

**ANNEX 5**

**RESOLUTION MSC.145(77)  
(adopted on 5 June 2003)**

**PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS  
ON BULK CARRIERS**

**THE MARITIME SAFETY COMMITTEE,**

**RECALLING** Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

**RECALLING ALSO** that, at its seventy-sixth session, it adopted amendments to chapter XII of the International Convention for the Safety of Life at Sea (SOLAS), 1974, *inter alia*, by introducing new regulation 12 requiring the installation of water level detectors for hold, ballast and dry spaces,

**BEARING IN MIND** that the above-mentioned amendments are expected to enter into force on 1 July 2004 unless, prior to that date, specified conditions with regard to objections to the amendments are met,

**RECOGNIZING** that performance standards against which the operation and efficiency of the water level detectors can be measured, should be made available in good time before the above entry-into-force date,

**RECOGNIZING ALSO** the need to ensure that the required water level detectors provide reliable operation and that, to that extent, they are appropriately tested and installed,

**HAVING CONSIDERED** the recommendation made by the Sub-Committee on Ship Design and Equipment at its forty-sixth session,

1. **ADOPTS** the Performance standards for water level detectors on bulk carriers and the appended Guidelines on installation and testing of water level detection systems for bulk carriers, as set out in the Annex to the present resolution;
2. **URGES** Governments to ensure that the annexed Performance standards and appended Guidelines are applied when water level detectors are installed on bulk carriers flying their flags, in compliance with SOLAS regulation XII/12.

ANNEX

**PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS  
ON BULK CARRIERS**

**1 PURPOSE**

These standards provide technical functional requirements for water level detection and alarm arrangements installed in bulk carriers for compliance with SOLAS regulation XII/12.

**2 DEFINITIONS**

2.1 *Water level detector* means a system comprising sensors and indication devices that detect and warn of water ingress in cargo holds and other spaces as required in SOLAS regulation XII/12.1.

2.2 *Sensor* means a unit fitted at the location being monitored that activates a signal to identify the presence of water at the location.

2.3 *Pre-alarm level* means the lower level at which the sensor(s) in the cargo hold space will operate.

2.4 *Main alarm level* means the higher level at which the sensor(s) in the cargo hold space will operate or the sole level in spaces other than cargo holds to which the requirements of SOLAS regulation XII/12 apply.

2.5 *Visual indication* means indication by activation of a light or other device that is visible to the human eye in all levels of light or dark at the location where it is situated.

2.6 *Audible indication* means an audible signal that is detectable at the location where it is signalled.

**3 FUNCTIONAL REQUIREMENTS**

**3.1 Means of detecting water level**

3.1.1 The method of detecting water level may be by direct or indirect means as defined below:

- .1 A direct means of detection determines the presence of water by physical contact of the water with the detection device.
- .2 Indirect means of detection include devices without physical contact with the water.

3.1.2 The sensors should be capable of being located either in the aft part of each cargo hold or in the lowest part of the spaces other than cargo holds to which these requirements apply.

3.1.3 The systems of detecting water level should be capable of continuous operation while the ship is at sea.

## **3.2 Detector system requirements**

3.2.1 Detector systems should provide a reliable indication of water reaching a preset level.

3.2.2 The system should be capable of the following:

For cargo holds:

- .1 An alarm, both visual and audible, activated when the depth of water at the sensor reaches the pre-alarm level in the space being monitored. The indication should identify the space.
- .2 An alarm, both visual and audible, activated when the level of water at the sensor reaches the main alarm level, indicating increasing water level in a cargo hold. The indication should identify the space and the audible alarm should not be the same as that for the pre-alarm level.

For compartments other than cargo holds:

- .3 An alarm, both visual and audible, indicating the presence of water in a compartment other than a cargo hold when the level of water in the space being monitored reaches the sensor. The visual and audible characteristics of the alarm indication should be the same as those for the main alarm level in a hold space.

3.2.3 Detection equipment should be suitably corrosion resistant for all intended cargoes.

3.2.4 The detector indicating the water level should be capable of activating to an accuracy of  $\pm 100$  mm.

3.2.5 The part of the system which has circuitry in the cargo area, should be intrinsically safe.

## **3.3 Alarm system requirements**

3.3.1 The visual and audible alarms should be suitable for location on the navigation bridge.<sup>1</sup>

3.3.2 Visual and audible alarms should conform to the Code on Alarms and Indicators, 1995 as applicable to a primary alarm for the preservation or safety of the ship.

3.3.3 The visual and audible alarms should be capable of the following:

- .1 Visual indication using a light of a distinct colour, or digital display that is clearly visible in all expected light levels, which does not seriously interfere with other activities necessary for the safe operation of the ship. The visual indication should be capable of remaining visible until the condition activating it has returned below the level of the relevant sensor. The visual indication should not be capable of being extinguished by the operator.

---

<sup>1</sup> Reference is made to the requirements of SOLAS regulations V/17 and V/18.

- .2 In conjunction with the visual indication for the same sensor, the system should be capable of providing audible indication and alarms in the space in which the indicator is situated. The audible indication should be capable of being muted by the operator.

3.3.4 Time delays may be incorporated into the alarm system to prevent spurious alarms due to sloshing effects associated with ship motions.

3.3.5 The system may be provided with a capability of overriding indication and alarms for the detection systems installed only in tanks and holds that have been designed for carriage of water ballast (SOLAS regulation XII/12.1).

3.3.6 An override visual indication capability should be provided throughout deactivation of the water level detector for the holds or tanks referred to in 3.3.5 above. Where such an override capability is provided, cancellation of the override condition and reactivation of the alarm should automatically occur after the hold or tank has been de-ballasted to a level below the lowest alarm indicator level.

