



# NAURU

## MARITIME ADMINISTRATION

### **GUIDELINES FOR THE MAINTENANCE AND INSPECTION OF FIRE PROTECTION SYSTEMS AND APPLIANCES (NMA\_C40.2020.REV.0)**

#### **PURPOSE**

This Circular serves to provide guidance on the maintenance and inspection of all fire protection systems (FPS), fire protection appliances (FPA) and emergency equipment. It incorporates the provisions of IMO Circular MSC.1/Circ.1432 "Revised guidelines for the maintenance and inspection of fire protection systems and appliances" as amended by IMO Circular MSC.1/Circ.1516.

Please note that this Marine Circular shall not be treated as an exhaustive listing of applicable requirements, but addresses those provisions where the Administration requirements differ, or where the Administration has deemed that additional clarification / emphasis is necessary.

#### **REFERENCE DOCUMENTS:**

1. Resolution A.951(23) – Improved Guidelines for Marine Portable Fire Extinguishers, adopted on 05 December 2003, dated 25 February 2004
2. MSC.1/Circ.1318 – Guidelines for the Maintenance and Inspections of Fixed Carbon Dioxide Fire-Extinguishing Systems, dated 11 June 2009
3. MSC.1/Circ.1312 – Revised Guidelines for the Performance and Testing Criteria and Surveys of High-Expansion Foam Concentrates for Fixed Fire-Extinguishing Systems, dated 10 June 2009 and Corr.1, dated 22 November 2011
4. MSC.1/Circ.1432 – Revised Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances, dated 31 May 2012
5. MSC.1/Circ.1516 – Amendments to the Revised Guidelines for the Maintenance and Inspection of Fire Protection Systems and Appliances, dated 08 June 2015

#### **APPLICATION**

This Circular is relevant and applicable to all Nauru flagged vessels.

#### **CONTENTS:**

##### **1. Shipboard Maintenance Plan**

- 1.1. SOLAS II-2/14 requires ships to have a maintenance plan that details the maintenance, testing and inspection of fire protection systems and appliances that is consistent with the vessel's Safety Management System (SMS) and be available for inspection.
- 1.2. It is important that a plan consistent with the vessel's SMS is developed prior to performing any maintenance, inspection and testing to account for all personnel and all foreseeable hazards. The plan shall establish an effective communications system between the inspection personnel and on-duty crew.

##### **2. Application of Requirements, Guidelines and Recommendations**

- 2.1. Ship owners and officers shall follow the applicable requirements of SOLAS (as amended), FSS Code (as amended), MODU Code (1979, 1989 and 2009 editions) and Class requirements with regards to the maintenance, testing and inspection of fire protection systems and appliances.
- 2.2. The Administration adopts the IMO guidance documents which provide the minimum recommended levels of maintenance, testing and inspection to be included in an onboard maintenance plan, unless stated otherwise in this circular.

### 3. Operational Readiness

- 3.1. All fire protection systems and appliances should at all times be in good order and readily available for immediate use while the ship is in service. If a fire protection system is undergoing maintenance, testing or 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. **(MSC.1/Circ.1432, 2)**
- 3.2. Should a fire protection system require repairs while the vessel is underway or prior to sailing or in the case of MODUs and MOUs engaged in operations, then approval should be obtained from the Administration for the RO to issue a short term Safety Equipment certificate.

### 4. Maintenance & Testing

- 4.1. Manuals by equipment manufacturers shall be available onboard. Instructions for shipboard maintenance and testing (not necessarily by the ship's crew) of active and passive fire protection systems and appliances, shall be simple for easy understanding and should be illustrated wherever possible.
- 4.2. The following, as appropriate, should be included for each system or appliance:
  - 4.2.1. Maintenance and repair instructions;
  - 4.2.2. Schedule of periodic maintenance;
  - 4.2.3. List of replaceable parts; and
  - 4.2.4. Log for records of inspections and maintenance, listing identified non-conformities and their target completion dates.
- 4.3. Onboard maintenance and inspections should be carried out in accordance with the ship's maintenance plan. **(MSC.1/Circ.1432, 3.1)**
- 4.4. Certain maintenance procedures and inspections may be performed by competent crew members who have completed an advanced fire-fighting training course, while others should be performed by specialised shore-based maintenance personnel. The onboard maintenance plan shall indicate the inspections and maintenance that are to be completed by competent crew members versus other trained personnel. **(MSC.1/Circ.1432, 3.2)**
- 4.5. Inspections should be carried out by the crew to ensure that the indicated weekly, monthly, quarterly, annual, two-year, five-year and ten-year actions are taken for the specified equipment, if provided. Records of the inspections should be carried on board the ship, or may be computer-based. In cases where the inspections and maintenance are carried out by trained service technicians other than the ship's crew, inspection reports should be provided at the completion of the testing. **(MSC.1/Circ.1432, 3.3)**
- 4.6. In addition to the onboard maintenance and inspections stated in these guidelines, manufacturer's maintenance and inspection guidelines should be followed. The quality of water in automatic sprinkler systems is of particular importance and should be maintained in accordance with manufacturer guidelines. Records of water quality should be maintained on board in accordance with the manufacturer's guidelines. **(MSC.1/Circ.1516, 1)**
- 4.7. Where particular arrangements create practical difficulties, alternative testing and maintenance procedures should be to the satisfaction of the Administration or RO. **(MSC.1/Circ.1432, 3.5)**

### 5. Fixed fire detection and alarm systems

#### 5.1. Weekly testing and inspections: **(MSC.1/Circ.1432, 4.1)**

Verify all fire detection and fire alarm control panel indicators are functional by operating the lamp/indicator test switch.

