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UNIFIED INTERPRETATIONS OF SOLAS CHAPTERS II-1 AND XII, OF THE TECHNICAL PROVISIONS FOR MEANS OF ACCESS FOR INSPECTIONS (RESOLUTION MSC.158(78)) AND OF THE PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS (RESOLUTION MSC.188(79))

1 The Maritime Safety Committee, at its ninety-second session (12 to 21 June 2013), approved unified interpretations of the provisions of SOLAS chapters II-1 and XII, the Technical provisions for means of access for inspections (resolution MSC.158(78)) and of the *Performance standards for water level detectors on bulk carriers and single hold cargo ships other than bulk carriers* (resolution MSC.188(79)), as set out in the annex, following the recommendations made by the Sub-Committee on Ship Design and Equipment at its fifty-seventh session, with a view to ensuring a uniform approach towards the application of the provisions of SOLAS chapters II-1 and XII.

2 Member Governments are invited to use the annexed interpretations when applying relevant provisions of SOLAS chapters II-1 and XII, and to bring them to the attention of all parties concerned.

3 This circular supersedes circulars MSC.1/Circ.1176 and MSC.1/Circ.1197.

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SUSTAINABLE DEVELOPMENT: IMO'S CONTRIBUTION BEYOND RIO+20

ANNEX

UNIFIED INTERPRETATIONS OF SOLAS CHAPTERS II-1 AND XII, OF THE TECHNICAL PROVISIONS FOR MEANS OF ACCESS FOR INSPECTIONS (RESOLUTION MSC.158(78)) AND OF THE PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS (RESOLUTION MSC.188(79))

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1 SOLAS REGULATION II-1/3-6 – ACCESS TO AND WITHIN SPACES IN THE CARGO AREA OF OIL TANKERS AND BULK CARRIERS

1.1 SOLAS REGULATION II-1/3-6, SECTION 1

Interpretation

Oil tankers

This regulation is only applicable to oil tankers having integral tanks for carriage of oil in bulk, which is contained in the definition of oil in Annex I of MARPOL. Independent oil tanks can be excluded. Regulation II-1/3-6 should not normally be applied to FPSO or FSO unless the Administration decides otherwise.

Technical background

Means of Access (MA) specified in the Technical provisions contained in resolution MSC.158(78) are not specific with respect to the application to integral cargo oil tanks or also to independent cargo oil tanks. ESP requirements of oil tankers have been established assuming the target cargo oil tanks are integral tanks. The MA regulated under SOLAS regulation II-1/3-6 is for overall and close-up inspections as defined in regulation IX/1. Therefore it is assumed that the target cargo oil tanks are those of ESP, i.e. integral cargo tanks. Regulation II-1/3-6 is applicable to new, purpose-built FPSO or FSU if they are subject to the scope of the ESP Code (resolution A.1049(27), as amended). Considering that the principles of the *Technical provisions for means of access for inspections* (resolution MSC.158(78)) recognize that permanent means of access should be considered and provided for at the design stage so that, to the maximum extent possible, they can be made an integral part of the designed structural arrangement, regulation II-1/3-6 is not considered applicable to an FPSO/FSU that is converted from an existing tanker.

Reference

SOLAS regulation IX/1 and resolution A.744(18), as amended.

1.2 SOLAS REGULATION II-1/3-6, PARAGRAPH 2.1

Interpretation

Each space for which close-up inspection is not required such as fuel oil tanks and void spaces forward of cargo area, may be provided with a means of access necessary for overall survey intended to report on the overall conditions of the hull structure.

1.3 SOLAS REGULATION II-1/3-6, PARAGRAPH 2.2

Interpretation

Some possible alternative means of access are listed under paragraph 3.9 of the Technical provisions for means of access for inspections (TP). Always subject to acceptance as equivalent by the Administration, alternative means such as an unmanned robot arm, ROVs and dirigibles with necessary equipment of the permanent means of access for overall and close-up inspections and thickness measurements of the deck head structure such as deck transverses and deck longitudinals of cargo oil tanks and ballast tanks, should be capable of:

.1 safe operation in ullage space in gas-free environment; and

.2 introduction into the place directly from a deck access.

Technical background

Innovative approaches, in particular a development of robots in place of elevated passageways, are encouraged and it is considered worthwhile to provide the functional requirement for the innovative approach.

1.4 SOLAS REGULATION II-1/3-6, PARAGRAPH 2.3

Interpretation

Inspection

The MA arrangements, including portable equipment and attachments, should be periodically inspected by the crew or competent inspectors as and when it is going to be used to confirm that the MAs remain in serviceable condition.

Procedures

1 Any Company authorized person using the MA should assume the role of inspector and check for obvious damage prior to using the access arrangements. Whilst using the MA, the inspector should verify the condition of the sections used by close-up examination of those sections and note any deterioration in the provisions. Should any damage or deterioration be found, the effect of such deterioration should be assessed as to whether the damage or deterioration affects the safety for continued use of the access. Deterioration found that is considered to affect safe use should be determined as "substantial damage" and measures should be put in place to ensure that the affected section(s) are not to be further used prior to effective repair.

2 Statutory survey of any space that contains MA should include verification of the continued effectiveness of the MA in that space. Survey of the MA should not be expected to exceed the scope and extent of the survey being undertaken. If the MA is found deficient the scope of survey should be extended if this is considered appropriate.

3 Records of all inspections should be established based on the requirements detailed in the ship's Safety Management System. The records should be readily available to persons using the MAs and a copy attached to the MA Manual. The latest record for the portion of the MA inspected should include as a minimum the date of the inspection, the name and title of the inspector, a confirmation signature, the sections of MA inspected, verification of continued serviceable condition or details of any deterioration or substantial damage found. A file of permits issued should be maintained for verification.

Technical background

It is recognized that MA may be subject to deterioration in the long term due to corrosive environment and external forces from ship motions and sloshing of liquid contained in the tank. MA therefore should be inspected at every opportunity of tank/space entry. The above interpretation should be contained in a section of the MA Manual.

1.5 SOLAS REGULATION II-1/3-6, PARAGRAPH 3.1

Interpretation

Access to a double-side skin space of bulk carriers may be either from a topside tank or double-bottom tank or from both.

Technical background

Unless used for other purposes, the double-side skin space should be designed as a part of a large U-shaped ballast tank and such space should be accessed through the adjacent part of the tank, i.e. topside tank or double-bottom/bilge hopper tank. Access to the double-side skin space from the adjacent part rather than direct from the open deck is justified. Any such arrangement should provide a directly routed, logical and safe access that facilitates easy evacuation of the space.

