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CIRCULAR

Maintenance and Inspection of Fire-Protection Systems and Appliances on Panama Flag Ships

Notice to: Ship Owners/ Managers/ Operators/ Surveyors/ Auditors/ Service Suppliers

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The Panama Maritime Authority has issued a revised Merchant Marine Circular [MMC-281](#), which supersedes MMC-96 and MMC-226 and gives guidelines for the maintenance, inspection of fire-protection systems and appliances.

Circular MMC-281 provides the minimum recommended level of maintenance and inspections for protection systems and appliances. The general requirements contained in the Circular are not an all-inclusive list of maintenance or inspection items for fire protection systems, fire-fighting appliances, and emergency equipment.

The Circular applies to all Panamanian-flagged ships, and its contents may be used as a basis for the ship's onboard maintenance plan required by SOLAS regulation II-2/14. The Circular also addresses maintenance and inspection of fixed carbon dioxide systems or portable fire extinguishers.

General Requirements for the Maintenance and Inspection of Fire-protection Systems and Appliances

Operational readiness

- All fire protection systems and appliances should always 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 provisions of alternative fixed or portable fire protection equipment or other measures. The onboard maintenance plan should include provisions for this purpose.
- Where the RO issuing the vessel's Statutory Certificate determines that the equipment does not comply with the requirements of the corresponding mandatory regulations, it must request authorization from conditionals@segumar.com for the issuance of the relevant Conditional Statutory Certificate or authorization before sailing, as per the Merchant Marine Circular No.156.

Maintenance and Testing

- Onboard maintenance and inspections should be carried out in accordance with the ship's maintenance plan.
- 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 persons specially trained in the maintenance of such systems. The on-board maintenance plan should indicate which parts of the recommended inspections and maintenance are to be completed by trained personnel.
- 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.
- In addition to the onboard maintenance and inspections stated in the circular, 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.
- Where particular arrangements create practical difficulties, the Administration should be consulted regarding alternative testing and maintenance procedures.

Weekly Testing and Inspections

- Fixed fire detection and alarm systems:
 - Verify all fire detection and fire alarm control panel indicators are functional by operating the lamp/indicator test switch.
- Fixed gas fire-extinguishing systems:
 - Verify all fixed fire-extinguishing system control panel indicators are functional by operating the lamp/indicator test switch.
 - Verify all control/section valves are in the correct position.
- Fire Doors:
 - Verify all fire door control panel indicators, if provided, are functional by operating the lamp/indicator switch.
- Public address and general alarm systems:
 - Verify all public address systems and general alarm systems are functioning properly.
- Breathing apparatus:
 - Examine all breathing apparatus and EEBD cylinder gauges to confirm they are in the correct pressure range.
- Low location lighting:
 - Verify low location lighting systems are functional by switching off normal lighting in selected locations.
- Water mist, water spray and sprinkler systems:
 - Verify all control panel indicators and alarms are functional.
 - Visually inspect the pump unit and its fittings.
 - Check the pump unit valve positions, if valves are not locked, as applicable.

Monthly testing and inspections

- Monthly inspections should be carried out to ensure that the indicated actions are taken for the specified equipment:
 - Fire mains, fire pumps, hydrants, hoses and nozzles:
 - Verify all fire hydrants, hoses and nozzles are in place, properly arranged, and are in serviceable condition.
 - Operate all fire pumps to confirm that they continue to supply adequate pressure.
 - Emergency fire pump fuel supply adequate, and heating system in satisfactory condition, if applicable.
 - Fixed gas fire-extinguishing systems:
 - Verify containers/cylinders fitted with pressure gauges are in the proper range and the installation is free from leakage.
 - Foam fire-extinguishing systems:
 - Verify all control and section valves are in the proper open or closed position, and all pressure gauges are in the proper range.
 - Water mist, water spray and sprinkler systems:
 - Verify all control, pump unit and section valves are in the proper open or closed position.
 - Verify sprinkler pressure tanks or other means have the correct levels of water.
 - Test automatic starting arrangements on all system pumps so designed.
 - Verify all standby pressure and air/gas pressure gauges are within the proper pressure ranges.
 - 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.