#### 5.2. Monthly testing and inspections: **(MSC.1/Circ.1432, 5.10)**

Test a sample of detectors and manual call points so that all devices have been tested within five years. For very large systems the sample size should be determined by the Administration or RO.

**5.3. Annual testing and inspections: (MSC.1/Circ.1432, 7.2)**

- 5.3.1. Test all fire detection systems and fire detection systems used to automatically release fire-extinguishing systems for proper operation, as appropriate;
- 5.3.2. Visually inspect all accessible detectors for evidence of tampering obstruction, etc., so that all detectors are inspected within one year; and
- 5.3.3. Test emergency power supply switchover.

**6. Public address and general alarm systems**

**6.1. Weekly testing and inspections: (MSC.1/Circ.1432, 4.4)**

Verify all public address systems and general alarm systems are functioning properly.

**7. Fire Doors**

**7.1. Weekly testing and inspections: (MSC.1/Circ.1432, 4.3)**

Verify all fire door control panel indicators, if provided, are functional by operating the lamp/indicator switch.

**7.2. Quarterly testing and inspections: (MSC.1/Circ.1432, 6.4)**

Test all fire doors located in main vertical zone bulkheads for local operation.

**7.3. Annual testing and inspections: (MSC.1/Circ.1432, 7.7)**

Test all remotely controlled fire doors for proper release.

**8. Low-location lighting**

**8.1. Weekly testing and inspections: (MSC.1/Circ.1432, 4.6)**

Verify low-location lighting systems are functional by switching off normal lighting in selected locations.

**8.2. Five year service: (MSC.1/Circ.1432, 9.5)**

Test the luminance of all systems in accordance with the procedures in resolution A.752(18).

**9. Ventilation systems and fire dampers**

**9.1. Quarterly testing and inspections: (MSC.1/Circ.1432, 6.3)**

Test all fire dampers for local operation.

**9.2. Annual testing and inspections: (MSC.1/Circ.1432, 7.6)**

- 9.2.1. Test all fire dampers for remote operation;
- 9.2.2. Verify galley exhaust ducts and filters are free of grease build-up; and
- 9.2.3. Test all ventilation controls interconnected with fire-protection systems for proper operation.

**10. Galley and deep fat cooking fire-extinguishing systems**

**10.1. Annual testing and inspections: (MSC.1/Circ.1432, 7.13)**

Check galley and deep fat cooking fire-extinguishing systems in accordance with the manufacturer's instructions.

**11. Firefighter's outfits**

**11.1. Monthly testing and inspections: (MSC.1/Circ.1432, 5.5)**

Verify lockers providing storage for fire-fighting equipment contain their full inventory and equipment is in serviceable condition.

## 12. Breathing apparatus

### 12.1. Weekly testing and inspections: *(MSC.1/Circ.1432, 4.5)*

Examine all breathing apparatus and EEBD cylinder gauges to confirm they are in the correct pressure range.

### 12.2. Annual testing and inspections: *(MSC.1/Circ.1432, 7.8)*

12.2.1. Check breathing apparatus air recharging systems, if fitted, for air quality;

12.2.2. Check all breathing apparatus face masks and air demand valves are in serviceable condition; and

12.2.3. Check EEBDs according to maker's instructions.

### 12.3. Five year service: *(MSC.1/Circ.1432, 9.4)*

Perform hydrostatic testing of all steel self-contained breathing apparatus cylinders. Aluminum and composite cylinders should be tested to the satisfaction of the RO.

## 13. Marine Portable Fire Extinguishers

### 13.1. Periodical inspections and annual servicing: *(Resolution A.951(23), 9.1)*

Extinguishers should be subject to periodical inspections in accordance with the manufacturer's instructions and serviced at intervals not exceeding one year.

### 13.2. Five-year test discharge: *(Resolution A.951(23), 9.1.1)*

At least one extinguisher of each type manufactured in the same year and kept on board a ship should be test discharged at five yearly intervals (as part of a fire drill).

### 13.3. Ten year service: *(Resolution A.951(23), 9.1.2)*

All extinguishers together with propellant cartridges should be hydraulically tested in accordance with the recognized standard or the manufacturer's instruction at intervals not exceeding ten years.

### 13.4. Requirement for inspection and servicing personnel: *(Resolution A.951(23), 9.1.3)*

Service and inspection should only be undertaken by, or under the supervision of, a person with demonstrable competence, based on the inspection guide in Table A.

### 13.5. Records of inspections: *(Resolution A.951(23), 9.2)*

Records of inspections should be maintained. The records should show the date of inspection, the type of maintenance carried out and whether or not a pressure test was performed.

