Guidelines for Additional Fire-fighting Measures for Container Carriers

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1. INTRODUCTION

Requirements related to fire safety systems are specified in the SOLAS Convention, the ClassNK Rules, etc. The requirements are suitable for the features of machinery spaces, accommodation spaces, cargo spaces, etc. In many cases, the requirements for cargo spaces were originally established to apply to ships carrying conventional cargo such as general dry cargo. However, as a result of recent innovative technologies, ships may transport cargo with characteristics and properties different from those in the past. Although the SOLAS Convention and other international regulations are amended as necessary to ensure that their requirements are appropriate for the cargo transport mode , these revisions sometimes fail to keep up with actual social changes.

Even though the conventions applicable to container carriers have been amended in response to the increasing size of these ships, not a few serious fire accidents have occurred in recent years. The International Maritime Organization (IMO) is reviewing the conventions for further safety.

In the IMO, a draft of a new work plan with the aim of developing new requirements for fire safety measures on container carriers was approved in the 103th session of the Maritime Safety Committee (MSC103) held in May 2021. As per this plan, the discussions are to be completed by 2025, coming into force in January 2028. At the 8th session of the IMO's Sub-Committee on Ship Systems and Equipment (SSE8) held in February 2022 and the 9th session (SSE9) held in February 2023, some proposals to install video thermal monitoring systems and fixed water monitor systems were submitted to respond to fires on weather deck cargo spaces.

On the other hand, there have also been movements among some ship owners and ship management companies which operate mega container carriers. They intend to proceed with a voluntary response in advance of the discussions in the IMO. For supporting such ship owners and companies, Nippon Kaiji Kyokai (ClassNK, hereinafter, the Society) decide to release "Guidelines for Additional Fire-fighting Measures for Container Carriers" for evaluation of additional fire-fighting measures implemented on a voluntary basis. The Society will affix the applicable class notations, corresponding to individual fire-fighting measures, to the container carriers that satisfy the Guidelines' requirements.

This report presents an overview of the requirements for the additional fire-fighting measures provided in the Guidelines.

Fig. 1 Container carrier

2. OVERVIEW OF ADDITIONAL FIRE-FIGHTING MEASURES

2.1 General Requirements

The general requirements mainly specify the strengthening of equipment and machinery required by the SOLAS Convention, such as fire pumps and fire hoses. The concrete requirements are as follows.

(1) Fire control stations: Fire control stations for controlling container fires are to be arranged. These fire control stations are to be provided with ① Information on openings for cargo holds and related information, ② Training manuals, ③ At least ten UHF radios, ④ Stopping devices for mechanical ventilation systems for cargo holds, ⑤ Electrical stopping devices for reefer containers, ⑥ Audible and visual alarms for fire detection systems for cargo holds and/or weather deck cargo spaces, ⑦ Water pressure indicators for fixed water spray systems for cargo holds and/or weather deck cargo spaces (in case fixed water spray systems are installed), and ⑧ Remote control systems for fixed water spray systems for cargo holds and/or weather deck cargo spaces (in case fixed type water spray systems are installed).
The fire control stations may be utilized as fire control stations specified in the existing ClassNK Rules for the Survey and Construction of Steel Ships (hereinafter, the Rules), etc.

(2) Fire pumps: The total capacity of fire pumps is to satisfy the maximum water quantity when using firefighting systems required to use simultaneously by the Rules and the Guidelines.

(3) Fire mains: Fire main lines are to be provided with isolation valves at intervals of not more than 40 meters. Fire hydrants are to be provided for each cargo hold, either one hydrant on both sides of the deck, or one double-mouth type hydrant located at or near the centerline of the ship.

(4) Fire hoses: At least ten fire hoses are to be provided for weather deck cargo spaces. The total number may include fire hoses required by the Rules. Fire hoses are to be provided equally on both sides of the deck.

(5) Water mist lances and mobile water monitors: Water mist lances and mobile water monitors already required in the Rules are to be provided.

(6) Indication of carriage of dangerous goods: In cases where dangerous goods classified as Class 4.3 in accordance with the International Maritime Dangerous Good Code (IMDG Code) or dangerous goods reactive to water are being carried, the relevant loading information is to be indicated at fire control stations.

