**Basic & Advanced Firefighting**

**STUDENT MANUAL**



**Maritime & Industrial Training Center**

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**IMO Circular 1432: Page 36**

Guidelines for the Maintenance

And Inspection of Fire Protection

Systems and Appliances

**IMO Circular 1318: Page 48**

Guidelines for the Maintenance and

Inspections of Fixed Carbon Dioxide

Fire-Extinguishing Systems

**IMO Resolution A.951(23) Page 54**

Guidelines for Marine Portable Fire

Extinguishers

*To the student:*

**This manual contains the IMO Circulars & Resolution:**

# Circular 1432: REVISED GUIDELINES FOR THE MAINTENANCE AND INSPECTION OF FIRE PROTECTION SYSTEMS AND APPLIANCES

1. **Circular 1318: GUIDELINES FOR THE MAINTENANCE AND INSPECTIONS OF FIXED CARBON DIOXIDE FIRE-EXTINGUISHING SYSTEM**
2. **Resolution A.951(23): IMPROVED GUIDELINES FOR MARINE PORTABLE FIRE EXTINGUISHERS**

**These Maintenance and Inspection Guidelines are incorporated into the Student Manual.**

***The student who has STCW advanced fire training should know and understand the inspection and maintenance requirements that the advanced firefighter must know under the IMO-STCW requirements.***

**Day One Classroom**

1. **Fire Prevention**
2. **Main Causes of Fire Aboard Ships**
3. **Housekeeping**
4. **Maintenance**
5. **Inspections**
6. **Compliance With Standards**
7. **Nature of Fire**

**1. Fire Tetrahedron**

**2. Rapid Oxidation**

**3. Slow Oxidation**

**4. Pyrolysis**

**5. Ignition Sources**

**6. Oxygen & Oxidizing Agents**

**7. Fire Travel**

**8. Flash Point**

**9. Fire or Flame Point**

**9. Ignition Temperature**

**10. Flammable Range**

**11. Specific Gravity**

**12. Vapor Density**

**C. Stages Of Fire**

**1. Growth - Incipient Stage**

**Flashover**

**2. Fully Developed - Free Burning Stage -**

**3. Decay - Smoldering Stage - Backdraft**

**D. Classification of Fire**

**1. Class A - Ordinary Combustibles**

1. **Class B - Flammable & Combustible Liquids & Gases**
2. **Class C - Energized Class A & B Fires**
3. **Class D - Combustible Metals**
4. **Class K – Kitchen Oils**

**E. Extinguishing Agents**

**1. Water**

**2. Foam**

**3. Carbon Dioxide**

1. **Dry Chemicals**
2. **Halons**
3. **Dry Powders**
4. **Wet Chemical**

**Day 2 Classroom**

* + - * 1. **Fire Extinguishers**

**1. Using the Extinguisher**

**2. Safety Rules**

**b. Types of Extinguishers**

**Water Extinguisher**

1. **Characteristics**
2. **Operation**
3. **Maintenance**
4. **Special Characteristics**

**CO2 Extinguisher**

**1. Characteristics**

**2. Operation**

**3. Maintenance**

**4. Special Characteristics**

**Dry Chemical Extinguishers**

**1. Sodium Bicarbonate Extinguisher**

**a. Characteristics**

**b. Operation**

**c. Maintenance**

1. **Special Characteristics**

**Potassium Bicarbonate Extinguisher – Purple K - PKP**

**a. Characteristics**

**b. Operation**

**c. Maintenance**

**d. Special Characteristics**

**Ammonium Phosphate Extinguisher**

**a. Characteristics**

**b. Operation**

**c. Maintenance**

1. **Special Characteristics**

**Halon Extinguishers**

1. **Types**

**a. Characteristics**

**b. Operation**

**c. Maintenance**

1. **Special Characteristics**

**Foam Extinguishers**

**1. Types**

**a. Characteristics**

**b. Operation**

**c. Maintenance**

**d. Special Characteristics**

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| **Wheeled (mobile) fire extinguisher**  Monthly: Verify all extinguishers are in place, properly arranged, and are in proper condition. |
| Yearly: Perform periodical inspections in accordance with the manufacturer's instructions |
| Yearly: Visually inspect all accessible components for proper condition; |
| Yearly: Check the hydrostatic test date of each cylinder; |
| Yearly: For dry powder (chemical) extinguishers, invert extinguisher to ensure powder is agitated. |
| Five Years: Visually examine at least one extinguisher of each type manufactured in the same year and kept on board |
| Ten Years: All extinguishers together with propellant cartridges should be hydrostatically tested by specially trained persons in accordance with recognized standards or the manufacturer's instructions. |
| 1. **Portable fire extinguishers** |
| Annual: Check to see if the extinguisher may have been operated |
| Annual: Inspect for corrosion, dents, or damage which may affect the safe operation of the extinguisher |
| Annual: Weigh the extinguisher and check the mass compared to the fully charged extinguisher |
| Annual: Check that hoses and nozzles are clear & undamaged |
| Annual: Check that the operating instructions are in place & legible |

1. **Fire Detection Systems**
2. **Types**
3. **Automatic Systems**
4. **Fire Detectors**
5. **Spot detectors**
6. **Line detectors**

**2. Rate of rise detectors**

**3. Sprinkler systems**

1. **Smoke detection systems**

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| 1. **Fixed fire detection and alarm systems** |
| Weekly: Verify all fire detection and fire alarm control panel indicators are functional by operating the lamp/indicator test switch. |
| Monthly: Test a sample of detectors and manual call points so that all devices have been tested within five years. |
| Yearly: Test all fire detection systems and fire detection systems used to automatically release fire-extinguishing systems for proper operation, as appropriate; |
| Yearly: Visually inspect all accessible detectors for evidence of tampering obstruction |
| Yearly: Test emergency power supply switchover |