### 13.6. Miscellaneous: *(Resolution A.951(23), 9.3 and 9.4)*

Extinguishers should be provided with a visual indication of discharge. Instructions for recharging extinguishers should be supplied by the manufacturer and be available for use onboard.

### 13.7. Spare Charges: *(SOLAS as amended, Chapter II-2, Reg. 10.3.3.3)*

13.7.1. Spare charges shall be provided for:

13.7.1.1. 100% of the first 10 extinguishers; and

13.7.1.2. 50% of the remaining fire extinguishers capable of being recharged on board;

13.7.1.3. Not more than 60 total spare charges are required.

13.7.2. For fire extinguishers which cannot be recharged onboard, additional portable fire extinguishers of the same quantity, type, capacity and number as determined in paragraph 13.7.1 above shall be provided in lieu of spare charges.

<b>ANNUAL INSPECTION</b>	
Safety clip and indicating devices	Check to see if the extinguisher may have been operated.
Pressure indicating device	Where fitted, check to see that the pressure is within limits. Check that dust covers on pressure indicating devices and relief valves are in place.
External examination	Inspect for corrosion, dents or damage which may affect the safe operation of the extinguisher.
Weight	Weigh the extinguisher and check the mass compared to the fully charged extinguisher.
Hose and nozzle	Check that hoses and nozzles are clear and undamaged.
Operating instructions	Check that they are in place and legible.
<b>INSPECTION AT RECHARGE</b>	
Water and foam charges	Remove the charge to a clean container if to be reused and check if it is still suitable for further use. Check any charge container.
Powder charges	Examine the powder for reuse. Ensure that it is free flowing and that there is no evidence of caking lumps or foreign bodies.
Gas cartridge	Examine for damage and corrosion.
<b>INSPECTION AT FIVE AND TEN YEAR INTERVALS</b>	
<b>INSPECTION AFTER DISCHARGE TEST</b>	
Air passages and operating mechanism	Prove clear passage by blowing through vent holes and vent devices in the cap. Check hose, nozzle strainer, discharge tube and breather valve, as applicable. Check the operating and discharge control. Clean and lubricate as required.
Operating mechanism	Check that the safety pin is removable and that the lever is undamaged.
Gas cartridge	Examine for damage and corrosion. Weigh the cartridge to ascertain that it is within prescribed limits.
O-rings washers and hose diaphragms	Check O-rings and replace hose diaphragms if fitted.
Water and foam bodies	Inspect the interior. Check for corrosion and lining deterioration. Check separate containers for leakage or damage.
Powder body	Examine the body and check internally for corrosion and lining deterioration.
<b>INSPECTION AFTER RECHARGE</b>	
Water and foam	Replace the charge in accordance with the manufacturers instructions.
Reassemble	Reassemble the extinguisher in accordance with the manufacturers instructions.
Maintenance label	Fill in entry on maintenance label, including full weight.
Mounting of extinguishers	Check the mounting bracket or stand.
Report	Complete a report on the state of maintenance of the extinguisher.

**Table 9.1.3 – Inspection guide**

**Table A**

**Marine Portable Fire Extinguishers Inspection Guide. (Resolution A.951(23), Table 9.1.3)**

## **14. Portable foam applicators**

### **14.1. Monthly testing and inspections: (MSC.1/Circ.1432, 5.8)**

Verify all portable foam applicators are in place, properly arranged, and are in proper condition.

### **14.2. Annual testing and inspections: (MSC.1/Circ.1432, 7.11)**

- 14.2.1. Verify all portable foam applicators are set to the correct proportioning ratio for the foam concentrate supplied and the equipment is in proper order;
- 14.2.2. Verify all portable containers or portable tanks containing foam concentrate remain factory sealed, and the manufacturer's recommended service life interval has not been exceeded;
- 14.2.3. Portable containers or portable tanks containing foam concentrate, excluding protein based concentrates, less than 10 years old, that remain factory sealed can normally be accepted without the periodical foam control tests required in *MSC.1/Circ.1312* being carried out;
- 14.2.4. Protein based foam concentrate portable containers and portable tanks should be thoroughly checked and, if more than five years old, the foam concentrate should be subjected to the periodical foam control tests required in *MSC.1/Circ.1312*, or renewed; and
- 14.2.5. The foam concentrates of any non-sealed portable containers and portable tanks, and portable containers and portable tanks where production data is not documented, should be subjected to the periodical foam control tests required in *MSC.1/Circ.1312*.

## **15. Wheeled (mobile) fire extinguishers**

### **15.1. Monthly testing and inspections: (MSC.1/Circ.1432, 5.9)**

Verify all extinguishers are in place, properly arranged, and are in proper condition.

### **15.2. Annual testing and inspections: (MSC.1/Circ.1432, 7.12)**

- 15.2.1. Perform periodical inspections in accordance with the manufacturer's instructions;
- 15.2.2. Visually inspect all accessible components for proper condition;
- 15.2.3. Check the hydrostatic test date of each cylinder; and
- 15.2.4. For dry powder extinguishers, invert extinguisher to ensure powder is agitated.

