

# **Water Level Detection and Alarm Systems for Multiple-Hold Cargo Ships**

## **Amended Rules and Guidance**

Rules for the Survey and Construction of Steel Ships Parts B and D

Guidance for the Survey and Construction of Steel Ships Parts B and D

Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use

## **Reason for Amendment**

Triggered by the sinking of the cargo ship “El Faro” in 2015 and the findings of multiple investigations into its causes, a proposal for making the installation of water level detection and alarm systems mandatory for multiple-hold cargo ships (excluding bulk carriers) was submitted to the IMO Maritime Safety Committee (MSC) at its 100th session (MSC100).

The proposal was discussed and eventually led to an amendment to SOLAS Chapter II-1 requiring the installation of water level detection and alarm systems for multiple-hold cargo ships (excluding bulk carriers and tankers) being subsequently adopted as Resolution MSC.482(103) by the MSC at its 103rd session (MSC 103).

In conjunction with the above, Resolution MSC.188(79), which specifies the performance standards for water level detection and alarm systems, was also amended and adopted as Resolution MSC.188(79)/Rev.1. In addition, amendments to further modify some parts of said performance standards were adopted as Resolution MSC.188(79)/Rev.2 by the MSC at its 107th session (MSC 107) in May 2023.

Accordingly, relevant requirements were amended based on Resolutions MSC.482(103), MSC.188(79)/Rev.1 and MSC.188(79)/Rev.2.

## **Outline of Amendment**

The main contents of this amendment are as follows:

- (1) Specifies requirements for the installation of water level detectors and alarm systems for multiple-hold cargo ships (excluding bulk carriers and tankers) as 13.8.7, Part D of the Rules for the Survey and Construction of Steel Ships.
- (2) Amends the requirements of D13.8, Part D of the Guidance for the Survey and Construction of Steel Ships in order to correspond to Resolutions MSC.188(79) /Rev.1 and MSC.188(79)/Rev.2, which amended the performance standards for water level detectors and alarm systems.

“Rules for the survey and construction of steel ships” has been partly amended as follows:

## **Part B            CLASS SURVEYS**

### **Chapter 2   CLASSIFICATION SURVEYS**

#### **2.1        Classification Survey during Construction**

##### **2.1.4        Presence of Surveyor\***

Sub-paragraph -1(8) has been amended as follows.

**1**     The presence of the Surveyor is required at the following stages of the work in relation to hull and equipment. To implement surveys of items specified otherwise by the Society, in lieu of traditional ordinary surveys where the Surveyor is in attendance, the Society may approve other survey methods which it considers to be appropriate in the following cases.

((1) to (7) are omitted.)

(8)    When performance tests are carried out on closing appliances of openings, remote control devices, steering gears, anchoring and mooring equipment, emergency towing arrangements, means of embarkation and disembarkation (specified in **14.14, Part 1, Part C or 21.8, Part CS**), fire fighting systems, piping, water level detection and alarm systems (specified in **13.8.5, ~~and 13.8.6~~ and 13.8.7, Part D**), dewatering arrangements (specified in **13.5.10, Part D**), etc. Performance tests for one detector of each group (for on-board function tests of fixed fire detection and alarm systems installed in machinery spaces specified in **7.4.1-1, Part R of the Rules**, refer to the test procedures shown in **Annex 2.1.4**).

((9) to (17) are omitted.)

##### **2.1.6        Documents to be Maintained On Board\***

Sub-paragraph -1 has been amended as follows.

**1**     At the completion of a classification survey, the Surveyor confirms that the finished versions of the following applicable drawings, plans, manuals, lists, etc., are on board.

(1)    Documents approved by the Society or their copies

((a) to (t) are omitted.)

(2)    Other documents

((a) to (g) are omitted.)

(h)    Manuals for the water level detection and alarm systems (**13.8.5-4, ~~or 13.8.6-3~~ or 13.8.7-5, Part D**)

((i) to (x) are omitted.)

(3)    Finished plans specified in **2.1.7**

## Part D MACHINERY INSTALLATIONS

### Chapter 13 PIPING SYSTEMS

Title of Section 13.8 has been amended as follows.