2.2 Additional Fire Detection Systems for Cargo Holds

2.2.1 Smoke and Heat Detection Systems

For continuous detection of smoke/heat or both in spaces where smoke or heat may accumulate in cargo holds, the following detection systems, for example, are to be provided in the cargo holds.

- Sample extraction smoke detection systems whose detection interval is shorter than the interval specified in the Rules
- Laser smoke detection systems
- Thermography camera systems
- Optical image systems

The following spaces are some examples of requiring continuous detection.

- Void spaces, not loaded with containers, in cargo holds
- Inlets and outlets where smoke may accumulate or pass
- Upper parts in cargo holds
- Spaces provided with equipment for reefer containers (if provided)

2.2.2 Thermal Monitoring Systems

Thermal monitoring systems which are capable of continuously detecting the temperature in cargo holds are to be provided for early detection of heat increases or fires inside containers. As an example of the installation locations of these systems, transverse bulkheads of cargo holds is assumed.

2.3 Additional Fire Detection Measures for Weather Deck Cargo Spaces

2.3.1 Fire Patrols

In order to conduct fire patrols effectively, the equipment for fire patrols is to be provided below, and implementation procedures are to be established.

- Periodical fire patrols provided with portable thermal sensors and UHF radios are to be carried out in accordance with

approved fire training procedures.

- At least two portable thermal sensors for fire patrol use are to be provided in the fire control stations specified in section 2.1.

2.3.2 Thermal Monitoring Systems – Whole Area

Thermal monitoring systems are to be provided for continuous monitoring of the temperature of the whole weather deck cargo spaces. Since these systems are to be capable of monitoring the containers loaded at the highest position, the assumed installation positions are such as bridge deck or funnels (not affected by exhaust gas).

2.3.3 Thermal Monitoring Systems – Local Area

Thermal monitoring systems are to be provided for continuous monitoring of the local temperature of weather deck cargo spaces. The assumed installation positions are at or around lashing bridges.

2.4 Additional Water Spray Systems Installed in Cargo Holds

Water spray systems are to be provided to prevent from spreading fires to other holds and adjacent spaces. Water spray nozzles are to be arranged so as to prevent the spread of a fire in a cargo hold to the upper weather deck and adjacent cargo holds over hatch covers, bulkheads, etc. The following nozzle arrangements are examples.

- Uniformly distributing at 5 liters/min/m^2 to hatch covers, hatch coamings and upper surface areas of the top tiers containers in cargo holds.
- Uniformly distributing at 2 liters/min/m^2 to the end walls of the container in cargo holds and the upper one-third parts of the fore/aft bulkheads in way of cargo holds.

In addition, drainage systems are to satisfy the following.

- Drainage systems are to be sized to no less than 125% of the total capacity of both the water spray system and the water supply from fire hoses.
- Stop valves for drainage systems are to be controllable from positions outside of cargo holds. In addition, such positions are to be easily accessible during cargo hold fires.
- Strainers or grating are to be provided for bilge wells to prevent clogging.
- Eductor systems using the main fire pumps may be provided when the capacity of such pumps is a sufficient amount of water necessary for other fire-fighting activities.

In addition, water level detection systems are to be provided, detecting the water level with a function indicating the water level.

2.5 Additional Fixed Water-Based Systems Installed in Weather Deck Cargo Spaces

2.5.1 Fixed Water Curtain Systems

Fixed water curtain systems are to be provided to prevent fire from spreading in weather deck cargo spaces. The following arrangements are assumed as examples of water spray nozzles.

- Distributing at 2 liters/min/m^2 to deckhouse and engine room case end-walls where is faced to container bays.
- Distributing at 2 liters/min/m^2 to the end wall surface of maximum loadable containers stowed in a bay. (Water spray systems /water curtain systems may be installed at all container lashing bridges for distributing water to all coverage areas.)

2.5.2 Fixed Water Monitor Systems

Fixed water monitor systems, that can protect the entire container bay on deck, are to be provided for fires in weather deck cargo spaces. These systems are to be capable of protecting the upper area of containers stowed on top tiers covered at 2 liters/min/m^2 by at least two monitors. The two monitors located at the fore/aft near the fire may be used simultaneously.