1.6 SOLAS REGULATION II-1/3-6, PARAGRAPH 3.2

Interpretation

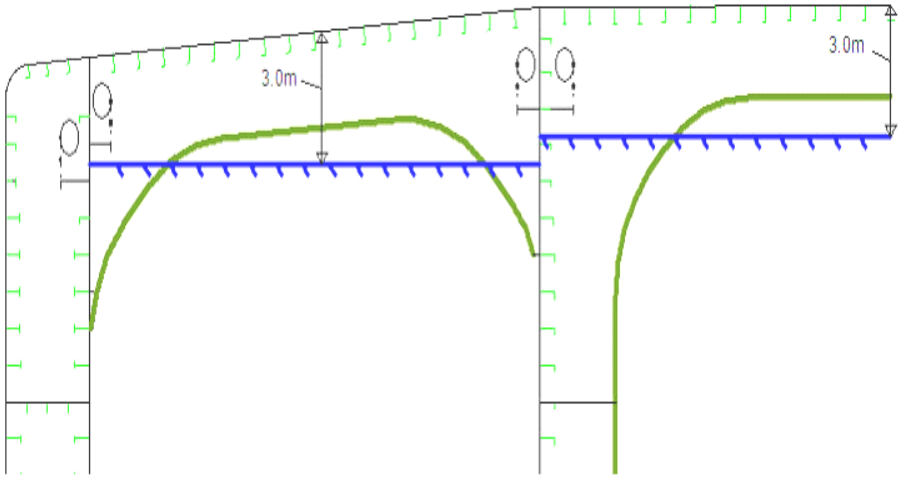
1 A cargo oil tank of less than 35 m length without a swash bulkhead requires only one access hatch.

2 Where rafting is indicated in the ship structures access manual as the means to gain ready access to the under-deck structure, the term "*similar obstructions*" referred to in the regulation includes internal structures (e.g. webs >1.5 m deep) which restrict the ability to raft (at the maximum water level needed for rafting of under-deck structure) directly to the nearest access ladder and hatchway to deck. When rafts or boats alone, as an alternative means of access, are allowed under the conditions specified in the ESP Code (resolution A.1049(27)), permanent means of access are to be provided to allow safe entry and exit. This means:

.1 access direct from the deck via a vertical ladder and small platform fitted approximately 2 m below the deck in each bay; or

.2 access to the deck from a longitudinal permanent platform having ladders to the deck in each end of the tank. The platform should, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of the under-deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank (see figure below). A permanent means of access from the longitudinal permanent platform to the water level indicated above should be fitted in each bay (e.g. permanent rungs on one of the deck webs inboard of the longitudinal permanent platform).

1.7 SOLAS REGULATION II-1/3-6, PARAGRAPH 4.1



Interpretation

1 The access manual should address spaces listed in paragraph 3 of regulation II-1/3-6. As a minimum the English version should be provided. The ship structure access manual should contain at least the following two parts:

Part 1: Plans, instructions and inventory required by paragraphs 4.1.1 to 4.1.7 of regulation II-1/3-6. This part should be approved by the Administration or the organization recognized by the Administration.

Part 2: Form of record of inspections and maintenance, and change of inventory of portable equipment due to additions or replacement after construction. This part should be approved for its form only at new building.

2 The following matters should be addressed in the ship structure access manual:

.1 the access manual should clearly cover scope as specified in the regulations for use by crews, surveyors and port State control officers;

.2 approval/re-approval procedure for the manual, i.e. any changes of the permanent, portable, movable or alternative means of access within the scope of the regulation and the Technical provisions are subject to review and approval by the Administration or by the organization recognized by the Administration;

.3 verification of MA should be part of the safety construction survey for continued effectiveness of the MA in that space which is subject to the statutory survey;

.4 inspection of MA by the crew and/or a competent inspector of the company as a part of regular inspection and maintenance (see interpretation of paragraph 2.3 of SOLAS regulation II-1/3-6);

.5 actions to be taken if MA is found unsafe to use; and

.6 in case of use of portable equipment plans showing the means of access within each space indicating from where and how each area in the space can be inspected.

1.8 SOLAS REGULATION II-1/3-6, PARAGRAPH 4.2

Interpretation

1 Critical structural areas should be identified by advanced calculation techniques for structural strength and fatigue performance, if available, and feedback from the service history and design development of similar or sister ships.

2 Reference should be made to the following publications for critical structural areas, where applicable:

.1 Oil tankers: Guidance Manual for Tanker Structures by TSCF;

.2 Bulk carriers: Bulk Carriers Guidelines for Surveys, Assessment and Repair of Hull Structure by IACS; and

.3 Oil tankers and bulk carriers: ESP Code (resolution A.1049(27)), as amended.

Technical background

These documents contain the relevant information for the present ship types. However, identification of critical areas for new double-hull tankers and double-side skin bulk carriers of improved structural design should be made by structural analysis at the design stage, this information should be taken into account to ensure appropriate access to all identified critical areas.

1.9 SOLAS REGULATION II-1/3-6, PARAGRAPH 5.1

Interpretation

The minimum clear opening of 600 mm x 600 mm may have corner radii up to 100 mm maximum. The clear opening is specified in MSC/Circ.686 to keep the opening fit for passage of personnel wearing a breathing apparatus. In such a case where as a consequence of structural analysis of a given design the stress should be reduced around the opening, it is considered appropriate to take measures to reduce the stress such as making the opening larger with increased radii, e.g. 600 x 800 with 300 mm radii, in which a clear opening of 600 x 600 mm with corner radii up to 100 mm maximum fits.

Technical background

The interpretation is based upon the established Guidelines in MSC/Circ.686.

Reference

Paragraph 9 of the annex to MSC/Circ.686.

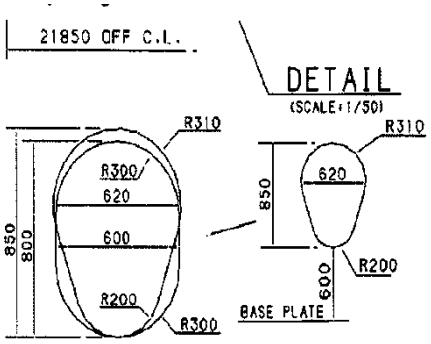
1.10 SOLAS REGULATION II-1/3-6, PARAGRAPH 5.2

Interpretation

1 The minimum clear opening of not less than 600 mm x 800 mm may also include an opening with corner radii of 300 mm. An opening of 600 mm in height x 800 mm in width may be accepted as access openings in vertical structures where it is not desirable to make large openings in the structural strength aspects, i.e. girders and floors in double-bottom tanks.

2 Subject to verification of easy evacuation of an injured person on a stretcher the vertical opening 850 mm x 620 mm with wider upper half than 600 mm, while the lower half may be less

than 600 mm with the overall height not less than 850 mm is considered an acceptable alternative to the traditional opening of 600 mm x 800 mm with corner radii of 300 mm.