1. **Fixed Systems**

**1. Types**

**a. Fire Main System**

**1. Fire Stations**

**2. Sea Chest**

**3. Nozzles**

**4. Efficiency of Water**

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| **Fire mains, fire pumps, hydrants, hoses and nozzles**  Monthly: Verify all fire hydrants, hose and nozzles are in place, properly arranged, and are in serviceable condition; |
| Monthly: Operate all fire pumps to confirm that they continue to supply adequate pressure; |
| Monthly: Emergency fire pump fuel supply adequate, and heating system in satisfactory condition, if applicable. |
| Quarterly: Verify international shore connection(s) is in serviceable condition. |
| Yearly: Visually inspect all accessible components for proper condition |
| Yearly: Flow test all fire pumps for proper pressure and capacity. |
| Yearly: Test emergency fire pump with isolation valves closed; |
| Yearly: Test all hydrant valves for proper operation; |
| Yearly: Pressure test a sample of fire hoses at the maximum fire main pressure, so that all fire hoses are tested within five years; |
| Yearly: Verify all fire pump relief valves, if provided, are properly set; |
| Yearly: Examine all filters/strainers to verify they are free of debris and contamination; |
| Yearly: Nozzle size/type correct, maintained and working. |

**b. Sprinkler Systems**

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| **Sprinkler System**  Weekly: Verify all control panel indicators and alarms are functional; |
| Weekly: Visually inspect pump unit and its fittings; and |
| Weekly: Check the pump unit valve positions, if valves are not locked, as applicable. |
| Monthly: Test automatic starting arrangements on all system pumps so designed; |
| Monthly: Verify all control, pump unit and section valves are in the proper open or closed position; |
| Monthly: Verify sprinkler pressure tanks or other means have correct levels of water; |
| Monthly: Verify all standby pressure and air/gas pressure gauges are within the proper pressure ranges. |
| Monthly: 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.) |
| Yearly: Verify proper operation of all water mist, water-spray and sprinkler systems using the test valves for each section; |
| Yearly: Externally examine all high pressure cylinders for evidence of damage or corrosion; |
| Yearly: Check the hydrostatic test date of all high pressure cylinders; |
| Yearly: Visually inspect all accessible components for proper condition; |
| Yearly: Functionally test all fixed system audible and visual alarms; |
| Yearly: Test all antifreeze systems for adequate freeze protection; |
| Yearly: Test all system cross connections to other sources of water supply for proper operation; |
| Yearly: Verify all pump relief valves, if provided, are properly set; |
| Yearly: Examine all filters/strainers to verify they are free of debris and contamination; |
| Yearly: Verify all control/section valves are in the correct position; |
| Yearly: 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; |
| Yearly: Test emergency power supply switchover, where applicable; |
| Yearly: 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, playrooms, etc.) So that all sprinklers are inspected within one year; |
| Yearly: Check for any changes that may affect the system such as obstructions by ventilation ducts, pipes, etc.; |
| Yearly: 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; and test a minimum of two automatic sprinklers or automatic water mist nozzles for proper operation. |
| Five Year Flush all ro-ro deck deluge system piping with water, drain and purge with air; |
| Five Year Perform internal inspection of all control/section valves; and |
| Five Year Check condition of any batteries, or renew in accordance with manufacturer's recommendations |
| Ten Years: Perform a hydrostatic test and internal examination for gas and water pressure cylinders per flag Administration guidelines or, where these do not exist, |

1. **Foam Systems**

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| **Portable foam applicators**  Monthly: Verify all portable foam applicators are in place, properly arranged, and are in proper condition. |
| Quarterly: Verify the proper quantity of foam concentrate is provided in the foam system storage tank. |
| Yearly: Verify all portable foam applicators are set to the correct proportioning ratio for the foam concentrate supplied and the equipment is in proper order |
| Yearly: 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; |
| Yearly: 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; |
| Yearly: 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; |
| Yearly: 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 |

**d. Carbon Dioxide Systems**

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| 1. **Carbon Dioxide fixed gas fire-extinguishing system** |
| * 1. Weekly: Verify all fixed fire-extinguishing system control panel indicators are functional by operating the lamp/indicator test switch. |
| * 1. Weekly: Verify all control/section valves are in the correct position. |
| * 1. Monthly: Verify containers/cylinders fitted with pressure gauges are in the proper range and the installation free from leakage |
| * 1. Yearly: Visually inspect all accessible components for proper condition; |
| * 1. Yearly: Externally examine all high pressure cylinders for evidence of damage or corrosion; |
| * 1. Yearly: Check the hydrostatic test date of all storage containers; |
| * 1. Yearly: Functionally test all fixed system audible and visual alarms; |
| * 1. Yearly: Verify all control/section valves are in the correct position; |
| * 1. Yearly: Check the connections of all pilot release piping and tubing or tightness; |
| * 1. Yearly: Examine all flexible hoses in accordance with manufacturer's recommendations; |
| * 1. Yearly: Test all fuel shut-off controls connected to fire-protection systems for proper operation; |
| * 1. Yearly: The boundaries of the protected space should be visually inspected to confirm that no modifications have been made to the enclosure that have created un-closeable openings that would render the system ineffective; |
| * 1. Yearly: 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. |
| * 1. Two Years All high pressure extinguishing agent’s 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; |
| * 1. Two Years 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. |
| * 1. Five Years: Perform internal inspection of all control valves |
| * 1. Ten Years: 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 |
| * 1. Ten Years: Flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years; |
| * 1. Ten Years: If permitted by the Administration, visual inspection and NDT (non-destructive testing) of halon cylinders may be performed in lieu of hydrostatic testing. |

**e. Halon Systems**

**Halon 1301**

**FM 200 – FE 227**

**FE 13 – HFC 23**

**FE 25 – HFC 125**

**FE 36 – HFC 236**

**FE 241 – HCFC 124**

**f. Novec 1230**

**g. Inergen**

**h. ProInert**

1. **High Pressure Water Mist**

**j. Class K - Kitchen Fires - Vegetable Oils - Deep Fat Fryers**

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| 1. **Galley and deep fat cooking fire-extinguishing systems**     1. Yearly: Check galley and deep fat cooking fire-extinguishing systems in accordance with the manufacturer's instructions |

1. **Ship Structure**
   1. **Bulkheads**
      1. **Class 1**
      2. **Class 2**
      3. **Class 3**

**STANDARD FIRE TEST: SUBPART 72.O5-5-G A standard fire test is one which develops in the test furnace a series of time-temperature relationships as follows:**

