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# **GUIDELINES FOR ENHANCED FIRE SAFETY OF CONTAINER SHIPS**

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## **PREFACE**

Container ships are used to carry standard-specification containers, which are characterized by a large amount of cargoes and high loading density. However, this unique loading situation causes narrow passages in the cargo stowage area and inconvenient operations for personnel, which poses certain difficulties to the fire safety of container ships. In recent years, the size of container ships has become increasingly large, so has the loading capacity. With the increase in loading capacity, more and more containers are stowed in the open area, and the loading height is getting increasingly high. If a fire occurs to cargoes on board, the hazard will be significant. As the size of the ship becomes larger and the loading density and height are higher, it poses greater difficulties to the fire-fighting work on the container ship. In order to detect fires in the cargo area of container ships in time, delay the spread of fire, and extinguish fires in a shorter time, the Guidelines for Enhanced Fire Safety of Container Ships (hereinafter referred to as the Guidelines) are developed by CCS.

Aimed at container ships, the Guidelines specify requirements additional to those in SOLAS and CCS Rules for Classification of Sea-going Steel Ships, in order to enhance the fire safety of container ships.

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## **Chapter 1 General**

### **1.1 Scope of application**

1.1.1 The Guidelines apply to container ships which apply for the notations of enhanced fire safety as specified in 1.2.

1.1.2 For other types of ships carrying containers, requirements in the Guidelines may be followed.

### **1.2 Notations**

1.2.1 For container ships complying with the requirements of relevant chapters and sections of the Guidelines, the following notations of enhanced fire safety are assigned:

- (1) EFS: basic requirements for enhanced fire safety;
- (2) acc: protection for accommodation, lifeboats, liferafts, embarkation stations and muster stations, in addition to the basic requirements for enhanced fire safety;
- (3) fm: provision of deck fixed water monitor systems, in addition to the basic requirements for enhanced fire safety;
- (4) fd: provision of temperature monitoring systems for container stowage areas, in addition to the basic requirements for enhanced fire safety;
- (5) ws: provision of cargo hold water spraying systems, in addition to the basic requirements for enhanced fire safety.

1.2.2 For container ships complying with the requirements of several chapters of the Guidelines, more than one notations may be assigned at the same time, e.g. EFS (acc, fm).

### **1.3 General requirements**

1.3.1 The Guidelines specify additional requirements for those in SOLAS and CCS Rules for Classification of Sea-going Steel Ships.

1.3.2 For specific requirements in Chapter 2, 3, 4, 5 and 6 of the Guidelines, alternative design and arrangement may be accepted, subject to acceptance of CCS.

1.3.3 If plans and information required in the Guidelines are included in other plans and information submitted for approval, they need not be re-submitted for review.

1.3.4 When applying for notations acc, fm and ws at the same time, if the water spraying systems protecting accommodation bulkheads, lifeboats, liferafts, embarkation stations and muster stations, deck fixed water monitor systems and under-deck cargo hold water spraying systems are not provided with dedicated water pumps, but are supplied from ship's fire mains and main fire pumps, the capacity of main fire pumps is to satisfy the need of the following two, whichever is greater:

- (1) simultaneous use of 2 mobile water monitors, 4 fire hydrants, 2 water mist lances, water spraying systems protecting accommodation, lifeboats, liferafts, embarkation stations and muster stations, and deck fixed water monitor systems; or
- (2) simultaneous use of 6 mobile water monitors, 2 fire hydrants, 2 water mist lances and under-deck cargo hold water spraying systems.

1.3.4.1 When applying for notations fm and ws at the same time, if dedicated piping systems are observed, one common piping system and common water supply pumps may be used for the deck fixed water monitor system and cargo hold water spraying system, and the total capacity of water supply pumps is to satisfy the greatest need of water of the deck fixed water monitor system or cargo hold water spraying system.

## Chapter 2 Basic Requirements

### 2.1 Scope of application

2.1.1 This Chapter applies to ships which apply for notation EFS.

### 2.2 Plans and information

2.2.1 The following plans and information, as appropriate, are to be submitted:

- (1) information on water mist lance (for information);
- (2) information on water monitors (working pressure, capacity, water throw etc.) (for information);
- (3) fire main system and arrangement plan (for approval);
- (4) arrangement plan of fire-fighter's outfits (for information);
- (5) air compressor system for recharging air cylinders of breathing apparatus and arrangement plan (for approval).

### 2.3 Container surface temperature measurement

2.3.1 Appropriate tools are to be provided, e.g. portable infrared cameras/temperature measuring instruments, which are to be used to measure the surface temperature of containers.