### **15.3. Five year service: (MSC.1/Circ.1432, 9.6)**

Visually examine at least one extinguisher of each type manufactured in the same year and kept on board.

### **15.4. Ten year service: (MSC.1/Circ.1432, 10.5)**

All extinguishers together with propellant cartridges should be hydrostatically tested by specially trained persons in accordance with recognized standards or the manufacturer's instructions.

## **16. Fire mains, fire pumps, hydrants, hoses and nozzles**

### **16.1. Monthly testing and inspections: (MSC.1/Circ.1432, 5.1)**

- 16.1.1. Verify all fire hydrants, hose and nozzles are in place, properly arranged, and are in serviceable condition;
- 16.1.2. Operate all fire pumps to confirm that they continue to supply adequate pressure; and
- 16.1.3. Emergency fire pump fuel supply adequate, and heating system in satisfactory condition, if applicable.

**16.2. Quarterly testing and inspections: (MSC.1/Circ.1432, 6.1)**

Verify international shore connection(s) is in serviceable condition.

**16.3. Annual testing and inspections: (MSC.1/Circ.1432, 7.1)**

16.3.1. Visually inspect all accessible components for proper condition;

16.3.2. Flow test all fire pumps for proper pressure and capacity. Test emergency fire pump with isolation valves closed;

16.3.3. Test all hydrant valves for proper operation;

16.3.4. Pressure test a sample of fire hoses at the maximum fire main pressure, so that all fire hoses are tested within five years;

16.3.5. Verify all fire pump relief valves, if provided, are properly set;

16.3.6. Examine all filters/strainers to verify they are free of debris and contamination; and

16.3.7. Nozzle size/type correct, maintained and working.

**17. Water mist, water spray and sprinkler systems**

**17.1. Weekly testing and inspections: (MSC.1/Circ.1432, 4.7)**

17.1.1. Verify all control panel indicators and alarms are functional;

17.1.2. Visually inspect pump unit and its fittings; and

17.1.3. Check the pump unit valve positions, if valves are not locked, as applicable.

**17.2. Monthly testing and inspections: (MSC.1/Circ.1432, 5.4)**

17.2.1. Verify all control, pump unit and section valves are in the proper open or closed position;

17.2.2. Verify sprinkler pressure tanks or other means have correct levels of water;

17.2.3. Test automatic starting arrangements on all system pumps so designed;

17.2.4. Verify all standby pressure and air/gas pressure gauges are within the proper pressure ranges; and

17.2.5. Test a selected sample of system section valves for flow and proper initiation of alarms. (Note – The valves selected for testing should be chosen to ensure that all valves are tested within a one-year period.)

**17.3. Quarterly testing and inspections: (MSC.1/Circ.1516, 2)**

Assess system water quality in the header tank and pump unit against the manufacturer's water quality guidelines.

**17.4. Annual testing and inspections: (MSC.1/Circ.1516, 3)**

17.4.1. Verify proper operation of all water mist, water-spray and sprinkler systems using the test valves for each section;

17.4.2. Visually inspect all accessible components for proper condition;

17.4.3. Externally examine all high pressure cylinders for evidence of damage or corrosion;

17.4.4. Check the hydrostatic test date of all high pressure cylinders;

- 17.4.5. Functionally test all fixed system audible and visual alarms;
- 17.4.6. Flow test all pumps for proper pressure and capacity;
- 17.4.7. Test all antifreeze systems for adequate freeze protection;
- 17.4.8. Test all system cross connections to other sources of water supply for proper operation;
- 17.4.9. Verify all pump relief valves, if provided, are properly set;
- 17.4.10. Examine all filters/strainers to verify they are free of debris and contamination;
- 17.4.11. Verify all control/section valves are in the correct position;
- 17.4.12. Blow dry compressed air or nitrogen through the discharge piping of dry pipe systems, or otherwise confirm the pipework and nozzles are clear of any obstructions. This may require the removal of nozzles, if applicable;
- 17.4.13. Test emergency power supply switchover, where applicable;
- 17.4.14. Visually inspect all sprinklers focusing in areas where sprinklers are subject to aggressive atmosphere (like saunas, spas, kitchen areas) and subject to physical damage (like luggage handling areas, gyms, play rooms, etc.) so that all sprinklers are inspected within one year. Sprinklers with obvious external damage, including paint, should be replaced and not included in the number of sprinklers tested in paragraph 17.4.17;
- 17.4.15. Check for any changes that may affect the system such as obstructions by ventilation ducts, pipes, etc.;
- 17.4.16. Test a minimum of one section in each open head water mist system by flowing water through the nozzles. The sections tested should be chosen so that all sections are tested within a five-year period;
- 17.4.17. Test automatic sprinklers and automatic water mist nozzles in accordance with the following flow chart (Refer to Figure B and Figure C); and
- 17.4.18. During basic testing, and extended testing when applicable, of automatic sprinkler heads/nozzles as outlined in paragraph 17.4.17, water quality testing should be conducted in each corresponding piping section. (Note – should a tested sprinkler fail, assessing the corresponding water quality at that time would assist in determining the cause of failure.)