3 If a vertical opening is at a height of more than 600 mm steps then handgrips should be provided. In such arrangements it should be demonstrated that an injured person can be easily evacuated.

Technical background

The interpretation is based upon the established Guidelines in MSC/Circ.686 and an innovative design is considered for easy access by humans through the opening.

Reference

Paragraph 11 of the annex to MSC/Circ.686.

2 TECHNICAL PROVISIONS FOR MEANS OF ACCESS FOR INSPECTIONS (RESOLUTION MSC.158(78))

2.1 PARAGRAPH 1.3

Interpretation

A "combined chemical/oil tanker complying with the provisions of the IBC Code" is a tanker that holds both a valid IOPP certificate as a tanker and a valid certificate of fitness for the carriage of dangerous chemicals in bulk, i.e. a tanker that is certified to carry both oil cargoes under MARPOL Annex I and Chemical cargoes in chapter 17 of the IBC Code either as full or part cargoes. The Technical provisions should be applied to ballast tanks of combined chemical/oil tankers complying with the provisions of the IBC Code.

2.2 PARAGRAPH 1.4

Interpretation

1 In the context of the above requirement, the deviation should be applied only to distances between integrated PMA that are the subject of paragraph 2.1.2 of table 1.

2 Deviations should not be applied to the distances governing the installation of under-deck longitudinal walkways and dimensions that determine whether permanent access is required or not, such as height of the spaces and height to elements of the structure (e.g. cross-ties).

2.3 PARAGRAPH 3.1

Interpretation

The permanent means of access to a space can be credited for the permanent means of access for inspection.

Technical background

The Technical provisions specify means of access to a space and to hull structure for carrying out overall and close-up surveys and inspections. Requirements of MA to hull structure may not always be suitable for access to a space. However, if the MA for access to a space can also be used for the intended surveys and inspections such MA can be credited for the MA for use for surveys and inspections.

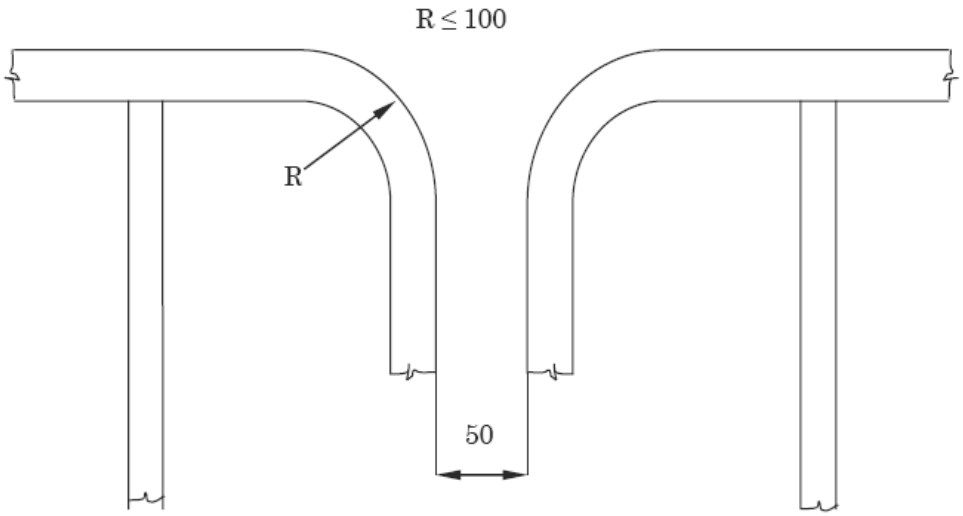
2.4 PARAGRAPH 3.3

Interpretation

1 Sloping structures are structures that are sloped by 5 or more degrees from horizontal plane when a ship is in an upright position at even-keel.

2 Guard rails should be fitted on the open side and should be at least 1,000 mm in height. For stand-alone passageways guard rails should be fitted on both sides of these structures. Guardrail stanchions are to be attached to the PMA. The distance between the passageway and the intermediate bar and the distance between the intermediate bar and the top rail should not be more than 500 mm.

3 Discontinuous top handrails are allowed, provided the gap does not exceed 50 mm. The same maximum gap is to be considered between the top handrail and other structural members (i.e. bulkhead, web frame, etc.). The maximum distance between the adjacent stanchions across the handrail gaps is to be 350 mm where the top and mid handrails are not connected together and 550 mm when they are connected together. The maximum distance between the stanchion and other structural members is not to exceed 200 mm where the top and mid handrails are not connected together and 300 mm when they are connected together. When the top and mid handrails are connected by a bent rail, the outside radius of the bent part is not to exceed 100 mm (see figure below).



4 Non-skid construction is such that the surface on which personnel walks provides sufficient friction to the sole of boots even if the surface is wet and covered with thin sediment.

5 "Substantial construction" is taken to refer to the as designed strength as well as the residual strength during the service life of the vessel. Durability of passageways together with guard rails should be ensured by the initial corrosion protection and inspection and maintenance during services.

6 For guard rails, use of alternative materials such as GRP should be subject to compatibility with the liquid carried in the tank. Non-fire resistant materials should not be used for means of access to a space with a view to securing an escape route at a high temperature.

7 Requirements for resting platforms placed between ladders should be equivalent to those applicable to elevated passageways.

Reference

Paragraph 10 of the annex to MSC/Circ.686.

2.5 PARAGRAPH 3.4

Interpretation

Where the vertical manhole is at a height of more than 600 mm above the walking level, it should be demonstrated that an injured person can be easily evacuated.

2.6 PARAGRAPH 3.5

Interpretation

MA for access to ballast tanks, cargo tanks and spaces other than fore peak tanks:

For oil tankers:

1 Tanks and subdivisions of tanks having a length of 35 m or more with two access hatchways:

First access hatchway: Inclined ladder or ladders should be used.

Second access hatchway:

.1 A vertical ladder may be used. In such a case where the vertical distance is more than 6 m, vertical ladders should comprise one or more ladder-linking platforms spaced not more than 6 m apart vertically and displaced to one side of the ladder.

The uppermost section of the vertical ladder, measured clear of the overhead obstructions in the way of the tank entrance, should not be less than 2.5 m but not exceed 3.0 m and should comprise a ladder-linking platform which should be displaced to one side of a vertical ladder. However, the vertical distance of the uppermost section of the vertical ladder may be reduced to 1.6 m, measured clear of the overhead obstructions in the way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range; or

.2 Where an inclined ladder or combination of ladders is used for access to the space, the uppermost section of the ladder, measured clear of the overhead obstructions in the way of the tank entrance, should be vertical for not less

than 2.5 m but not exceed 3.0 m and should comprise a landing platform continuing with an inclined ladder. However, the vertical distance of the uppermost section of the vertical ladder may be reduced to 1.6 m, measured clear of the overhead obstructions in the way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range. The flights of the inclined ladders are normally to be not more than 6 m in vertical height. The lowermost section of the ladders may be vertical for the vertical distance not exceeding 2.5 m.

