

CLASSIFICATION NOTES

Type Approval, Installation and Testing of Water Level Detectors on Bulk Carriers and Single Hold Cargo Ships other than Bulk Carriers

General Information

This edition of the classification notes 'Type approval, installation and testing of water level detectors on bulk carriers and Single Hold Cargo Ships other than Bulk Carriers' (January, 2013) supersedes the July, 2011 edition.

Summary of additions and amendments incorporated in this edition are indicated in Table-1.

TABLE-1 AMENDMENTS INCORPORATED IN THIS EDITION

These amendments will come into force from 1st July 2012

| <i>Section/ Clause</i> | <i>Subject/amendment</i> |
|-----------------------------------|--|
| 2.2 | Requirements for fitting water level detectors on Single Hold Cargo Ships other than Bulk Carriers given |
| 3.1, 3.4, 4.2.3 | References to SOLAS II-1 Regulation 25 added |

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Water Level Detectors on Bulk Carriers and Single Hold Cargo Ships other than Bulk Carriers

1.0 General

This Classification Note provides guidelines on technical and functional requirements and performance tests (type tests) that are required to be fulfilled for type approval of Water Level Detectors in accordance with the general “Certification Scheme for Type Approval of products” of IRS.

2.0 Application

2.1 The requirement of fitting water level detection system for detecting water ingress in the cargo holds and other spaces of bulk carriers in accordance with SOLAS XII Regulation 12 is applicable regardless of date of build of the bulk carrier. The detectors are to be provided as follows:

- 2.1.1. In each cargo hold, giving audible and visual alarms, one when the water level above the inner bottom in any hold reaches a height of 0.5 m and another at a height not less than 15% of the depth of the cargo hold but not more than 2.0 m. The water level detectors are to be fitted in the aft end of the cargo holds. For cargo holds which are used for water ballast, an alarm overriding device may be installed. The visual alarms are to clearly discriminate between the two different water levels detected in each hold;
- 2.1.2. In any ballast tank forward of the collision bulkhead required by SOLAS regulation II-1/11, giving an audible and visual alarm when the liquid in the tank reaches a level not exceeding 10% of the tank capacity.
- 2.1.3. In any dry or void space other than a chain cable locker, any part of which extends forward of the foremost cargo hold, giving an audible and visual alarm at a water level of 0.1 m above the deck. Such alarms need not be provided in enclosed spaces the volume of which does not exceed 0.1% of the ship's maximum displacement volume.

2.2 The requirement of fitting water level detection system for detecting water ingress in the cargo hold on single hold cargo ships other than bulk carriers in accordance with SOLAS II-1 Regulation 25 is applicable regardless of date of build to ships having a loadline length (L_{LL}) of less than 80 m, or 100 m if constructed before 1st July 1998, and having

- a single cargo hold below the freeboard deck, or,
- cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck.

The water level detectors required need not be fitted in ships already complying with SOLAS XII Regulation 12, or in ships having watertight side compartments each side of the cargo hold length extending vertically at least from inner bottom to freeboard deck. The detectors are to:

- 2.2.1 give an audible and visual alarm when the water level above the inner bottom in the cargo hold reaches a height of not less than 0.3 m, and another when such level reaches not more than 15% of the mean depth of the cargo hold; and
- 2.2.2 be fitted at the aft end of the hold, or above its lowest part where the inner bottom is not parallel to the designed waterline. Where webs or partial watertight bulkheads are fitted above the inner bottom, IRS may require the fitting of additional detectors.

3.0 Definitions

- 3.1 *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 II-1/25 or SOLAS regulation XII/12.1.
- 3.2 *Sensor* means a unit fitted at the location being monitored that activates a signal to identify the presence of water at the location.
- 3.3 *Pre-alarm level* means the lower level at which the sensor (s) in the cargo hold space will operate.
- 3.4 *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 II-1/25 or SOLAS regulation XII/12 apply.
- 3.5 *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.
- 3.6 *Audible indication* means an audible signal that is detectable at the location where it is signalled.

4.0 Functional Requirements

4.1 Means of Detecting Water Level

4.1.1 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.

4.1.2 The sensors are to be capable of being located in such positions that water levels can be detected in the aft part of each cargo hold or in way of the lowest part of the spaces other than cargo holds to which these requirements apply. In ballast tanks, sensors are not to be located near suction / discharge points.

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

4.2 Detector System Requirements

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

IR4.2.1 One sensor capable of detecting both preset levels (pre-alarm level and main alarm level) is considered to meet the above requirement.

4.2.2 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.

4.2.3 Detection equipment i.e. sensor, filter and protection arrangements for the detector installed in cargo holds and other spaces as required by SOLAS regulation II-1/25 or SOLAS regulation XII 12.1 is to be suitably corrosion resistant.

