



GUIDE FOR

**FIRE-FIGHTING SYSTEMS FOR ON-DECK CARGO
AREAS OF CONTAINER CARRIERS**

MAY 2017

**American Bureau of Shipping
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Foreword (1 May 2017)

Container Carriers have grown much larger in recent years and the volume of cargo carried on deck has expanded exponentially. Fires involving the containers on deck, especially with the volume of cargo now being carried, can present a substantial risk to the safety of the crew and the vessel.

The requirements of SOLAS Chapter II-2 Regulation 10 have been revised in accordance with IMO Resolution MSC 365(93) to address the risk and came into effect for ships designed to carry containers on or above the weather deck, constructed on or after 1 January 2016. While the basic SOLAS requirements are incorporated by reference in the ABS *Rules for Building and Classing Steel Vessels (Steel Vessel Rules)*, this Guide has been developed to provide for further enhancement of the fire-fighting capabilities for on-deck cargo areas of Container Carriers beyond that required by SOLAS.

This Guide is for the use of designers, builders, owners and operators in the marine industry and specifies the ABS requirements and criteria for obtaining **one of** the optional notations **as follows**:

- **FOC** (Fire-fighting On-deck Container),
- **FOC-R** (Fire-fighting On-deck Container – Restricted),
- **FOC+** (Fire-fighting On-deck Container Plus), or
- **FOC-R+** (Fire-fighting On-deck Container – Restricted Plus).

The **FOC** notation is being offered primarily to recognize enhanced container deck firefighting capability onboard Container Carriers beyond that required by SOLAS Chapter II-2 Regulation 10 requirements [as amended by IMO Resolution MSC 365(93)].

The **FOC-R** notation is being offered primarily to recognize container deck firefighting capability onboard Container Carriers when full compliance with the **FOC** notation requirements is not practical. It is applicable to container carriers constructed either before 1 January 2016 (designed to carry any number of container tiers on deck) or those constructed after 1 January 2016 (designed to carry 4 or less tiers of containers on deck), but do provide on deck firefighting arrangements that exceed the SOLAS requirements applicable to those vessels.

The **FOC+** and **FOC-R+** notations invoke additional requirements addressing the protection of the hatch covers.

The requirements are based on SI units, and the values shown in US (foot-pound-second) units are derived by numerical conversion.

This Guide becomes effective on the first day of the month of publication.

Users are advised to check periodically on the ABS website www.eagle.org to verify that this version of this Guide is the most current.

We welcome your feedback. Comments or suggestions can be sent electronically by email to rsd@eagle.org.



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SECTION 1 Introduction

1 Scope (*1 May 2017*)

This Guide identifies the required criteria for obtaining **one of the optional notations for Container Carriers classed with ABS as follows:**

- **FOC** (Fire-fighting On-deck Container),
- **FOC-R** (Fire-fighting On-deck Container – Restricted),
- **FOC+** (Fire-fighting On-deck Container Plus), or
- **FOC-R+** (Fire-fighting On-deck Container – Restricted Plus).

3 Application (*1 May 2017*)

Container Carriers provided with a fire-fighting piping system and additional fire-fighting equipment in compliance with Section 2 of this Guide will be eligible for the notation **FOC**. **Container Carriers fitted with fire-fighting equipment and arrangements complying with Section 3 of this Guide will be eligible for the notation FOC-R.** A vessel also in compliance with the enhanced requirements of Section 4 of this Guide will be eligible for **either the notation FOC+ or FOC-R+, as applicable.**

The **FOC** notation is being offered primarily to recognize enhanced container deck firefighting capability onboard Container Carriers beyond that required by SOLAS Chapter II-2 Regulation 10 requirements [as amended by IMO Resolution MSC 365(93)].

The **FOC-R** notation is being offered primarily to recognize container deck firefighting capability onboard Container Carriers when full compliance with the **FOC** notation requirements is not practical. It is applicable to container carriers constructed either before 1 January 2016 (designed to carry any number of container tiers on deck) or those constructed after 1 January 2016 (designed to carry 4 or less tiers of containers on deck), but do provide on deck firefighting arrangements that exceed the SOLAS requirements applicable to those vessels.

