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## BERMUDA MERCHANT SHIPPING NOTICE

### Maintenance and Inspection of Fixed Carbon Dioxide Fire Extinguishing Systems

**This Notice is intended for:** Classification Societies, Ship Owners, Managers, Masters, Safety, Deck and Engineering Officers and all seafarers on board Bermuda Merchant ships

**Ref: SOLAS 74/88 as amended, Regulation II-2 14.2.2.1**

#### Summary

This notice reproduces the guidance contained in IMO MSC1./Circ.1318 at Annex A for the maintenance and inspection of fixed Carbon Dioxide Extinguishing Systems with additional guidance applicable to Bermuda flagged ships. It also provides general guidance for the application of this IMO Circular.

Maintenance, testing and inspections shall be carried out based on the guidelines developed by the organisation (MSC.1/Circ 1318) and in a manner having due regard to ensuring the reliability of fire-fighting systems and appliances.

This Notice **supersedes** the requirements in Shipping Notice 2015-027.

This Notice was issued on 1<sup>st</sup> June 2018

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With the acceptance of IMO MSC.1/Circ 1318 Bermuda provides the following general guidance for this circular.

- (1) Although the MSC/Circular 1318 guidelines are not mandatory, the Bermuda Shipping and Maritime Administration will accept them when inspecting fixed CO<sub>2</sub> systems on Bermuda flagged vessels subject to the guidance provided in this shipping notice being complied with.
- (2) Monthly inspections (MSC/Circular 1318 paragraph 4) - may be performed by competent crew members, e.g. a member of the ship's crew who has been trained for the work by the person who carries out the work onboard under direct supervision of a senior officer, being an experienced person holding a STCW II/2 or III/2 Certificate of Competency and an Advanced Fire Fighting certificate, and in accordance with the ship's planned maintenance system, including documented procedures, work instructions and manuals, and using tools, spares and calibrated equipment readily available on board.

- (3) Annual inspections (MSC/Circular 1318 paragraph 5) - it is recommended that these are performed by persons specially trained in the maintenance of such systems, e.g. the manufacturer or an approved service company.
- (4) Full maintenance (MSC/Circular 1318 paragraph 6) - should be performed by persons specially trained in the maintenance of such systems, e.g. manufacturer or approved service company.
- (5) An “approved service company” is a service company approved for a specific service by ABS, BV, DNV-GL, LR, Class NK, RINA or the UK Maritime and Coastguard Agency (MCA).
- (6) The inspection of fixed CO<sub>2</sub> systems during the full maintenance period should pay particular attention to the correct operation of the isolation and section valves and where there is a possibility of moisture from condensation collecting on ball valves these should be opened up and their condition verified.
- (7) Annually a function test of the CO<sub>2</sub> protected space shut down, alarms and isolations should be performed. The gas tightness of the protected space is to be inspected annually.
- (8) For Low Pressure Carbon Dioxide systems the servicing should be in accordance with manufacturer’s recommendations and
  - (a) The two CO<sub>2</sub> quantity measurements methods agree and that loss of contents exceeding 5% must be made up;
  - (b) Alarms and ventilation shut downs are functioning;
  - (c) Pipework remains in good condition, free of damage and corrosion;
  - (d) Storage tank(s) are examined externally, especially in way of tank supports and pipe connections, which may require approval of small areas of tank insulation.
  - (e) Storage tank(s) are examined internally at any time they are empty and at intervals not exceeding 10 years;
  - (f) Pressure test of the storage tank(s) may be required depending upon the results of the internal and external examination.
  - (g) If the internal examination reveals corrosion damage, thickness measurement should be carried out. If the thickness reduction at any point is found to exceed 10% repairs of the tank or replacement is required.
  - (h) Storage tank(s) should be fitted with two safety valves, arranged so that either valve can be shut-off while the other is connected to the vessel. The safety valves should be tested every 2 years.