Fig. 2 shows the image of the water systems described in the sections 2.4. and 2.5.

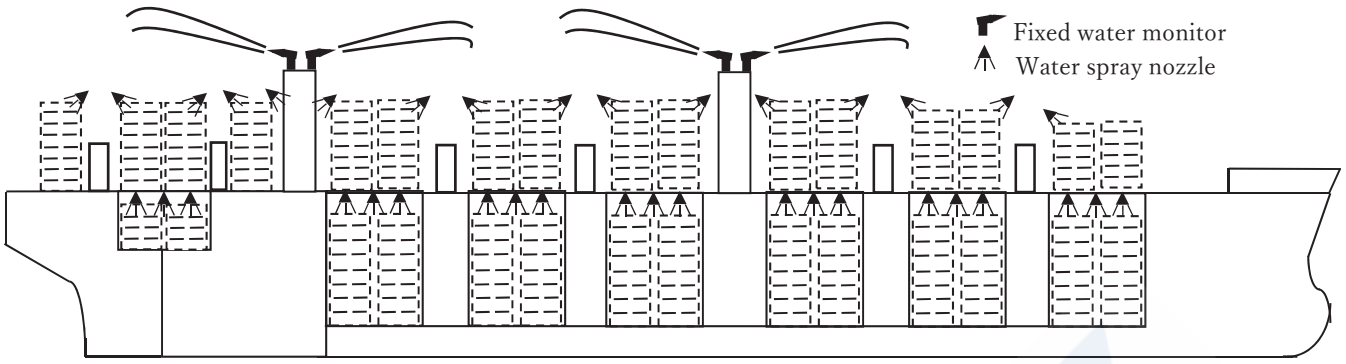

Fig. 2　Image of water systems

2.6　Flooding of Cargo Holds

Systems for flooding cargo holds are to be provided. In principle, simultaneous flooding of multiple cargo holds is not assumed. In cases where fixed flooding system is installed, it is desirable that the system is capable of reaching the design flooding height within 24 hours.

The following auxiliary devices are also to be provided for the flooding systems.

(1) Water Level Detecting Systems: Water level detecting systems are capable of detecting the water level in the flooding cargo holds and have a function for indicating water level are to be provided. System operation is not to be affected by heat generated by cargo hold fires.

(2) Water Ingress Prevention Means: Other cargo holds and surrounding spaces are to be designed to prevent water from entering into other spaces when the flooding is done for fire-fighting purposes.

Sufficient study must be given to the hull strength and stability in the set flooding condition. The requirements to be considered when providing flooding systems are as follows.

(1) Design Flooding Level: Designed flooding level is to be allowable in consideration of hull girder strength, primary supporting hull structural strength and local strength. In case where the design flooding level is below the tops of cargo holds, the design flooding level is to be clearly mentioned in the stability documents.

(2) Stability: Stability is to be mentioned in cases where cargo holds are flooded. The prerequisite conditions for stability calculations are as follows.

- Each cargo hold is flooded under the condition of loading containers into the cargo hold.
- Flooding level is the above-mentioned design flooding level.
- For the free surface effects of flooding water in a cargo hold, the flooding level with the most severe free surface effects is to be applied. In addition, the flooding level used is to be between the bottom level of the cargo hold and the design flooding level. In such cases, free surface effects are to be calculated under the condition of empty cargo holds (no containers in the cargo hold).
- The specific gravity used for calculations is to be the specific gravity of the actual liquid used for the flooding purpose.
- Flooding rate of the cargo holds is to be 0.7 or a value deemed appropriate by the Society.

(3) Strength Requirements: Hull girder collapse and other serious damage to the cargo hold structure are to be avoided, even when a cargo hold is flooded.

(4) Longitudinal Strength: Longitudinal strength under the flooding condition is to be assessed for each cargo hold. The flooding rate is to be taken as 0.7 when calculating the calm sea water bending moment for flooding. However, other values may be used when their appropriateness can be verified.

(5) Primary Structural Support Strength: Primary structural support strength is to satisfy the requirements for the water ingress condition in Chapter 8 of the Rules, Part 1, Part C in consideration of the water head for the design water flooding level.