The **FOC+** and **FOC-R+** notations invoke additional requirements addressing the protection of the hatch covers.

5 Definitions

5.1 Bay

A *Bay* is an athwartship block of containers associated with a hatch or hatch cover containing multiple stacks extending longitudinally between two adjacent lashing bridges or lashing stations.

5.3 Container Carrier

A *Container Carrier* is a seagoing vessel specifically designed, constructed, and equipped with the appropriate facilities to carry cargo containers. These containers are stowed in cargo spaces (i.e., in cargo holds below deck) and on hatches and cargo areas located on the weather deck. A fully cellular type carries only containers with cell-guides under deck and the necessary fittings and equipment on deck.

5.5 Dangerous Goods

Dangerous Goods are the substances, materials, and articles covered by the International Maritime Dangerous Goods Code (IMDG Code).

5.7 Mobile Water Monitors

Mobile Water Monitors are large bore water discharge devices of portable or wheeled type, consisting of inlet fitting(s), monitor waterway, swivel fittings, and discharge nozzle.

5.9 On-deck Cargo Area

On-deck Cargo Area is the portion of the weather deck, including hatch covers, arranged with the necessary fittings and equipment to stow a number of container stacks.

5.11 Stack

Stack is a single vertical row of containers containing one or more tiers. Also referred to as a *row*.

5.13 Tier

Tier is an indication of the vertical position of a container in a stack. The first tier is the lowest or bottom-most position in the stack.

5.15 Water Mist Lance

A *Water Mist Lance* consists of a tube with a piercing nozzle which is capable of penetrating a container wall and producing a water mist inside the container when connected to the fire main.

7 Submission of Design Plans and Data

Plans should generally be submitted electronically to ABS. However, hard copies will also be accepted. For details, see 4-1-1/5.1 of the *ABS Rules for Building and Classing Steel Vessels (Steel Vessel Rules)*.

In addition to the submission of plans according to the requirements stated in 4-1-1/5.3 and 4-7-1/7 of the *Steel Vessel Rules*, the following design plans and data are to be submitted:

7.1 FOC and FOC-R Notations (1 May 2017)

- i) Diagrammatic plans of the piping system for the fire main and the fire protection of the on-deck cargo area. These plans are to be **accompanied** by lists of material denoting:
 - Size, wall thickness, maximum working pressure, material and standards of all pipes
 - Type, size, pressure rating, material and standards of any fittings, valves, and fire hydrants
 - Type, capacity, pressure rating and the performance curves of pumps
- ii) Detailed specifications including operating flow rates, pressures, spray patterns and throw distance of all types of mobile water monitors and water mist lances
- iii) Detailed specifications including operating flow rates and pressure rating of the water mist lances and analysis/testing results or other information validating that the water mist lance is of a type capable of penetrating a standard container
- iv) Flow rate and pressure analysis of the fire protection piping system during operations at the most hydraulically remote location
- v) Operating procedures for the fire protection system of the on-deck cargo area. As a minimum, these procedures are to include:
 - The storage location, handling and operation instructions of the mobile water monitors, hoses, fittings, and fixing hardware
 - Arrangements showing the locations and attachment methods of the mobile water monitors for each bay
 - Storage location, handling and operation instructions of the water mist lance
 - Storage location of fire protection equipment for the crew
 - Manufacturer's operating manual for the mobile water monitors which includes information on the safe operations of the monitors

7.3 FOC+ and FOC-R+ Notations (1 May 2017)

In addition to 1/7.1, the following is to be submitted:

- i)* Diagrammatic plans of the piping system for the water-spray system of 4/3.1. These plans are to be accompanied by lists of material giving:
 - Size, wall thickness, maximum working pressure, material and standards of all pipes
 - Type, size, pressure rating, material and standards of any fittings, valves, and spray nozzles
 - Type, capacity, and pressure rating of pumps
- ii)* Flow rate and pressure analysis of the piping system for hatch cover



SECTION 2 FOC Notation

1 General (1 May 2017)

The **FOC** notation is being offered primarily to recognize enhanced container deck firefighting capability onboard Container Carriers beyond that required by SOLAS Chapter II-2 Regulation 10 requirements [as amended by IMO Resolution MSC 365(93)]. Where the optional **FOC** notation is requested, the following fire safety equipment and arrangements, which includes the basic SOLAS requirements, are to be provided.