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

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

- In general, the construction and type testing is to be in accordance with IEC Publication 60079; Electrical Equipment for Explosive Gas Atmospheres to a minimum requirement of EX(ib). Where a ship is designed only for the carriage of cargoes that cannot create an a combustible or explosive atmosphere then the requirement for intrinsically safe circuitry is not to be insisted upon provided the operational instructions included in the Manual as required by Section 7 specifically excluding the carriage of cargoes that could produce a potential explosive atmosphere. Any exclusion of cargoes identified in the manual is to be consistent with the ship's Cargo Book and any Certification relating to the carriage of specifically identified cargoes.
- The maximum surface temperature of equipment installed within cargo spaces is to be appropriate for the combustible dusts and/or explosive gases likely to be encountered. Where the characteristics of the dust and gases are unknown, the maximum surface temperature of equipment is not to exceed 85 deg. C.
- The intrinsically safe equipment is to be of a certified safe type.
- The plans of the arrangements showing detector systems including intrinsically safe circuits are to be submitted for approval.

4.2.6 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.

- The electrical power supply is to be from two separate sources, one is to be the main source of electrical power and the other is to be the emergency source, unless a continuously charged dedicated accumulator battery is fitted, having arrangement, location and endurance equivalent to that of the emergency source (18hours). The battery supply may be an internal battery in the water level detector system.
- The changeover arrangement of supply from one electrical source to another need not be integrated into the water level detector system.
- Where batteries are used for the secondary power supply, failure alarms for both power supplies are to be provided.

4.3 Alarm System Requirements

4.3.1 The visual and audible alarms should be suitable for location on the navigation bridge.

4.3.2 The pre-alarm, as a primary alarm, is to indicate a condition that requires prompt attention to prevent an emergency condition and the main-alarm, as an emergency alarm, is to indicate that immediate actions are to be taken to prevent danger to human life or to the ship.

4.3.3 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 level of the relevant sensor. The visual indication should not be capable of being extinguished by the operator. Dimmers are to be provided to reduce the intensity of light as necessary.
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.

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

4.3.5 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).

IR4.3.5 The water ingress alarm system is not to be capable of overriding the alarm of the spaces (e.g. dry spaces, cargo holds, etc.), that are neither designed nor intended to carry water ballast.

- Enabling the facility to override alarms is to be customized for each specific ship prior to the commissioning tests witnessed by IRS Surveyor pursuant to certification. Any subsequent modifications are subject to re-certification.
- A “Caution Plate”, which prohibits personnel from overriding an alarm to any hold, is not considered an acceptable alternative to the above provisions.

4.3.6 An override visual indication capability should be provided throughout deactivation of the water level detector for the hold or tank referred to in 4.3.5 above.

4.3.7 Fault monitoring is to address faults associated with the system e.g. open circuit, short circuit, loss of power supplies, CPU failure.

5.0 Type Testing Requirements

5.1 General

5.1.1 Water level detector equipment should undergo type tests as specified below and satisfy the following criteria

- The type tests are to be witnessed by a IRS Surveyor.
- Type tests are to be carried out on a prototype or randomly selected item(s) which are representative of the manufactured item that is being type tested.
- Results of the type tests are to be documented (type test reports) by the manufacturer and submitted for review by IRS Surveyor.

5.1.2 Tests required for electrical components.

Protection of the enclosures of electrical components in the cargo holds, ballast tanks and dry spaces are to satisfy the requirements of IP68 in accordance with IEC 60529.

- The submerged test period for electrical components intended to be installed in ballast tanks and cargo tanks used as ballast tanks is to be not less than 20 days.
- The submerged test period for electrical components intended to be installed in dry spaces and cargo holds not intended to be used as ballast tanks is to be not less than 24 hours.
- Where a detector and/or cable connecting device (e.g. junction box, etc.) is installed in a space adjacent to a cargo hold (e.g. lower stool, etc.) and the space is considered to be flooded under damage stability calculations, the detectors and equipment are to satisfy the requirements of IP68 for a water head equal to the hold depth for a period of 20 days or 24 hours on the basis of whether or not the cargo hold is intended to be used as a ballast tank as described in the previous bullet points.

5.2 Type test required for the sensor

5.2.1 The type test required for the sensor is to be in accordance with the following:

- The test container for the cargo/water mixture is to be dimensioned so that its height and volume are such that the sensor and any filtration fitted can be totally submerged for the repeated functional tests to be conducted 10 times without cleaning any filtering arrangements. It has to undergo static and dynamic inclination tests if detector contains moving parts.