3.3.7 Requirements for malfunctions, alarms and indications should be capable of the following:

A facility for continuous monitoring of the system which, on detecting a fault activates a visual and audible alarm. The audible alarm should be capable of being muted but the visual indication should remain active until the malfunction is cleared.

3.3.8 The water level detector system should be capable of being supplied with electrical power from two independent electrical supplies. Failure of the primary electrical power supply should be indicated by an alarm.

### 3.4 Testing

3.4.1 Water level detector systems should be type tested to demonstrate their robustness and suitability under the appropriate internationally recognized conditions<sup>2</sup>.

3.4.2 Detectors serving a cargo hold should be capable of being functionally tested *in situ* when the hold is empty using either direct or indirect methods.

### 3.5 Manuals

3.5.1 Documented operating and maintenance procedures for the water level detection system should be kept on board and readily accessible.

## 4 INSTALLATION AND TESTING

Guidelines on installation and testing of water level detection systems for bulk carriers are set out in the appendix.

---

<sup>2</sup> With regard to testing, reference is made to IEC 60092-0504 and the IEC 60529.

Electrical components installed in the cargo holds, ballast tanks and dry spaces should satisfy the requirements of IP68 in accordance with IEC 60529.

## APPENDIX

### GUIDELINES ON INSTALLATION AND TESTING OF WATER LEVEL DETECTION SYSTEMS FOR BULK CARRIERS

#### 1 PURPOSE

These Guidelines provide procedures for installation and testing of water level detection and alarm systems installed in bulk carriers for compliance with SOLAS regulation XII/12.

#### 2 EQUIPMENT

##### 2.1 Detector equipment type test requirements

2.1.1 Detector equipment should provide a reliable indication of water reaching a preset level and should be type tested to demonstrate their robustness and suitability under the appropriate conditions of IEC 60092-504 and the following:

- .1 Protection of the enclosures of electrical components installed in the cargo holds, ballast tanks and dry spaces should satisfy the requirements of IP68 in accordance with IEC 60529. The water pressure testing of the enclosure should be based on a pressure head held for a period depending on the application. For detectors to be fitted in holds intended for the carriage of water ballast or ballast tanks the application head should be the hold or tank depth and the hold period should be 20 days. For detectors to be fitted in spaces intended to be dry the application head should be the depth of the space and the hold period should be 24 h.
- .2 Operation in cargo/water mixture for the selected range of cargoes such as iron ore dust, coal dust, grains and oils using seawater with a suspension of representative fine material for each cargo. For type test purposes an agitated suspension of representative fine materials in seawater, with a concentration of 50% by weight, should be used with the complete detector assembly including any filtration fitted. The functioning of the detection assembly with any filtration arrangements should be verified in the cargo/water mixture with immersion repeated ten times without cleaning any filtration arrangements.

2.1.2 Protection of the enclosures of electrical equipment installed above ballast and cargo spaces should satisfy the requirements of IP56 in accordance with IEC 60529.

##### 2.2 Detector equipment installation requirements

2.2.1 The sensors should be located in a protected position that is in communication with the aft part of the cargo hold such that the position of the sensor detects the level that is representative of the levels in the actual hold space. These sensors should be located:

- .1 either as close to the centreline as practicable, or
- .2 at both the port and starboard sides of the cargo hold.

2.2.2 The detector installation should not inhibit the use of any sounding pipe or other water level gauging device for cargo holds or other spaces.

2.2.3 Detectors and equipment should be installed where they are accessible for survey, maintenance and repair.

2.2.4 Any filter element fitted to detectors should be capable of being cleaned before loading.

2.2.5 Electrical cables and any associated equipment installed in cargo holds should be protected from damage by cargoes or mechanical handling equipment associated with bulk carrier operations, such as in tubes of robust construction or in similar protected locations.

2.2.6 Any changes/modifications to the ship's structure, electrical systems or piping systems that involves cutting and/or welding should be approved by the classification society before work is carried out.

### **3 SYSTEMS**

#### **3.1 Alarm system requirements**

3.1.1 Alarm systems should be type tested in accordance with IEC 60092-504, as appropriate.

3.1.2 A switch for testing audible and visual alarms should be provided at the alarm panel and the switch should return to the off position when not operated.

#### **3.2 Alarm system testing requirement**

The visual and audible alarms should be tested to demonstrate the following:

- .1 The visual indication may not be extinguished by the operator.
- .2 It should be set at a level that alerts operators but does not interfere with the safe operation of the ship.
- .3 That they are distinguishable from other alarms.

#### **3.3 System test requirements**

3.3.1 After installation a functionality test should be carried out. The test should represent the presence of water at the detectors for every level monitored. Simulation methods may be used where the direct use of water is impracticable.

3.3.2 Each detector alarm should be tested to verify that the pre-alarm and main alarm levels operate for every space where they are installed and indicate correctly. Also, the fault monitoring arrangements should be tested as far as practicable.

3.3.3 Records of testing of alarm systems should be retained on board.

#### **4      MANUALS**

Manuals should be provided on board and should contain the following information and operational instructions:

- .1      A description of the equipment for detection and alarm arrangements together with a listing of procedures for checking that, as far as practicable, each item of equipment is working properly during any stage of ship operation.
- .2      Evidence that the equipment has been type tested to the requirements of 2.1 above.
- .3      Line diagrams of the detection and alarm system showing the positions of equipment.
- .4      Installation instructions for orientation, setting, securing, protecting and testing.
- .5      List of cargoes for which the detector is suitable for operating in a 50% seawater slurry mixture (see paragraph 2.1.1.2).
- .6      Procedures to be followed in the event of equipment not functioning correctly.
- .7      Maintenance requirements for equipment and system.

\*\*\*

