



RULES FOR CLASSIFICATION OF **SHIPS**

NEWBUILDINGS

SPECIAL EQUIPMENT AND SYSTEMS ADDITIONAL CLASS

PART 6 CHAPTER 4

ADDITIONAL FIRE PROTECTION (F-AMC)

JULY 2006

*This booklet includes the relevant amendments and corrections
shown in the July 2009 version of Pt.0 Ch.1 Sec.3.*

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CHANGES IN THE RULES

General

The present edition of the rules includes additions and amendments decided by the Board as of June 2006 and supersedes the January 2003 edition of the same chapter.

The rule changes come into force as indicated below.

This chapter is valid until superseded by a revised chapter. Supplements will not be issued except for minor amendments and an updated list of corrections presented in Pt.0 Ch.1 Sec.3. Pt.0 Ch.1 is normally revised in January and July each year.

Revised chapters will be forwarded to all subscribers to the rules. Buyers of reprints are advised to check the updated list of rule chapters printed in Pt.0 Ch.1 Sec.1 to ensure that the chapter is current.

Main changes coming into force 1 January 2007

• General

- The scope of this revision is to implement the experience gained with the new **F-M** class, revise the **F-A** part (accommodation) and to develop new rules for the **F-C** part (cargo spaces).

• Sec.1 General Requirements

- Item A101 has been amended to further clarify the applicability of the optional class notation **F-AMC**.
- Sub-section element B100 Manuals and particulars, has been amended with respect to requirements to plans and documents that shall be submitted.
- Sub-Section C Manuals has been modified and requirements to signboards have been deleted.
- Sub-section D Firefighter's Outfits, has been completely revised to reflect current safety objectives.

• Sec.2 Accommodation

- The entire section has been revised. Requirement for A-60 transversal division of accommodation and A-60 protection of standard HVAC rooms and service trunks have been deleted. This is not an important part of the **F-A** additional class notation but has through the years been the root of several discussions. The above has been compensated by introducing self-closing cabin doors and use of optical smoke detectors in accommodation spaces. By experience fire hazard laundries shall now have A-class boundaries (B-class accepted under SOLAS).

• Sec.3 Machinery Spaces

- The entire section has been revised. Some items not considered to be cost efficient with respect to fire safety have been deleted. Among these are the additional requirements for escape hatches from the engine room and DNV's requirements for CO₂ valves being of all stainless steel. Some of the existing requirements such as dead ship condition, centralised controls for shut down and release of fire extinguishing systems have been further clarified. Components known to have reliability problems have been specified to a higher standard or requirements introducing robust back-up arrangements have been added.

• Sec.4 Cargo Decks and Cargo Spaces

- The entire section has been revised. The requirements have been re-organised and each ship type given its part in order to make clear and user-friendly rules. The rules for tankers (oil/chemical and LPG/LNG) have been revised to suit today's expectations whereas new rules have been implemented for car carriers / ro-ro vessels, dry cargo / bulk and container carriers. The rules for these ship types were either no longer relevant or not available under the 2001 edition of **F-C** additional class notation.

Corrections and Clarifications

In addition to the above stated rule requirements, a number of corrections and clarifications have been made in the existing rule text.

Comments to the rules may be sent by e-mail to rules@dnv.com

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SECTION 1 GENERAL REQUIREMENTS

A. Classification

A 100 Application

101 The rules in this chapter apply to vessels with additional fire safety measures in accommodation spaces, machinery spaces and cargo areas. Only vessels that comply with the SOLAS requirements (for cargo ships or passenger ships) can be assigned one or combinations of **F-A**, **F-M** and **F-C**. The requirements shall be regarded as supplementary to those given in SOLAS Ch. II-2.

102 The rules aim at increased fire protection through preventive measures as well as measures for reducing the consequences of fire.

A 200 Class notations

201 Vessels with the accommodation built and equipped in accordance with the requirements in Sec.1 and Sec.2 will be given the additional class notation **F-A**.

202 Vessels with the machinery spaces built and equipped in accordance with the requirements in Sec.1 and Sec.3 will be given the additional class notation **F-M**.

203 Vessels with the deck and cargo areas built and equipped in accordance with the requirements in Sec.1 and Sec.4 will be given the additional class notation **F-C**.

204 Vessels built and equipped in accordance with all the requirements of this chapter will be given the additional class notation **F-AMC**.