- The sensor and any filtration fitted that are to be submerged and are to be arranged in the container as they would be installed in accordance with the installation instructions given in the manual (see section 7).
- The pressure in the container for testing the complete detector is to be not more than 0.2 bar at the sensor and any filter arrangement. The pressure may be realized by pressurization or by using a container of sufficient height.
- The cargo/water mixture is to be pumped into the test container and suitable agitation of the mixture provided to keep the solids in suspension. The effect of pumping the cargo/water mixture into the container is not to affect the operation of the sensor and filter arrangements.

5.2.2 The cargo/water mixture is to be pumped into the test container to a predetermined level that submerges the detector and the operation of the alarm observed.

- The test container is then to be drained and the de-activation of the alarm condition observed.
- The test container and sensor with any filter arrangement should be allowed to dry without physical intervention.
- The test procedure is to be repeated consecutively ten times without cleaning any filter arrangement that may be fitted in accordance with the manufacturer's installation instructions.
- Satisfactory alarm activation and de-activation at each of the ten consecutive tests will demonstrate satisfactory type testing.
- The cargo/water mixture used for type testing are to be representative of the range of cargoes within the following groups and is to include the cargo with the smallest particles expected to be found from a typical representative sample.
- Iron ore particles and seawater.
- Coal particles and seawater.
- Grain particles and seawater.
- Aggregate (sand) particles and seawater.

The smallest and largest particle size together with the density of the dry mixture is to be ascertained and recorded. The particles are to be evenly distributed throughout the mixture. Type testing with representative particles will in general qualify all types of cargoes within the four groupings shown above.

5.2.3 The following provides guidance on the selection of particles for testing purposes.

- Iron ore particles are to mainly consist of small loose screenings of iron ore and not lumps of ore (dust with particle size < 0.1 mm)
- Coal particles are to mainly consist of small loose screenings of coal and not lumps of coal (dust with particle size < 0.1mm)
- Grain particles are to mainly consist of small loose grains of free flowing grain (grain having a size > 3 mm, such as wheat)
- Aggregate particles are to mainly consist of small loose grains of free flowing sand and without lumps (dust with particle size < 0.1 mm).

5.3 Alarm systems is to be type tested in accordance with the requirements given below.

(For details refer to– “Classification Notes - Type Approval of Electrical Equipment used for Control, Protection, Safety and Internal Communication in Marine Environment” of IRS.)

For alarm/monitoring panel:

- functional and performance tests as given in this Section;
- electrical power supply failure test;
- power supply variation test.
- dry heat test;
- damp heat test;
- vibration test;
- electro Magnetic Compatibility (EMC) tests;
- insulation resistance test;
- high voltage test (if required); and
- static and dynamic inclinations tests, if moving parts are involved.

For Intrinsic Safe barriers unit if located in the wheelhouse:

- In addition to the certificate issued by a competent independent testing laboratory, Electro Magnetic Interference (EMI)-EMC tests are also to be carried out.

For detection equipment:

- functional tests, Performance tests as above;
- electrical power supply failure test;
- power supply variation test;
- dry heat test;
- damp heat test;
- cold test;
- vibration test;
- enclosure class (IP68 for sensors and IP56 for electrical equipment if applicable);
- insulation resistance test;
- high voltage test (if required);
- EMC tests, (if the detector is capable of producing electromagnetic noise), and
- static and dynamic inclinations tests, (if the detectors contain moving parts);
- salt mist test (if installed in weather exposed areas).

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

6.0 Installation and Testing

6.1 General

6.1.1 The sensors should be located in a protected position that is in communication with the specified part of cargo hold (usually the aft part) 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 centre line as practicable, (See note below) or
2. At both the port and starboard sides of the cargo hold.

Note:

For ships having keel laid on or after 1 July 2004, if sensors are not placed within a distance less than or equal to one corrugation space or one bulkhead vertical stiffener space from the centerline, sensors are to be located at both the port and starboard sides of the cargo hold.

For ships having keel laid before 1 July 2004, if sensors are not placed within a distance less than or equal to B/6 from the centerline, sensors are to be located at both the port and starboard sides of the cargo hold.

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

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

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

6.1.5 Electrical cables and any associated equipment installed in cargo holds should be protected from damage by cargo or mechanical handling equipment associated with bulk carrier operations, such as by passing through conduit pipes of robust construction or in similar protective measures.

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

6.2 Alarm system testing requirement

6.2.1 The visual and audible alarms are to 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. They are distinguishable from other alarms.

6.3 Water level detector system test requirements

6.3.1 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.

6.3.2 Each detector alarm should be tested to verify that the pre-alarms 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.

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

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

7.0 Documentation

7.1 Manuals should be provided on board and should contain following information and operational instruction.

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 5.0 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 5.2.3
6. Procedures to be followed in the event equipment not functioning correctly.
7. Maintenance requirements for equipment and system.

7.2 Records of all tests carried out, to be submitted for review of IRS.