the engine mounted oil piping.
- Secondary containment which are not transparent shall provide drainage to a safe location where the leak can easily be visually detected.
- Secondary containment that are neither transparent nor provide easy visual detection of the drainage, shall be equipped with an automatic leakage detection system within the shielding solution.

4.3.2.2 The tank top or floor plating below oil piping located within category A machinery spaces shall be painted white or with a light colour to ensure easy visual leakage detection.

4.3.2.3 To allow for easy manual detection of leaks, the maintenance procedure required in [1.5] shall include a procedure that ensures cleanliness of the tank top and machinery spaces in general.

4.3.3 Shutdown of system

4.3.3.1 An emergency response procedures shall be in place to ensure an efficient response to a severe oil leak. The procedures shall as a minimum cover:

- Considerations of what a severe oil leak is, including location of potential ignition sources and signs of potential for escalation.
- Instructions for shutdown of machinery and oil supply.
- Considerations of engine room fire risks versus other major accident risks such as navigational risks and black-out risk.

4.3.3.2 The engine fuel inlets shall be equipped with remote shut off valves. The engine return lines shall be equipped with either a non-return valve or a remote shut off valve. The valves shall be installed on the fuel inlets and outlets of each individual engine.

- The valves shall be located as close as practically possible to the engines, but before any flexible hoses connecting the piping system to the engines.
- The remotely operated valves shall be able to be operated from a safe location outside the space in which the engine is located.

4.3.3.3 Each engine shall be equipped with a local control panel with an emergency shutdown function. The control panel shall be easily accessible in case of emergency. For vessels contracted after January 2019, emergency shutdown functions shall also be located outside the engine room close to each local fire extinguishing release position.

4.3.3.4 Emergency shutdown of an engine shall lead to automatic shutdown of fuel supply to that engine.

4.4 Containment of oil leakage

4.4.1 Secondary containment

4.4.1.1 Leakage points in the pressurized parts of oil systems in category A machinery spaces, including the oil piping on the engine and the flexible connections, shall be enclosed by a secondary containment preventing oil from reaching, directly or indirectly, possible ignition sources.

4.4.1.2 The secondary containment shall be designed with drainage to a safe area without potential ignition sources.

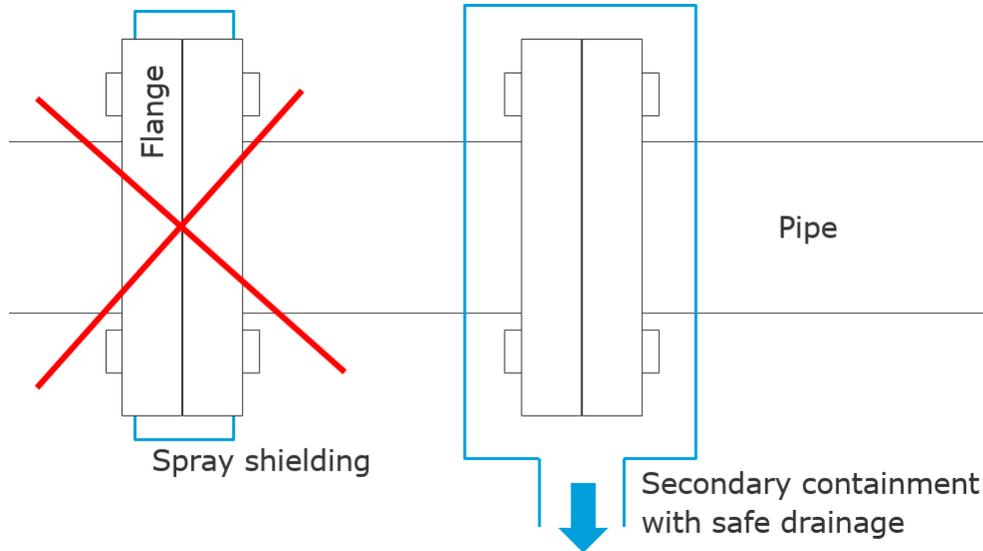
4.4.1.3 The secondary containment shall have automatic oil leak detection or manual visual oil leak detection, see [4.3] for details.

4.4.1.4 Ease of access for maintenance and robustness against wear and tear shall be considered when designing secondary containment.

4.4.1.5 The secondary containment shall provide a tight protection from pipe to pipe, with the drainage solution being the only opening.