#### 13.8 ~~Pipes~~ Sounding Devices

Paragraph 13.8.7 has been added as follows.

##### **13.8.7 Water Level Detection and Alarm Systems for Multiple-Hold Cargo Ships**

**1** For cargo ships having multiple holds (excluding the bulk carriers defined in **Annex 1.1 An1.2.1(1), Part 2-2, Part C** and tankers), water level detection and alarm systems are to be fitted in cargo holds intended for dry cargoes in order to give audible and visible alarms at the navigation bridge in accordance with the following **(1)** and **(2)**. However, water level detection and alarm systems are not required for cargo holds located entirely above the freeboard deck.

**(1)** Systems are to give alarms when water levels reach the following **(a)** and **(b)** at the aft ends of cargo holds. In cases where inner bottoms are not parallel to the designed waterline, systems are to be fitted above lowest parts of cargo holds.

**(a)** A height not less than 0.3 *m* above the inner bottom

**(b)** A height not less than 15% of the depth of the cargo hold but not more 2.0 *m*

**(2)** Systems are to have constructions and functions deemed appropriate by the Society.

**2** Alarms given by the water level detection and alarm systems specified in **-1** above are to be capable of identifying the space where the water level reaches the alarm level and the water level specified in **-1(1)** above at the navigation bridge. The above alarms are also to be capable of being easily distinguishable from alarms given by other installations at the navigation bridge.

**3** The water level detection and alarm systems specified in **-1** above for ballast tanks and cargo holds which have been designed to carry water ballast may be provided with override devices that are deemed appropriate by the Society.

**4** Bilge alarm systems which are fitted in cargo hold bilge wells or other suitable locations may be used as the water level detection and alarm systems required by **-1(1)(a)** on the condition that they give audible and visible alarms in accordance with the following **(1)** to **(3)**.

**(1)** Systems are to give audible and visible alarms at the navigation bridge when water levels above the inner bottoms of cargo holds reach heights not less than 0.3 *m*. In cases where the bottoms of bilge wells are lower than the inner bottoms of cargo holds, alarms are to be given when water levels reach heights not less than 0.3 *m* above the bottoms of bilge wells.

**(2)** Alarms are to be capable of identifying the spaces where water levels reach alarm levels and being easily distinguishable from other alarms given by the systems specified in **-1** above.

**(3)** Systems are to have constructions and functions deemed appropriate by the Society.

**5** Manuals documenting operating and maintenance procedures are to be kept on board for the water level detection and alarm systems specified in **-1** above and the bilge alarm systems used as water level detection and alarm systems in accordance with **-4** above.

“Guidance for the survey and construction of steel ships” has been partly amended as follows:

## **Part B CLASS SURVEYS**

### **B1 GENERAL**

#### **B1.1 Surveys**

##### **B1.1.3 Intervals of Class Maintenance Surveys**

Sub-paragraph -3(5) has been deleted.

**3** The Occasional Surveys specified in **1.1.3-3(5), Part B of the Rules** are as specified below:  
(1) to (4) are omitted.)

- (5) ~~Water level detection and alarm systems on single hold cargo ships (Deleted)~~  
~~For cargo ships 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, a survey is to be carried out to verify that the water level detection and alarm systems specified in 13.8.6, Part D of the Rules are provided not later than the date of the first intermediate or special survey of the ship after 1 January 2007. Notwithstanding the above, the following ships are not required to have such a system:~~
- ~~(a) Ships of less than 500 gross tonnage~~
  - ~~(b) Ships not engaged on international voyages~~
  - ~~(c) Bulk carriers as defined in 1.3.1(13), Part B of the Rules which had been at the beginning stage of construction before 1 July 2006~~
  - ~~(d) Bulk carriers as defined in 31A.1.2(1), Part C of the Rules which had been at the beginning stage of construction on or after 1 July 2006~~
  - ~~(e) Ships having a length ( $L_t$ ) of not less than:~~
    - ~~i) 80 m, for ships that had been at the beginning stage of construction on or after 1 July 1998~~
    - ~~ii) 100 m, for ships that had been at the beginning stage of construction before 1 July 1998~~
  - ~~(f) Ships complying with the requirements of 13.8.6, Part D of the Rules~~
  - ~~(g) Ships having watertight side compartments each side of the cargo hold length extending vertically at least from inner bottom to freeboard deck and breadths of which are not to be less than 760 mm measured perpendicular to the side shell~~

((6) to (24) are omitted.)