**5 minutes 1000° Fahrenheit**

**10 minutes 1300° Fahrenheit**

**30 minutes 1550° Fahrenheit**

**60 minutes 1700° Fahrenheit**

**Structural Fire Protection. Subpart 92.07**

**Definitions.**

**Cargo vessels.**

**“A” Class Divisions: Bulkheads or decks of the “A” class shall be constructed of steel or equivalent metal construction, suitable stiffened and made intact with the main structure of the vessel; such as shell, structural bulkheads, and decks. They shall be so constructed, that if subjected to the standard fire test, they would be capable of preventing the passage of flame and smoke for one hour.**

**“B” Class Bulkheads: Bulkheads of the “B” Class shall be constructed with approved incombustible materials and made intact from deck to deck and to shell to other boundaries. They shall be so constructed that, if subjected to the standard fire test, they would be capable of preventing the passage of flame for 30 minutes.**

**“C” Class Divisions: Bulkheads or decks of the “C” Class shall be constructed of approved incombustible materials, but need meet no other requirements relative to the passage of flame.**

**Passenger vessels. Subpart 72.05**

**All bulkheads and decks shall be classed as A-60, A-30, A-15, A-0, B-15, B-0, or C, depending upon the type of space on each side of the bulkhead or above and below the deck.**

**Bulkheads or decks of the “A” class shall be constructed of steel or equivalent metal construction, suitable stiffened and made intact with the main structure of the vessel; such as shell, structural bulkheads, and decks. They shall be so constructed, that if subjected to the standard fire test, they would be capable of preventing the passage of flame and smoke for one hour. In addition, they shall be so insulated with approved structural insulation, bulkhead panels, or deck covering that the average temperatures on the unexposed side would not rise more than 250 ° Fahrenheit above the original temperature, nor would the temperature at any one point, including any joint, rise more than 325 ° Fahrenheit above the original temperature within the time listed below.**

**Class A-60 60 minutes.**

**Class A-30 30 minutes.**

**Class A-15 15 minutes.**

**Class A-0 0 minutes — no insulation requirements.**

**Bulkheads of the “B” Class shall be constructed with approved incombustible materials and made intact from deck to deck ( or to the ceiling as provided in paragraph ( h ) of this section) and to shell to other boundaries. They shall be so constructed that, if subjected to the standard fire test, they would be capable of preventing the passage of flame for 30 minutes. In addition, their insulation value shall be such that the average temperatures on the unexposed side would not rise more than 250 ° Fahrenheit above the original temperature, nor would the temperature at any one point, including any joint, rise more than 405 ° Fahrenheit above the original temperature within the time listed below.**

**Class B-15 15 minutes.**

**Class B-0 0 minutes — no insulation requirements**

**Bulkheads or decks of the “C” Class shall be constructed of approved incombustible materials, but need meet no other requirements relative to the passage of flame.**

* 1. **Electrical Systems**
  2. **Fuel shutoffs**

**III. Day Three - Classroom**

**Video:**

**Fire Down Below**

**Investigative Report**

Investigator Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_

Location of the Incident:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time & Date of Incident: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Type of Investigation:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Personnel Involved: Name Rank

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cause of the Incident: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Factors Leading Up to the Incident: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Contributing Factors: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time Victim Reported Onboard: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time Victim Was Put To Work: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What was the Indoctrination Procedure? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Initial Actions Taken to extinguish the Fire: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Actions Taken after the Initial Attempt: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Was Anyone Hurt or Killed? Name Injury

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Who found the Victim? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where was the Victim Found? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If injured, who provided care?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Investigator’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Recommendations:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**B. Organization & Training**

**1. Station Bills**

**2. Signals**

**3. Training For On-Board Firefighting**

**4. Attack**

**5. Rescue**

**6. Protecting Exposures**

**7. Ventilation**

**8. Overhaul**

**9. De-watering**

**10. Fire under Control**

**11. Fire Out**

**12. Critique**

**13. Fighting Shipboard Fires**

**C. Hazardous Materials**

**1. Definitions**

**2. Properties of Hazardous Materials**

**3. Recognizing Hazardous Materials: Placards & Labels**

**4. Incident Command**

Note:

The scenarios listed on the next page will not done in the order listed. For operational and safety purposes, they will be done in a different order and on a different days.

**IV. Day Four - Field**

**A. Hose Handling**

**B. Fire Extinguishment – Portable Extinguishers**

**C. Electrical Fire – CO2 Fire Extinguishers**

**D. Drip Pan Fires – Ansul Cartridge Activated Fire Extinguishers**

**E. Drum Storage – Dry Chemical Extinguishers**

**F. 10’x10’ Fire With Obstacles & Leaking Fuel Flange – Dry Chemical & Water in Combination**

**G. Fire Extinguishment – Fixed CO2 System Demonstration**

**H. Fire Extinguishment – High Velocity Water Fog**

**I. Compartment Entry – Team Training**

**J. LPG Flange Fire – Fuel Isolation; Low Velocity Water Fog**

**K. Outside Bilge Fire - Team Training**

**V. Day Five - Field**

**A. Self-Contained Breathing Apparatus – SCBA; Lecture**

**B. Compartment ( With & Without SCBA )**

**C. Smoke Maze – Search & Rescue With SCBA**

**D. Compartment Fire – Horizontal Attack**

**E. Compartment Fire – Vertical Attack**

**F. Fire Extinguishment – Foam Demonstration**

**1. Protein Foam**

**2. Aqueous Film Forming Foam (A.F.F.F.)**

**G. Galley & Cabin Fires – Team Training**

**H. Engine Room Fires – Team Training**

1. **Course review & Critique**

**DELGADO FIRE SCHOOL**

**BASIC AND ADVANCED SHIPBOARD FIRE FIGHTING**

**CHEMICAL DATA GUIDE HOMEWORK**

**1. Grade A flammable liquids are those with a Reid vapor pressure:**

**A. 5 to 8-1/2 psia**

**B. More than 8-1/2 but less than 14 psia**

**C. 14 psia or more**

**D. None of the above**

**2. According to the Chemical Data Guide, the flammable limits of ethylene oxide are:**

**A. 1.85 to 48%**

**B. 2 to 100%**

**C. 2.7 to 34%**

**D. 1.9 to 88%**

**3. According to the Chemical Data Guide, ethylene oxide exhibits which of the following fire and explosion hazards?**

**A. It breaks down into highly toxic fumes of bromides**

**B. It reacts with water to form flammable vapors**

**C. It does not need oxygen for combustion. If local hot spots develop on the tank, the liquid in the tank may explode**