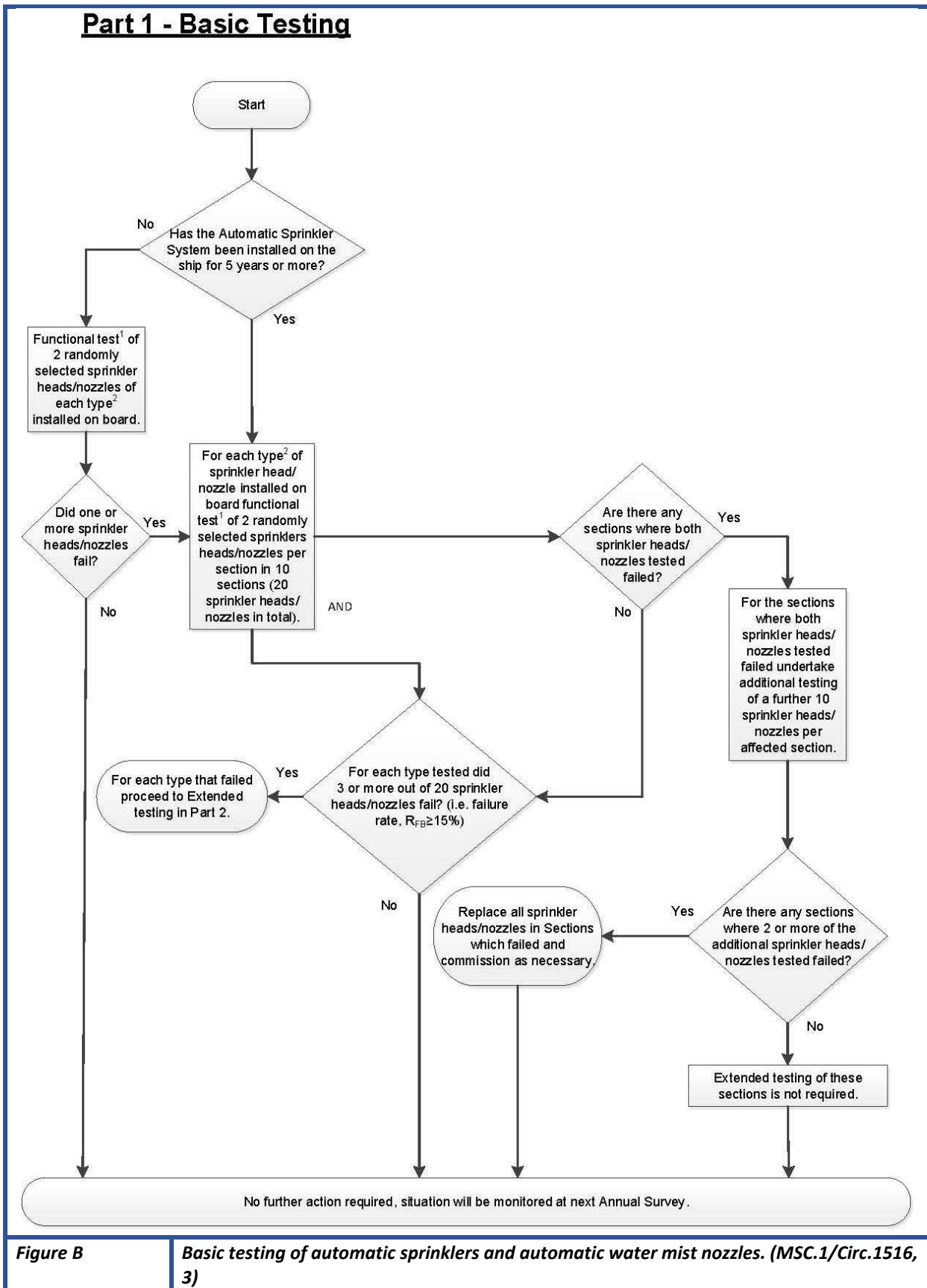
**17.5. Five year service: (MSC.1/Circ.1516, 4)**

- 17.5.1. Flush all ro-ro deck deluge system piping with water, drain and purge with air;
- 17.5.2. Perform internal inspection of all control/section valves; water quality testing should be conducted in all corresponding piping sections, if not previously tested as outlined in paragraph 17.4.8 within the last five years;
- 17.5.3. Check condition of any batteries, or renew in accordance with manufacturer's recommendations; and
- 17.5.4. For each section where the water is refilled after being drained or flushed, water quality should meet manufacturer's guidelines. Testing of the renewed water quality should be conducted and recorded as a new baseline reference to assist future water quality monitoring for each corresponding section.



17.6. Ten year service: (MSC.1/Circ.1432, 10.2)

Perform a hydrostatic test and internal examination for gas and water pressure cylinders according to flag Administration guidelines or, where these do not exist, EN 1968:2002 + A1.



