MSC.1/Circ.1370

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GUIDELINES FOR THE DESIGN, CONSTRUCTION AND TESTING OF FIXED HYDROCARBON GAS DETECTION SYSTEMS

1 The Maritime Safety Committee, at its eighty-seventh session (12 to 21 May 2010), having considered the proposal by the Sub-Committee on Fire Protection, at its fifty-fourth session, with regard to the amendments to SOLAS regulation II-2/4, adopted by resolution MSC.291(87), and chapter 16 of the FSS Code, adopted by resolution MSC.292(87), approved Guidelines for the design, construction and testing of fixed hydrocarbon gas detection systems, as set out in the annex.

2 Member Governments are invited to apply the annexed Guidelines when approving fixed hydrocarbon gas detection systems in accordance with paragraph 5.7.3 of SOLAS regulation II-2/4 and chapter 16 of the FSS Code, 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 DESIGN, CONSTRUCTION AND TESTING OF FIXED HYDROCARBON GAS DETECTION SYSTEMS

1 GENERAL

1.1 Application

These Guidelines apply to fixed hydrocarbon gas detection systems required for oil tankers by SOLAS regulation II-2/4.5.7 and chapter 16 of the International Code for Fire Safety Systems (FSS Code). These Guidelines apply to ships constructed on or after 21 May 2010.

1.2 Definitions

1.2.1 Alarm setpoint is a fixed or adjustable setting at which the system will automatically indicate an alarm. The FSS Code, chapter 16, limits the maximum alarm setpoint to the equivalent of 30% of the lower flammable limit.

1.2.2 Calibration is the process of confirming the accuracy of the detector readings by comparison with a standard.

1.2.3 Detection time is the time interval, measured in seconds, between the time a change in the gas concentration occurs at the gas analysis unit, and the time the unit registers a reading of 90% of the gas concentration, also known as T(90).

1.2.4 Detector is the sensing element which measures the gas concentration.

1.2.5 Extraction is the physical removal of vapours from a space by means of a pump.

1.2.6 Extraction time is the time interval, measured in seconds, between the time a gas sample enters the gas sampling pipe and the time it reaches the gas analysis unit.

1.2.7 Gas analysis unit is the assembly in which the detector is housed, along with any associated analysis components.

1.2.8 Gas concentration is the amount of gas or vapour being measured, as expressed in % LFL.

1.2.9 Lower flammable limit (LFL) is the volume fraction of gas or vapour below which an explosive atmosphere does not form. Also referred to as lower explosive limit (LEL).

1.2.10 Response time is the sum of extraction time and detection time.

1.2.11 Sampling pipes are the means by which gas is conveyed from the spaces being monitored to the gas analysis unit, including any fittings, valves or filters.

1.2.12 Sampling point is the entrance to a sampling pipe inside a ballast or void space.

1.2.13 Span calibration gas is a gas mixture of known concentration used for calibration/adjustment of the gas analysis unit.

1.2.14 System refers to the fixed hydrocarbon gas detection system.

1.2.15 Zero calibration gas is a gas which is free from flammable gases, used for calibration/adjustment of the apparatus zero point.

1.2.16 Zero point is the gas concentration at which the gas analysis unit registers zero.

2 ENGINEERING SPECIFICATIONS

2.1 General

2.1.1 The system should consist of a control panel housing the gas analysis unit and sample extraction pump(s), connected to gas sampling pipes, and one or more indicating units.

2.1.2 The system should be capable of continuously measuring hydrocarbon gas concentrations, and may be arranged to operate on a sequential scanning principle, provided that each sampling line of each protected space is analysed at intervals not exceeding 30 min.

2.1.3 The system should be provided with a means to monitor air flow acceptable to the Administration.

2.1.4 Means should be provided to prevent ballast water from entering the system.

2.1.5 The system should have ingress protection suitable for the installed location of each component. In any event, the system should be designed such that dust may not enter in sufficient quantity to interfere with the satisfactory operation of the equipment and water splashing against the enclosure from any direction has no harmful effect.

2.1.6 Enclosures containing electrical components such as gas analysis units, extraction pumps, and alarm control devices should be of gas-tight construction having doors fitted with gaskets. Electrical components which would reasonably be expected to come into contact with sample gases should be explosion-proof.

2.1.7 The system should be designed, constructed and installed to prevent the leakage of hydrocarbon gases into any accommodation and service spaces, control stations or machinery spaces.

2.1.8 The system should be designed to withstand supply voltage variations and transients, ambient temperature changes, vibration, humidity, shock, impact, and corrosion normally encountered on ships, and to avoid the possibility of ignition of a flammable gas mixture.

2.1.9 The switchover sequence should be designed to keep changing the sampling line of each protected space according to a planned sequence, even if flammable gas above the alarm level is detected at a sampling point.

2.2 Component requirements

2.2.1 The gas analysis unit should be:

.1 designed and tested according to standard IEC 60079-29-1, or alternative standards acceptable to the Administration;

.2 capable of accurately measuring gas concentrations between 0% and 200% of the alarm setpoint defined by paragraph 1.2.1; and

.3 designed to prevent tampering or unauthorized interference with the alarm setpoint.