**D. Its flash point is 80.4o Fahrenheit**

**4. Which of the following is an example of a Grade A flammable liquid?**

**A. Iso-propylamine**

**B. Acetone**

**C. Morpholine**

**D. Ethyl acetate**

**5. According to the Chemical Data Guide, ethyl chloride produces which of the following when ignited?**

**A. Toxic fumes of oxides of nitrogen**

**B. Toxic fumes of lead**

**C. Poisonous phosgene gas**

**D. Poisonous chlorine gas**

**6. According to the Chemical Data Guide, benzene has been fatal in 5 to 10 minutes at:**

**A. 3000 ppm .3%**

**B. 7500 ppm .75%**

**C. 20,000 ppm 2%**

**D. 50,000 ppm 5%**

**7. Which of the following is a Grade B liquid?**

**A. Gasoline**

**B. Iso-propylamine**

**C. Carbon disulfide**

**D. Methyl alcohol**

**8. Which of the following flash points would indicate a Grade B flammable liquid?**

**A. 85o F**

**B. 90o F**

**C. 80o F**

**D. 150o F**

**9. According to the Chemical Data Guide, carbon disulfide, when burning, produces:**

**A. Phosphene gas**

**B. Sulfuric acid gas**

**C. Sulfur dioxide**

**D. Carbon tetrachloride**

**10. What is the flash point of iso-hexane?**

**A. -10o Fahrenheit**

**B. 20o Centigrade**

**C. 68o Fahrenheit**

**D. 152o Centigrade**

**11. According to the Chemical Data Guide, which of the following can be shipped in bulk in U.S. waters?**

**A. Liquid oxygen**

**B. Nitrogen dioxide**

**C. Chlorine**

**D. Ethyleneimine**

**12. Which of the following would be classified as Grade C petroleum product?**

**A. Reid vapor pressure of 14 psia, flash point of 60o F**

**B. Reid vapor pressure of 7 psia, flash point of 85o F**

**C. Reid vapor pressure of 5 psia, flash point of 70o F**

**D. Reid vapor pressure above 8-1/2 psia, but less than 14 psia**

**13. In order to determine the fire and explosion hazards for Naphtha, you would use the information in the Chemical Data Guide for which of the following chemicals?**

**A. Treacle**

**B. Naphthalene**

**C. Tar Camphor**

**D. Mineral Spirits**

**14. According to the Chemical Data Guide, what is the flash point of di-iso-butylamine?**

**A. 125o F**

**B. 75o F**

**C. 84o F**

**D. 100o F**

**15. Which of the following extinguishing agents may be ineffective for controlling methyl ethyl ketone (MEK) fires in open containers?**

**A. CO2**

**B. Dry chemical**

**C. Water spray**

**D. Alcohol foam**

**16. In regard to vinyl chloride, which of the following is/are true?**

**A. May polymerize when exposed to heat**

**B. Sweet odor**

**C. Decomposes from heat to form phosgene gas**

**D. All of the above**

**17. The threshold limit value (TLV) for n-butyl alcohol is:**

**A. 100 ppm**

**B. 50 ppm**

**C. 10 ppm**

**D. 25 ppm**

**18. The symptoms for the inhalation of diesel oil vapors are:**

**A. Drowsiness**

**B. Headache and stupor**

**C. Nausea and vomiting**

**D. Both B and C**

**19. What are the flammable limits for ammonia?**

**A. 2.5 - 11%**

**B. 16 - 25%**

**C. 6.5 - 12%**

**D. Is not flammable**

**20. In general, one should avoid breathing the vapor of Bunker C. If a person does breathe the vapors, what are some of the symptoms?**

**A. Headache and dizziness**

**B. Dizziness and vertigo**

**C. Unconsciousness**

**D. All of the above**

**21. What is the Reid vapor pressure psia for nitric acid (95%)?**

**A. 2.7**

**B. 7.1**

**C. 1.9**

**D. 33**

**22. The Chemical Data Guide states one should avoid breathing vapors of which of the following alcohols?**

**A. Ethyl alcohol**

**B. Sec-butyl alcohol**

**C. Methyl alcohol**

**D. Both B and C**

**23. What extinguishing agent can be used for a kerosene fire in a confined space?**

**A. Alcohol foam**

**B. CO2**

**C. Dry chemical**

**D. Both B and C**

**24. Which of the following is a synonym for sulfuric acid?**

**A. Sulfurous**

**B. Acid of sulfur**

**C. Battery acid**

**D. Hydrochloric acid**

**25. Which of the following is/are true concerning sulfuric acid?**

**A. Sulfuric acid will not burn**

**B. Sulfuric acid has a flammable range of 5-18%**

**C. Gives off hydrogen gas, which is highly flammable, when reacting with most metals**

**D. Both A and C**

**26. Which of the following is/are true concerning 1,1,2-trichloroethane?**

**A. It is a suspected carcinogen**

**B. Its synonym is chloroethane**

**C. Short exposure tolerance is 1500 ppm**

**D. Both B and C**

**27. According to the Chemical Data Guide, liquid oxygen is classified as:**

**A. Extremely flammable**

**B. Grade A flammable liquid**

**C. Non flammable**

**D. Non-reactive**

**28. When freon comes in contact with hot surfaces or a naked flame, it will form which of the following?**

**A. Free oxygen**

**B. Extremely poisonous phosgene gas**

**C. Hydrogen cyanide gas**

**D. Carbon dioxide**

**29. According to the Chemical Data Guide, sodium hypochlorite solution has which of the following characteristics?**

**A. It is an oxidizer**

**B. It is flammable**

**C. Decomposes in a fire to form chlorine gas**

**D. Both A and C**

**30. According to the Chemical Data Guide, when a spill occurs involving any chemical in the guide, who should be called?**