## Part 2 - Extended testing

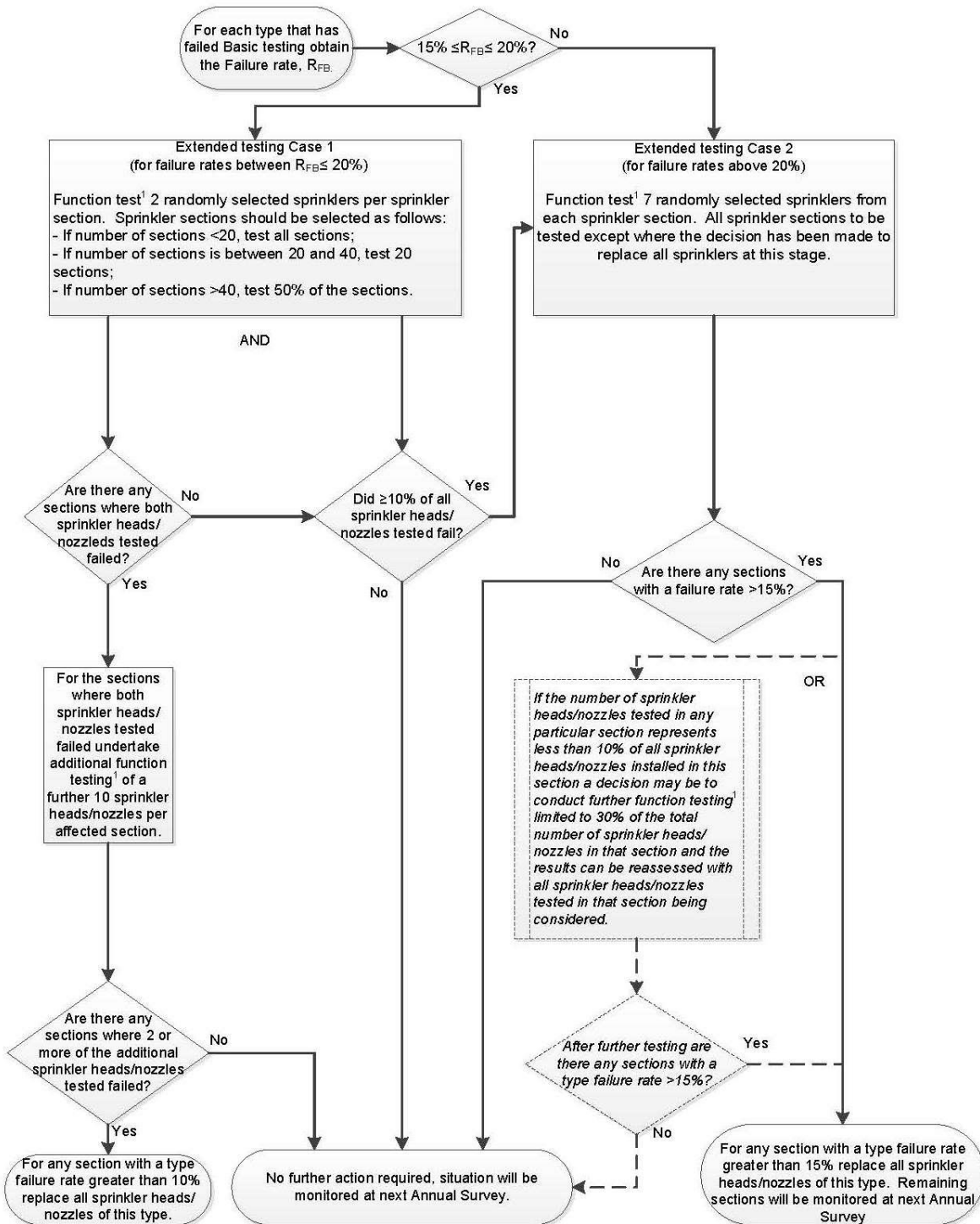


Figure C

Extended testing of automatic sprinklers and automatic water mist nozzles. (MSC.1/Circ.1516, 3)

### Explanatory notes to the flow chart:

- Functional test is defined as a test that demonstrates the operation and flow of water from sprinkler head/nozzle.
- Type is defined as each different manufacturer model of sprinkler head/nozzle.
- Static/standby pressure is defined as the constant pressure maintained in the system at all times prior to activation.
- All testing should be carried out at static/standby pressure.
- Failure rate ( $R_{FB}$ ) is the number of sprinkler heads/nozzles to fail testing divided by test sample size multiplied by 100.

## 18. Fixed foam fire-extinguishing systems

### 18.1. Monthly testing and inspections: *(MSC.1/Circ.1432, 5.3)*

Verify all control and section valves are in the proper open or closed position, and all pressure gauges are in the proper range.

### 18.2. Quarterly testing and inspections: *(MSC.1/Circ.1432, 6.2)*

Verify the proper quantity of foam concentrate is provided in the foam system storage tank.