Guidance note:

As an example, the secondary containment on the right is providing a tight cover from pipe to pipe, unlike the spray shielding on the left.



Tight floor plating above leakage points may be accepted as an alternative to a secondary containment, on the condition that the plating is completely covering the leakage point and preventing angled spray emitting at the edge of the floor plating. Tape solutions are not accepted as equivalent solutions.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

4.4.1.6 Leakage points that for practical reasons cannot comply with the requirements for secondary containment of [4.4.1.1] to [4.4.1.5], compensating measures such as an automatic oil leak detection system, as mentioned in [4.3.1], may be accepted.

4.4.1.7 Maintenance of the secondary containment shall be covered in the required maintenance procedure as mentioned in [1.5].

4.5 Prevention of ignition

4.5.1 Location of oil leakage points

4.5.1.1 Location of leakage points shall be so that the possibility for a leak to reach ignition sources is minimized. Leakage points should in particular be minimized near the turbocharger.

4.5.1.2 As few as possible leakage points should be installed inside category A machinery spaces.

4.5.2 Design of hot surface insulation

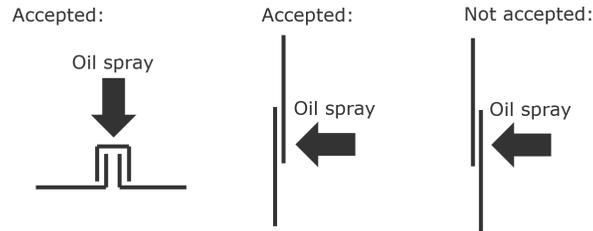
4.5.2.1 To ensure robust solutions for hot surface insulation and a sufficient temperature margin up to the typical autoignition points for oils, the maximum allowed surface temperature in category A machinery spaces shall be 150° C upon completion of installation or after maintenance, and 180° C during operation.

4.5.2.2 All hot surface insulation shall be made of non-combustible and non-absorbable insulation protected by steel sheet cladding, or equivalent solutions.

4.5.2.3 The connections points in the hot surface insulation shall prevent oil seeping or dripping through to ignition sources.

Guidance note:

Examples of accepted and not accepted connection points in hot surface insulation.



---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

4.5.3 Maintenance of hot surface insulation

4.5.3.1 Procedures for maintenance of hot surface insulation in category A machinery spaces shall be included in the vessel's planned maintenance system and/or the safety management system and/or planned maintenance system. The maintenance procedure shall cover both maintenance of the hot surface insulation and maintenance of measuring equipment and other relevant tools.

4.5.3.2 A procedure for monitoring hot surfaces in machinery spaces of category A shall be included in the vessel's planned maintenance system and/or the safety management system, and shall as a minimum include the following:

- requirements for preparations and execution
- safety precautions
- inspection intervals
- method and tools for measurement
- rating and assessment criteria
- procedure and guidance for reporting, analysis and follow-up, see [4.2.2.2] for details
- areas of attention for inspection.

The process shall be aligned with maker's recommendations. The measurements shall be performed by shipboard personnel in order to ensure understanding and ownership to the safety system.

4.5.4 Emergency response

4.5.4.1 The required emergency response procedure in [1.5] shall include instructions on manual release of the local fire extinguishing system in case of a major oil leak, as a measure to prevent ignition. The procedure shall provide rapid local fire extinguishing by any personnel with duties in the category A machinery space and it shall cover limitations to the specific local fire extinguishing system.

5 Cargo decks and cargo spaces - F(C)

5.1 Introduction

5.1.1 Purpose, application and general requirements

The purpose of these requirements is:

- to quickly detect and confirm a fire (applicable for enclosed spaces)
- to ensure that the fire extinguishing system operates as intended and has the reliability and performance that is needed to extinguish a fire.

5.1.2 The rules apply to the following vessel types:

- tankers for oil, tankers for chemicals (including combinations)
- tankers for liquefied gas (LNG, LPG)
- general cargo carriers and dry bulk cargo carriers
- ships with ro-ro decks (car carriers, general ro/ro ships, ferries)
- container carriers.

Each of the above vessel types has a dedicated paragraph ([5.2] through [5.6]) in this section. Only the requirements defined under the applicable paragraph(s) shall apply with respect to **F(C)** additional class notation.

