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GUIDELINES FOR THE APPROVAL OF FIXED DRY CHEMICAL POWDER FIRE-EXTINGUISHING SYSTEMS FOR THE PROTECTION OF SHIPS CARRYING LIQUEFIED GASES IN BULK

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 approval of fixed dry chemical powder fire-extinguishing systems for the protection of ships carrying liquefied gases in bulk, as set out in the annex.

2 Member Governments are invited to apply the annexed Guidelines when approving fixed dry chemical powder fire-extinguishing systems for the protection of ships carrying liquefied gases in bulk, and bring them to the attention of ship designers, shipowners, equipment manufacturers, test laboratories and other parties concerned.

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ANNEX

GUIDELINES FOR THE APPROVAL OF FIXED DRY CHEMICAL POWDER FIRE-EXTINGUISHING SYSTEMS FOR THE PROTECTION OF SHIPS CARRYING LIQUEFIED GASES IN BULK

1 Application

These Guidelines apply to fixed dry chemical powder fire-extinguishing systems for the protection of on-deck cargo areas of ships carrying liquefied gases in bulk in accordance with SOLAS regulation II-2/1.6.2 and chapter 11 of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

2 Definitions

2.1 *Caking* is a chemical reaction between dry chemical powder and moisture that causes individual particles of the medium to bind together to form an aggregate mass.

2.2 *Dry chemical powder* is an extinguishing medium consisting of very fine particles of sodium or potassium bicarbonate treated or supplemented with additional materials to prevent packing and caking (moisture absorption) and to ensure consistent flow characteristics.

2.3 *Dry chemical powder unit* is a complete system including dry chemical storage container(s), pressurizing gas storage container(s), controls, piping and hand hose lines.

2.4 *Gas point* is a defined point in the discharge of a dry chemical powder unit when the discharge of dry chemical powder ends, and is marked by a change in the nozzle stream to the discharge of primarily pressurizing gas.

2.5 *Hand hose line* is a hand-held dry chemical powder nozzle covering cargo areas not covered by a monitor.

2.6 *Monitor* is a fixed dry chemical powder nozzle protecting cargo loading and discharge manifold areas.

2.7 *Packing* is a phenomenon that occurs when dry chemical powder stored in a container is subjected to vibration causing the smaller particles to move to the bottom of the container and the larger particles to travel to the top.

2.8 *Pressurizing medium* is the gas used to expel the dry chemical from the system, usually dry nitrogen.

3 Principal requirements for the system

3.1 The system should be capable of manual release. A manual release station should be located adjacent to each hand hose line storage area and each monitor. A back-up release station should be provided at the fixed dry chemical powder unit. The operation of any manual release station should initiate the pressurization of the fixed dry chemical powder unit and begin the discharge of dry chemical powder to all connected hand hose lines and monitors.

3.2 The system and its components should be designed to withstand ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered on the open deck of ships, and manufactured and tested to the satisfaction of the Administration in accordance with the criteria given in the appendix.

3.3 Systems should be designed for the discharge characteristics and flow rates of a specific dry chemical medium. The type of dry chemical in the system should not be changed unless testing to verify performance is conducted by a laboratory to the satisfaction of the Administration. Different dry chemical media should not be mixed.

3.4 Only chemicals based on the salts of potassium should be used. Dry chemical storage containers should be designed to pressure codes of practice acceptable to the Administration, for the maximum system pressure developed at 55ºC.

3.5 A means for pressurizing the system using an inert gas, which is normally dry nitrogen, in high pressure cylinders should be provided. The nitrogen should be industrial grade with a dewpoint of -50ºC or lower. Pressure gauges should be provided for monitoring the contents of the cylinders. A pressure regulator should be installed to reduce the gas pressure to the required system operating pressure.

3.6 The quantity of expellant gas should be adequate for the system to discharge the entire charge of dry chemical powder within the time period specified in paragraph 4.1 below. If multiple gas cylinders are provided, they should be arranged with normally closed cylinder valves that are automatically opened by a pilot system when a release station is actuated. Each cylinder should have, in addition, the capability of manual operation.

3.7 System piping should be arranged to ensure that the required flow rates are achieved at each hand hose line and monitor. Flow through the piping should be based on flow calculation methods determined by the test laboratory for the specific dry chemical powder medium and equipment used.

3.8 Hand hose line nozzles, monitors and hose couplings should be constructed of brass or stainless steel. Piping, fittings and related components, except gaskets, should be designed to withstand 925ºC.

3.9 Dry chemical storage container pick-up tubes and related internal structures should be shown to be resistant to corrosive effects of the dry chemical medium.

3.10 Dry chemical storage containers should have a fill opening of at least 100 mm to allow onboard recharging, and suitable connections to allow the dry powder charge to be fully agitated with nitrogen, in accordance with the system manufacturer’s maintenance instructions.

3.11 Operating instructions for the system should be placed at each operating station.

3.12 Recharging instructions should be provided on a permanent nameplate affixed to the fixed dry chemical powder unit. As a minimum, the instructions should indicate the required type of dry chemical powder, the manufacturer of the powder and the required charge. The required pressurizing medium pressure, number of cylinders and regulator valve setting should also be provided.