### 18.3. Annual testing and inspections: *(MSC.1/Circ.1432, 7.4)*

18.3.1. Visually inspect all accessible components for proper condition;

18.3.2. Functionally test all fixed system audible alarms;

18.3.3. Flow test all water supply and foam pumps for proper pressure and capacity, and confirm flow at the required pressure in each section (Ensure all piping is thoroughly flushed with fresh water after service.);

18.3.4. Test all system cross connections to other sources of water supply for proper operation;

18.3.5. Verify all pump relief valves, if provided, are properly set;

18.3.6. Examine all filters/strainers to verify they are free of debris and contamination;

18.3.7. Verify all control/section valves are in the correct position;

18.3.8. Blow dry compressed air or nitrogen through the discharge piping or otherwise confirm the pipework and nozzles of high expansion foam systems are clear of any obstructions, debris and contamination. This may require the removal of nozzles, if applicable;

18.3.9. Take samples from all foam concentrates carried on board and subject them to the periodical control tests in *MSC.1/Circ.1312*, for low expansion foam, or *MSC/Circ.670* for high expansion foam. (Note – Except for non-alcohol resistant foam, the first test need not be conducted until 3 years after being supplied to the ship.); and

18.3.10. Test all fuel shut-off controls connected to fire-protection systems for proper operation.

### 18.4. Five year service: *(MSC.1/Circ.1432, 9.2)*

18.4.1. Perform internal inspection of all control valves;

18.4.2. Flush all high expansion foam system piping with fresh water, drain and purge with air;

18.4.3. Check all nozzles to prove they are clear of debris; and

18.4.4. Test all foam proportioners or other foam mixing devices to confirm that the mixing ratio tolerance is within +30 to -10% of the nominal mixing ratio defined by the system approval.

## 19. Fixed dry chemical powder systems

### 19.1. Monthly testing and inspections: *(MSC.1/Circ.1432, 5.6)*

Verify all control and section valves are in the proper open or closed position, and all pressure gauges are in the proper range.

### 19.2. Annual testing and inspections: *(MSC.1/Circ.1432, 7.9)*

19.2.1. Visually inspect all accessible components for proper condition;

19.2.2. Verify the pressure regulators are in proper order and within calibration; and

- 19.2.3. Agitate the dry chemical powder charge with nitrogen in accordance with system manufacturer's instructions. (Note – Due to the powder's affinity for moisture, any nitrogen gas introduced for agitation must be moisture free.)

**19.3. Two-year testing and inspections: (MSC.1/Circ.1432, 8.2)**

- 19.3.1. Blow dry nitrogen through the discharge piping to confirm that the pipe work and nozzles are clear of any obstructions;
- 19.3.2. Operationally test local and remote controls and section valves;
- 19.3.3. Verify the contents of propellant gas cylinders (including remote operating stations);
- 19.3.4. Test a sample of dry chemical powder for moisture content; and
- 19.3.5. Subject the powder containment vessel, safety valve and discharge hoses to a full working pressure test.

**19.4. Ten year service: (MSC.1/Circ.1432, 10.3)**

Subject all powder containment vessels to hydrostatic or non-destructive testing carried out by an accredited service agent.

**20. Fixed gas fire-extinguishing systems**

**20.1. Weekly testing and inspections: (MSC.1/Circ.1432, 4.2)**

- 20.1.1. Verify all fixed fire-extinguishing system control panel indicators are functional by operating the lamp/indicator test switch; and
- 20.1.2. Verify all control/section valves are in the correct position.

**20.2. Monthly testing and inspections: (MSC.1/Circ.1432, 5.2)**

Verify containers/cylinders fitted with pressure gauges are in the proper range and the installation free from leakage.

**20.3. Annual testing and inspections: (MSC.1/Circ.1432, 7.3)**

- 20.3.1. Visually inspect all accessible components for proper condition;
- 20.3.2. Externally examine all high pressure cylinders for evidence of damage or corrosion;
- 20.3.3. Check the hydrostatic test date of all storage containers;
- 20.3.4. Functionally test all fixed system audible and visual alarms;
- 20.3.5. Verify all control/section valves are in the correct position;
- 20.3.6. Check the connections of all pilot release piping and tubing for tightness;
- 20.3.7. Examine all flexible hoses in accordance with manufacturer's recommendations;
- 20.3.8. Test all fuel shut-off controls connected to fire-protection systems for proper operation;
- 20.3.9. 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; and

- 20.3.10. If cylinders are installed inside the protected space, verify the integrity of the double release lines inside the protected space, and check low pressure or circuit integrity monitors on release cabinet, as applicable.

**20.4. Two-year testing and inspections: (MSC.1/Circ.1432, 8.1)**

- 20.4.1. All high pressure extinguishing agents 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 95 per cent of the nominal charge. Cylinders containing less than 95 per cent of the nominal charge should be refilled; and
- 20.4.2. Blow dry compressed air or nitrogen through the discharge piping or otherwise confirm the pipe work and nozzles are clear of any obstructions. This may require the removal of nozzles, if applicable.

**20.5. Five-year service: (MSC.1/Circ.1432, 9.1)**

Perform internal inspection of all control valves.

**20.6. Ten year service: (MSC.1/Circ.1432, 10.1)**

- 20.6.1. Perform a hydrostatic test and internal examination of 10 per cent of the system's extinguishing agent and pilot cylinders. If one or more cylinders fail, a total of 50 per cent of the onboard cylinders should be tested. If further cylinders fail, all cylinders should be tested;
- 20.6.2. Flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years; and
- 20.6.3. Visual inspection and non-destructive testing (NDT) of halon cylinders may be performed in lieu of hydrostatic testing by an authorized servicing facility which has been certified by a government agency or RO.