**A. Navy**

**B. Owner of the vessel**

**C. National response center**

**D. No one**

ALKANES

(Fuel Family)

|  |  |  |  |
| --- | --- | --- | --- |
| Formula | Use | Fuel Type | Flash Point F |
| C12 H44 | Lubricating  Oils | Lubricating Oils - Turbine  Lubricating Oil (Mineral - Motor - Paraffin) | 400  300 - 450 |
| C20 H42  C17 H36 | Heating  Oils | Fuel Oil # 6  Fuel Oil # 5  Fuel Oil # 4 | 150 - 270  156 - 300  142 - 240 |
| C16 H34  C13 H28 | High  Test  Fuels | Fuel Oil # 2  Fuel Oil # 1 (Kerosene)  Jet Fuel A-1  Jet Fuel JP-5  Jet Fuel JP-6  Diesel Fuel 4-D  Diesel Fuel 2-D  Diesel Fuel 1-D  Mineral Spirits  Stoddard Safety (Cleaning) | 126 - 204  110 - 162  110 - 150  95 - 145  100  130  125  100  104  > 100 |
| C12 H26  C5 H12 | Low  Test  Fuels | Crude Oil  Naphtha High Flash  Naphtha 50 Flash  Naphtha Regular  Petro-Ether  Gasoline (Octane 90-100)  Gasoline (Octane 100-130)  Gasoline (Octane 115-145) | 20-90  +85  +50  +28  < 0  -40  -50  -50 |
| C4 H10  CH4 | L.P.G. &  Natural  Gas |  |  |

Spontaneous Combustion Family

( Animal & Vegetable Oils )

(b) (a)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Most Hazardous | Class | I2 Value | Type | Uses |
|  |  |  |  |  |
| Cod Liver Oil | III | 190-240 | A.O. | Food Source |
| Linseed Oil | III | 170-204 | V.O.-D | Paints - Varnishes |
| Menhaden oil | III | 140-195 | A.O. | Oil In sardines |
| Fish Oil | III | 110-190 | A.O. | Food Source |
| Safflower Oil | III | 130-150 | V.O.-D | Paints - Varnishes |
| Perilla Oil | III | 110-160 | V.O. |  |
|  |  |  |  |  |
| Medium Hazard |  |  |  |  |
|  |  |  |  |  |
| Tung Oil | III | 160-180 | V.O.-D | Paints - Varnishes |
| Soybean Oil | III | 124-136 | V.O.-D | Paints - Varnishes |
| Sunflower Oil | III | 122-136 | V.O.-D | Paints - Varnishes |
| Whale Oil | III | 110-150 | A.O. | Food Source |
| Corn Oil | III | 116-130 | V.O.-S.D. | Paints - Varnishes |
| Sesame Oil | III | 104-116 | V.O.-S.D. | Paints - Varnishes |
| Pine Oil | III | 105-110 | V.O.-S.D. | Paints - Varnishes |
| Cottonseed Oil | III | 103-110 | V.O.-S.D. | Paints - Varnishes |
| Olive Oil | III | 74-94 | V.O.-N.D. | Paints |
|  |  |  |  |  |
| Low Hazard |  |  |  |  |
|  |  |  |  |  |
| Peanut Oil | III | 83-98 | V.O.-N.D. | Paints - Cooking |
| Castor Oil | III | 81-90 | V.O.-N.D. | Paints - Medicinal |
| Lard Oil | III | 46-66 | FAT - A.O. | Cooking |
| Palm Oil | III | 48-58 | FAT | Food Source |
| Oleo Oil | III | 40-55 | FAT | Cooking |
| Black Mustard Oil | III | 18-30 | V.O.-S.D. | Paints - Varnishes |
| Coconut Oil | III | 8-10 | FAT | Cooking |
| Turpentine Oil | I-c | - | V.O. | Cleaner - Solvent |

KEY: a. Fat Solid oil D. Drying Oil

A.O. Animal Oil S.D. Semi-Drying Oil

V.O. Vegetable Oil N.D. Non-Drying Oil

b. I2 Value - The higher the value indicates that there are a higher number of double covalent bonds in the chemical compound that give off heat energy when they combine with Oxygen spontaneously.

|  |  |
| --- | --- |
|  |  |



|  |
| --- |
|  |
| 31 May 2012 |

Circular 1432:

# REVISED GUIDELINES FOR THE MAINTENANCE AND INSPECTION OF FIRE PROTECTION SYSTEMS AND APPLIANCES

1. The Maritime Safety Committee, at its ninetieth session (16 to 25 May 2012), having considered a proposal by the Sub-Committee on Fire Protection, at its fifty-fifth session, and recognizing the need to include maintenance and inspection guidelines for the latest advancements in fire-protection systems and appliances, approved the Revised Guidelines for the maintenance and inspection of fire protection systems and appliances, as set out in the annex.
2. Member Governments are invited to apply the annexed Guidelines when performing maintenance, testing and inspections in accordance with SOLAS regulation II-2/14.2.2.1 on or after 31 May 2013 and bring the annexed Guidelines to the attention of shipowners, shipmasters, ships' officers and crew and all other parties concerned.
3. This circular supersedes MSC/Circ.850.

# ANNEX

**REVISED GUIDELINES FOR THE MAINTENANCE AND INSPECTION OF FIRE PROTECTION SYSTEMS AND APPLIANCES**

1. **Application**

These Guidelines apply to all ships and provide the minimum recommended level of maintenance and inspections for fire protection systems and appliances. This information may be used as a basis for the ship's onboard maintenance plan required by SOLAS regulation II-2/14. These Guidelines do not address maintenance and inspection of fixed carbon dioxide systems or portable fire extinguishers. Refer to the comprehensive instructions provided in the Guidelines for the maintenance and inspections of fixed carbon dioxide fire-extinguishing systems (MSC.1/Circ.1318) for fixed carbon dioxide systems, and in the Improved Guidelines for marine portable fire extinguishers (resolution A.951(23)) for portable fire extinguishers.

# 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 provision of alternate fixed or portable fire protection equipment or other measures. The onboard maintenance plan should include provisions for this purpose.

# Maintenance and testing

* 1. Onboard maintenance and inspections should be carried out in accordance with the ship's maintenance plan, which should include the minimum elements listed in sections 4 to 10 of these Guidelines.
  2. 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 onboard maintenance plan should indicate which parts of the recommended inspections and maintenance are to be completed by trained personnel.
  3. 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.
  4. In addition to the onboard maintenance and inspections stated in these Guidelines, manufacturer's maintenance and inspection guidelines should be followed.
  5. Where particular arrangements create practical difficulties, alternative testing and maintenance procedures should be to the satisfaction of the Administration.

# Weekly testing and inspections

* 1. 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.