3 Cargo Deck Area Fire Main System

3.1 General

Every vessel is to be provided with pumps, water service pipes, and hydrants complying with the provisions of this Subsection, as applicable.

3.3 Capacity (1 May 2017)

The total combined capacity of the fire pumps and fire main diameter are to be sufficient to supply the required pressure and volume for adequate and simultaneous operation of the following:

- i) Fire main system required by 4-7-3/1 of the *Steel Vessel Rules*, supplying four (4) hoses on the weather deck at the pressure identified in 2/3.5 below, equally divided between both sides,
- ii) A flow rate of water through the required number of monitors equivalent to 2.0 l/min/m² times the maximum projected area of the combined faces of the largest bay (forward and aft) that could be engaged in a fire, but not less than the minimum capacity of the required monitors [see 2/5.3iii)],
- iii) Water mist lance, see Subsection 2/9,
- iv) Any additional water arrangements required by 4-7-2/7.3 of the *Steel Vessel Rules* for dry cargo spaces intended to carry dangerous goods,
- v) Any other fixed fire-fighting systems served by the fire pumps that could be expected to operate at the same time, and
- vi) If applicable, the fixed water-spray system for hatch covers, see 4/3.1.
- vii) The application of water on container bays forward and aft of a bay engaged in a fire as specified in 2/3.11

The **drainage** of the cargo holds is to be independent of the cargo area fire main system. Dewatering of the cargo holds by eductors supplied from the fire pumps may be used provided the available capacity is adequate to simultaneously supply all required firefighting services as well as the eductors of any two adjacent holds.

3.5 Pressure (1 August 2016)

With the combined fire pumps in operation, the system is to be capable of delivering the quantity of water necessary to simultaneously supply all required mobile water monitors at the most hydraulically remote location at the required flow rate and with the pressure necessary to reach the top tier of the containers on deck [see 2/5.3v)] along with all other fire-fighting systems and equipment identified above in 2/3.3 at their required flow rates and pressures while maintaining the following minimum pressures at all hydrants on the vessel:

- i) Vessels of 6,000 gross tonnage and upwards: 0.27 N/mm² (2.8 kgf/cm², 40 psi)
- ii) Vessels less than 6,000 gross tonnage: 0.25 N/mm² (2.6 kgf/cm², 37 psi)

During all possible operating scenarios, the maximum pressure at any hydrant is not to exceed that at which the effective control of a fire hose can be demonstrated.

3.7 Cargo Deck Area Fire Main Piping (1 August 2016)

The fire main piping serving the on deck cargo area is to consist of two runs, one on each side of the vessel, traversing the length of the on-deck cargo area and located outboard of the cargo hatch area. The port and starboard lines are to be interconnected at the forward and aft ends of the vessel (i.e., loop fire main). The combined diameters of this piping are to be sufficient for the effective distribution of the discharge required by the equipment and systems identified in 2/3.3 at the required pressures from the fire pumps while operating simultaneously.

The water piping serving the cargo area is to be provided with manually operable isolation valves every 40 meters (130 feet). Also, isolation valves are to be installed adjacent to an accommodation superstructure or deck house and located before entering the on-deck cargo areas forward and aft of the superstructure or deck house. A normally closed isolation valve is to also be installed where the two fire lines connect together at the forward and aft ends of the vessel.

Drainage arrangements are to be provided to protect against freezing water damage.

3.9 Weather Deck Hydrants Arrangements (1 August 2016)

3.9.1 Number and Position

The number and position of hydrants in the cargo area are to comply with the following:

- i) All required monitors are to be capable of operating simultaneously
- ii) There are to be a sufficient number of hydrants immediately forward and aft of each container bay to supply the total required number of monitors; each from a separate hydrant and at least half the required number through a single 15 m (50 ft) length of fire hose.
- iii) The locations of the hydrants are to allow the monitors to be evenly distributed along the width of the spaces between the container bays, to the extent practicable;
- iv) At least one hydrant is to be located immediately outboard on each side of the space between the container bays. Where a lashing bridge is fitted, these hydrants are to be located on the top of the lashing bridge. The jet of water from a mobile water monitor connected to these hydrants is to be capable of reaching inboard at least **two** thirds the breadth of the vessel.