### 2.4 Fire mains, hydrants and hoses

2.4.1 Where it is arranged on the deck, the fire main is to be arranged to ensure that, in case of damage, the damaged part is to be effectively isolated so that the remaining part of fire mains and hydrants can continue to be used. Isolation valves are to be fitted in the fire main of container stowage area at intervals of not more than 40 m. Isolation valves are to be fitted in protected positions.

2.4.2 In the container stowage area, fire hoses are to be kept near the fire hydrants so that they are ready for use.

2.4.3 The number and arrangement of fire hydrants are to take into consideration the use of mobile water monitors.

2.4.4 The arrangement of the fire main system and the selection of pumps are to ensure the simultaneous use of 6 mobile water monitors, 2 fire hydrants and 2 water mist lances. At the same time, the pressure of each fire hydrant in the system is to satisfy the requirements of SOLAS regulation II-2/10.2.1.6.

### 2.5 Mobile water monitors

2.5.1 In addition to mobile water monitors required by SOLAS regulation II-2/10.7.3, 2 mobile water monitors are to be provided at intervals of not more than 80 m along the ship length, and the total number need not exceed 10. Mobile water monitors are to be kept ready for use in appropriate safe locations or spaces. The performance of mobile water monitors are to satisfy the requirements of the *Guidelines for the design, performance, testing and approval of mobile water monitors used for the protection of on-deck cargo areas of ships designed and constructed to carry five or more tiers of containers on or above the weather deck* (MSC.1/Circ.1472).

2.5.2 When deck fixed water monitor systems specified in Chapter 4 of the Guidelines are provided, additional mobile water monitors required by 2.5.1 of this Chapter need not be provided. Mobile water monitors are to be provided only according to the requirements of SOLAS regulation II-2/10.7.3.

## **2.6 Fire-fighter's outfits**

2.6.1 For ships carrying not more than five tiers of containers on the deck, 2 additional sets of fire-fighter's outfits complying with the FSS Code are to be provided. For ships carrying five or more tiers of containers on the deck, 4 additional sets of fire-fighter's outfits are to be provided. They are to be stored in widely separated safe spaces where emergency lighting is fitted. Two spare air cylinders are to be provided for each breathing apparatus of fire-fighter's outfits, or air compressors capable of fully recharging 4 air cylinders within 30 min are to be provided. Where the latter are provided, they are to be arranged in a protected position readily accessible so that the compressor's operation will not be affected by a fire in the container stowage area. Air charging piping systems are to be made of steel or equivalent material. At least two charging connections are to be provided, which are to be separated as widely as possible.

2.6.2 The helmet in the firefighter's outfit is to be fitted with a two-way communication device, and when being used, manual operation is not needed.

## **2.7 Water mist lances**

2.7.1 4 water mist lances satisfying the requirements of SOLAS regulation II-2/10.7.3.1.1 are to be provided, which can effectively pierce the container.

2.7.2 These water mist lances are to be stored with fire-fighter's outfits.

## **Chapter 3 Additional Protection of Accommodation Areas, Lifeboats, Liferafts, Embarkation Stations and Muster Stations**

### **3.1 Scope of application**

3.1.1 This Chapter applies to ships which apply for notation acc.

### **3.2 Plans and information**

3.2.1 The following plans and information, as appropriate, are to be submitted:

- (1) fire division plan (for approval);
- (2) fire main systems and arrangement plan (for approval);
- (3) water spraying systems protecting accommodation bulkheads, lifeboats, liferafts, embarkation stations and muster stations, arrange plan and pipe network pressure drop calculations (for approval).

### **3.3 Segregation of accommodation areas**

3.3.1 For superstructures and deckhouses of accommodation spaces, of service spaces and control stations where people work and frequently access, and of machinery spaces, if they directly face the container stowage area, and the horizontal distance from the container stowage area with dangerous goods or other goods of fire hazard is less than 5 m, the bulkheads are to be insulated to “A-60” class standard up to the underside of the deck of the navigation bridge and be protected by the water spraying system with a rate of water jet not less than  $5l/m^2min$ . The spraying nozzles are to be an approved type.

3.3.2 For superstructures and deckhouses of accommodation spaces, service spaces and control stations where people live, work and frequently access, and of machinery spaces, their vents, doors and openable windows are not to directly face the container stowage area carrying dangerous goods or other goods of fire hazard. Apart from being capable of being closed from the inside of the space served, such openings are also to be capable of being closed from the outside.

### **3.4 Arrangement and protection of lifeboats, liferafts, embarkation stations and muster stations**

3.4.1 Where lifeboats, liferafts, embarkation stations and muster stations directly face the container stowage area, the horizontal distance from the container stowage area with dangerous goods or other goods of fire hazard is not to be less than 5 m. In case the distance is not greater than 10 m, they are to be protected by a water spraying system with a rate of water jet not less than  $5l/m^2min$ . The spraying nozzles are to be an approved type.