## B3 ANNUAL SURVEYS

### B3.2 Annual Surveys for Hull, Equipment, Fire Extinction and Fittings

#### B3.2.3 Performance Tests

Sub-paragraph -6 has been amended as follows.

**6** Inspection of ~~W~~ater ~~L~~evel ~~D~~etection and ~~A~~larm ~~S~~ystems (refer to **13.8.5, Part D of the Rules, 13.8.6 and 13.8.7, Part D of the Rules and B1.1.3-9(5)**) specified in item 9 of **Table B3.3, Part B of the Rules**, is to be carried out on the items installed on the following ships.

- (1) Cargo ships of 500 *gross tonnage* and above engaged on international voyages, which have 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 and specified in the following (a) or (b):
  - (a) Cargo ships having a length ( $L_f$ ) of less than 100 *m*, which had been at the beginning stage of construction before 1 July 1998
  - (b) Cargo ships having a length ( $L_f$ ) of less than 80 *m*, which had been at the beginning stage of construction on and after 1 July 1998
- (2) Cargo ships of 500 *gross tonnage* and above engaged on international voyages and specified in the following (a) or (b):
  - (a) Bulk carriers defined in **1.3.1(13), Part B of the Rules**, which had been at the beginning stage of construction before 1 July 2006
  - (b) Bulk carriers defined in **31A.1.2-1(1), Part C of the Rules**, which had been at the beginning stage of construction on or after 1 July 2006
- (3) Cargo ships having multiple cargo holds (excluding bulk carriers defined in **Annex 1.1 An1.2.1(1), Part 2-2, Part C of the Rules** and tankers) that fall under any of the following.
  - (a) for which the building contract is placed on or after 1 January 2024;
  - (b) in the absence of a building contract, the keels of which are laid or which are at a similar stage of construction on or after 1 July 2024; or
  - (c) the delivery of which is on or after 1 January 2028

## Part D MACHINERY INSTALLATIONS

Title of Section D13.8 has been amended as follows.

### **D13.8 Sounding Pipes**~~Pipes~~**Devices**

Paragraph D13.8.5 has been amended as follows.

#### **D13.8.5 Water Level Detection and Alarm Systems for Bulk Carriers, etc.**

**1** With respect to ~~the provisions of 13.8.5-1, Part D of the Rules~~, water level detection and alarm systems (hereinafter, referred to as “the systems” in this paragraph) are to be installed on board in accordance with the following:

- (1) Detectors, electrical cables and any associated equipment installed in cargo holds are to be protected from any damage caused by either cargo or cargo handling equipment.
- (2) The systems are to be installed in locations where they are accessible for survey, maintenance and repair. Any filtration arrangements, if fitted to the detectors, are to be capable of being cleaned before loading.
- (3) The installation of the systems is not to inhibit the use of any other sounding devices such as sounding pipes or other water level gauging devices.

**2** Water levels specified in **13.8.5-1(1), Part D of the Rules** are to be measured from the top plating and to be detected at as close to the centre line as practicable, or at both the port and starboard sides of the cargo hold. For cargo holds fitted with insulation or close ceilings, water levels may be measured from the upper surface of the insulation or close ceilings in cases where watertightness is verified by tests. For this purpose, the position “at as close to the centre line as practicable” is to be of area within a distance from the centre line of less than or equal to 1 spacing of vertical stiffeners on the watertight bulkhead (or 1 corrugation space as shown in **Fig. D13.8.5-1**). In addition, the water levels specified in **13.8.5-1(2)** and **(3)** are to be detected at the lowest position possible of the relevant compartments.

**3** The wording “the systems to have constructions and functions deemed appropriate by the Society” in **13.8.5-1(4), Part D of the Rules** means those systems complying with the following requirements and being of a type approved by the Society in accordance with ~~the provisions of Chapter 5, Part 7 of the Approval and Type Approval of Materials and Equipment for Marine Use~~ or those systems approved by an organization deemed appropriate by the Society in accordance with the Resolution *MSC.188(79)*, as amended.