3.9.2 Protection of Hoses and Hydrants

Arrangements are to be provided to cool the hoses and hydrants that will be located between the container bays from the effects of the heat of the fire, unless otherwise determined to be suitable for prolonged exposure under such conditions.

3.11 Application of Water on Container Bays Forward and Aft of Bay Engaged in a Fire (1 May 2017)

The system is to provide for the simultaneous operation of all required monitors evenly distributed between the forward and aft of any bay that could be engaged in a fire at the required capacity and pressure (refer to 3/3.5) in addition to any other system identified in 2/3.3.

3.13 Relief Valves, Pipes and Hydrants

Relief valves are to comply with 4-7-3/1.5.6 of the *Steel Vessel Rules*.

Pipes and hydrants are to comply with 4-7-3/1.11.1 and 4-7-3/1.11.2 of the *Steel Vessel Rules*.

All piping, valves, and hydrants are to be suitably protected from damage and corrosion.

5 Mobile Water Monitors (1 May 2017)

5.1 Minimum Number of Mobile Water Monitors

- i) Vessels with a breadth **less than** 30 m (98 ft) are to be provided with at least four (4) mobile water monitors.
- ii) Vessels with a breadth **of at least** 30 m (98 ft) **but less than** 45 m (147.6 ft) are to be provided with at least six (6) mobile water monitors.
- iii) Vessels with a breadth **of at least** 45 m (147.5 ft) **but less than** 60 m (197 ft) are to be provided with at least eight (8) mobile water monitors.
- iv) Vessels with a breadth **of** 60 m (197 ft) **or more** are to be provided with at least ten (10) mobile water monitors.

5.3 Mobile Water Monitors

Each mobile water monitor, as a minimum, is to comply with the following:

- i) Constructed of lightweight, corrosion-resistant materials.
- ii) Equipped with a coupling allowing connection to the vessel's fire hydrants via a fire hose. The coupling and hose are to be sized for the proper flow and pressure **to support the** performance of the monitor.
- iii) The minimum capacity is to be 60 m³/hr (1,000 liters/min, 265 gpm) at the pressure necessary to reach the top tier of the containers on deck (see 2/5.3v below).
- iv) Capable of a minimum horizontal throw of 40 m (131 ft) at an inlet pressure of 0.4 N/mm² (4.1 kgf/cm², 58 psi), when discharging at a horizontal elevation of 30-35°.
- v) Capable of a minimum vertical throw sufficient to reach the top of the highest tier of containers when discharging at an elevation of not more than 75°.
- vi) Allows swiveling of the discharge nozzle for adjusting the throw direction of the water in both the horizontal and vertical planes, while in continuous operation. The vertical swivel range is to be 0° to 90°. If lubrication is required, external lubrication fittings are to be provided for the swivel joints.
- vii) The discharge nozzle is to be of a dual-purpose spray/jet type incorporating a shutoff and capable of discharging an effective water spray between container bays in the event of a container fire in the on-deck cargo area.
- viii) The design configuration is to minimize nozzle thrust reaction, and is to permit unattended operation once the monitor is placed in position.
- ix) Provide means to ensure a secure/safe fixing to the vessel's weather deck, lashing bridge, or other structure.
- x) Provide a carrying handle or other means for ease of transport. Monitors weighing more than 23 kg (50 lbs) are to be fitted with wheels.
- xi) Where monitors are to be used on a lashing bridge, arrangements such as davits or hoists are to be provided on the port and starboard sides of each lashing bridge to raise and lower the monitors.

The mobile water monitors, all necessary hoses, fittings, and required fixing hardware are to be kept ready for use in a location outside the cargo space area and accessible in the event of a fire in the cargo spaces.

Efficient drainage of water from deck surfaces is to be provided when the mobile water monitors are in operation.

7 Alternative Arrangements (1 August 2016)

A fixed water spray system or a combination of a fixed and mobile water monitor system may be specially considered as an alternative to the hydrants and mobile water monitors addressed above provided it is established to provide an equivalent level of protection.