B. Documentation

B 100 Manuals and particulars

101 DNV will review the defined plans for vessels with one or combinations of **F-A**, **F-M** or **F-C** additional class notations. The plans will be reviewed even in cases where DNV are not authorised to issue a safety certificate.

102 The requirements in Sec.1 to Sec.4 shall be identified in the documentation required by Pt.4 Ch.10 (using the entry for SOLAS ships where DNV is authorised to issue safety certificates). In addition to these documents and plans, the following documentation shall be submitted for approval or incorporated into plans required by Pt.4 Ch.10:

*For class notation **F-A***

- water hose reel system
- documentation of combustible materials (test reports or reference to type approvals by the Society).

*For class notation **F-M***

- infrared thermo scanning report, with corrective measures (for information)
- colour TV monitoring system
- typical details and methods for shielding of couplings in oil piping systems

*For class notation **F-C***

- fire extinguishing system for cargo areas
- water spray protection for cargo manifold and lifeboats (as applicable)

C. Manuals

C 100 Manuals

101 Manuals for the fire fighting, fire detection and alarm systems shall be kept in one place (for example: the wheelhouse or engine control room, if this is accessible in a fire). The manuals shall include instructions for use of the systems, periodical maintenance and specification of periodical tests.

D. Firefighter's Outfit

D 100 General

101 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 Fire Safety Systems (FSS) Code, and as defined in Pt.4 Ch.10. Additional requirements are given for some ship types under the **F-C** notation (Sec.4). The firefighter's outfit defined in these rules need not be additional to those required by SOLAS.

102 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 it is deemed to be more suitable for the intended service and more spares are provided.

103 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).

104 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 must be operable and that the air to be compressed must be sufficiently clean for breathing purposes.

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105 The firemen'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.

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

SECTION 2 ACCOMMODATION

A. General

A 100 Purpose and application

101 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.

Guidance note:

These rules and related references are applicable to cargo vessels. However, parts of these rules may be applicable for other ship types, such as passenger vessels.

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B. Fire Integrity

B 100 Restricted use of combustible materials

101 Construction method IC (see SOLAS Ch. II-2/9.2.3.2) shall be used.

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

103 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 FTPC, Part 8.

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

B 200 Subdivision

201 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.

202 All doors fitted in the corridor bulkheads (providing access to cabins, public spaces, etc.) shall be of self-closing type. Service hatches need not to comply with this requirement.

203 If a door required being self-closing is equipped with an approved hold back device, this shall be arranged so that it will automatically release the door when the fire alarm is sounded.

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

205 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).

206 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.

207 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 though 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.

B 300 Escape ways for accommodation and service spaces

301 Dead end corridors are prohibited. Recesses are accepted where their length along the corridor is greater than its width.

302 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.

C. Fire Detection and Alarm System

C 100 General

101 In all accommodation, service spaces and control stations there is to be installed an approved automatic fire detection and alarm system of addressable type and in accordance with Pt.4 Ch.10. Optical smoke detectors are to 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.

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

D. Portable Fire Extinguishers

D 100 Number and location

101 The required portable extinguishers shall be approved 12 kg powder or 9 litre foam portable extinguishers.

102 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 dayrooms and similar spaces. At least two extinguishers of suitable type for deep fat fryers shall be provided for the galley.

E. Hose Reel System

E 100 General

101 The accommodation shall be provided with a water extinguishing system consisting of fire hose reels for rigid hose permanently connected to a piping system under constant pressure.

102 The hose reels shall be so located that any point in the

accommodation can be reached with water spray from at least one hose reel.

103 Hoses for hose reels shall be of at least 19 mm internal diameter and shall have a combined jet or spray nozzle. Hose length shall be maximum 20 m per hose reel.

The system shall discharge freshwater of potable quality with a pressure of not less than 3 bar at the nozzle.

104 Hose reels shall be ready for immediate use. The hose shall be operable when pressurised on the reel.

105 Conventional fire hose equipment shall be provided to fight more extensive fires in the accommodation. When planning such systems, the fact that the fire shall be fought from the

outside has to be considered. Hydrants and hose equipment are therefore to be located outside the entrance doors to the accommodation. Size of fire hoses should be chosen based on the number of fire fighters dedicated to this task (38 mm hoses is normally recommended).

F. Firefighter's Outfit

F 100 General

101 The ship shall be provided with firefighter's outfit as described in Sec.1D.

SECTION 3 MACHINERY SPACES

A. General

A 100 Emergency escape and access

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

102 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 vessels shall have minimum one escape route being independent of machinery spaces of category A.