- (1) The systems are to have sufficient corrosion resistance with consideration being given to the locations where the systems are to be installed and are to be maintain their functionality under expected service temperatures. In addition, any parts of the systems which may be exposed to cargo or bilge containing cargo, such as detectors, etc., are to be sufficiently able to cope with different conditions such as acidity, alkalinity, dust, etc. with consideration being given to the intended cargoes.
- (2) Protection of the enclosures of electrical components for the systems is to satisfy the following **(a)** to **(c)**:
  - (a) The requirements of IP68 for those installed in spaces, tanks or cargo holds. This includes all adjacent spaces considered to be simultaneously flooded under damage stability calculations of the spaces/tanks/cargo holds required by the provisions of **Chapter 4, Part C of the Rules** or the requirements for ships to be assigned reduced freeboard in accordance with **Part V of the Rules**;
  - (b) The requirements of IP56 for those installed on exposed decks above the

spaces/tanks/cargo holds; and

(c) The provisions of **Part H of the Rules** for any of those not specified in (a) or (b) above.

- (3) Electrical installations for the systems installed in the following areas are to be of an intrinsically safe type ~~of Exib complying at least with IEC 60079-11:2011~~ or safe type of an appropriate apparatus group and temperature class suitable for the cargo carried, and the maximum surface temperature of the installations is not to exceed 85 °C, except electrical installations installed in ships designed only to carry cargo which are not combustible or explosive atmosphere. In addition, in cases where a ship is designed to carry only limited kinds of cargo, the maximum surface temperature may be appropriately relaxed depending on the kind of cargo. In this case, such limitations relating to cargo are to be documented in booklets for cargo operations. Finally, those electric installations installed at the edges of the following areas are to be approved at the discretion of the Society with due consideration being given to their design with respect to gas-tightness, etc.

(a) Cargo holds

(b) Enclosed spaces adjacent to cargo holds having openings without a gas-tight or watertight door/hatch and the like into a hold

(c) Areas within 3 *m* of any cargo hold mechanical exhaust ventilation outlet

- (4) For electrical installations for the systems which are installed in ships intended for carrying dangerous goods, the provisions of **Chapter 19, Part R of the Rules** are to be referred to.
- (5) Detectors are to be capable of indicating water level within an accuracy of  $\pm 100$  *mm*. Time delays are to be so incorporated into alarm systems, in order to prevent spurious alarms due to any sloshing effects associated with ship motion, so that alarms will activate after detecting water level continuously for a standard period of not less than 10 *seconds*. The accuracy of these detectors may be set on the basis of seawater density.
- (6) The systems are to be of a continuously self-monitoring type that also monitors any detectors. Audible and visual alarms are to be activated when any faults are detected. In this requirement, the term “fault” refers to problems such as open circuits, short circuits, loss of power supplies and CPU failures. The audible alarms are to be capable of being muted. However, visual alarms are to remain active until the malfunction has been cleared and such alarms are not to be capable of being turned off by hand. In addition, the systems are to be provided with means for testing their respective detectors when holds are empty.
- (7) Alarm panels for the systems are to be provided with a switch for the testing of all audible and visual alarms. This switch is to return to the off position automatically when not being operated.
- (8) The systems are to be supplied with electrical power from two independent sources. Any failure of ~~the primary~~ two electrical power supplies is to be indicated by an alarm on the navigation bridge. In cases where secondary electrical power is supplied by dedicated batteries, such batteries are to be in accordance with the following (a) to (c):
- (a) Batteries are to have a capacity for a period of at least 18 *hours* and they are to be continuously charged;
- (b) Batteries are to be arranged and located in accordance with **3.3.5, Part H of the Rules**, and may be integrated into the system; and
- (c) Any failures of the battery systems, including battery charging systems specified in above (a), are to be indicated by an alarm on the navigation bridge.

4 With respect to the provisions of **13.8.5-2, Part D of the Rules**, those audible alarms specified in **13.8.5-1(1)(b), (2) and (3), Part D of the Rules** need not be capable of being distinguished from. Visual alarms are to remain visible until the condition activating the alarm has returned below the level of the relevant detector and not to be capable of being turned off by hand.