- (i) All flexible hoses (if applicable) to be examined annually and tested or renewed in accordance with manufacturer's recommendation.
  - (j) At the periodical survey, or every two years, the system should be blown through to prove all line and nozzles are clear and one safety valve is to be overhauled.
- (9) The System should at all times be in good order and available for immediate use while the ship is in service. If the system is under repair, then suitable arrangements should be made to ensure safety is not diminished through the provision of alternate fixed or portable fire protection equipment or other measures. The onboard maintenance plan should include provisions for this purpose.
- (10) Where MSC/Circular 1318 specifies "annual" inspection or servicing of the system a variation of  $\pm 3$  month may be considered acceptable. Where a 5 yearly interval is specified a variation of  $\pm 3$  months may be accepted. This general principal may be applied unless the manufacturer's instructions contradict it where upon the manufacturer's schedule applies.

## **Annex A**

### **1. General**

- (1) These Guidelines provide the minimum recommended level of maintenance and inspections for fixed carbon dioxide fire-extinguishing systems on all ships, and are intended to demonstrate that the system is kept in good working order as specified in SOLAS regulation II-2/14.2.1.2.
- (2) These Guidelines are intended to supplement the fire-extinguishing system manufacturer's approved maintenance instructions.
- (3) Certain maintenance procedures and inspections may be performed by competent crewmembers, while others should be performed by persons specially trained in the maintenance of such systems. The onboard maintenance plan should indicate which parts of the recommended inspections and maintenance should be completed by trained personnel.

### **2. Safety**

- (1) Whenever carbon dioxide fire-extinguishing systems are subjected to inspection or maintenance, strict safety precautions should be followed to prevent the possibility that individuals performing or witnessing the activities are placed at risk.
- (2) Prior to performing any work, a safety plan should be developed to account for all personnel and establish an effective communications system between the inspection personnel and the on-duty crew.
- (3) Measures to avoid accidental discharges such as locking or removing the operating arms from directional valves, or shutting and locking the system block valve should be taken as the initial procedure for the protection of personnel performing any maintenance or inspections.
- (4) All personnel should be notified of the impending activities before work is begun.

### **3. Maintenance and inspection plan**

- (1) Fixed carbon dioxide fire-extinguishing systems should be kept in good working order and readily available for immediate use.
- (2) Maintenance and inspections should be carried out in accordance with the ship's maintenance plan having due regard to ensuring the reliability of the system.
- (3) The onboard maintenance plan should be included in the ship's safety management system and should be based on the system manufacturer's recommendations including:
  - (a) Maintenance and inspection procedures and instructions;

- (b) Required schedules for periodic maintenance and inspections;
- (c) Listing of recommended spare parts; and
- (d) Records of inspections and maintenance, including corrective actions taken to maintain the system in operable condition.

#### **4 Monthly inspections**

(1) At least every 30 days a general visual inspection should be made of the overall system condition for obvious signs of damage, and should include verification that:

- (a) All stop valves are in the closed position;
- (b) All releasing controls are in the proper position and readily accessible for immediate use;
- (c) All discharge piping and pneumatic tubing is intact and has not been damaged;
- (d) All high pressure cylinders are in place and properly secured; and
- (e) The alarm devices are in place and do not appear damaged.

(2) In addition, on low pressure systems the inspections should verify that:

- (a) The pressure gauge is reading in the normal range;
- (b) The liquid level indicator is reading within the proper level;
- (c) The manually operated storage tank main service valve is secured in the open position; and
- (d) The vapour supply line valve is secured in the open position.

#### **5 Annual inspections**

The following minimum level of maintenance and inspections should be carried out in accordance with the system manufacturer's instructions and safety precautions:

- (1) The boundaries of the protected space should be visually inspected to confirm that no modifications have been made to the enclosure that have created uncloseable openings that would render the system ineffective;
- (2) All storage containers should be visually inspected for any signs of damage, rust or loose mounting hardware. Cylinders that are leaking, corroded, dented or bulging should be hydrostatically retested or replaced;

- (3) System piping should be visually inspected to check for damage, loose supports and corrosion. Nozzles should be inspected to ensure they have not been obstructed by the storage of spare parts or a new installation of structure or machinery;
- (4) The manifold should be inspected to verify that all flexible discharge hoses and fittings are properly tightened; and
- (5) All entrance doors to the protected space should close properly and should have warning signs, which indicate that the space is protected by a fixed carbon dioxide system and that personnel should evacuate immediately if the alarms sound. All remote releasing controls should be checked for clear operating instructions and indication as to the space served.
  - a) All high pressure cylinders and pilot cylinders should be weighed or have their contents verified by other reliable means to confirm that the available charge in each is above 90% of the nominal charge. Cylinders containing less than 90% of the nominal charge should be refilled. The liquid level of low pressure storage tanks should be checked to verify that the required amount of carbon dioxide to protect the largest hazard is available;
  - b) The Bermuda Maritime Administration requires an accurate determination of the cylinder contents and comparison with original readings e.g. liquid level gauging, test weighing etc.