3.4.2 The water spraying system is at least to cover:

- (1) all the lifeboats, liferafts and their release gears and operating positions;
- (2) all the embarkation stations and muster stations.

### **3.5 System water supply**

3.5.1 Where a dedicated piping system is used for the water spraying system protecting accommodation areas, lifeboats, liferafts, embarkation stations and muster stations, such system is to be provided with at

least one water supply pump. The dedicated water supply pipelines are to provide connection from the fire main, through a normally closed stop check valve.

3.5.2 The system may use the ship's fire main and main fire pumps, provided that the capacity of the main fire pumps is to be increased accordingly to meet the need for simultaneous use of the following equipment and systems:

- (1) 4 or 6 mobile water monitors (according to 2.5.1 of the Guidelines); and
- (2) 2 fire hydrants; and
- (3) 2 water mist lances; and
- (4) deck fixed water monitor systems (if fitted).

At the same time, the pressure of each fire hydrant is to satisfy the requirements of SOLAS regulation II-2/10.2.1.6.

3.5.3 Where deck fixed water monitor systems specified in Chapter 4 of the Guidelines are provided, the number of mobile water monitors are taken as 2 when determining the capacity of fire pumps according to 3.5.2.

3.5.4 The system water supply pumps are to be capable of manual start locally, as well as being started remotely from the navigation bridge or fire control station.

3.5.5 The design and arrangement of the system's pipelines (including dedicated or common seawater inlets) are to be such as not to affect the normal operation of other equipment or systems on the ship, e.g. the main engine cooling system, when this system is in operation.

3.5.6 The pipes, valves and fittings (except for gaskets) of this system are to be made of steel or other equivalent materials.

3.5.7 Where this system is arranged with section valves, they are to be arranged in readily accessible safe positions.

## Chapter 4 Deck Fixed Water Monitor Systems

### 4.1 Scope of application

4.1.1 This Chapter applies to ships which apply for notation fm.

### 4.2 Plans and information

4.2.1 The following plans and information, as appropriate, are to be submitted:

- (1) fire main systems and arrangement plan (for approval);
- (2) deck fixed water monitor systems, arrange plan and pipe network pressure drop calculations (for approval).

### 4.3 Fixed water monitors

4.3.1 At the fore and aft end of any row container bay of dangerous goods, including the fore end of the foremost container stowage area and the aft end of the aftermost container stowage area, at least one fixed water monitor at each side is to be provided at suitable places. The fixed water monitors are to be connected to dedicated pipelines or fire mains through fixed pipelines so as to ensure effective water curtains can be formed before and after the stowage bay in the event of a fire.

4.3.2 The performance of fixed water monitors are to satisfy the requirements of the *Guidelines for the design, performance, testing and approval of mobile water monitors used for the protection of on-deck cargo areas of ships designed and constructed to carry five or more tiers of containers on or above the weather deck* (MSC.1/Circ.1472). In addition, its water throw is to be able to reach the highest container at the opposite side of the ship.

### 4.4 System water supply

4.4.1 Where dedicated pipelines are used, the system is to be provided with at least two water supply pumps with a total capacity meeting the water demand of this system. When the system is in operation, the water rate of the water curtain is not to be less than  $5l/m^2min$  (the largest cross-sectional area of any container stowage area). The dedicated water supply pipelines are to be provided with connection from the fire main and be connected through a stop check valve.

4.4.2 The system may use the ship's fire main and main fire pumps, provided that the capacity of the main fire pumps is to be increased accordingly to meet the need for simultaneous use of the following equipment and systems:

- (1) 2 mobile water monitors; and
- (2) 4 fire hydrants; and
- (3) 2 water mist lances; and
- (4) water spraying system protecting accommodation areas, lifeboats, liferafts, embarkation stations and muster stations (if fitted).

At the same time, the pressure of each fire hydrant is to satisfy the requirements of SOLAS regulation II-2/10.2.1.6.

4.4.3 The system water supply pumps are to be capable of manual start locally, as well as being started remotely from the navigation bridge or fire control station.

4.4.4 The design and arrangement of the system's pipelines (including dedicated or common seawater inlets) are to be such as not to affect the normal operation of other equipment or systems on the ship, e.g. the main engine cooling system, when this system is in operation.

4.4.5 The pipes, valves and fittings (except for gaskets) of this system are to be made of steel or other equivalent materials.