- Firefighter's outfits:
 - Verify lockers providing storage for firefighting equipment contain their full inventory, and equipment is in serviceable condition.
 - The Administration encourages the responsible officer to verify that all firefighters' outfits onboard comply with the FSS Code/Ch 3/Section 2.1.1.1, which allows such insulated protective clothing to protect the skin from heat radiating from the fire and from burns and scalding by steam. In addition, the outer surface shall be water-resistant.
- Fixed dry chemical powder systems:
 - Verify all control and section valves are in the proper open or closed position, and all pressure gauges are in the proper range.
- Fixed aerosol extinguishing systems:
 - Verify all electrical connections and/or manual operating stations are properly arranged and are in proper condition.
 - Verify the actuation system/control panel circuits are within the manufacturer's specifications.
- Portable foam applicators:
 - Verify all portable foam applicators are in place, properly arranged, and are in proper condition.
- Wheeled (mobile) fire extinguishers:
 - Verify all extinguishers are in place, properly arranged, and are in proper condition.
- Fixed fire detection and alarm systems:

- 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.

Quarterly testing and inspections

- Quarterly inspections should be carried out to ensure that the actions are taken for the specified equipment:
 - Fire mains, fire pumps, hydrants, hoses and nozzles:
 - Verify international shore connection(s) is in serviceable condition.
 - Foam fire-extinguishing systems:
 - Verify the proper quantity of foam concentrate is provided in the foam system storage tank.
 - Ventilation systems and fire dampers:
 - Test all fire dampers for local operation.
 - Fire doors:
 - Test all fire doors located in the main vertical zone bulkheads for local operation.
 - Water mist, water spray and sprinkler systems:
 - Assess system water quality in the header tank and pump unit against the manufacturer's water quality guidelines.

Annual testing and inspections.

- Annual inspections should be carried out to ensure that the indicated actions are taken for the specified equipment:
 - Fire mains, fire pumps, hydrants, hoses and nozzles:
 - Visually inspect all accessible components for proper condition.
 - Flow test all fire pumps for proper pressure and capacity. Test the emergency fire pump with isolation valves closed.
 - Test all hydrant valves for proper operation.
 - Pressure test a sample of fire hoses at the maximum fire main pressure, so that all fire hoses are tested within five years.
 - Verify all fire pump relief valves, if provided, are properly set.
 - Examine all filters/strainers to verify they are free of debris and contamination.
 - Nozzle size/type correct, maintained and working.
 - Fixed fire detection and fire alarm systems:
 - Test all fire detection systems and fire detection systems used to automatically release fire-extinguishing systems for proper operation, as appropriate.
 - Visually inspect all accessible detectors for evidence of tampering, obstruction, etc., so that all detectors are inspected within one year.
 - Test emergency power supply switchover.
 - Fixed gas fire-extinguishing systems:
 - Visually inspect all accessible components for proper condition.
 - Externally examine all high-pressure cylinders for evidence of damage or corrosion.
 - Check the hydrostatic test date of all storage containers.
 - Functionally test all fixed system audible and visual alarms.
 - Verify all control/section valves are in the correct position.
 - Check the connections of all pilot release piping and tubing for tightness.
 - Examine all flexible hoses in accordance with the manufacturer's recommendations.
 - Test all fuel shut-off controls connected to fire-protection systems for proper operation.