A 200 Ventilation

201 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.

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202 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 vessels, this will be in addition to the controls normally arranged at the safety centre if arranged below weather deck. The hand lever of dampers is not to be located more than 2 m above the deck.

Guidance note:

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

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203 All dampers and fire dampers enclosing the engine room shall be made of corrosion resistant materials, such as stainless steel and brass.

A 300 Centralised fire control station

301 Controls for release of the local extinguishing system, stop of fuel pumps and ventilation fans shall be located in a normally 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.

302 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 defined above.

303 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.

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

305 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.

A 400 Emergency fire pump and fire hoses

401 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.

402 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.

Guidance note:

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 A204. 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.

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403 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 normally recommended).

B. Oil Systems

B 100 General

101 The term *oil systems* means systems for fuel oils, thermal oils, lubricating oils and hydraulic oils.

102 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.

B 200 Separation of risk objects

201 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.

202 The above rooms shall be provided with fixed main fire extinguishing system as per F100 and a local extinguishing system as per E100.

203 Hydraulic power aggregates shall comply with Pt.4 Ch.1 Sec.3 A410. However, all 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 10 m away) and electric motors and similar (less than 3 m away).

B 300 Shielding of oil piping within machinery spaces of category A

301 Oil piping with working pressure above 15 bar located within a machinery space of category A, apart from those con-

tained within separate spaces required by B201, shall not be laid above combustion machinery unless arranged in double wall piping with safe drain from annular space. 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 for instance tight floor plating.

Guidance note:

Certified tape is not accepted as an equivalent.

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C. Hot Surfaces

C 100 Infrared scanning

101 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).

102 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 DNV surveyor. The calibration of equipment to be documented and the chosen emissivity factor shall be justified.

103 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).

104 The corrective actions may be verified by manual equipment.

105 The infrared scanning shall be repeated on an annual basis when the vessel is in operation.

C 200 Insulation of hot surfaces

201 All insulation shall be made of non-combustible insulation protected by steel sheet cladding. The cladding shall be easy to dismantle and assemble wherever inspection of the protected equipment is necessary. 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.

D. Fire Detection and Confirmation

D 100 Fire detection

101 The requirements in SOLAS and Ch.3 Sec.2 E for ships with periodically unattended machinery space are to be complied with for all ships with **F-M** class.

102 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 vessels, auxiliary machinery spaces (fire category 10 and 11) shall also be covered by the detection system.

103 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 IMO 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 5 seconds.

104 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.

D 200 TV monitoring system

201 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.

E. Local Extinguishing Systems

E 100 General

101 A local application system in accordance with SOLAS Ch. II-2, Reg.10.5.6 and IMO MSC/Circ.913 shall be installed. Spaces identified in B201 shall also be protected.

102 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.

103 The requirement addressed in 102 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 ships having two independent power systems in addition to the emergency generator (for example **RPS** additional class notation) 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.

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E 200 Arrangement

201 The local application system shall be type approved by the Society in accordance with IMO MSC/Circ.913.

202 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 E102) 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).

203 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.

204 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.

205 The spray head arrangement shall be according to the IMO requirements and the DNV 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.

206 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.

207 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 206, shall be provided in parallel with the section valve. A signboard identifying the valve and its operation shall be posted adjacent to the by pass valve.

208 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).

209 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 are to 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 5 seconds.

210 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 fire fighting

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.

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F. Main Extinguishing Systems

F 100 General

101 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 200
- a low pressure CO₂ total flooding system as described in 300
- a water mist system as described in 400
- a high expansion foam or inside air foam system as described in 500
- an equivalent gaseous agent as described in 600.

102 The main fire extinguishing system shall in addition to these specific rules applicable to each system, comply with the functional requirements of E102 and E103.

103 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.

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 fire fighting performance (small fires/enclosed cabinets) and do not damage the electrical equipment.

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

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

F 200 CO₂ total flooding system

201 Any CO₂ total flooding system for the machinery spaces category A shall comply with Pt.4 Ch.10 Sec.4 in addition to this sub-section element.

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

203 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.

204 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).

205 Piping system upstream of section valves shall be presented to the Society's surveyor prior to installation of section valves. This in order to ensure that these pipes are clean.

206 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.

207 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.

F 300 Fixed low pressure CO₂ total flooding system

301 Any low pressure CO₂ total flooding system shall comply with Pt.4 Ch.10 Sec.4 and the requirements of F202 and F206 in addition to this sub-section element.

302 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.