2 Tanks less than 35 m in length and served by one access hatchway: an inclined ladder or combination of ladders should be used to the space as specified in 1.2 above.

3 In spaces of less than 2.5 m in width the access to the space may be by means of vertical ladders that comprise one or more ladder-linking platforms spaced not more than 6 m apart vertically and displaced to one side of the ladder. The uppermost section of the vertical ladder, measured clear of the overhead obstructions in the way of the tank entrance, should not be less than 2.5 m but not exceed 3.0 m and should comprise a ladder-linking platform which should be displaced to one side of a vertical ladder. However, the vertical distance of the uppermost section of the vertical ladder may be reduced to 1.6 m, measured clear of the overhead obstructions in the way of the tank entrance, if the ladder lands on a longitudinal or athwartship permanent means of access fitted within that range. Adjacent sections of the ladder should be laterally offset from each other by at least the width of the ladder (see paragraph 20 of MSC/Circ.686).

4 Access from the deck to a double-bottom space may be by means of vertical ladders through a trunk. The vertical distance from deck to a resting platform, between resting platforms, or a resting platform and the tank bottom should not be more than 6 m, unless otherwise approved by the Administration.

MA for inspection of the vertical structure of oil tankers:

Vertical ladders provided for means of access to the space may be used for access for inspection of the vertical structure.

Unless stated otherwise in table 1 of TP, vertical ladders that are fitted on vertical structures for inspection should comprise one or more ladder-linking platforms spaced not more than 6 m apart vertically and displaced to one side of the ladder. Adjacent sections of ladder should be laterally offset from each other by at least the width of the ladder (see paragraph 20 of MSC/Circ.686).

Obstruction distances

The minimum distance between the inclined ladder face and obstructions, i.e. 750 mm and, in the way of openings, 600 mm specified in TP 3.5 should be measured perpendicular to the face of the ladder.

Technical background

It is common practice to use a vertical ladder from the deck to the first landing to clear overhead obstructions before continuing to an inclined ladder or a vertical ladder displaced to one side of the first vertical ladder.

Reference

For vertical ladders: paragraph 20 of the annex to MSC/Circ.686.

2.7 PARAGRAPH 3.6

Interpretation

1 The vertical height of handrails should not be less than 890 mm from the centre of the step and two course handrails need only be provided where the gap between the stringer and the top handrail is greater than 500 mm.

2 The requirement of two square bars for treads specified in TP, paragraph 3.6, is based upon the specification of the construction of ladders in paragraph 3(e) of annex 1 to resolution A.272(VIII), which addresses inclined ladders. TP, paragraph 3.4, allows for single rungs fitted to vertical surfaces, which is considered a safe grip. For vertical ladders, when steel is used, the rungs should be formed of single square bars of not less than 22 mm by 22 mm for the sake of safe grip.

3 The width of inclined ladders for access to a cargo hold should be at least 450 mm to comply with the Australian AMSA Marine Orders part 32, appendix 17.

4 The width of inclined ladders other than an access to a cargo hold should be not less than 400 mm.

5 The minimum width of vertical ladders should be 350 mm and the vertical distance between the rungs should be equal and should be between 250 mm and 350 mm.

6 A minimum climbing clearance in width should be 600 mm other than the ladders placed between the hold frames.

7 The vertical ladders should be secured at intervals not exceeding 2.5 m apart to prevent vibration.

Technical background

1 TP, paragraph 3.6, is a continuation of TP, paragraph 3.5, which addresses inclined ladders. Interpretations for vertical ladders are needed based upon the current standards of IMO, AMSA or the industry.

2 Interpretations 2 and 5 address vertical ladders based upon the current standards.

3 Double square bars for treads become too large for a grip for vertical ladders and single rungs facilitate a safe grip.

4 Interpretation 7 is introduced consistently with the requirement and the interpretation of TP, paragraph 3.4.

Reference

1 Annex 1 to resolution A.272(VIII).

2 Australian AMSA Marine Orders part 32, appendix 17.

3 ILO Code of Practice "Safety and Health in Dockwork" – section 3.6, Access to Ship's Holds.

2.8 PARAGRAPH 3.9.6

Interpretation

A mechanical device such as hooks for securing at the upper end of a ladder should be considered as an appropriate securing device if a movement fore/aft and sideways can be prevented at the upper end of the ladder.

Technical background

Innovative design should be accepted if it fits the functional requirement with due consideration for safe use.

2.9 PARAGRAPHS 3.10 AND 3.11

Interpretation

See interpretation for paragraphs 5.1 and 5.2 of SOLAS regulation II-1/3-6.

2.10 PARAGRAPH 3.13.1

Interpretation

Either a vertical or an inclined ladder or a combination of them may be used for access to a cargo hold where the vertical distance is 6 m or less from the deck to the bottom of the cargo hold.

2.11 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 1.1

Interpretation

1 Subparagraphs .1, .2 and .3 define access to under-deck structure, access to the uppermost sections of transverse webs and connection between these structures.

2 Subparagraphs .4, .5 and .6 define access to vertical structures only and are linked to the presence of transverse webs on longitudinal bulkheads.

3 If there are no under-deck structures (deck longitudinals and deck transverses) but there are vertical structures in the cargo tank supporting transverse and longitudinal bulkheads, access in accordance with subparagraphs from .1 through to .6 should be provided for inspection of the upper parts of vertical structure on transverse and longitudinal bulkheads.

4 If there is no structure in the cargo tank, section 1.1 of table 1 should not be applied.

5 Section 1 of table 1 should also be applied to void spaces in the cargo area, comparable in volume to spaces covered by regulation II-1/3-6, except those spaces covered by section 2.

6 The vertical distance below the overhead structure should be measured from the underside of the main deck plating to the top of the platform of the means of access at a given location.

7 The height of the tank should be measured at each tank. For a tank the height of which varies at different bays, item 1.1 should be applied to such bays of a tank that have a height of 6 m and over.

Technical background

Interpretation 7, if the height of the tank is increasing along the length of a ship, the permanent means of access should be provided locally where the height is above 6 m.

Reference

Paragraph 10 of the annex to MSC/Circ.686.

2.12 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 1.1.2

Interpretation

There is a need to provide a continuous longitudinal permanent means of access when the deck longitudinals and deck transverses are fitted on deck but supporting brackets are fitted under the deck.