* 1. Fixed gas fire-extinguishing systems
     1. verify all fixed fire-extinguishing system control panel indicators are functional by operating the lamp/indicator test switch; and
     2. verify all control/section valves are in the correct position.
  2. Fire doors

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

* 1. Public address and general alarm systems

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

* 1. Breathing apparatus

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

* 1. Low-location lighting

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

* 1. Water mist, water spray and sprinkler systems

1. verify all control panel indicators and alarms are functional;
2. visually inspect pump unit and its fittings; and
3. 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.

* 1. Fire mains, fire pumps, hydrants, hoses, and nozzles

1. verify all fire hydrants, hose and nozzles are in place, properly arranged, and are in serviceable condition;
2. operate all fire pumps to confirm that they continue to supply adequate pressure; and
3. emergency fire pump fuel supply adequate, and heating system in satisfactory condition, if applicable.
   1. Fixed gas fire-extinguishing systems

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

* 1. 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.

* 1. Water mist, water spray and sprinkler systems

1. verify all control, pump unit and section valves are in the proper open or closed position;
2. verify sprinkler pressure tanks or other means have correct levels of water;
3. test automatic starting arrangements on all system pumps so designed;
4. verify all standby pressure and air/gas pressure gauges are within the proper pressure ranges; and
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.)

* 1. Firefighter's outfits

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

* 1. 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.

* 1. Fixed aerosol extinguishing systems

1. verify all electrical connections and/or manual operating stations are properly arranged, and are in proper condition; and
2. verify the actuation system/control panel circuits are within manufacturer's specifications.
   1. Portable foam applicators

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

* 1. Wheeled (mobile) fire extinguishers

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

* 1. 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 indicated actions are taken for the specified equipment:

* 1. Fire mains, fire pumps, hydrants, hoses and nozzles Verify international shore connection(s) is in serviceable condition.
  2. Foam fire-extinguishing systems

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

* 1. Ventilation systems and fire dampers Test all fire dampers for local operation.
  2. Fire doors

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

# Annual testing and inspections

Annual inspections should be carried out to ensure that the indicated actions are taken for the specified equipment:

* 1. Fire mains, fire pumps, hydrants, hoses and nozzles

1. visually inspect all accessible components for proper condition;
2. flow test all fire pumps for proper pressure and capacity. Test emergency fire pump with isolation valves closed;
3. test all hydrant valves for proper operation;
4. pressure test a sample of fire hoses at the maximum fire main pressure, so that all fire hoses are tested within five years;
5. verify all fire pump relief valves, if provided, are properly set;
6. examine all filters/strainers to verify they are free of debris and contamination; and
7. nozzle size/type correct, maintained and working.
   1. Fixed fire detection and fire alarm systems
8. test all fire detection systems and fire detection systems used to automatically release fire-extinguishing systems for proper operation, as appropriate;
9. visually inspect all accessible detectors for evidence of tampering obstruction, etc., so that all detectors are inspected within one year; and
10. test emergency power supply switchover.
    1. Fixed gas fire-extinguishing systems
11. visually inspect all accessible components for proper condition;
12. externally examine all high pressure cylinders for evidence of damage or corrosion;
13. check the hydrostatic test date of all storage containers;
14. functionally test all fixed system audible and visual alarms;
15. verify all control/section valves are in the correct position;
16. check the connections of all pilot release piping and tubing for tightness;
17. examine all flexible hoses in accordance with manufacturer's recommendations;
18. test all fuel shut-off controls connected to fire-protection systems for proper operation;
19. the boundaries of the protected space should be visually inspected to confirm that no modifications have been made to the enclosure that have created un-closeable openings that would render the system ineffective; and
20. 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.
    1. Foam fire-extinguishing systems
21. visually inspect all accessible components for proper condition;
22. functionally test all fixed system audible alarms;
23. 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.);
24. test all system cross connections to other sources of water supply for proper operation;
25. verify all pump relief valves, if provided, are properly set;
26. examine all filters/strainers to verify they are free of debris and contamination;
27. verify all control/section valves are in the correct position;
28. 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;
29. 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

1. test all fuel shut-off controls connected to fire-protection systems for proper operation.
   1. Water mist, water spray and sprinkler systems
2. verify proper operation of all water mist, water-spray and sprinkler systems using the test valves for each section;
3. visually inspect all accessible components for proper condition;
4. externally examine all high pressure cylinders for evidence of damage or corrosion;
5. check the hydrostatic test date of all high pressure cylinders;
6. functionally test all fixed system audible and visual alarms;
7. flow test all pumps for proper pressure and capacity;
8. test all antifreeze systems for adequate freeze protection;
9. test all system cross connections to other sources of water supply for proper operation;
10. verify all pump relief valves, if provided, are properly set;
11. examine all filters/strainers to verify they are free of debris and contamination;
12. verify all control/section valves are in the correct position;
13. 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;
14. test emergency power supply switchover, where applicable;
15. 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;
16. check for any changes that may affect the system such as obstructions by ventilation ducts, pipes, etc.;
17. 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; and
18. test a minimum of two automatic sprinklers or automatic water mist nozzles for proper operation.
    1. Ventilation systems and fire dampers
19. test all fire dampers for remote operation;
20. verify galley exhaust ducts and filters are free of grease build-up; and
21. test all ventilation controls interconnected with fire-protection systems for proper operation.
    1. Fire doors

Test all remotely controlled fire doors for proper release.

* 1. Breathing apparatus

1. check breathing apparatus air recharging systems, if fitted, for air quality;
2. check all breathing apparatus face masks and air demand valves are in serviceable condition; and
3. check EEBDs according to maker's instructions.
   1. Fixed dry chemical powder systems
4. visually inspect all accessible components for proper condition;
5. verify the pressure regulators are in proper order and within calibration; and
6. 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.)

* 1. 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.

* 1. Portable foam applicators

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;
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;
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;
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
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.
   1. Wheeled (mobile) fire extinguishers
6. perform periodical inspections in accordance with the manufacturer's instructions;
7. visually inspect all accessible components for proper condition;
8. check the hydrostatic test date of each cylinder; and
9. for dry powder extinguishers, invert extinguisher to ensure powder is agitated.
   1. 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.

* 1. Fixed gas fire-extinguishing systems

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
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.
   1. Fixed dry chemical powder systems
3. blow dry nitrogen through the discharge piping to confirm that the pipe work and nozzles are clear of any obstructions;
4. operationally test local and remote controls and section valves;
5. verify the contents of propellant gas cylinders (including remote operating stations);
6. test a sample of dry chemical powder for moisture content; and
7. 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, the following inspections should be carried out for the specified equipment.