303 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 by pass valve.

304 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.

305 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.

F 400 Water mist system

401 Any water mist system shall comply with SOLAS and the requirements defined in this sub-section element.

Guidance note:

Reference is made to IMO MSC/Circ.668, as amended by IMO MSC/Circ.728 and IMO MSC/Circ. 1165.

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402 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.

403 Foam injection pumps, if fitted, shall be duplicated. The back up 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 stand by mode.

404 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 by pass valve.

F 500 High expansion and inside air foam system

501 All foam systems shall comply with Pt.4 Ch.10 Sec.4 and the requirements defined in this sub-section element.

502 Foam injection pumps, if fitted, shall be duplicated. The back up 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 stand by mode.

503 It shall be possible to operate the foam system and the exhaust fan defined in A201 simultaneously.

F 600 Equivalent gaseous agent

601 Any equivalent gaseous agent for the machinery spaces category A shall comply with IMO MSC/Circ. 848 as amended and Pt.4 Ch.10 Sec.4.

G. Portable Fire Extinguishers

G 100 Number and location

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

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

- 4 at the lower level and 4 at the platform level for each main engine (extinguisher can be combined if there are several main engines in one space)
- 1 near each auxiliary engine (3 required for 3 auxiliary engines)
- 1 at the entrance to and 1 inside the spaces defined under B201.

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.

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H. Firefighter's Outfit

H 100 General

101 The ship shall be provided with firefighter's outfits as specified in Sec.1 D.

SECTION 4 CARGO DECKS AND CARGO SPACES

A. Introduction

A 100 Purpose, application and general requirements

101 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.

102 The rules apply to the following ship 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 ship types has a dedicated paragraph (B through F) in this section. Only the requirements defined under the applicable paragraph(s) shall apply with respect to **F-C** additional class notation.

B. Tankers for Oil, Tankers for Chemicals

B 100 Gas detection systems and inert gas systems

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

102 An inert gas generating system in compliance with SOLAS Ch. II-2, Reg.4.5.5 shall be provided for all tankers with **F-C** class (also those being less than 20.000 grt).

B 200 Cargo pump rooms

201 Cargo pump room shall have a fixed fire extinguishing system that complies with SOLAS and the requirements defined for **F-M** additional class notation (Sec.3 F).

202 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.

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

204 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.

B 300 Fire main system (ring-main)

301 The vessel shall have a fire main on deck arranged as a ring main laid to the port and starboard side. Isolation valves shall be globe valves of steel or 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 DNV rules.

302 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).

303 The size of the fire hoses shall take into account the manning and fire fighting 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.

304 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.

B 400 Foam main system

401 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 IMO FSS Code (applicators only are not considered as equivalent).

402 The vessel shall have an independent foam main for the deck foam extinguishing systems as specified in SOLAS and DNV 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 DNV rules.

403 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.

404 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 DNV 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.

405 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 stand by mode.

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

407 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.

408 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.

B 500 Water spray protection for lifeboats

501 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 B200 and B300 if these are used for supply to the water spray system for lifeboats.

B 600 Firefighter's outfits

601 The ship shall be provided with not less than 6 sets of Firefighters' outfits, which shall comply with Sec.1 D.

C. Tankers for Liquefied Gas (LNG, LPG)

C 100 Cargo handling spaces

101 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.

102 The fire extinguishing system shall comply with the requirements defined for **F-M** additional class notation (Sec.3 F). Note the requirements for ex-rating electrical equipment in gas dangerous spaces.

103 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.

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

C 200 Fire main system

201 The fire main system shall be as given for other tankers under B200.

202 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 meter 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.

C 300 Powder fire-extinguishing system

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

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

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

304 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.

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305 The distance from the powder tank to the monitors shall be limited to 10m. 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.

306 Each dry powder hose station shall consist of:

- 1 dry powder trigger nozzle
- 1 dry powder hose line
- 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.

C 400 Fire extinguishing in the gas venting arrangement

401 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.

C 500 Water spray system for cargo tanks and manifolds

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

C 600 Water spray protection for lifeboats

601 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 C200 if these are used for supply to the water spray system for lifeboats.

C 700 Firefighter's outfits

701 The ship shall be provided with not less than 8 sets of firefighters' outfits, which shall comply with Sec.1 D.

D. General Cargo Carriers and Dry Bulk Cargo Carriers

D 100 Application

101 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.

D 200 Fire detection

201 The requirements of SOLAS, IMO FSS Code and DNV rules shall be complied with.

202 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.