2.13 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 1.1.3

Interpretation

Means of access to tanks may be used for access to the permanent means of access for inspection.

Technical background

As a matter of principle, in such a case where the means of access can be utilized for the purpose of accessing structural members for inspection there is no need of duplicated installation of the MA.

2.14 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 1.1.4

Interpretation

The permanent fittings required to serve alternative means of access such as wire lift platform, that should be used by crew and surveyors for inspection should provide at least an equal level of safety as the permanent means of access stated by the same paragraph. These means of access should be carried on board the ship and be readily available for use without filling of water in the tank. Therefore, rafting should not be acceptable under this provision. Alternative means of access should be part of the Access Manual which should be approved on behalf of the flag State. For water ballast tanks of 5 m or more in width, such as on an ore carrier, side shell plating should be considered in the same way as "longitudinal bulkhead".

2.15 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 2.1

Interpretation

Section 2 of table 1 should also be applied to wing tanks designed as void spaces. Paragraph 2.1.1 represents requirements for access to under-deck structures, while paragraph 2.1.2 is a requirement for access for survey and inspection of vertical structures on longitudinal bulkheads (transverse webs).

Technical background

Regulation II-1/3-6.2.1 requires each space to be provided with means of access. Though void spaces are not addressed in the technical provisions contained in resolution MSC.158(78), it is arguable whether MA are not required in void spaces. MA or portable means of access are necessary arrangements to facilitate inspection of the structural condition of the space and the boundary structure. Therefore the requirements of section 2 of table 1 should be applied to double-hull spaces even when designed as void spaces.

2.16 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 2.1.1

Interpretation

1 For a tank, the vertical distance between horizontal upper stringer and deck head of which varies at different sections, item 2.1.1 should be applied to such sections that fall under the criteria.

2 The continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms as necessary on web frames. In case the vertical opening of the web frame is located in the way of the open part between the wide longitudinal and the longitudinal on the opposite side, platforms should be provided on both sides of the web frames to allow safe passage through the web frame.

3 Where two access hatches are required by SOLAS regulation II-1/3-6.3.2, access ladders at each end of the tank should lead to the deck.

Technical background

Interpretation 1: The interpretation of varied tank height in item 1 of table 1 is applied to the vertical distance between horizontal upper stringer and deck head for consistency.

2.17 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 2.1.2

Interpretation

The continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms as necessary on web frames. In case the vertical opening of the web is located in the way of the open part between the wide longitudinal and the longitudinal on the opposite side, platforms should be provided on both sides of the web to allow safe passage through the web. A "reasonable deviation", as noted in TP, paragraph 1.4, of not more than 10 per cent may be applied where the permanent means of access is integral with the structure itself.

2.18 TABLE 1 – MEANS OF ACCESS FOR BALLAST AND CARGO TANKS OF OIL TANKERS, PARAGRAPH 2.2

Interpretation

1 Permanent means of access between the longitudinal continuous permanent means of access and the bottom of the space should be provided.

2 The height of a bilge hopper tank located outside of the parallel part of the ship should be taken as the maximum of the clear vertical distance measured from the bottom plating to the hopper plating of the tank.

3 The foremost and aftmost bilge hopper ballast tanks with raised bottom, of which the height is 6 m and over, a combination of transverse and vertical MA for access to the upper knuckle point for each transverse web, should be accepted in place of the longitudinal permanent means of access.

Technical background

Interpretation 2: The bilge hopper tanks at fore and aft of cargo area narrow due to raised bottom plating and the actual vertical distance from the bottom of the tank to hopper plating of the tank is more appropriate to judge if a portable means of access could be utilized for the purpose.

Interpretation 3: In the foremost or aftmost bilge hopper tanks where the vertical distance is 6 m or over but installation of longitudinal permanent means of access is not practicable, permanent means of access of combination of transverse and vertical ladders provides an alternative means of access to the upper knuckle point.

2.19 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.1

Interpretation

1 Means of access should be provided to the cross-deck structures of the foremost and aftermost part of each cargo hold.

2 Interconnected means of access under the cross deck for access to three locations at both sides and in the vicinity of the centreline should be acceptable as the three means of access.

3 Permanent means of access fitted at three separate locations accessible independently, one at each side and one in the vicinity of the centreline, should be acceptable.

4 Special attention should be paid to the structural strength where any access opening is provided in the main deck or cross deck.

5 The requirements for a bulk carrier cross-deck structure should also be considered applicable to ore carriers.

Technical background

Pragmatic arrangements of the MA are provided.

2.20 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.3

Interpretation

Particular attention should be paid to preserve the structural strength in way of access opening provided in the main deck or cross deck.

2.21 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.4

Interpretation

"Full upper stools" are understood to be stools with a full extension between topside tanks and between hatch end beams.

2.22 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.5

Interpretation

1 The movable means of access to the under-deck structure of cross deck need not necessarily be carried on board the ship. It should be sufficient if it is made available when needed.

2 The requirements for a bulk carrier cross-deck structure should also be considered applicable to ore carriers.

2.23 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.6

Interpretation

The maximum vertical distance of the rungs of vertical ladders for access to hold frames should be 350 mm. If a safety harness is to be used, means should be provided for connecting the safety harness in suitable places in a practical way.

Technical background

The maximum vertical distance of the rungs of 350 mm is applied with a view to reducing trapping cargoes.

2.24 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.7

Interpretation

Portable, movable or alternative means of access should also be applied to corrugated bulkheads.

2.25 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 1.8

Interpretation

Readily available means able to be transported to location in cargo hold and safely erected by ships' crew.

2.26 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 2.3

Interpretation

If the longitudinal structures on the sloping plate are fitted outside of the tank, a means of access should be provided.

2.27 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 2.5

Interpretation

1 The height of a bilge hopper tank located outside of the parallel part of the vessel should be taken as the maximum of the clear vertical height measured from the bottom plating to the hopper plating of the tank.

2 It should be demonstrated that portable means for inspection can be deployed and made readily available in the areas where needed.

2.28 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 2.5.2

Interpretation

A wide longitudinal frame of at least 600 mm clear width may be used for the purpose of the longitudinal continuous permanent means of access. The foremost and aftermost bilge hopper ballast tanks with raised bottom, of which the height is 6 m and over, a combination of transverse and vertical MA for access to the sloping plate of hopper tank connection with side shell plating for each transverse web can be accepted in place of the longitudinal permanent means of access.

2.29 TABLE 2 – MEANS OF ACCESS FOR BULK CARRIERS, PARAGRAPH 2.6

Interpretation

The height of web frame rings should be measured in way of side shell and tank base.

Technical background

In the bilge hopper tank the sloping plating is above the opening, while the movement of the surveyor is along the bottom of the tank. Therefore the measurement of 1 m should be taken from the bottom of the tank.