9 Water Mist Lance

Vessels carrying containers on the weather deck are to be provided with at least one water mist lance. The water mist lance is to be of a type capable of penetrating a standard container.

11 Fire-fighter's Breathing Apparatus (1 August 2016)

For each required breathing apparatus, four spare charges are to be provided in addition to the requirements of 4-7-3/15.5.1(b) of the *Steel Vessel Rules*.



SECTION 3 FOC-R Notation (1 May 2017)

1 General

The **FOC-R** notation is being offered primarily to recognize container deck firefighting capability onboard Container Carriers when full compliance with the **FOC** notation requirements is not practical.

It is applicable to container carriers constructed either before 1 January 2016 designed to carry any number of container tiers on deck or those constructed after 1 January 2016 designed to carry 4 or less tiers of containers on deck, but do provide on deck firefighting arrangements that exceed the SOLAS requirements applicable to those vessels. The notation is intended to recognize the additional level of fire protection being provided on such vessels and is available for all Container Carriers that comply with this section.

3 Cargo Deck Area Fire Main System

3.1 General

Every vessel is to be provided with pumps, water service pipes, and hydrants complying with the provisions of this Subsection, as applicable.

3.3 Capacity

The total combined capacity of the fire pumps and fire main diameter are to be sufficient to supply the required pressure and volume for adequate and simultaneous operation of the following:

- i) Fire main system required by 4-7-3/1 of the *Steel Vessel Rules*, supplying the minimum number of hoses required by the *Steel Vessel Rules* on the weather deck at the pressure identified in 3/3.5 below
- ii) The minimum required flow rate of water through each of the required number of monitors as specified in 3/5.3iii),
- iii) Any other fixed fire-fighting systems served by the fire pumps that could be expected to operate at the same time
- iv) If applicable, the fixed water-spray system for hatch covers, see 4/3.1.
- v) The application of water on container bays forward and aft of a bay engaged in a fire as specified in 3/3.11

The drainage of the cargo holds is to be independent of the cargo area fire main system. Dewatering of the cargo holds by eductors supplied from the fire pumps may be used provided the available capacity is adequate to simultaneously supply all required firefighting services as well as the eductors of any two adjacent holds.

3.5 Pressure

With the combined fire pumps in operation, the system is to be capable of delivering the quantity of water necessary to simultaneously supply all required mobile water monitors at the most hydraulically remote location at the required flow rate and with the pressure necessary to reach the top tier of the containers on deck along with all other fire-fighting systems and equipment identified above in 3/3.3 at their required flow rates and pressures while maintaining the following minimum pressures at all hydrants on the vessel:

- i) Vessels of 6,000 gross tonnage and upwards: 0.27 N/mm² (2.8 kgf/cm², 40 psi)
- ii) Vessels less than 6,000 gross tonnage: 0.25 N/mm² (2.6 kgf/cm², 37 psi)

During all possible operating scenarios, the maximum pressure at any hydrant is not to exceed that at which the effective control of a fire hose can be demonstrated.

3.7 Cargo Deck Area Fire Main Piping

The fire main piping serving the on deck cargo area is to consist of two runs, one on each side of the vessel, traversing the length of the on-deck cargo area and located outboard of the cargo hatch area. The combined diameters of this piping are to be sufficient for the effective distribution of the discharge required by the equipment and systems identified in 3/3.3 at the required pressures from the fire pumps while operating simultaneously.

The water piping serving the cargo area is to be provided with manually operable isolation valves every 40 meters (130 feet). Also, isolation valves are to be installed adjacent to an accommodation superstructure or deck house and located before entering the on-deck cargo areas forward and aft of the superstructure or deck house.

Drainage arrangements are to be provided to protect against freezing water damage.

3.9 Weather Deck Hydrants Arrangements

3.9.1 Number and Position

The number and position of hydrants in the cargo area are to comply with the following:

- i) All required monitors are to be capable of operating simultaneously.
- ii) There are to be a sufficient number of hydrants immediately forward and aft of each container bay to supply the total required number of monitors
- iii) At least one hydrant is to be located within one (1) hose length outboard on each side of the space between the container bays. The jet of water from a mobile water monitor connected to these hydrants is to be capable of reaching inboard at least two thirds the breadth of the vessel.