5.2 Tankers for oil, tankers for chemicals

5.2.1 Gas detection systems and inert gas systems

The fixed gas detection system required by SOLAS Reg. II-2/4.5.10 shall be extended to cover all other enclosed spaces in the cargo area, including ballast tanks, but excluding cargo tanks.

5.2.2 An inert gas generating system in compliance with SOLAS Reg. II-2/4.5.5 shall be provided for all tankers with **F(C)** class notation (also those being less than 20 000 GT).

5.2.3 Cargo pump rooms

Cargo pump room shall have a fixed fire extinguishing system that complies with SOLAS and the requirements defined for **F(M)**, see [3.6].

5.2.4 If a CO₂ system is provided, the available quantity of CO₂ gas shall be sufficient to give a minimum volume of free gas corresponding to 45% of the gross volume. If gas fire extinguishing system of another type is provided, the gas concentration shall be minimum 1.3 times the ideal extinguishing concentration for the cargos in question, but in no case less than that required by IMO MSC/Circ. 848.

Guidance note:

Some of the cargoes carried on crude oil tankers and chemical tankers may require a higher concentration of the fire extinguishing gas than that established for refined fuel oils.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

5.2.5 A smoke detection system approved for use in gas hazardous atmosphere and in compliance with FSS Code Ch. 9 shall be provided in the cargo pump room. The system shall be monitored from the cargo control room (if provided) and the wheelhouse.

5.2.6 One portable extinguisher shall be provided adjacent to the entrance of the cargo pump room and two shall be located in readily accessible positions in the lower part of the cargo pump room. The portable extinguishers shall be approved 12 kg powder or 9 l foam portable extinguishers.

5.2.7 Fire main system (ring main)

The vessel shall have a fire main on deck arranged as a ring main to the port and starboard side. Isolation valves shall be globe valves of steel or approved fire safe butterfly valves. Both main fire pumps shall be

arranged with remote start from the wheelhouse. Other requirements for the fire main shall be as specified in SOLAS and the rules.

Guidance note:

Butterfly valves tested to API 607 or equivalent may be approved.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

5.2.8 There shall be fire hose equipment for at least half the number of hydrants required for the tank deck, in no case shall less than 9 fire hoses be provided for vessels below 10 000 GT and 12 fire hoses for vessels above this size. The equipment shall be stored in clearly marked boxes made of corrosion resistant materials (FRP or equivalent). One box with a minimum of 3 hoses shall be provided next to the accommodation superstructure, readily accessible for use on the tank deck (not more than one deck above the tank deck). A minimum of two portable foam applicators, required by SOLAS, shall be stored next to the front of the accommodation facing cargo area, whereas a minimum of two shall be at a suitable position for ready use on the cargo manifolds (the position will be aft of the manifold on a standard tanker).

5.2.9 The size of the fire hoses shall take into account the manning and firefighting philosophy of the vessel. The size of the fire hoses placed within cargo area shall have diameters of 50 mm or 38 mm. All couplings and hose connections for use within the cargo deck area shall be interchangeable.

5.2.10 All hoses shall be capable of also handling supplies from the foam line. The hose shall be made of synthetic fibres and shall be approved according to the most recent edition of EN 671-2, ISO 15540 or 15541 or an equivalent standard. The nozzle shall be made of metallic, corrosion resistant material. All movable parts shall be of copper alloy or equivalent. All the hydrants onboard shall be made of copper alloy or an equivalent material.

5.2.11 Foam main system

These requirements apply to all tankers above 4 000 grt. Tankers below 4 000 grt need not a foam ring main but shall have a fixed foam main and monitor system in compliance with the FSS Code Ch. 14 (applicators only are not considered as equivalent).

5.2.12 The vessel shall have an independent foam main for the deck foam extinguishing systems as specified in SOLAS and the rules. This line shall be arranged along the centre line as a single line with foam outlet branches to both port and starboard arranged just aft of each monitor. For the two monitors required in front of the accommodation, one foam hydrant to be arranged. Marked boxes made of corrosion resistant materials containing hose and foam nozzle to be placed adjacent to each foam hydrant. The arrangement shall otherwise comply with SOLAS and the rules.

5.2.13 The foam extinguishing system shall have redundancy in design with two foam mixing units and two foam concentrate pumps placed together with the storage tank for foam concentrate in a dedicated room.