D 300 Fire extinguishing system

301 The requirements of SOLAS, IMO FSS Code and DNV 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.

302 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.

303 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** additional class notation (Sec.3 E201 and F203 to F206). 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.

304 Any other type of fire extinguishing system shall comply with applicable requirements specified in the **F-M** additional class notation (E300, E400, E500 or E600).

305 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.

D 400 Firefighter's outfits

401 The ship shall be provided with 4 sets of firefighters' outfits, which shall comply with Sec.1 D.

E. Ships with Ro-Ro Decks (Car Carriers, General Ro-Ro Ships, Ferries)

E 100 Application

101 The rules apply to ro-ro decks and special category spaces for vessels having **F-C** additional class notation.

E 200 Fire detection and confirmation

201 The requirements of SOLAS, IMO FSS Code and DNV rules shall be complied with.

202 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.

E 300 Fire Confirmation (TV monitoring system for passenger ships)

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

E 400 Portable extinguishers

401 The requirements of SOLAS, IMO FSS Code and DNV rules shall be complied with.

402 The required portable extinguishers shall be approved 12 kg powder or 9 l foam portable extinguishers.

E 500 Fire extinguishing system

501 The requirements of SOLAS, IMO FSS Code and DNV rules shall be complied with. The system that is provided shall in addition comply with E600 to E900. One of the following systems shall be installed:

- high pressure CO₂ system as described in E600
- low pressure CO₂ system as described in E700
- water mist system as described in E800
- water spray system according to IMO Res. A123(V)
- high expansion foam or inside air foam as described in E900.

E 600 High pressure CO₂ systems

601 The requirements regarding components specifications, cleaning of piping and operational procedures for **F-M** additional class notation (Sec.3 E201 and F203 to F206) shall be implemented.

602 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.

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E 700 Low pressure CO₂ systems

701 The requirements regarding tank level indication, components specifications, back-up valves, cleaning of piping and operational procedures for **F-M** additional class notation (Sec.3 F301 and F303 – 306) shall be implemented.

702 A connection from the fire main, as defined for the high pressure CO₂ systems (F602) shall be provided.

E 800 Water mist

801 The requirements regarding dimensioning and foam pump for **F-M** additional class notation (Sec.3 F401 to F403) shall be implemented. The applicable IMO standard for this system is IMO MSC/Circ.914.

E 900 High expansion and inside air foam system

901 The requirements regarding dimensioning and foam pump for **F-M** additional class notation (Sec.3 F501 and F502) shall be implemented.

902 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.

E 1000 Communication - radios

1001 The vessel shall be provided with a minimum of 10 sets of type approved UHF radios of specified type (see Pt.3 Ch.3 Sec.10). Only one type of radio shall be used for this purpose.

1002 At least two of the radios shall be especially adapted for use by the fire fighting team (installed inside helmet).

1003 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 (see also Pt.3 Ch.3 Sec.10).

E 1100 Firefighter's outfits

1101 The ship shall be provided with 8 sets of firefighter's outfits, which shall comply with Sec.1 D.

F. Container Carriers

F 100 Application

101 The rules apply to container carriers for vessels having **F-C** additional class notation.

F 200 Fire extinguishing system – enclosed cargo holds

201 The requirements of SOLAS, IMO FSS Code and DNV rules shall be complied with.

202 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.

203 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** additional class notation (Sec.3 E201 and F203 to F206). 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.

204 Any other type of fire extinguishing system shall comply with applicable requirements specified in the **F-M** additional class notation (E300, E400, E500 or E600).

205 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.

F 300 Fire extinguishing systems – open decks

301 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.

302 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 40m. Isolation valve shall also be installed adjacent to the accommodation superstructure before entering the cargo spaces forward and aft of this superstructure.

303 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.

304 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 on board with 2 monitors and 2 fire hoses in operation. The monitors shall be of a type that can be fixed to the ships structure and thus be operated without the crew being in position.

305 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 note applies to 303, 304 and 305. The purpose of these systems is as follows. The large number 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.

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F 400 Communication - radios

401 The vessel shall be provided with a minimum of 10 sets of type approved UHF radios of specified type (see Pt.3 Ch.3 Sec.10). Only one type of radio shall be used for this purpose.

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

403 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 (see also Pt. 3 Ch.3 Sec.11).

F 500 Firefighter's outfits

501 The ship shall be provided with 8 sets of firefighters' outfits, which shall comply with Sec.1 D.