- 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.
 - 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 the release cabinet, as applicable.
- Foam fire-extinguishing systems:
 - Visually inspect all accessible components for proper condition.
 - Functionally test all fixed system audible alarms.
 - 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).
 - Test all system cross connections to other sources of water supply for proper operation.
 - Verify all pump relief valves, if provided, are properly set.
 - Examine all filters/strainers to verify they are free of debris and contamination.
 - Verify all control/section valves are in the correct position.
 - 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.
 - 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
 - Test all fuel shut-off controls connected to fire-protection systems for proper operation.
- Water mist, water spray and sprinkler systems:
 - Verify proper operation of all water mist, water-spray and sprinkler systems using the test valves for each section.
 - Visually inspect all accessible components for proper condition.
 - Externally examine all high-pressure cylinders for evidence of damage or corrosion.
 - Check the hydrostatic test date of all high-pressure cylinders.
 - Functionally test all fixed system audible and visual alarms.
 - Flow test all pumps for proper pressure and capacity.
 - Test all antifreeze systems for adequate freeze protection.
 - Test all system cross connections to other sources of water supply for proper operation.
 - Verify all pump relief valves, if provided, are properly set.
 - Examine all filters/strainers to verify they are free of debris and contamination.
 - Verify all control/section valves are in the correct position.
 - 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.
 - Test emergency power supply switchover, where applicable.
 - Visually inspect all sprinklers, focusing on 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.
 - Check for any changes that may affect the system, such as obstructions by ventilation ducts, pipes, etc.
 - 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.
 - Test automatic sprinklers and automatic water mist nozzles in accordance with the following flow chart: [click here](#).

- During basic testing and extended testing, when applicable, of automatic sprinkler heads/nozzles, water quality testing should be conducted in each corresponding piping section. Should a tested sprinkler fail, assessing the corresponding water quality at that time would assist in determining the cause of failure.
- Ventilation systems and fire dampers:
 - Test all fire dampers for remote operation.
 - Verify galley exhaust ducts and filters are free of grease buildup.
 - Test all ventilation controls interconnected with fire-protection systems for proper operation.
- Fire doors:
 - Test all remotely controlled fire doors for proper release.
- Breathing apparatus:
 - Check breathing apparatus air recharging systems, if fitted, for air quality.
 - Check all breathing apparatus face masks and air demand valves are in serviceable condition.
 - Check EEBDs according to the maker's instructions.
- Fixed dry chemical powder systems:
 - Visually inspect all accessible components for proper condition.
 - Verify the pressure regulators are in proper order and within calibration.
 - Agitate the dry chemical powder charge with nitrogen in accordance with the system manufacturer's instructions.
 - Note: Due to the powder's affinity for moisture, any nitrogen gas introduced for agitation must be moisture-free.
- Fixed aerosol extinguishing systems:
 - 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.
- Portable foam applicators:
 - Verify all portable foam applicators are set to the correct proportioning ratio for the foam concentrate supplied, and the equipment is in proper order.
 - 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.
 - 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.
 - 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.
 - 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.
- Wheeled (mobile) fire extinguishers:
 - Perform periodical inspections in accordance with the manufacturer's instructions.
 - Visually inspect all accessible components for proper condition.
 - Check the hydrostatic test date of each cylinder.
 - For dry powder extinguishers, invert the extinguisher to ensure powder is agitated.
- Galley and deep fat cooking fire-extinguishing systems:
 - Check galley and deep fat cooking fire-extinguishing systems in accordance with the manufacturer's instructions.

Two-year testing and inspections

- Two-year inspections should be carried out to ensure that the indicated actions are taken for the specified equipment:
 - Fixed gas fire-extinguishing systems:
 - The hydrostatic test date of all storage containers should be checked.
 - All high-pressure extinguishing agent 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.
 - Blow dry compressed air or nitrogen through the discharge piping or otherwise confirm the piping and nozzles are clear of any obstructions. This may require the removal of nozzles, if applicable.
 - Fixed dry chemical powder systems.
 - Blow dry nitrogen through the discharge piping to confirm that the piping and nozzles are clear of any obstruction.
 - Operationally test local and remote controls and section valves.
 - Verify the contents of propellant gas cylinders (including remote operating stations).
 - Test a sample of dry chemical powder for moisture content.
 - Subject the powder containment vessel, safety valve and discharge hoses to a full working pressure test.