3.9.2 Protection of Hoses and Hydrants

Arrangements are to be provided to cool any hoses and hydrants that may be located between the container bays from the effects of the heat of the fire, unless otherwise determined to be suitable for prolonged exposure under such conditions.

3.11 Application of Water on Container Bays Forward and Aft of Bay Engaged in a Fire

The system is to provide for the simultaneous operation of all required monitors evenly distributed between the forward and aft of any bay that could be engaged in a fire at the required capacity and pressure (refer to 3/3.5) in addition to any other system identified in 3/3.3.

3.13 Relief Valves, Pipes, Hydrants and Hoses

- i) Relief valves are to comply with 4-7-3/1.5.6 of the *Steel Vessel Rules*.
- ii) Pipes and hydrants are to comply with 4-7-3/1.11.1 and 4-7-3/1.11.2 of the *Steel Vessel Rules*.
- iii) All piping, valves, and hydrants are to be suitably protected from damage and corrosion.
- iv) Hoses are to comply with 4-7-3/1.13 of the *Steel Vessel Rules* and be of sufficient number and size to support the arrangements identified in 3/3.11 above as well as all required hose streams.

5 Mobile Water Monitors

5.1 Minimum Number of Mobile Water Monitors

- i) Vessels with a breadth less than 30 m (98 ft) are to be provided with at least two (2) mobile water monitors.
- ii) Vessels with a breadth of 30 m (98 ft) and above are to be provided with at least four (4) mobile water monitors.

5.3 Mobile Water Monitors

Each mobile water monitor, as a minimum, is to comply with the following:

- i) Constructed of lightweight, corrosion-resistant materials.
- ii) Equipped with a coupling allowing connection to the vessel's fire hydrants via a fire hose. The coupling and hose are to be sized for the proper flow and pressure to support the performance of the monitor.
- iii) Monitors are to have a minimum capacity of not less than 33 m³/hr (550 liters/min, 145 gpm) at the pressure necessary to reach the top tier of the containers on deck.
- iv) Capable of a minimum horizontal throw of 40 m (131 ft) at an inlet pressure of 0.4 N/mm² (4.1 kgf/cm², 58 psi), when discharging at a horizontal elevation of 30-35°.
- v) Allows swiveling of the discharge nozzle for adjusting the throw direction of the water in both the horizontal and vertical planes, while in continuous operation. The vertical swivel range is to be 0° to 90°. If lubrication is required, external lubrication fittings are to be provided for the swivel joints.
- vi) The discharge nozzle is to be of a dual-purpose spray/jet type incorporating a shutoff and capable of discharging an effective water spray between container bays in the event of a container fire in the on-deck cargo area.
- vii) The design configuration is to minimize nozzle thrust reaction, and is to permit unattended operation once the monitor is placed in position.
- viii) Provide means to ensure a secure/safe fixing to the vessel's weather deck, lashing bridge, or other structure.
- ix) Provide a carrying handle or other means for ease of transport. Monitors weighing more than 23 kg (50 lbs) are to be fitted with wheels.
- x) Where monitors are to be used on a lashing bridge, arrangements such as davits or hoists are to be provided on the port and starboard sides of each lashing bridge to raise and lower the monitors.

The mobile water monitors, all necessary hoses, fittings, and required fixing hardware are to be kept ready for use in a location outside the cargo space area and accessible in the event of a fire in the cargo spaces.

Efficient drainage of water from deck surfaces is to be provided when the mobile water monitors are in operation.

7 Alternative Arrangements

A fixed water spray system or a combination of a fixed and mobile water monitor system may be specially considered as an alternative to the hydrants and mobile water monitors addressed above provided it is established to provide an equivalent level of protection.

9 Water Mist Lance

Vessels carrying containers on the weather deck are to be provided with at least one water mist lance. The water mist lance is to be of a type capable of penetrating a standard container.

11 Fire-fighter's Breathing Apparatus

For each required breathing apparatus, four spare charges are to be provided in addition to the requirements of 4-7-3/15.5.1(b) of the *Steel Vessel Rules*.