* 1. Fixed gas fire-extinguishing systems
  2. Perform internal inspection of all control valves.
  3. Foam fire-extinguishing systems

1. perform internal inspection of all control valves;
2. flush all high expansion foam system piping with fresh water, drain and purge with air;
3. check all nozzles to prove they are clear of debris; and
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.
   1. Water mist, water spray and sprinkler systems
5. flush all ro-ro deck deluge system piping with water, drain and purge with air;
6. perform internal inspection of all control/section valves; and
7. check condition of any batteries, or renew in accordance with manufacturer's recommendations.
   1. Breathing apparatus

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

* 1. Low-location lighting

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

* 1. 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

At least once every 10 years, the following inspections should be carried out for the specified equipment:

* 1. Fixed gas fire-extinguishing systems

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;
2. flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years; and
3. if permitted by the Administration, visual inspection and NDT (non-destructive testing) of halon cylinders may be performed in lieu of hydrostatic testing.
   1. 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.

* 1. Fixed dry chemical powder systems

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

* 1. Fixed aerosol extinguishing systems

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

* 1. 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.

# Circular 1318

# GUIDELINES FOR THE MAINTENANCE AND INSPECTIONS OF FIXED CARBON DIOXIDE FIRE-EXTINGUISHING SYSTEMS

1. The Committee, at its eighty-sixth session (27 May to 5 June 2009), having considered the proposal by the Sub-Committee on Fire Protection, at its fifty-third session, approved Guidelines for the maintenance and inspections of fixed carbon dioxide fire-extinguishing systems, as set out in the annex.
2. Member Governments are invited to apply the annexed Guidelines when inspecting fixed carbon dioxide fire-extinguishing systems on board all ships and bring them to the attention of ship designers, ship-owners, equipment manufacturers, and other parties concerned.

# ANNEX

**GUIDELINES FOR THE MAINTENANCE AND INSPECTIONS OF FIXED CARBON DIOXIDE FIRE-EXTINGUISHING SYSTEMS**

1. **General**

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. These Guidelines are intended to supplement the fire-extinguishing system manufacturer’s approved maintenance instructions. 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.

# Safety

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. 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. 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. All personnel should be notified of the impending activities before work is begun.

# Maintenance and inspection plan

Fixed carbon dioxide fire-extinguishing systems should be kept in good working order and readily available for immediate use. 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. 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:

* 1. maintenance and inspection procedures and instructions;
  2. required schedules for periodic maintenance and inspections;
  3. listing of recommended spare parts; and
  4. records of inspections and maintenance, including corrective actions taken to maintain the system in operable condition.

# 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:
     1. all stop valves are in the closed position;
     2. all releasing controls are in the proper position and readily accessible for immediate use;
     3. all discharge piping and pneumatic tubing is intact and has not been damaged;
     4. all high pressure cylinders are in place and properly secured; and
     5. the alarm devices are in place and do not appear damaged.
  2. In addition, on low pressure systems the inspections should verify that:

1. the pressure gauge is reading in the normal range;
2. the liquid level indicator is reading within the proper level;
3. the manually operated storage tank main service valve is secured in the open position; and
4. the vapor supply line valve is secured in the open position.

# 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.

# Minimum recommended maintenance

* 1. At least biennially (intervals of 2 years ± 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):
     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;
     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 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. Flexible hoses should be replaced at the intervals recommended by the manufacturer and not exceeding every 10 years; and
     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.
  2. 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:

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.

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

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

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;

1. 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
2. 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.

# EXAMPLE SERVICE CHARTS

HIGH PRESSURE CO2 SYSTEM

|  |  |  |  |
| --- | --- | --- | --- |
| Date: | Name of ship/unit: | IMO No.: |  |

**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 CO2 system.

LOW PRESSURE CO2 SYSTEM

|  |  |  |  |
| --- | --- | --- | --- |
| Date: | Name of ship/unit: | IMO No.: |  |

**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 CO2 tank checked by tank level indicator |  |  |  |  |
| 5 | Contents of CO2 tank checked by riser tube reading |  |  |  |  |
| 6 | Contents of CO2 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 CO2 system.

# Resolution A.951(23)

**Adopted on 5 December 2003**

**(Agenda item 17)**

**IMPROVED GUIDELINES FOR MARINE PORTABLE FIRE EXTINGUISHERS**

THE ASSEMBLY,

RECALLING Article 15(U) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

RECALLING ALSO that, by resolution A.602(15), it adopted the Revised Guidelines for Marine Portable Fire Extinguishers, to supplement the relevant requirements of chapter II-2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, as well as chapter V of the Torremolinos International Convention for the Safety of Fishing Vessels, 1977,

RECOGNIZING the need to further improve the said Revised Guidelines following the adoption of amendments to chapter II-2 of the 1974 SOLAS Convention and of the 1993 Torremolinos Protocol to the 1977 Torremolinos Convention referred to above, and in the light of the experience gained from the application of the Revised Guidelines,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its seventy-fifth session,

1. ADOPTS the Improved Guidelines for Marine Portable Fire Extinguishers, the text of which is set out in the Annex to the present resolution;
2. RECOMMENDS Governments concerned to apply the annexed Improved Guidelines in conjunction with the appropriate requirements of the international instruments referred to above;
3. AUTHORIZES the Maritime Safety Committee to keep the Improved Guidelines under review and amend or extend them as necessary;
4. REVOKES resolution A.602(15).

ANNEX

# IMPROVED GUIDELINES FOR MARINE PORTABLE FIRE EXTINGUISHERS

1. **Scope**

These Guidelines have been developed to supplement the relevant requirements for marine portable fire extinguishers\* of the International Convention for the Safety of Life at Sea 74, as amended, the International Code for Fire Safety Systems (FSS Code) and the 1993 Torremolinos Protocol relating to the Torremolinos International Convention for the Safety of Fishing Vessels, 1977. The Guidelines are offered to Administrations to assist them in determining appropriate design and construction parameters. The status of the Guidelines is advisory. Their content is based on current practices and does not exclude the use of designs and materials other than those indicated below.