5 With respect to the provisions of **13.8.5-2, Part D of the Rules**, one sensor capable of

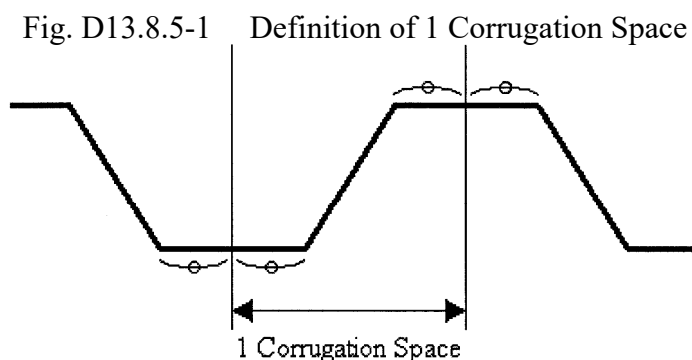
detecting both of the preset water levels specified in **13.8.5-1(1)(a) and (b), Part D of the Rules** may be allowed.

**6** The wording “override devices that are deemed appropriate by the Society” in **13.8.5-3, Part D of the Rules** means those complying with the following requirements:

- (1) Alarms for tanks/cargo holds are to be capable of being independently turned off;
- (2) Visual override indications are to be given to the navigation bridge throughout any deactivation of water level detectors for tanks/cargo holds;
- (3) Such override devices are to be arranged so that alarm systems are automatically reactivated upon completion of any de-ballasting; and
- (4) In cases where the override functions for water level detection and alarm systems are required to be specifically customized for each ship, override functions for spaces other than ballast tanks or cargo holds carrying ballast water are to be modified so that they cannot be activated when they are being installed on a ship. The above modification and any subsequent modifications are to be confirmed by the Surveyor. A warning plate which prohibits personnel from overriding such alarms is not an acceptable alternative to the above modification.

**7** Manuals specified in **13.8.5-4, Part D of the Rules** are to contain the following information and operational instructions:

- (1) Descriptions of the equipment in the system together with listings 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 system has been approved in accordance with ~~the provisions of Chapter 5, Part 7 of the Approval and Type Approval of Materials and Equipment for Marine Use~~ or the Resolution *MSC.188(79)*, as amended.
- (3) Line diagrams of the system showing equipment positions
- (4) Instructions for operator training, setting, securing, protecting and testing.
- (5) Information regarding the types of cargo that guarantees performance. (In cases where electrical installations are required to be of an intrinsically safe, certificates verifying this are to be included.)
- (6) Temperature range for which the equipment is suitable.
- ~~(6)~~ Procedures to be followed in the event equipment in the system is not functioning properly.
- ~~(7)~~ Maintenance requirements for the system.





Paragraph D13.8.7 has been added as follows.

**D13.8.7 Water Level Detection and Alarm Systems for Multiple Hold Cargo Ships**

**1** The water level detection and alarm systems required by **13.8.7-1, Part D of the Rules** are to be in accordance with **D13.8.5**.

**2** The wording “override devices that are deemed appropriate by the Society” in **13.8.7-3, Part D of the Rules** means those complying with **D13.8.5-6**.

**3** The bilge alarms systems used as water level detection and alarm systems in accordance with **13.8.7-4, Part D of the Rules** are to comply with **D13.8.5**.

**4** For the bilge wells which are applicable to **19.3.5-1, Part R of the Rules**, the following requirements **(1)** and **(2)** are to be complied with.

**(1)** Where the cargo hold bilge well is sealed, suitable alternative detectors are to be provided.

**(2)** Where the cargo hold bilge well is used, the bilge well is not to be sealed so that the bilge alarm system can detect the water level.