3 SOLAS REGULATION II-1/26 – GENERAL

3.1 SOLAS REGULATION II-1/26.4, DEAD SHIP CONDITION

Interpretation

1 Dead ship condition for the purpose of regulation II-1/26.4 should be understood to mean a condition under which the main propulsion plant, boilers and auxiliaries are not in operation and in restoring the propulsion, no stored energy for starting and operating the propulsion plant, the main source of electrical power and other essential auxiliaries is assumed to be available.

2 Where the emergency source of power is an emergency generator which complies with regulation II-1/44, IACS SC185 and IACS SC124, this generator may be used for restoring operation of the main propulsion plant, boilers and auxiliaries where any power supplies necessary for engine operation are also protected to a similar level as the starting arrangements.

3 Where there is no emergency generator installed or an emergency generator does not comply with regulation II-1/44, the arrangements for bringing main and auxiliary machinery into operation should be such that the initial charge of starting air or initial electrical power and any power supplies for engine operation can be developed on board ship without external aid. If for this purpose an emergency air compressor or an electric generator is required, these units should be powered by a hand-starting oil engine or a hand-operated compressor. The arrangements for bringing main and auxiliary machinery into operation should have capacity such that the starting energy and any power supplies for engine operation are available within 30 min of a dead ship condition.

3.2 SOLAS REGULATION II-1/26.11, MACHINERY INSTALLATIONS – SERVICE TANK ARRANGEMENTS

Interpretation

1 Arrangements complying with this regulation and acceptable "equivalent arrangements", for the most commonly utilized fuel systems, are shown below.

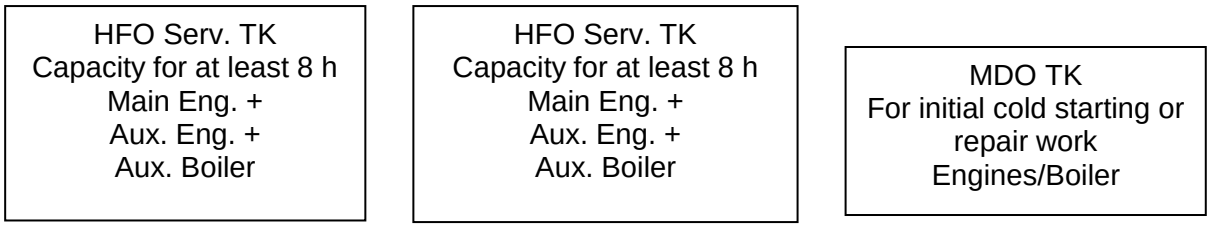
2 A service tank is a fuel oil tank which contains only fuel of a quality ready for use, i.e. fuel of a grade and quality that meets the specification required by the equipment manufacturer. A service tank should be declared as such and not be used for any other purpose.

3 Use of a setting tank with or without purifiers, or purifiers alone, and one service tank is not acceptable as an "equivalent arrangement" to two service tanks.

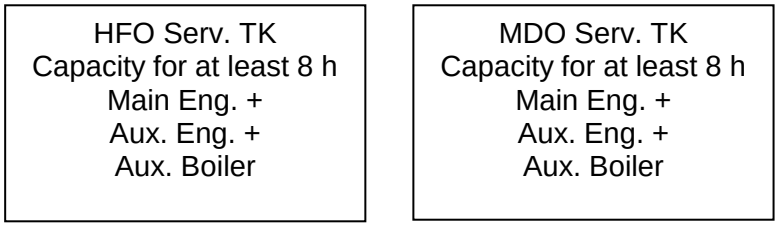
Examples of application for the most common systems

1 Example 1

1.1 Requirement according to SOLAS – Main and auxiliary engines and boiler(s) operating with heavy fuel oil (HFO) (one fuel ship)



1.2 Equivalent arrangement



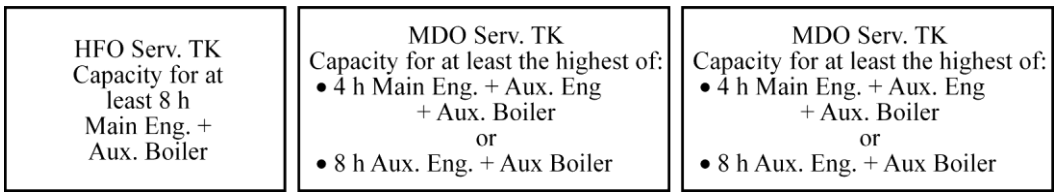
This interpretation only applies where main and auxiliary engines can operate with heavy fuel oil under all load conditions and, in the case of main engines, during manoeuvring.

For pilot burners of auxiliary boilers if provided, an additional MDO tank for eight hours may be necessary.

2 Example 2

2.1 Requirement according to SOLAS – Main engine(s) and auxiliary boiler(s) operating with HFO and auxiliary engine operating with marine diesel oil (MDO)

2.2 Equivalent arrangement



The arrangements in paragraphs 1.2 and 2.2 apply, provided the propulsion and vital systems which use two types of fuel support rapid fuel changeover and are capable of operating in all normal operating conditions at sea with both types of fuel (MDO and HFO).

4 SOLAS REGULATIONS II-1/40 – GENERAL – AND II-1/41 – MAIN SOURCE OF ELECTRICAL POWER AND LIGHTING SYSTEMS

Interpretation

Essential services and arrangements of sources of power, supply, control and monitoring to the different categories of essential services

1 Classification of essential services

1.1 Essential services are those services essential for propulsion and steering, and safety of the ship, which are made up of "Primary Essential Services" and "Secondary Essential Services". Definitions and examples of such services are given in 2 and 3 below.

1.2 Services to ensure minimum comfortable conditions of habitability are those services defined in 4 below.

2 Primary Essential Services

Primary Essential Services are those services which need to be in continuous operation to maintain propulsion and steering. Examples of equipment for "Primary Essential Services" are as follows:

- steering gears;
- pumps for controllable pitch propellers;

- scavenging air blower, fuel oil supply pumps, fuel valve cooling pumps, lubricating oil pumps and cooling water pumps for main and auxiliary engines and turbines necessary for propulsion;
- forced draught fans, feed water pumps, water circulating pumps, vacuum pumps and condensate pumps for steam plants on steam turbine ships, and also for auxiliary boilers on ships where steam is used for equipment supplying primary essential services;
- oil burning installations for steam plants on steam turbine ships and for auxiliary boilers where steam is used for equipment supplying primary essential services;
- azimuth thrusters, which are the sole means for propulsion/steering with lubricating oil pumps, cooling water pumps;
- electrical equipment for electric propulsion plant with lubricating oil pumps and cooling water pumps;
- electric generators and associated power sources supplying the above equipment;
- hydraulic pumps supplying the above equipment;
- viscosity control equipment for heavy fuel oil;
- control, monitoring, and safety devices/systems for equipment to primary essential services;
- fire pumps and other fire extinguishing medium pumps;
- navigation lights, aids and signals;
- internal safety communication equipment;
- lighting system.