# Definitions

* 1. An *extinguisher* is an appliance containing an extinguishing medium, which can be expelled by the action of internal pressure and be directed into a fire. This pressure may be stored pressure or be obtained by release of gas from a cartridge.
  2. A *portable extinguisher* is one, which is designed to be carried and operated by hand, and which in working order has a total weight of not more than 50 pounds or 23 kg.
  3. *Extinguishing medium* is the substance contained in the extinguisher which is discharged to cause extinction of fire.
  4. *Charge of an extinguisher* is the mass or volume of the extinguishing medium contained in the extinguisher. The quantity of the charge of water or foam extinguishers is normally expressed in volume (litres) and that of other types of extinguishers in mass (kilograms) or (pounds).

# Classification

* 1. Extinguishers are classified according to the type of extinguishing medium they contain. At present the types of extinguishers and the uses for which they are recommended are as follows:

|  |  |
| --- | --- |
| **Extinguishing medium** | **Recommended for use on fires involving** |
| Water  Water with additives | wood, paper, textiles and similar materials |
| Foam | wood, paper, textiles and flammable liquids |
| Dry powder/dry chemical (standard/ classes B, C ) | flammable liquids, electrical equipment and flammable gases |
| Dry powder/dry chemical (multiple or general purpose/classes A, B, C) | wood, paper, textiles, flammable liquids, electrical equipment and flammable gases |
| Dry powder/dry chemical (metal) | combustible metals |
| Carbon dioxide | flammable liquids and electrical equipment |
| Wet chemical for class F or K | cooking grease, fats or oil fires |
| Clean agents\*\* |  |

\* Wherever in the text of these Guidelines the word *"portable extinguisher"* appears it *should* be taken as meaning "marine portable fire extinguisher".

\*\* Refer to the recommendations by the International Organization for Standardization, in particular Publication

* 1. A table is provided in the appendix which describes the general characteristics of each type of extinguisher.

# Construction

* 1. The construction of an extinguisher should be designed and manufactured for simple and rapid operation, and ease of handling.
  2. Extinguishers should be manufactured to a recognized national or international standard\*, which includes a requirement that the body, and all other parts subject to internal pressure, be tested:
     1. to a pressure of 5.5MPa (798 psi) or 2.7 times the normal working pressure, whichever is the higher, for extinguishers with a service pressure not exceeding 2.2 MPa (362 psi); or
     2. in accordance with the recognized standard for extinguishers with a service pressure exceeding 2.2 MPa (362 psi).
  3. In the design of components, selection of materials and determination of maximum filling ratios and densities, consideration should be given to the temperature extremes to which extinguishers may be exposed on board ships and operating temperature ranges specified in the recognized standards.

4.3 The materials of construction of exposed parts and adjoining dissimilar metals should be carefully selected to function properly in the marine environment.

# Fire classifications

* 1. Fire classifications are generally indicated as A, B, C, D and F (or K). There are currently two standards, defining classes of fires per the nature of the material undergoing combustion, as follows:

|  |  |
| --- | --- |
| **International Organization for Standardization**  **(ISO standard 3941)\*** | **National Fire Protection Association**  **(NFPA 10)** |
| **Class A:** Fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers. | **Class A:** Fires in ordinary combustible materials such as wood, cloth, paper, rubber and many plastics. |
| **Class B:** Fires involving liquids or liquefiable  solids | **Class B:** Fires in flammable liquids, oils, greases, tars, oil base paints, lacquers and flammable gases. |
| **Class C:** Fires involving gases. | **Class C:** Fires, which involve energized electrical equipment where the electrical  non-conductivity of the extinguishing medium is of importance. (When electrical equipment is de-energized, extinguishers for class A or B fires may be used safely.) |
| **Class D:** Fires involving metals. | **Class D:** Fires in combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium. |
| **Class F:** Fires involving cooking oils. | **Class K**: Fires involving cooking grease, fats and oils. |

**\*Comite Europeen de Normalisation (CEN standard EN2) closely follows ISO standard 3941.**

# Test specifications

* 1. Construction, performance and fire-extinguishing test specifications should be to the satisfaction of the Administration, having due regard to an established international standard\*.

# Criteria for assessing compliance with chapter 4 of the FSS Code and regulations V/20 and V/38 of the 1993 Torremolinos Protocol relating to the 1977 Torremolinos Convention

* 1. Chapter 4 of the FSS Code requires that extinguishers have a fire-extinguishing capability at least equivalent to that of a 9 L fluid extinguisher having a rating of 2A on class A fire which may be water or foam as required by the Administration. This equivalence may be demonstrated by fire test ratings determined according to an international, national or other recognized standard\*.
  2. The size and type of extinguishers should be dependent upon the potential fire hazards in the protected spaces while avoiding a multiplicity of types. Care should also be taken to ensure that the quantity of extinguishing medium released in small spaces does not endanger personnel.

# Marking of extinguishers

* 1. Each extinguisher should be clearly marked with the following minimum information:

1. name of the manufacturer;
2. types of fire and rating for which the extinguisher is suitable;
3. type and quantity of extinguishing medium;
4. approval details;
5. instructions for use and recharge (it is recommended that operating instructions be given in pictorial form, in addition to explanatory text in language understood by the likely user);
6. year of manufacture;
7. temperature range over which the extinguisher will operate satisfactorily; and
8. test pressure.

# Periodical inspections and maintenance

* 1. Extinguishers should be subject to periodical inspections in accordance with the manufacturer's instructions and serviced at intervals not exceeding one year.
     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).
     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.
     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 9.1.3.
  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.
  3. Extinguishers should be provided with a visual indication of discharge.
  4. Instructions for recharging extinguishers should be supplied by the manufacturer and be available for use on board.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ANNUAL INSPECTION** | | | | | |
| 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. | | | | |
| **INSPECTION AT RECHARGE** | | | | | |
| 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. | | | | |
| **INSPECTION AT FIVE AND TEN YEAR INTERVALS** | | | | | |
| **INSPECTION AFTER DISCHARGE TEST** | | | | | |
| 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. | | | | |
| **INSPECTION AFTER RECHARGE** | | | | | |
| Water and foam | Replace the charge in accordance with the manufacturer’s instructions. | | | | |
| Reassemble | Reassemble the extinguisher manufacturer’s instructions. | in | accordance | with | the |
| 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. | | | | |