5.2.14 The water supply to the foam extinguishing system shall be supplied by the main fire pumps. The capacity of the pumps shall be sufficient for simultaneously meeting the requirement of the foam system as defined in SOLAS and the rules (applied though the monitors) and with one foam nozzle engaged (400 l/min) from the foam line and two fire hoses engaged (2 x 400 l/min) from the fire main.

5.2.15 Arrangement of the foam concentrate pumps and the foam mixing units together with the main fire pumps shall be such that each of the two sets will be capable of delivering the required amount of foam solution. The pumps shall be installed in a manner that minimises the risk of both pumps being stuck by the foam concentrate or otherwise put out of operation. One acceptable solution is keep the valves to one foam pump closed after flushing, while the other is in open standby mode.

5.2.16 Foam concentrate sufficient for 30 minutes of continuous foam production shall be stored onboard. Only synthetic foam (not protein based) shall be provided.

5.2.17 The monitors shall have a free movement of plus or minus 45° in the vertical plane and in the horizontal plane they shall be able to point at any part of the deck intended to be protected. The monitors shall be lockable in any position within these ranges. The monitors and their foundations shall be of strong construction and capable of withstanding the loads that they will be subjected to on the open deck.

5.2.18 Two foam monitors at each side of the accommodation front and monitors covering the cargo manifold shall be arranged for remote control from the bridge or from another protected area with a good view over the area covered by the monitors. The remote control arrangement shall cover the vertical as well as the horizontal movement of the monitors. These monitors shall be of a type that is in a fixed position when not operated by crew. Valves positioned within cargo area for supply of foam mixture to the monitors shall be capable of remote operation from the same position as the remote control for the monitors.

5.2.19 Water spray protection for lifeboats

Lifeboats that are not shielded by steel bulkheads from the cargo areas shall be provided with a water spray system. The system can be supplied from the fire main and shall in any case be capable of quick release from the wheelhouse. The system shall deliver minimum 10 l/min/m² for the sides and top of each lifeboat. The capacity for water spray shall be added to the requirements for the main fire pumps given in [5.2.2] and [5.2.3] if these are used for supply to the water spray system for lifeboats.

5.2.20 Firefighter's outfits

The vessel shall be provided with not less than 6 sets of firefighters' outfits, which shall comply with, see [1.7].

5.3 Tankers for liquefied gas

5.3.1 Cargo handling spaces

The following spaces shall be provided with a fire extinguishing system complying with this section:

- cargo compressor room
- cargo re-liquefy room, if fitted
- any electrical equipment room or other such spaces located in the cargo area.

5.3.2 The fire extinguishing system shall comply with the requirements defined for **F(M)** additional class notation ([3.6]). Note the requirements for ex-rating electrical equipment in gas dangerous spaces.

5.3.3 If a CO₂ system is provided, the available quantity of CO₂ gas shall be sufficient to give a minimum volume of free gas corresponding to 45% of the gross volume. If gas fire extinguishing system of another type is provided, the gas concentration shall be minimum 1.3 times the ideal extinguishing concentration for the cargos in question, but in no case less than that required by IMO MSC/Circ. 848.

Guidance note:

Substances like methane, ethane and heavier gases will normally require a higher concentration of the fire extinguishing gas than that established for fuel oils.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

5.3.4 A smoke detection system approved for use in gas hazardous atmosphere shall be provided. The system shall be monitored from the wheelhouse.

5.3.5 Fire main system

The fire main system shall be as given for other tankers in [5.2.2].

5.3.6 In addition, fixed water monitors supplied with water from the fire main shall be arranged at the same position as the powder monitors for additional coverage of the cargo manifold area. The water monitors shall have fixed arrangement for making dispersion of the water jet creating a water spray of not less than 10 l/min/m² horizontal coverage of the manifold area extending 1.5 metres to each side and aft and forward

from the manifold connections. The water monitors and section valve for water supply to monitors shall be arranged with both manual and remotely operation from a safe position outside of the cargo area.

5.3.7 Powder fire-extinguishing system

The dry chemical powder fire-extinguishing systems shall satisfy the requirements as specified in Pt.5 Ch.7 Sec.11 in addition the requirements in this sub-section element.

5.3.8 The dry powder stored on the tanks shall provide for 60 sec operation of each system, when all attached monitors are activated.

5.3.9 The powder distribution lines and the pressure gas lines shall be made of stainless steel grade 316 or equivalent corrosion resistant materials.