## **6 Minimum recommended maintenance**

- (1) At least biennially (intervals of 2 years  $\pm$  3 months) in passenger ships or at each intermediate, periodical or renewal survey in cargo ships, the following maintenance should be carried out (to assist in carrying out the recommended maintenance, examples of service charts are set out in the appendix):

**Note:** The ambient temperature of the storage space for the CO<sub>2</sub> cylinders and type of content check must be included in the inspection report. Attention is drawn to the inability of liquid level detectors to operate satisfactorily when the ambient temperature is near or above the critical temperature for CO<sub>2</sub> which is 30.5°C. If the weighing method is used each cylinder weight and ambient temperature should be recorded in the service report. If the liquid level detection method is used, the level should be marked on each cylinder and the linear dimension and temperature recorded in the service report.

- (2) The hydrostatic test date of all storage containers should be checked. High pressure cylinders should be subjected to periodical tests at intervals not exceeding 10 years. At the 10-year inspection, at least 10% of the total number of cylinders provided in the main CO<sub>2</sub> bottle room should be subjected to an internal inspection and hydrostatic test. (Refer to ISO 6406 - Periodic inspection and testing of seamless steel gas cylinders). If one or more cylinders fail, a total of 50% of the onboard cylinders should be tested. If further cylinders fail, all cylinders should be tested.

- (a) In addition to the above requirements, 10% of all high pressure CO<sub>2</sub> cylinders located outside of the main CO<sub>2</sub> bottle room should also be subject to internal inspection and hydrostatic testing at intervals not exceeding 10 years. Flexible hoses should be replaced at intervals recommended by the manufacturer and not exceeding 10 years; and
  - (b) Notwithstanding the above, on Bermuda Registered vessels any cylinders which are found to be in poor condition (rusty, damaged etc.) at the 10 year interval should be hydrostatically tested. For vessels where no testing was carried out at 10 years and where cylinders complied with the requirements of BS EN 1968-2002 it is recommended that 10% of the onboard cylinders be hydrostatically tested at the next dry dock-refit period. In all cases Bermuda Registered vessels shall be expected to have tested at least 20% of the onboard cylinders by the 20 year interval subject to the requirements of MSC/Circular 1318 paragraph 6.1.2 for additional testing of cylinders in the event of a cylinder failing a hydrostatic test
- (3) The discharge piping and nozzles should be tested to verify that they are not blocked. The test should be performed by isolating the discharge piping from the system and flowing dry<sup>1</sup> air or nitrogen from test cylinders or suitable means through the piping.
- (4) At least biennially (intervals of 2 years ± 3 months) in passenger ships or at each renewal survey in cargo ships, the following maintenance should be carried out by service technicians/specialists trained to standards accepted by the administration:
- (a) Where possible, all activating heads should be removed from the cylinder valves and tested for correct functioning by applying full working pressure through the pilot lines.
    - (i) In cases where this is not possible, pilot lines should be disconnected from the cylinder valves and blanked off or connected together and tested with full working pressure from the release station and checked for leakage.
    - (ii) In both cases this should be carried out from one or more release stations when installed.
  - (b) If manual pull cables operate the remote release controls, they should be checked to verify the cables and corner pulleys are in good condition and freely move and do not require an excessive amount of travel to activate the system;
  - (c) All cable components should be cleaned and adjusted as necessary, and the cable connectors should be properly tightened. If the remote release controls are operated by pneumatic pressure, the tubing should be checked for

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<sup>1</sup> Control air is to be used rather than service air, as service air is typically not dried or filtered

leakage, and the proper charge of the remote releasing station pilot gas cylinders should be verified. All controls and warning devices should function normally, and the time delay, if fitted should prevent the discharge of gas for the required time period; and

- (d) After completion of the work, the system should be returned to service. All releasing controls should be verified in the proper position and connected to the correct control valves. All pressure switch interlocks should be reset and returned to service. All stop valves should be in the closed position.