(6) Local Strength: Plates and stiffeners are to satisfy the requirements for the water ingress condition in Chapter 6 of the Rules, Part 1, Part C in consideration of the water head for the design water flooding level.

Emergency Technical Assistance Service (ETAS): Ships provided with flooding systems are to be registered for Emergency Technical Assistance Service (ETAS).

3. CLASSIFICATION CHARACTERS

"Additional Fire-fighting Measures for Container Carrier (XX)" (abbreviated AFC (XX) is affixed to the classification characters of container carriers adding the measures described in Chapter 2. The additional fire-fighting measures corresponding to "XX" are shown in Table 1.

Table 1 Affixation of class notation for additional fire-fighting measures

Class Notation	Detail
AFC(G)	*Additional Fire-Fighting Measures for Container Carrier (General) (**AFC(G)**)*: Affixed to the classification characters for ships provided with the additional fire-fighting measures specified in **2.1.**
AFC(DH)	*Additional Fire-Fighting Measures for Container Carrier (Detection of Cargo Holds) (**AFC(DH)**)*: Affixed to the classification characters for ships provided with the additional fire detection systems in cargo holds specified in **2.2.**
AFC(DH-SH)	The class notation ***AFC(DH-SH)*** is affixed to the classification characters for ships provided with a combination of **S**moke Detection Systems and /or **H**eat Detection Systems as additional fire detection systems in cargo holds.
AFC(DH-TM)	The class notation ***AFC(DH-TM)*** is affixed to the classification characters for ships provided with **T**hermal **M**onitoring Systems as additional fire detection systems in cargo holds
AFC(DD)	*Additional Fire-Fighting Measures for Container Carrier (Detection for Weather Deck Cargo Spaces) (**AFC(DD)**)*: Affixed to the classification characters for ships provided with additional fire detection systems for weather deck cargo spaces specified in **2.3**.
AFC(DD-FP)	The class notation ***AFC(DD-FP)*** is affixed to the classification characters for ships provided with measures for **F**ire **P**atrols as an additional fire detection measure on weather deck cargo spaces.
AFC(DD-TMW)	The class notation ***AFC(DD-TMW)*** is affixed to the classification characters for ships provided with **T**hermal **M**onitoring Systems - **W**hole Area as additional fire detection measures on weather deck cargo spaces.
AFC(DD-TML)	The class notation ***AFC(DD-TML)*** is affixed to the classification characters for ships provides with **T**hermal **M**onitoring Systems - **L**ocal Area as additional fire detection measures on weather deck cargo spaces.
AFC(WH)	*Additional Fire-Fighting Measures for Container Carrier (Water Spray Systems Installed in Cargo Holds) (**AFC(WH)**)*: Affixed to the classification characters for ships provided with additional water spray systems in cargo holds specified in **2.4.**
AFC(WD)	*Additional Fire-Fighting Measures for Container Carrier (Fixed Water-Based Systems Installed in Weather Deck Cargo Spaces) (**AFC(WD)**)*: Affixed to the classification characters for ships provided with additional fixed water-based systems in weather deck cargo spaces specified in **2.5.**
AFC(WD-C)	The class notation ***AFC(WD-C)*** is affixed to the classification characters for ships provided with Fixed Water **C**urtain Systems as additional fixed water-based systems in weather deck cargo spaces.
AFC(WD-M)	The class notation ***AFC(WD-M)*** is affixed to the classification characters for ships provided with Fixed Water **M**onitor Systems as additional fixed water-based systems in weather deck cargo spaces.
AFC(FH)	*Additional Fire-Fighting Measures for Container Carrier (Flooding of Cargo Holds)(**AFC(FH)**)*: Affixed to the classification characters for ships that conform to the requirements for flooding of cargo holds specified in **2.6.**

4. CONCLUSIONS

The Society issued the Guidelines summarizing additional fire-fighting measures to improve the safety against cargo fires on container carriers. While also monitoring the discussion in the IMO, the Society will update the Guidelines as necessary and provide useful Guidelines for additional fire-fighting measures for container carriers. We hope that the Guidelines make container carriers improve fire safety and proactive implementation of safety-related initiatives in the maritime industry.