2.2.2 Extraction pumps

2.2.2.1 Extraction pumps should have sufficient power and be of adequate capacity to operate with the normal conditions of ventilation in the protected spaces with the connected sampling pipe sizes to ensure a response time in accordance with paragraph 2.1.2 for all sampling points.

2.2.2.2 Main and back-up extraction pumps of equal power and capacity should be provided and arranged to automatically switch over to the back-up pump in case of failure of the main pump. Alternatively, any failure of the main extraction pump should be automatically indicated and at least one spare extraction pump or equivalent parts should be provided on board.

2.2.3 Sampling pipes

2.2.3.1 Sampling pipes should be constructed of stainless steel, or other corrosion resistant materials acceptable to the Administration, and should be a minimum of 6 mm in inner diameter.

2.2.3.2 The location, number and arrangement of sampling points within a space should be determined in consideration of design parameters including the configuration of the space, internal obstructions, the length and internal diameter of sampling pipes, the extraction pump capacity, and the density of the vapours of the oil products intended to be carried.

2.2.3.3 Sampling pipes located within ballast tanks should be of sufficient strength to withstand hydrostatic pressure when in the most severe ballast condition.

2.2.3.4 Sampling pipes should be arranged to prevent progressive flooding upon failure.

2.2.3.5 Sampling pipes should be provided with a suitable connection for the fitting of portable detection equipment.

2.2.3.6 Sampling pipes should include a means to prevent blockage from debris accumulation.

2.2.3.7 Sampling pipes should be self-draining.

3 SYSTEM CONTROL REQUIREMENTS

3.1 Control panels and indicating units

3.1.1 The control panel should be located in the cargo control room, on the navigation bridge, or in a gas safe continuously manned central control station.

3.1.2 Clear information should be displayed on or adjacent to the control panel to allow the crew to readily determine the source of the alarm or fault condition.

3.1.3 The control panel should have a button or switch to manually reset to normal operating condition after alarm and fault conditions are cleared.

3.1.4 An indicating unit should be located on the navigation bridge if the control panel is located elsewhere.

3.1.5 Control panel and indicating unit alarm signals should be distinct from fault condition signals.

3.1.6 Indicating units may have common alarms servicing multiple sampling points, provided that all sampling points within an alarm group are located in the same space.

3.1.7 Control panels should have the capability to manually test audible and visual alarms.

3.2 Alarm conditions

3.2.1 Audible and visual alarms in accordance with the Code on Alerts and Indicators should be initiated on the navigation bridge, at the control panel, and at all indicating units under the following conditions:

.1 upon detection of gas concentrations above the alarm setpoint in any monitored space;

.2 in a fault condition, such as power failure or short-circuit;

.3 low or no flow in any sampling pipe;

.4 tampering with the alarm setpoint; or

.5 failure of any self-test functions described in paragraph 4.1.4.

3.2.2 A visual alarm should remain in effect while an alarm condition is present. The audible alarm may be silenced manually.

3.2.3 The gas concentration inside the control panel enclosure should be monitored. Upon detection of gas concentrations above the alarm setpoint within the enclosure, in addition to the alarm, the gas analysis unit should be automatically isolated from all sampling pipes and shut down. Appropriate measures should be taken to vent flammable gas inside the enclosure to an open space away from ignition sources.

4 MAINTENANCE AND CALIBRATION

4.1 Maintenance

4.1.1 The following onboard maintenance should be carried out monthly and after any fault condition:

.1 visual inspection;

.2 testing of audible and visual alarms; and

.3 zero and span calibrations as described in paragraph 4.2.

4.1.2 Additional maintenance should be carried out as specified by the manufacturer's instructions.

4.1.3 The maintenance and testing described in paragraphs 4.1.1 and 4.1.2 should be included in the maintenance plans required by SOLAS regulations II-2/14.2.2 and II-2/14.4.4.

4.1.4 Computerized systems should have a self-test function to monitor the following on start-up and repeated at least once every 24 h:

.1 power supply; and

.2 volatile memory.

4.2 Calibration

4.2.1 The system should be designed to permit onboard calibration by the crew.

4.2.2 Calibration of the detector should be performed with a zero calibration gas and a span calibration gas.

4.2.3 The span calibration gas should be:

.1 methane, for systems intended for sensing methane and hydrocarbon mixtures containing methane;

.2 propane for systems intended for sensing hydrocarbon mixtures not containing methane; or

.3 the actual gas or a chemically similar gas with a comparable flammable range.

4.2.4 The concentration of the span gas used for calibration should be equal to the alarm setpoint as defined in paragraph 1.2.1, or as determined by the Administration.

5 OPERATING AND MAINTENANCE INSTRUCTIONS

Operating and maintenance instructions for the system should be provided on board that includes the following information:

.1 operating instructions;

.2 the gases for which the system is suitable;

.3 system diagrams showing sampling points and the relationship of all components;

.4 transfer functions relating the output relative to the calibration gas to other gases;

.5 calibration and maintenance procedures;

.6 trouble-shooting procedures;

.7 minimum and maximum flow rates; and

.8 nature and significance of fault signals.