## Appendix – Example Service Charts

<b>HIGH PRESSURE CO<sub>2</sub> SYSTEM</b>					
Date:	Name of ship/unit:	IMO No.:			
<b>Technical description</b>					
No.	Text	Value			
1	Manufacturer				
2	Number of main cylinders				
3	Main cylinders capacity (each)				
4	Number of pilot cylinders				
5	Pilot cylinder capacity (each)				
6	Number of distribution lines				
7	Oldest cylinder pressure test date				
8	Protected space(s)				
9	Date flexible hoses fitted/renewed				
<b>Description of inspection/Tests</b>					
No.	Description	Carried out	Not carried out	Not applicable	Comment
1	Release controls and distribution valves secured to prevent accidental discharge				
2	Contents in main cylinders checked by weighing				
3	Contents in main cylinders checked by liquid level indicator				
4	Contents of pilot cylinders checked				
5	All cylinder valves visually inspected				
6	All cylinder clamps and connections checked for tightness				
7	Manifold visually inspected				
8	Manifold tested for leakage, by applying dry working air				

9	Main valve and distribution valves visually inspected				
10	Main valve and distribution valves tested for operation				
11	Time delay devices tested for correct setting*				
12	Remote release system visually inspected				
13	Remote release system tested				
14	Servo tubing/pilot lines pressure tested at maximum working pressure and checked for leakages and blockage				
15	Manual pull cables, pulleys, gang releases tested, serviced and tightened/adjusted as necessary				
16	Release stations visually inspected				
17	Warning alarms (audible/visual) tested				
18	Fan stop tested*				
19	10% of cylinders and pilot cylinder/s pressure tested every 10 years				
20	Distribution lines and nozzles blown through, by applying dry working air				
21	All doors, hinges and locks inspected*				
22	All instruction and warning signs on installation inspected				
23	All flexible hoses renewed and check valves in manifold visually inspected every 10 years				
24	Release controls and distribution valves reconnected and system put back in service				
25	Inspection date tags attached				
* If fitted as part of the CO <sub>2</sub> system.					
<b>LOW PRESSURE CO<sub>2</sub> SYSTEM</b>					
Date:	Name of ship/unit:	IMO No.:			
<b>Technical description</b>					

No.	Text	Value			
1	Manufacturer				
2	No. of tanks				
3	Tanks capacity (tonnes)				
4	Number of pilot cylinders				
5	Pilot cylinder capacity (each)				
6	Number of distribution lines				
7	Protected space(s)				
<b>Description of inspection/Tests</b>					
No.	Description	Carried out	Not carried out	Not applicable	Comment
1	Tank main service valve closed and secured to prevent accidental discharge				
2	Distribution valves verified closed				
3	Check correct function of level indicator				
4	Contents of CO <sub>2</sub> tank checked by tank level indicator				
5	Contents of CO <sub>2</sub> tank checked by riser tube reading				
6	Contents of CO <sub>2</sub> tank checked by level control valve				
7	Supports of tank inspected				
8	Insulation on tank inspected				
9	Safety valves of tank inspected				
10	Safety valves of tank tested				
11	Contents of pilot cylinders checked				
12	Start/stop function of cooling compressors tested				
13	All connected electrical alarms and indicators tested				

14	Main manifold valve inspected				
15	Main manifold valve tested				
16	Distribution valves inspected				
17	Distribution valves tested				
18	Release stations inspected				
19	Total flooding release mechanism inspected				
20	Total flooding release mechanism tested				
21	Time delay devices tested for correct setting*				
22	Time delay devices tested for correct setting*				
23	Fan stop tested*				
24	Distribution lines and nozzles inspected				
25	Distribution lines and nozzles tested				
26	Distribution lines and nozzles blown through				
27	All doors, hinges and locks inspected*				
28	All instruction plates inspected				
29	Tank main service valve reopened and secured open				
30	System put back in service				
31	Inspection date tags attached				
*If fitted as part of the CO <sub>2</sub> system.					

**Chief Surveyor**  
**Bermuda Shipping and Maritime Authority**