Five-year service

- At least once every five years, an internal inspection of all control valves should be performed. The following inspections should be carried out for the specified equipment:
 - Fixed gas fire-extinguishing systems:
 - Perform internal inspection of all control valves.
 - Foam fire-extinguishing system:
 - Perform internal inspection of all control valves.
 - Perform internal inspection of all control valves.
 - Flush all high-expansion foam system piping with fresh water, drain and purge with air.
 - Check all nozzles to prove they are clear of debris.
 - 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.
 - Water mist, water spray and sprinkler systems:
 - Flush all ro-ro deck deluge system piping with water, drain and purge with air.
 - Perform internal inspection of all control/section valves. Water quality testing should be conducted in all corresponding piping sections if not previously tested within the last five years.
 - Check the condition of any batteries or renew them in accordance with the manufacturer's recommendations.
 - For each section where the water is refilled after being drained or flushed, water quality should meet the 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.
 - Breathing apparatus:
 - Perform hydrostatic testing of all steel self-contained breathing apparatus cylinders. Aluminium and composite cylinders should be tested to the satisfaction of the Administration.

- Low-location lighting:
 - Test the luminance of all systems in accordance with the procedures in resolution A.752(18).
- Wheeled (mobile) fire extinguishers:
 - Visually examine at least one extinguisher of each type manufactured in the same year and kept on board.

Ten-year Service

- These requirements shall not override any more stringent manufacturer's maintenance plan. At least once every 10 years, the hydrostatic test date of all storage containers should be checked. The following inspections should be carried out for the specified equipment:

- Fixed gas fire-extinguishing systems:
 - 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. Before the 20-year anniversary and every 10-year anniversary thereafter, all cylinders should be subjected to a hydrostatic test.
 - Flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years. When cylinders are removed for testing, the cylinders should be replaced such that the quantity of fire-extinguishing medium continues to satisfy the requirements of 2.2.1 of chapter 5 of the FSS Code, subject to SOLAS regulation II-2/14.2 and
 - If permitted by the Administration, visual inspection and NDT (non-destructive testing) of halon cylinders may be performed instead of hydrostatic testing.

Note: In case of high-pressure CO₂ cylinders already passing the 20-year anniversary date, the remaining cylinders should be hydrostatically tested not later than the 30-year anniversary date to comply with 100% of the cylinders being hydrostatically tested.

In case of high-pressure CO₂ cylinders already over 10-year anniversary, where the remaining cylinders could not be hydrostatically tested to comply with the 100% of the cylinders being hydrostatically tested at or before the 20-year anniversary date, these remaining cylinders shall be hydrostatically tested not later than the next dry-dock survey after the 20-year anniversary date to comply with 100% of the cylinders being hydrostatically tested.

In any case, at the 30-year anniversary date of the high-pressure CO₂ cylinders and every 10-year anniversary thereafter, all cylinders should be subjected to a hydrostatic test.

- Water mist, water spray and sprinkler systems:
 - 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.
- Fixed dry chemical powder systems:
 - Subject all powder containment vessels to hydrostatic or nondestructive testing carried out by an accredited service agent.
- Fixed aerosol extinguishing systems:
 - Condensed or dispersed aerosol generators to be renewed in accordance with the manufacturer's recommendations.
- Wheeled (mobile) fire extinguishers:
 - All extinguishers together with propellant cartridges should be hydrostatically tested by specially trained persons in accordance with recognized standards or the manufacturer's instructions.

Requirements for Specific Maintenance and Inspection of Portable Fire Extinguishers

Refer to Resolution A. 951(23) - Improved Guidelines for Marine Portable Fire Extinguishers.