**5** In applying **13.8.7-5, Part D of the Rules**, manuals documenting operating and maintenance procedures for bilge alarm systems used as water level detection and alarm systems are to contain the following information and operational instructions in addition to that required by **D13.8.5-7**:

**(1)** Manuals for switching to the alternative arrangements (if fitted), and

**(2)** List of cargoes for which alternative provisions are to be used

“Guidance for the approval and type approval of materials and equipment for marine use” has been partly amended as follows:

## **Part 7 CONTROL AND INSTRUMENTATION EQUIPMENT AND ELECTRICAL INSTALLATIONS**

### **Chapter 5 APPROVAL OF USE OF WATER LEVEL DETECTION AND ALARM SYSTEMS**

#### **5.1 General**

##### **5.1.1 Scope**

Sub-paragraph -1 has been amended as follows.

**1** The requirements in this chapter apply to tests and inspection for the approval of use in ships of water level detection and alarm systems installed in cargo holds, ballast tanks, cofferdams, etc., in accordance with the requirements in **13.8.5, ~~and 13.8.6~~ and 13.8.7, Part D of the Rules for the Survey and Construction of Steel Ships** (hereinafter referred to as “the Rules”).

#### **5.2 Application**

Paragraph 5.2.3 has been amended as follows.

##### **5.2.3 Documents**

Three copies each of the drawings and data in the following **(1)** through **(9)** are to be submitted together with the application form specified in **5.2.1**.

- (1)** Specifications of the said systems including any limitation regarding the type of cargoes for the guarantee of performance
- (2)** Construction drawings and explanatory documents of the working principle of the said systems
- (3)** Approval test plan (including place and expected date of test)
- (4)** Explanatory documents of the testing facilities
- (5)** Explanatory documents of the manufacturer
- (6)** Explanatory documents on the manufacturing and quality control standards of the said systems
- (7)** Manufacturing and delivery records of the said systems
- (8)** Technical documents of the said devices including the manual specified in **13.8.5-4, ~~and 13.8.6-3~~ and 13.8.7-5, Part D of the Rules**
- (9)** Other data deemed necessary by the Society

## 5.4 Approval Test

Paragraph 5.4.1 has been amended as follows.

### 5.4.1 Construction and Function

The construction and the function of the water level detection and alarm system ~~is~~are to satisfy the following ~~requirements~~ **(1) through (5)**:

- (1) To be able to adequately withstand ship vibration, ship motions, trim and heel.
- (2) To be able to withstand the most severe pressure and temperature expected during working conditions and, for parts in contact with the liquid, to have adequate compatibility between the device and the liquid considered.
- (3) The construction in addition to the above is to be as follows:
  - (a) maintenance and inspection can be carried out easily and safely.
  - (b) appropriate means are provided to prevent metal fittings from coming loose.
- (4) The construction and function specified in **D13.8.5-3, Part D of the Guidance for the Survey and Construction of Steel Ships** (hereinafter, referred to as “the Guidance”) and the alarm function specified in **13.8.5-3, ~~and 13.8.6-2~~ and 13.8.7-2, Part D of the Rules and D13.8.5-4 of the Guidance** are to be provided.
- (5) For the systems provided with override devices, the function specified in **D13.8.5-6 of the Guidance** is to be provided.

### 5.4.2 Details of Test

Sub-paragraph -1 has been amended as follows.

**1** The approval test is to include the following ~~items~~ **(1) through (5)** depending on the application and the type of the water level detection and alarm system.

((1) to (3) are omitted.)

- (4) For the systems installed in cargo holds, confirmation whether the test specimen detects seawater as specified or not, by merging in a test mixture of fine materials of ~~each~~ the intended cargoes in seawater (a solution of sodium chloride having a specific gravity of 1.025  $g/cm^3$  may be accepted as an alternative to seawater) in accordance with the followings:
  - (a) The concentration of fine materials in a test mixture is to be of minimum 50% by weight. In general, the type of test mixture may be limited to the followings. The smallest and largest particle size together with the density of the dry mixture used in this test is to be ascertained and recorded in the test records and the manuals required by **13.8.5-4, ~~and 13.8.6-3~~ and 13.8.7-5, Part D of the Rules**.
    - i) Minimum one type of fine mineral (dust of iron ore, coal, sand, etc. with particle size of, in general, less than 0.1 mm)
    - ii) Minimum one type of grain (barleycorn, wheat, corn, etc. with particle size of, in general, greater than 3 mm)
  - (b) (Omitted)
  - (c) (Omitted)
- (5) (Omitted)