## **Chapter 5 Temperature Monitoring System of Container Stowage Areas**

### **5.1 Scope of application**

5.1.1 This Chapter applies to ships which apply for notation fd.

### **5.2 Plans and information**

5.2.1 The following plans and information, as appropriate, are to be submitted:

- (1) temperature monitoring systems and arrangement plan (for approval);
- (2) effective monitoring area plan of temperature monitoring systems (for information).

### **5.3 On-deck container stowage areas and open cargo holds**

5.3.1 Infrared monitoring equipment is to be provided at fore and aft end of any container stowage area, to monitor any change of the surface temperature of container, which is to be indicated on the navigation bridge. An audible and visual alarm is to be given on the navigation bridge in case any of the following conditions of the surface temperature of containers is detected:

- (1) being above 100 °C; or
- (2) being 50 °C above the ambient temperature; or
- (3) temperature being rising at a rate exceeding 1 °C per minute, before the temperature exceeds 78 °C but not until the temperature exceeds 54 °C.

5.3.2 The infrared monitoring equipment is to be so arranged to detect as much surface area of containers as possible and to be protected against damage.

### **5.4 Under-deck enclosed cargo holds**

5.4.1 In addition to fire detection and fire alarm systems or sample extraction smoke detection systems complying with the FSS Code, under-deck enclosed cargo holds are to be provided with infrared monitoring equipment satisfying the requirements of 5.3 or other equipment capable of detecting the surface temperature of container.

5.4.2 For the design of under-deck enclosed cargo holds, due consideration is to be given to the installation and working space required for infrared monitoring equipment or other equipment capable of detecting the surface temperature of container.

### **5.5 System power supply**

5.5.1 The temperature monitoring system of container stowage area is to be supplied by main and emergency sources of electrical power.

### **5.6 Miscellaneous**

5.6.1 The temperature monitoring system is to meet recognized national or international standards for temperature monitoring.

5.6.2 When the system is fitted in the stowage area and cargo hold for stowing dangerous goods, relevant requirements of SOLAS Regulation II-2/19.3.2 are also to be observed.

## Chapter 6 Cargo Hold Water Spraying Systems

### 6.1 Scope of application

6.1.1 This Chapter applies to ships which apply for notation ws.

### 6.2 Plans and information

6.2.1 The following plans and information, as appropriate, are to be submitted:

- (1) fire main systems and arrangement plan (for approval);
- (2) cargo hold water spraying systems, arrange plan and pipe network pressure drop calculations (for approval);
- (3) cargo hold drainage systems and arrangement plan (for approval).

### 6.3 Cargo hold water spraying system

6.3.1 Fixed water spraying systems are to be arranged in the cargo holds, with a rate of water spraying not less than  $5l/m^2min$ . The spraying nozzles of the system are to be uniformly arranged so that the water can be uniformly sprayed between the container and the hatch cover, and effectively cool the hatch cover, the ship structure above the containers and the interior of the cargo hold while extinguishing the fire.

6.3.2 The total water supply of the system is to be determined according to the cargo hold with the largest water demand.

6.3.3 The system may use a dedicated piping system, or it can be connected from the fire main system.

### 6.4 System water supply

6.4.1 Where dedicated piping system is used, the system is to be provided with at least two water supply pumps with a total water supply meeting the water demand of this system. The dedicated water supply piping system is to be provided with connection from the fire main through a stop check valve.

6.4.2 The system may use the ship's fire main and main fire pump, provided that the capacity of the main fire pumps is to be increased accordingly to meet the need of simultaneous use of the following equipment and systems:

- (1) 6 mobile water monitors; and
- (2) 2 fire hydrants; and
- (3) 2 water mist lances.

At the same time, the pressure of each fire hydrant is to satisfy the requirements of SOLAS regulation II-2/10.2.1.6.

6.4.3 The system water supply pumps are to be capable of manual start locally, as well as being started remotely from the navigation bridge or fire control station.

6.4.4 The design and arrangement of the system's pipelines (including dedicated or common seawater inlets) are to be such as not to affect the normal operation of other equipment or systems on the ship, e.g. the main engine cooling system, when this system is in operation.

6.4.5 The pipes, valves and fittings (except for gaskets) of this system are to be made of steel or other equivalent materials.

## **6.5 Cargo hold drainage systems**

6.5.1 The drainage system of under-deck cargo hold is to be able to effectively remove the amount of water accumulated from operation of the water spraying system, with a capacity of removing no less than 125% of the combined water amount from both the water spraying system and 4 fire hydrants. The valves are to be operable from outside the protected space at a position in the vicinity of the water spraying system operation.

6.5.2 For cargo holds used for stowing dangerous goods, the drainage system is also to satisfy applicable requirements of SOLAS regulation II-2/19.3.5.