- Spare Charges, Additional Fire Extinguishers and Refilling of Extinguishers:
 - Spare charges shall be provided for 100% of the first 10 extinguishers and 50% of the remaining fire extinguishers capable of being recharged on board. Not more than 60 total spare charges are required. Instructions for recharging shall be carried on board.
 - For fire extinguishers which cannot be recharged onboard, additional portable fire extinguishers of the same quantity, type, capacity and number as determined above shall be provided instead of spare charges.
 - Periodic refilling of the cylinders should be in accordance with the manufacturer's recommendations. Only refills approved for the extinguisher may be used for recharging. Partially emptied extinguishers should be recharged.
 - Ships constructed on or after 1 January 2009 should use the table shown in the MSC.1/Circ. 1275 (Unified Interpretation of SOLAS CH II-2 on the number and arrangement of portable fire extinguishers on board ships), as a reference for the number and arrangement of portable fire extinguishers in accommodation spaces, service spaces, control stations, machinery spaces of category A, other machinery spaces, cargo spaces, weather deck and other spaces on board ship. For ships constructed before 1 January 2009, ship-owners are encouraged to implement this unified interpretation.
 - A portable fire extinguisher required for a small space may be located outside and near the entrance to that space.
 - If the wheelhouse is adjacent to the chartroom and has a door giving direct access to the chartroom, no additional fire extinguisher is required in the chartroom. The same applies to safety centres if they are within the boundaries of the wheelhouse in passenger ships>
 - Two portable fire extinguishers, each having a capacity of not less than 6kg of dry powder or equivalent, should be provided when dangerous goods are carried on the weather deck, in open ro-ro spaces and vehicle spaces, and in cargo space as appropriate. Two portable fire extinguishers, each having a suitable capacity, should be provided on the weather deck for tankers.
 - No portable fire extinguisher needs to be provided in cargo holds of container ships if motor vehicles with fuel in their tank for their own propulsion are carried in open or closed containers

Requirements for Specific Maintenance and Inspection of Fixed Fire-Extinguishing Systems

Refer to:

- MSC.1/Circ. 1318/Rev.1 - Guidelines for the maintenance and inspections of fixed carbon dioxide fire-fire-extinguishing systems, especially regarding the amended item number 19 and added No. 20, of the Description of inspection/Tests for the high-pressure CO2 system. In addition, item No. 15 of the Description of inspection/Tests for the low-pressure CO2 system.
- MSC.1/Circ. 1312 - Revised Guidelines for the Performance and Testing Criteria, and Surveys of Foam Concentrates for Fixed Fire Extinguishing Systems.
- MSC.1/Circ.798 - Guidelines for Performance and Testing Criteria and Surveys of Medium expansion Concentrates For Fire Extinguishing Systems.
- MSC.1/Circ.670 - Guidelines for the Performance and Testing Criteria and Surveys of High-expansion Foam Concentrates for Fixed Fire Extinguishing Systems.

Additional Requirements for Halon Systems

- Halon installations of fire-extinguishing systems on board ships, whose keel was laid or at a similar stage of construction on or after October 1994, are prohibited. Moreover, full-scale tests of Halon fire-extinguishing systems on board ships have been prohibited since January 1992 in accordance with Resolution A.719 (17). However, an annual leakage check shall be carried out as per MSC.1/Circ. 600 - Annual Leakage Check of Halon Fire-Extinguishing Systems. The Chief Engineer can carry out this test if provided with the proper equipment and training.
- During the annual leakage check, if any cylinder shows signs of leakage, loss of contents exceeding 5% from the installed quantity, signs of mechanical damage or excessive corrosion, it must be withdrawn from service.

Fire Protection - Paint Lockers

- Paint lockers shall be protected by:
 - A carbon dioxide system, designed to give a minimum volume of free gas equal to 40% of the gross volume of the protected space; or
 - A dry powder system, designed for at least 0.5 kg powder/m³; or
 - A water spraying or sprinkler system, designed for 5 l/m² min. Water spraying systems may be connected to the fire main of the ship; or
 - The fitting of a portable fire extinguisher immediately outside the entrance to the paint locker. The number of portable extinguishers is to be adequate for the size of the paint locker as determined by the Recognized Organization.

Note: In any case, the system shall be operable from outside the protected space.

SOLAS - Emergency Fire Pump

The Administration accepts gasoline engine-driven portable emergency fire pumps on board cargo ships less than 2000 GRT. Proper precautions must be observed in the storage and handling of gasoline with this equipment.

Act now

Ship owners / managers / ship operators and surveyors / auditors should apply the above instructions where they are intended to ensure that all fire protection systems and appliances are always in good condition and available for immediate use while the ship is in service.