5.3.10 Nitrogen shall be provided as pressure gas for the powder. All release lines associated to the pressure tank (also on the low pressure side) shall be regarded as class I piping. However, the main powder line can be classified as class III piping.

Guidance note:

CO₂ is not considered as equivalent to nitrogen as the content cannot be readily checked. Class I piping is required, as pressure regulators and safety valves are sometimes clogged by the powder and become inoperative. This can pressurise piping systems not intended for direct connection with the nitrogen cylinders.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

5.3.11 The distance from the powder tank to the monitors shall be limited to 10 m. However, if full scale testing has documented that the powder system can handle longer lines and measures are implemented to avoid free water in the lines (self-draining pipes for example), longer distances may be considered.

5.3.12 Each dry powder hose station shall consist of:

- one (1) dry powder trigger nozzle
- one (1) dry powder hose line
- one (1) nitrogen gas container for pneumatic release.

The equipment shall be stored in boxes made of corrosion resistant materials. The boxes shall be clearly marked and provided with brief instructions for operation of the system in the official language of the flag state as well as in English.

5.3.13 Fire extinguishing in the gas venting arrangement

Venting masts for cargo tank venting system on liquefied gas carriers shall be provided with a fixed system for extinguishing a fire at the vent outlet. Nitrogen, CO₂ or any other suitable medium is acceptable.

5.3.14 Water spray system for cargo tanks and manifolds

5.3.15 The water spray system required by IGC Code 11.3 shall have piping made of CuNi or equivalent corrosion resistant materials.

5.3.16 Water spray protection for lifeboats

Lifeboats that are not shielded by steel bulkheads from the cargo areas shall be provided with a water spray system. The system can be supplied from the fire main and shall in any case be capable of quick release from the wheelhouse. The system shall deliver minimum 10 l/min/m² for the sides and top of each lifeboat. The capacity for water spray shall be added to the requirements for the main fire pumps given in [3.6] if these are used for supply to the water spray system for lifeboats.

5.3.17 Firefighter's outfits

The vessel shall be provided with not less than eight (8) sets of firefighters' outfits, which shall comply with, see [1.7].

5.4 General cargo carriers and dry bulk cargo carriers

5.4.1 Application

The rules apply to dry cargo spaces (holds in bulk carriers and general cargo spaces) for vessels having **F(C)** additional class notation. The requirements apply to all cargo spaces as defined in SOLAS.

5.4.2 Fire detection

The requirements of SOLAS, FSS Code and the rules shall be complied with.

5.4.3 All dry cargo holds shall be fitted with a detection system based on smoke extraction or heat detection, which automatically indicates the presence of smoke or abnormal heat in any of these holds.

5.4.4 Fire extinguishing system

The requirements of SOLAS, FSS Code and the rules shall be complied with. A vessel having an exemption certificate (and thus not provided with a fixed fire extinguishing system for cargo spaces) cannot be assigned **F-C** additional class notation.

5.4.5 The storage room for the fixed fire extinguishing medium shall be easily accessible and close to the main superstructure. Operation controls for the fixed fire extinguishing system shall be grouped and shall be easily accessible.

5.4.6 If a high pressure CO₂ system is fitted, it shall comply with the requirements regarding components specifications, cleaning of piping and operational procedures for **F(M)**, see [3.5.4] and [3.6.6] to [3.6.12]. Further, when CO₂ is used for extinguishing, the available quantity of CO₂ gas shall be sufficient to give a minimum volume of free gas corresponding to 40 % of the gross volume of the largest hold.

5.4.7 Any other type of fire extinguishing system shall comply with applicable requirements specified in the **F(M)** notation, see [5.5.3] to [5.5.5] and [5.5.7] to [5.5.8].

5.4.8 Piping carrying fire extinguishing media such as CO₂ and water, for example, shall be protected internally and externally against corrosion for parts located outside the cargo space being protected. Full galvanised piping is accepted unless other requirements specify higher material standards.

5.4.9 Firefighter's outfits

The vessel shall be provided with 4 sets of firefighters' outfits, which shall comply with [1.4].

5.5 Ships with ro/ro decks (car carriers, general ro/ro ships, ferries)

5.5.1 Application

The rules apply to ro/ro decks and special category spaces for vessels having **F(C)** class notation.

5.5.2 Fire detection and confirmation

The requirements of SOLAS, FSS Code and the rules shall be complied with.