3.13 An approved design, installation, operation and maintenance manual should be provided to the shipowner for each type of fixed dry chemical powder unit.

4 Onboard testing

After installation, the pipes, valves fittings and assembled systems should be tested to the satisfaction of the Administration, including functional testing of the remote and local release stations. All distribution piping should be blown through with air to ensure that the piping is free of obstructions.

APPENDIX

APPROVAL TESTS

Except for paragraph 5, a fully charged fixed dry chemical powder unit conditioned at 21 ± 3ºC for at least 24 h should be used.

1 Discharge duration test

A fixed dry chemical powder unit should have a discharge duration of at least 45 s with all attached hand hose lines and monitors operating. The hand hose lines should be fully deployed for this test. To conduct the test, the hose lines and monitors should be held in a horizontal position and their discharge valves fully opened. The duration of discharge should be measured from the time dry chemical powder begins flowing from all attached devices until the gas point is reached at the first nozzle.

2 Maximum length of piping and fittings test

The discharge duration test should be conducted with the maximum length of discharge piping, elbows, tees and other fittings to be used on board, as recommended by the manufacturer. One nozzle should be located at the maximum height for which approval is requested.

3 Discharge range test

Dry chemical powder monitors should have a minimum discharge range as follows:

Monitor flow rate	**Minimum range**
10 kg/s	10 m
25 kg/s	30 m
45 kg/s	40 m

For monitors with a discharge rate between the above listed values, the minimum range should be determined by interpolation. The test should be conducted with the monitor positioned horizontally, 1 m above the floor. The monitor should be capable of achieving the minimum range for at least 40 s of the 45 s discharge.

4 Flow rate test

The minimum flow rate of each type of hand hose line nozzle should be at least 3.5 kg/s and each type monitor should be at least 10 kg/s. The minimum flow rate should be determined based on the average of three discharge tests. The tests should be conducted with the nozzle/monitor discharged for at least 30 s. The fixed dry chemical powder unit should be placed on a load cell or weighed before and after testing to determine the quantity of medium discharged during the test.

5 Minimum temperature test

A fully charged fixed dry chemical powder unit conditioned at the minimum expected storage temperature for at least 24 h should be capable of discharging at least 85% of the dry chemical medium with all attached hand hose lines and monitors operating. The minimum expected storage temperature should be determined by the Administration.

6 Hand hose line hydrostatic test

A full length representative sample of a hand hose line should be subjected to a hydrostatic pressure equal to two times the operating pressure that would be developed in the line by a fully charged unit with the nozzle discharge valve closed. The hose should be capable of withstanding this test pressure for a period of 1 min without rupturing.

7 Salt spray test

7.1 Representative samples of valves, pressure regulators, gauges, releasing controls and related components that will be installed at locations exposed to the weather should be subjected to a salt spray within a fog chamber. Prior to exposure, any components with inlet or outlet orifices should be sealed.

7.2 The salt solution should be a 20% by mass sodium chloride solution in distilled water. The pH should be between 6.5 and 7.2 and the density between 1.126 g/m*l* and 1.157 g/m*l* when atomized at 35ºC. Suitable means of controlling the atmosphere in the chamber should be provided. The specimens should be supported in their normal operating position and exposed to the salt spray (fog) in a chamber having a volume of at least 0.43 m^3 in which the exposure zone should be maintained at a temperature of 35 ± 2ºC. The temperature should be recorded at least once per day, at least 7 h apart (except weekends and holidays when the chamber normally would not be opened). Salt solution should be supplied from a recirculating reservoir through air-aspirating nozzles, at a pressure between 0.7 bar (0.07 MPa) and 1.7 bar (0.17 MPa). Salt solution run-off from exposed samples should be collected and should not return to the reservoir for recirculation. The samples should be shielded from condensate dripping.

7.3 Fog should be collected from at least two points in the exposure zone to determine the rate of application and salt concentration. The fog should be such that for each 80 cm^2 of collection area, 1 m*l* to 2 m*l* of solution should be collected per hour over a 16 h period and the salt concentration should be 20 ± 1% by mass.

7.4 The samples should withstand exposure to the salt spray for a period of 30 days. After this period, the samples should be removed from the fog chamber and allowed to dry for 4 to 7 days at a temperature of 20°C to 25°C in an atmosphere having a relative humidity not greater than 70%.

7.5 Following the drying period, the samples should be examined for evidence of failure. Any operating components should be functionally tested to verify continued operability. Gauges should remain watertight for at least 2 h when immersed in 0.3 m of water.

8 Dry chemical powder tests

8.1 Fluidity

The dry chemical powder should be tested to ensure that it remains free flowing throughout the temperature range requested by the applicant. Elevated temperature tests and hygroscopicity tests should be performed to the satisfaction of the Administration.

8.2 Fire-extinguishing capability

The dry chemical powder should be demonstrated capable of extinguishing fires in liquefied gas cargoes. Representative equipment should be subjected to full-scale fire tests to the satisfaction of the Administration.

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