3 Secondary Essential Services

Secondary Essential Services are those services which need not necessarily be in continuous operation to maintain propulsion and steering but which are necessary for maintaining the vessel's safety. Examples of equipment for secondary essential services are as follows:

- windlass;
- fuel oil transfer pumps and fuel oil treatment equipment;
- lubrication oil transfer pumps and lubrication oil treatment equipment;
- pre-heaters for heavy fuel oil;
- starting air and control air compressors;
- bilge, ballast and heeling pumps;
- ventilating fans for engine and boiler rooms;
- services considered necessary to maintain dangerous spaces in a safe condition;
- fire detection and alarm system;
- electrical equipment for watertight closing appliances;
- electric generators and associated power sources supplying the above equipment;
- hydraulic pumps supplying the above equipment;
- control, monitoring, and safety systems for cargo containment systems;
- control, monitoring, and safety devices/systems for equipment to secondary essential services.

4 Services for habitability

Services for habitability are those services which need to be in operation for maintaining the ship's minimum comfort conditions for the crew and passengers. Examples of equipment for maintaining conditions of habitability are as follows:

- cooking;
- heating;

- domestic refrigeration;
- mechanical ventilation;
- sanitary and fresh water;
- electrical generators and associated power sources supplying the above equipment.

5 Regulation II-1/40.1.1 and regulation II-1/41.1.1 – For the purposes of these regulations, the services as included in paragraphs 2 to 4 should be considered.

6 Regulation II-1/40.1.2 – For the purposes of this regulation, the services as included in paragraphs 2 and 3 and the services in regulation II-1/42 or II-1/43, as applicable, should be considered.

7 Regulation II-1/41.1.2 – For the purposes of this regulation, the services as included in paragraphs 2 to 4, except for those also listed in Interpretation 3 (SOLAS chapter II-1, regulation 41.1.2), should be considered.

8 Regulation II-1/41.1.5 – For the purposes of this regulation, the services as included in paragraphs 2, 3 and 4 should be considered[1].

9 Regulation II-1/41.5.1.2 – For the purposes of this regulation, the following interpretations are applicable:

.1 services in paragraph 2 should not be included in any automatic load shedding or other equivalent arrangements;

.2 services in paragraph 3 may be included in the automatic load shedding or other equivalent arrangement provided disconnection will not prevent services required for safety being immediately available when the power supply is restored to normal operating conditions; and

.3 services for habitability in paragraph 4 may be included in the load shedding or other equivalent arrangement.

5 SOLAS REGULATION II-1/41 – MAIN SOURCE OF ELECTRICAL POWER AND LIGHTING SYSTEMS

5.1 SOLAS REGULATION II-1/41.1.2, MAIN SOURCE OF ELECTRICAL POWER

Interpretation

Those services necessary to provide normal operational conditions of propulsion and safety do not include services such as:

.1 thrusters not forming part of the main propulsion;

.2 moorings;

.3 cargo handling gear;

.4 cargo pumps; and

.5 refrigerators for air conditioning (those which are not necessary to establish a minimum condition of habitability).

[1] See also IACS UI SC83.

5.2 SOLAS REGULATION II-1/41.1.3, SHAFT-DRIVEN GENERATOR SYSTEMS

Interpretation

Generators and generator systems, having the ship's main propulsion machinery as their prime mover, may be accepted as part of the ship's main source of electrical power, provided:

1 They should be capable of operating under all weather conditions during sailing and during manoeuvring, also when the ship is stopped, within the specified limits for the voltage variation in IEC 60092-301 and the frequency variation in IACS UR E5.

2 Their rated capacity is safeguarded during all operations given under 1, and is such that in the event of any other one of the generators failing, the services given under regulation II-1/41.1.2 (Interpretation 3) can be maintained.

3 The short circuit current of the generator/generator system is sufficient to trip the generator/generator system circuit-breaker taking into account the selectivity of the protective devices for the distribution system.

Protection should be arranged in order to safeguard the generator/generator system in case of a short circuit in the main bus bar. The generator/generator system should be suitable for further use after fault clearance.

4 Standby sets are started in compliance with paragraph 2.2 of SOLAS chapter II-1, regulation II-1/41.5 (Interpretation 5).

5.3 SOLAS REGULATION II-1/41.5.1.3, CONNECTING MEANS BY WHICH THE MAIN BUS BARS OF THE MAIN SOURCE OF ELECTRICAL POWER ARE NORMALLY CONNECTED

Interpretation

1 Other approved means can be achieved by:

.1 circuit breaker without tripping mechanism; or

.2 disconnecting link or switch by which bus bars can be split easily and safely.

2 Bolted links, for example bolted bus bar sections, should not be accepted.

5.4 SOLAS REGULATION II-1/41.5

Interpretation of paragraph 41.5.1.1

1 Where the electrical power is normally supplied by more than one generator set simultaneously in parallel operation, provision of protection, including automatic disconnection of sufficient non-essential services and if necessary secondary essential services as defined in the unified interpretation of SOLAS regulation II-1/40 and 41 above (Interpretation 2) and those provided for habitability, should be made to ensure that, in case of loss of any of these generating sets, the remaining ones are kept in operation to permit propulsion and steering and to ensure safety.

2 Where Administrations permit electrical power to be normally supplied by one generator, provision should be made, upon loss of power, for automatic starting and connecting to the main switchboard of stand-by generator(s) of sufficient capacity with automatic restarting of the essential auxiliaries, in sequential operation if required. Starting and connection to the main switchboard of one generator should be as rapid as possible, preferably within 30 minutes after loss of power. Where prime movers with longer starting time are used, this starting and connection time may be exceeded upon approval from the Administration.

Interpretation of paragraph 41.5.1.2

3 The load shedding should be automatic.

4 The non-essential services, service for habitable conditions, may be shed and, where necessary, additionally the Secondary Essential Services, sufficient to ensure the connected generator set(s) is/are not overloaded.

6 SOLAS REGULATIONS II-1/42 AND II-1/43 – EMERGENCY SOURCE OF ELECTRICAL POWER IN PASSENGER AND CARGO SHIPS

Interpretation

1 "Blackout" as used in regulations II-1/42.3.4 and II-1/43.3.4 should be understood to mean a "dead ship" condition-initiating event.