5.5.3 All ro/ro and special category spaces shall be covered by combined smoke and heat detectors served by an addressable fire detection system. The system shall be connected to a software based presentation system that displays the alarms on a general layout drawing.

5.5.4 Fire confirmation (TV monitoring system for passenger ships)

A colour TV monitoring system shall cover all decks, including moveable decks. Monitors shall be available in a manned control station. This requirement is only applicable to passenger ships (ferries).

5.5.5 Portable extinguishers

The requirements of SOLAS, FSS Code and the rules shall be complied with.

5.5.6 The required portable extinguishers shall be approved 12 kg powder or 9 l foam portable extinguishers. Portable extinguishers shall be located at easily accessible positions, such as along walkways or entry points to the ro-ro space.

5.5.7 Fire extinguishing system

The requirements of SOLAS, FSS Code and the rules shall be complied with. The system that is provided shall in addition comply with [5.5.6] and [5.5.8] to [5.5.9]. One of the following systems shall be installed:

- high pressure CO₂ system as described in [5.5.8]
- low pressure CO₂ system as described in [5.5.10]
- water mist system as described in [5.5.12]
- water spray/mist system according to MSC.1/Circ.1430
- high expansion foam or inside air foam as described in [5.5.13].

5.5.8 High pressure CO₂ systems

The requirements regarding components specifications, cleaning of piping and operational procedures for the **F(M)** class notation, see [3.5.4] and [3.6.8] to [3.6.11], shall be implemented.

5.5.9 A connection from the fire main system to the CO₂ discharge piping shall be provided. This connection shall be non-permanent (spool piece or fire hose to be used) and located in a space being readily accessible in case of a fire. It shall be possible to release the water through any of the CO₂ section valves.

Guidance note:

The purpose of this system is to cool down the space on fire after a CO₂ release or in case the CO₂ system fails to operate. It can also be applied to cool down the cargo space above the space on fire.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

5.5.10 Low pressure CO₂ systems

The requirements regarding tank level indication, components specifications, back-up valves, cleaning of piping and operational procedures for **F(M)**, see [3.6.13] and [3.6.15] to [3.6.17], shall be implemented.

5.5.11 A connection from the fire main, as defined for the high pressure CO₂ systems, see [5.5.9], shall be provided.

5.5.12 Water mist

The requirements regarding dimensioning and foam pump for **F(M)**, see [3.6.18], shall be implemented. The applicable IMO standard for this system is MSC.1/Circ.1430.

5.5.13 High expansion and inside air foam system

The requirements regarding dimensioning and foam pump for **F(M)**, see [3.6.22] and [3.6.23], shall be implemented.

5.5.14 It shall be possible to operate the foam system and at least one exhaust fan simultaneously. This fan can be served by power from the main switchboard, but power and control cables shall be routed independent of the protected space.

5.5.15 Deluge and water mist systems

5.5.15.1 Release controls and markings

Release stations with controls for start and stop of pumps and operation of deluge valves (opening and closing) shall be provided in the engine control room, deluge station and wheelhouse. Each of the release units shall have remote indication of pump running, position of valves (open/closed) and actual pressure in valve manifold.

Each control valve (deluge valve) shall be provided with remote position indicator and shall be clearly marked. A principal diagram of the protected area shall be provided for each valve and at the remote release

station. However, if the total number of such valves are less than ten a common diagram will be accepted, but each valve shall be marked with its section number.

A pressure switch shall be installed in the valve manifold (upstream of deluge valves).

Sections within the protected space shall be marked using same designation as the one used at the release stations. Letters and numbers shall be minimum 300 mm in height and be in a clearly visible and contrasting colour.

5.5.16 Piping

The piping and couplings shall be protected internally and externally against corrosion for all parts between sea inlet and the spray heads. Full galvanised piping is accepted unless other requirements specify a higher material standard.

If stainless steel piping is used the grade shall be 316 or a grade providing higher corrosion resistance for seawater.

A connection to a fresh water tank shall be provided. This shall have capacity to test any one section for 5 minutes at the required flow of water. The connection may be used to supply the system with an initial supply of fresh water in case of a fire if an approved and remote controlled switch-over to a seawater supply is provided.

An air connection and drain valve(s) shall be provided ensuring that all parts of the piping system can be drained and blown through with air after testing. All parts of the piping system shall be self-draining to drain valves or open nozzles.