**21. Fixed Carbon Dioxide Fire-Extinguishing Systems**

**21.1. Monthly testing and inspections: (MSC.1/Circ.1318, 4)**

- 21.1.1. 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:
- 21.1.1.1. all stop valves are in the closed position;
  - 21.1.1.2. all releasing controls are in the proper position and readily accessible for immediate use;
  - 21.1.1.3. all discharge piping and pneumatic tubing is intact and has not been damaged;
  - 21.1.1.4. all high pressure cylinders are in place and properly secured; and
  - 21.1.1.5. the alarm devices are in place and do not appear damaged.
- 21.1.2. In addition, on low pressure systems the inspections should verify that:
- 21.1.2.1. the pressure gauge is reading in the normal range;
  - 21.1.2.2. the liquid level indicator is reading within the proper level;
  - 21.1.2.3. the manually operated storage tank main service valve is secured in the open position; and
  - 21.1.2.4. the vapour supply line valve is secured in the open position.

## 21.2. Annual testing and inspections: (MSC.1/Circ.1318, 5)

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

- 21.2.1. 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;
- 21.2.2. 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;
- 21.2.3. 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;
- 21.2.4. the manifold should be inspected to verify that all flexible discharge hoses and fittings are properly tightened; and
- 21.2.5. 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.

## 21.3. Minimum recommended maintenance: (MSC.1/Circ.1318, 6)

21.3.1. The following maintenance:

- At least **biennially (intervals of 2 years ± 3 months)** in **passenger ships**; or
- At **each intermediate, periodical or renewal survey\*** in **cargo ships**.

*\* Refer to Survey guidelines under the Harmonized System of Survey and Certification, 2007 (resolution A.997(25)).*

21.3.2. should be carried out, and to assist in carrying out the recommended maintenance, examples of service charts are set out in the appendix (Refer to Figure D and Figure E):

- 21.3.2.1. *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;*
- 21.3.2.2. *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.*
- 21.3.2.3. *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 air or nitrogen from test cylinders or suitable means through the piping.*

21.3.3. The following maintenance:

- At least **biennially (intervals of 2 years ± 3 months)** in **passenger ships**; or
- At **each renewal survey\*** in **cargo ships**.

*\* Refer to Survey guidelines under the Harmonized System of Survey and Certification, 2007 (resolution A.997(25)).*

should be carried out by service technicians/specialists trained to standards accepted by the Administration or RO:

- 21.3.3.1. *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.*

*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.*

*In both cases this should be carried out from one or more release stations when installed.*

- 21.3.3.2. *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 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*

- 21.3.3.3. *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

HIGH PRESSURE CO<sub>2</sub> SYSTEM

Date:	Name of ship/unit:	IMO No.:	
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Technical description

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	

Description of inspection/Tests

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.

Figure D

Example service charts for high pressure CO<sub>2</sub> system. (MSC.1/Circ.1318, Annex)



LOW PRESSURE CO<sub>2</sub> SYSTEM

Date:	Name of ship/unit:	IMO No.:	
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**Technical description**

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)	

**Description of inspection/Tests**

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	Warning alarms tested				
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.

**Figure E**

**Example service charts for low pressure CO<sub>2</sub> system. (MSC.1/Circ.1318, Annex)**

#### **21.4. Ten year service: (MSC.1/Circ.1318, 6.1.2)**

21.4.1. At least 10% of the total number provided should be subjected to an internal inspection and hydrostatic test\*\*. 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.; and

21.4.2. Flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years;

*\*\* Refer to standard ISO 6406 Periodic inspection and testing of seamless steel gas cylinders.*

#### **22. Fixed aerosol extinguishing systems**

##### **22.1. Monthly testing and inspections: (MSC.1/Circ.1432, 5.7)**

22.1.1. Verify all electrical connections and/or manual operating stations are properly arranged, and are in proper condition; and

22.1.2. Verify the actuation system/control panel circuits are within manufacturer's specifications.

##### **22.2. Annual testing and inspections: (MSC.1/Circ.1432, 7.10)**

Verify condensed or dispersed aerosol generators have not exceeded their mandatory replacement date. Pneumatic or electric actuators should be demonstrated working, as far as practicable.

##### **22.3. Ten year service: (MSC.1/Circ.1432, 10.4)**

Condensed or dispersed aerosol generators to be renewed in accordance with manufacturer's recommendations.

#### **23. Alternative Fixed Gas Fire-Fighting Media and Systems**

The Administration recognises that there are other media (e.g. NOVEC™ 1230 fluid, INERGEN®, FM 200®, etc.) that can be used in fixed gas fire-extinguishing systems for machinery spaces and cargo pump rooms. Use of such alternatives shall be subject to approval with any attached conditions, as appropriate, by the Administration or RO and in accordance with SOLAS Reg II-2 requirements for alternative fire-fighting systems and relevant guidance. Maintenance and inspection of these systems shall be carried out in accordance with manufacturer's instructions.

For further assistance, please do not hesitate to contact the Administration at: [tech@naurumaritime.com](mailto:tech@naurumaritime.com).