SECTION 4 FOC+ and FOC-R+ Notations (1 May 2017)

1 General

Vessels complying with the requirements of Section 2 or 3, as applicable, and Subsection 4/3 are eligible for either the notation **FOC+** or **FOC-R+**, as applicable.

3 Hatch Cover Protection

3.1 Fixed Water-spray System

The water-spray system is to provide cooling to the hatch cover areas. The water-spray system is to be arranged such that:

- i) All hatch cover areas are protected by spray nozzles incorporated into the hatch covers.
- ii) The spray nozzles are to be appropriately distributed in the hatch cover area and arranged so as to uniformly discharge water onto the top of the hatch cover area.
- iii) Nozzles are to be grouped into separate sections, and each section is to contain the nozzles necessary to cover the hatch cover area for a cargo bay. Each section of nozzles is to be capable of being isolated by one stop valve only. The stop valve in each section is to be readily accessible.
- iv) The nozzles and supply piping are to be suitably protected from mechanical damage that could occur due to the handling or operation of the hatch covers or containers.
- v) Where the nozzles and supply piping are fixed on the hatch cover, quick connect arrangements are to be provided to connect the supply piping on the hatch covers to the fixed supply piping on deck.
- vi) The total pumping capacity is to be provided by at least two independently driven pumps. The pumps and the piping system are to be capable of maintaining the necessary pressure to provide a continuous output of water sufficient for the coverage of the hatch cover area for the largest cargo bay at the application rate specified in 4/3.1vii).

With any one pump inoperable, the availability of water is at least 50 percent of the total capacity with adequate spray patterns on a hatch cover area.

If pumps for other fire protection systems are used, they are provided with sufficient capacity to provide pressure and volume for adequate operation of the other fire protection systems and the water-spray system, simultaneously.

- vii) Nozzles are placed and spaced in a suitable pattern to maintain an average application rate of not less than 5 liters/min/m² (0.12 gpm/ft²) over the hatch cover area.
- viii) All piping, valves, and nozzles are suitably protected from damage and corrosion.
- ix) Drainage arrangements are provided to protect against freezing water damage.
- x) Efficient drainage of water from deck surfaces is provided when the water-spray system is in operation.

3.3 Novel Concepts

In lieu of 4/3.1, special consideration will be given to novel concepts such as mechanical or structural means to direct the flow of water from monitors onto the hatch cover area. Any novel concept is to comply with the application rate of 4/3.1vi) and the drainage of 4/3.1ix).



SECTION 5 Test and Trials (1 May 2017)

1 Initial and Annual Surveys

1.1 Initial Installation Survey

The arrangements and equipment referred to in Section 2 or 3 are to be examined and tested to the satisfaction of the attending Surveyor upon completion of installation. This is to include:

- i) Water service distribution piping for the on-deck cargo area
- ii) Hydrants for the on-deck cargo area
- iii) Mobile water monitors and fixing hardware to the ship structure
- iv) Water mist lance

It is to be demonstrated to the satisfaction of the attending Surveyor that the total capacity of the on deck fire protection system is sufficient to provide the required pressure and volume for the simultaneous operation of:

- i) The fire main system supplying the required number of hoses for the on-deck cargo area equally divided between both sides,
- ii) For a bay determined by the Surveyor, all required water monitors and that each monitor's water jet reaches the vertical distance equivalent to the top tier of containers,
- iii) Water mist lance,
- iv) Any other fixed fire-fighting system served by the fire pumps,
- v) If applicable, the fixed water-spray system of Subsection 4/3.

It is to be verified that sufficient spare charges required by Subsection 2/11 or 3/11 are available for each breathing apparatus in addition to those required by 4-7-3/15.5.1(b) of the *Steel Vessel Rules*.

1.3 Annual Surveys

At each Annual Survey, in addition to surveys of hull, machinery, and equipment otherwise required by the Rules, the fire-fighting equipment to be verified in operating condition is to include the following:

- i) All required mobile water monitors,
- ii) Water mist lance
- iii) If applicable, the fixed water-spray system for the protection of the hatch cover area.

It is to be verified that sufficient spare charges required by Subsection 2/11 or 3/11 are available for each breathing apparatus in addition to those required by 4-7-3/15.5.1(b) of the *Steel Vessel Rules*.