5.5.17 Water monitors for weather decks

All weather decks shall be protected by dedicated water monitor(s). The monitor(s) shall be able to serve all parts of the weather deck even when calculating with 75% of the nominal throw length (this will compensate for adverse wind condition). One water monitor is acceptable if this can cover all weather decks.

Each monitor shall have a capacity of minimum 3.000 litre per minute (180 m³ per hour) for decks above 1000 m² and minimum 1.500 litre per minute (90 m³ per hour) for decks below 1000 m².

The monitors shall be accessible in case of fire on weather deck or ro/ro spaces. Manual control is acceptable.

The monitors shall be supplied from the deluge pump of the fire main. The capacity shall be such that any monitor, two deluge sections (the adjacent or below sections) and 4 hoses (calculated at their actual capacity but not less than 4 x 25 m³/h) may be served by the actual pump configuration (deluge pumps plus fire main pumps as applicable).

5.5.18 Access point of weather decks

An access point shall be provided to ensure that crew can have a clear view above cargo stowed on weather deck. This may be a deck structure or dedicated ladders and platforms provided for this purpose. The access point should be designed to provide a safe access and escape in case of fire on the weather deck.

5.5.19 Arrangement of open ro/ro decks

Open ro/ro decks and open special category spaces are not permitted.

5.5.20 Ventilation systems

Access to ventilation controls shall not be cut off by a fire in any ro/ro space or on weather decks unless controls are remotely operated from a safe position with indication (open/closed) at this position and designed with fire resistant components (using steel piping or equivalent and fire resistant cables).

Any inlet or outlet from a ro-ro space shall either be located at least 3.0 m above lifeboats, air intakes to engine rooms, emergency generator and accommodation or at least 10 m fore or aft of such items.

Any damper or fire damper being operated by actuators shall be of a fail-to-close type. This requirement does not preclude use of manual dampers.

5.5.21 Safe operations on ro/ro decks

5.5.21.1 Electrical connections on ro-ro decks serving reefer units and other consumers

A plan for stowing and fighting fires in reefer units shall be available if the vessel is intended to carry such units. It is advised that such units are stowed in locations where impact from fires is minimised, preferably weather deck.

Sockets serving reefer units and other consumers on ro/ro deck shall be of safe design and designed according to a recognised standard.

Power supply circuits serving such units shall be monitored for short circuit/ground fault with alarm to a continuously manned control station. Means to isolate these circuits shall be readily accessible for the crew and clearly marked.

5.5.21.2 Electrical vehicles/alternative fuelled vehicles

A plan for stowing and fighting fires in electrical vehicles and vehicles powered by alternative fuel, such as gas (compressed or liquid), methanol / ethanol and hydrogen shall be available. Hydrogen vehicles shall be stowed along bulkheads or other suitable locations where the impact of hydrogen fire is minimised. For other vehicles (electrical vehicles and alternative fuel other than hydrogen) there are no specific requirements but it is advised that electrical vehicles are stowed in locations where impact from fires in other cars and cargo is minimised.

On board charging of electrical vehicles is only accepted if a safety case is presented. The case shall consider the following elements:

- i) Available charging per unit shall in general be provided with low/medium power (up to 5 kW). Charging at higher power, including supercharging, will require special measures.
- ii) Power supply circuits serving such units shall be monitored for short circuit/ground fault with alarm to a continuously manned control station. Means to isolate these circuits shall be readily accessible for the crew and clearly marked.
- iii) A manual for safe operation of the charging facility shall be available. Connection of chargers shall be monitored by the crew.
- iv) Charging shall be in an area where impact from a fire in other units is minimised and impact from a fire starting in charges or electrical vehicle being charge is minimised. An acceptable solution is A60 above and below the area where chargers are available.
- v) The design of the charging system should be based on the principles from IEC 61851-1, *Electrical vehicle conductive charging system, general requirements*.

5.5.21.3 Other activities

All available sockets, other than any covered by the above safety case, shall be marked and secured to prevent unauthorized use. Diesel powered reefer units are not allow to operate on board, except if located on weather deck.

5.5.22 Communication - radios

The vessel shall be provided with a minimum of ten (10) sets of type approved UHF radios of specified type. Only one type of radio shall be used for this purpose. Relevant SOLAS requirements and the Society's statutory interpretations apply for mandatory internal communications systems.

5.5.23 At least two of the radios shall be especially adapted for use by the firefighting team (installed inside helmet).

5.5.24 Stations for relaying the UHF signals shall be provided, where a radio at the ro/ro deck cannot communicate with the bridge or another radio on the ro/ro deck. This requirement shall apply to a minimum of 95% of the accessible ro-ro deck. Relevant SOLAS requirements and the Society's statutory interpretations apply for mandatory internal communications systems.

5.5.25 Firefighter's outfits

The vessel shall be provided with 8 sets of firefighter's outfits, which shall comply with [1.7].

5.6 Container carriers

5.6.1 Application

The rules apply to container carriers for vessels having **F(C)**.

5.6.2 Fire extinguishing system – enclosed cargo holds

The requirements of SOLAS, FSS Code and the rules shall be complied with.

5.6.3 The storage room for the fixed fire extinguishing medium shall be easily accessible and close to the main superstructure. Operation controls for the fixed fire extinguishing system shall be grouped and shall be easily accessible.

5.6.4 If a high pressure CO₂ system is fitted, it shall comply with the requirements regarding component specifications, cleaning of piping and operational procedures for **F(M)**, see [3.5.4] and [3.6.8] to [3.6.11]. Further, when CO₂ is used for extinguishing, the available quantity of CO₂ gas shall be sufficient to give a minimum volume of free gas corresponding to 40 % of the gross volume of the largest hold.

5.6.5 Any other type of fire extinguishing system shall comply with applicable requirements specified in the **F(M)** additional class notation, see [5.5.4], [5.5.5], [5.5.7] or [5.5.8].

5.6.6 Piping carrying the fire extinguishing media such as CO₂ and water, for example, shall be protected internally and externally against corrosion for parts located outside the cargo space being protected. Full galvanised piping is accepted unless other requirements specify higher material standards.

5.6.7 Fire extinguishing systems – open decks

The main fire pumps and available general service pumps shall have a total capacity of at least 250 m³/h at a minimum of 10 bar.

5.6.8 The fire main line on cargo deck shall be dimensioned for a flow of 250 m³/h at a flow velocity not exceeding 5 m/s (typically pipes with 125 mm diameter) and shall be provided with manually operable isolation valves every 40 m. Isolation valve shall also be installed adjacent to the accommodation superstructure before entering the cargo spaces forward and aft of this superstructure.

5.6.9 The fire main line shall have double hydrants for each 25 m. 10 fire hoses of suitable type (38 mm diameter is recommended) shall be provided at an readily accessible locker for use on the cargo deck. The hoses shall be divided equally both sides.

5.6.10 At least two mobile water monitors with flexible supply hoses of suitable capacity and length shall be provided. These shall have a capacity of minimum 60 m³/h each, with an effective through length of minimum 25 m when tested onboard with two (2) monitors and two (2) fire hoses in operation. The monitors shall be of a type that can be fixed to the vessels structure and thus be operated without the crew being in position.

5.6.11 At least two water mist lances shall be provided. These shall be of a type capable of penetrating a standard container. Alternatively, dedicated tools for this purpose shall be provided. A separate water supply system, capable of supplying the two lances for 60 minutes, shall be installed if the lances cannot use the fire main system.

Guidance note:

This guidance note applies to [5.6.9], [5.6.10] and [5.6.11]. The purpose of these systems is as follows. The large numbers of hoses are required to provide flexibility for the fire fighters when fighting fires in the containers or cooling the cargo hatches to avoid collapse. The mobile monitors are intended to cool down the container on fire and adjacent containers and thereby prevent the fire from escalating and preventing any hazardous cargo from exploding due to heat radiation. The water mist lances are provided to extinguish fires in containers that cannot be accessed or where opening the container door can escalate the fire.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

5.6.12 Communication - radios

The vessel shall be provided with a minimum of 10 sets of type approved UHF radios of specified type. Only one type of radio shall be used for this purpose. Relevant SOLAS requirements and the Society's statutory interpretations apply for mandatory internal communications systems.

5.6.13 At least two of the radios shall be specially adapted for use by the firefighting team (installed inside helmet).

Stations for relaying the UHF signals shall be provided, where a radio at the cargo spaces cannot communicate with the bridge or another radio on the ro/ro deck. This requirement shall apply to a minimum of 95% of the accessible cargo spaces, see [Pt.5 Ch.3](#).

5.6.14 Firefighter's outfits

The vessel shall be provided with eight (8) sets of firefighters' outfits, which shall comply with [\[1.7\]](#).