2 "Dead ship" condition, for the purpose of regulations II-1/42.3.4 and II-1/43.3.4, should be understood to mean a condition under which the main propulsion plant, boilers and auxiliaries are not in operation and in restoring the propulsion, no stored energy for starting the propulsion plant, the main source of electrical power and other essential auxiliaries should be assumed available. It is assumed that means are available to start the emergency generator at all times.

3 Emergency generator stored starting energy is not to be directly used for starting the propulsion plant, the main source of electrical power and/or other essential auxiliaries (emergency generator excluded).

4 For steam ships, the 30-min time limit given in SOLAS can be interpreted as time from blackout defined above to light-off of the first boiler.

5 Exceptionally is understood to mean conditions such as:

.1 blackout situation;

.2 dead ship situation;

.3 routine use for testing;

.4 short-term parallel operation with the main source of electrical power for the purpose of load transfer; and

.5 use of the emergency generator during lay time in port for the supply of the ship's main switchboard, provided the requirements of 6 (Suitable measures for the exceptional use of the emergency generator for power-supply of non-emergency circuits in port) are achieved and unless instructed otherwise by the Administration.

6 Suitable measures for the exceptional use of the emergency generator for power-supply of non-emergency circuits in port:

.1 To prevent the generator or its prime mover from becoming overloaded when used in port, arrangements should be provided to shed sufficient non-emergency loads to ensure its continued safe operation.

.2 The prime mover should be arranged with fuel oil filters and lubrication oil filters, monitoring equipment and protection devices as required for the prime mover for main power generation and for unattended operation.

.3 The fuel oil supply tank to the prime mover should be provided with a low-level alarm, arranged at a level ensuring sufficient fuel oil capacity for the emergency services for the period of time as required by SOLAS.

.4 The prime mover should be designed and built for continuous operation and should be subjected to a planned maintenance scheme ensuring that it is always available and capable of fulfilling its role in the event of an emergency at sea.

.5 Fire detectors should be installed in the location where the emergency generator set and emergency switchboard are installed.

.6 Means should be provided to readily change over to emergency operation.

.7 Control, monitoring and supply circuits, for the purpose of the use of emergency generator in port should be so arranged and protected that any electrical fault will not influence the operation of the main and emergency services.

.8 When necessary for safe operation, the emergency switchboard should be fitted with switches to isolate the circuits.

.9 Instructions should be provided on board to ensure that when the ship is under way all control devices (e.g. valves, switches) are in a correct position for the independent emergency operation of the emergency generator set and emergency switchboard.

7 SOLAS REGULATION II-1/44 – STARTING ARRANGEMENTS FOR EMERGENCY GENERATING SETS

7.1 SOLAS REGULATION II-1/44, PARAGRAPH 1

Interpretation (from MSC/Circ.736)

Emergency generating sets should be capable of being readily started in their cold condition at a temperature of 0ºC. If this is impracticable, or if lower temperatures are likely to be encountered, heating should be provided to ensure ready starting of the generating sets.

7.2 SOLAS REGULATION II-1/44, PARAGRAPH 2

Interpretation (from MSC/Circ.736)

Each emergency generating set arranged to be automatically started should be equipped with starting devices with a stored energy capability of at least three consecutive starts. A second

source of energy should be provided for an additional three starts within 30 min unless manual starting can be demonstrated to be effective.

8 SOLAS CHAPTER II-1, PARTS B AND B-1

DOORS IN WATERTIGHT BULKHEADS OF PASSENGER SHIPS AND CARGO SHIPS

Interpretation

This interpretation pertains to doors[2] located in way of the internal watertight subdivision boundaries and the external watertight boundaries necessary to ensure compliance with the relevant subdivision and damage stability regulations.

This interpretation does not apply to doors located in external boundaries above equilibrium or intermediate waterplanes.

The design and testing requirements for watertight doors vary according to their location relative to the equilibrium waterplane or intermediate waterplane at any stage of assumed flooding.

1 DEFINITIONS

For the purpose of this interpretation the following definitions apply:

1.1 ***Watertight:*** Capable of preventing the passage of water in any direction under a design head. The design head for any part of a structure should be determined by reference to its location relative to the bulkhead deck or freeboard deck, as applicable, or to the most unfavourable equilibrium/intermediate waterplane, in accordance with the applicable subdivision and damage stability regulations, whichever is the greater. A watertight door is thus one that will maintain the watertight integrity of the subdivision bulkhead in which it is located.

1.2 ***Equilibrium waterplane:*** The waterplane in still water when, taking account of flooding due to an assumed damage, the weight and buoyancy forces acting on a ship are in balance. This relates to the final condition when no further flooding takes place or after cross flooding is completed.

1.3 ***Intermediate waterplane:*** The waterplane in still water, which represents the instantaneous floating position of a ship at some intermediate stage between commencement and completion of flooding when, taking account of the assumed instantaneous state of flooding, the weight and buoyancy forces acting on a ship are in balance.

[2] Doors in watertight bulkheads of small cargo ships, not subject to any statutory subdivision and damage stability requirements, may be hinged quick-acting doors arranged to open out of the major space protected. They should be constructed in accordance with the requirements of the Administration and have notices affixed to each side stating, "To be kept closed at sea".

1.4 ***Sliding door or rolling door:*** A door having a horizontal or vertical motion generally parallel to the plane of the door.

1.5 ***Hinged door:*** A door having a pivoting motion about one vertical or horizontal edge.

2 STRUCTURAL DESIGN

Doors and their frames should be of approved design and substantial construction in accordance with the requirements of the Administration and should preserve the strength of the subdivision bulkheads in which they are fitted.

3 OPERATION MODE, LOCATION AND OUTFITTING

Doors should be fitted in accordance with all requirements regarding their operation mode, location and outfitting, i.e. provision of controls, means of indication, etc., as shown in table 1 below. This table should be read in conjunction with paragraphs 3.1 to 5.4 below.

3.1 Frequency of use whilst at sea

3.1.1 *Normally closed:* Kept closed at sea but may be used if authorized. To be closed again after use.

3.1.2 *Permanently closed:* The time of opening such doors in port and of closing them before the ship leaves port should be entered in the logbook. Should such doors be accessible during the voyage, they should be fitted with a device to prevent unauthorized opening.

3.1.3 *Normally open:* May be left open provided it is always ready to be immediately closed.

3.1.4 *Used:* In regular use, may be left open provided it is ready to be immediately closed.

3.2 Type

Power operated, sliding or rolling[3]	POS
Power operated, hinged	POH
Sliding or rolling	S
Hinged	H

3.3 Control

3.3.1 Local

3.3.1.1 All doors, except those which should be permanently closed at sea, should be capable of being opened and closed by hand locally[4], from both sides of the doors, with the ship listed to either side.

3.3.1.2 For passenger ships, the angle of list at which operation by hand should be possible is 15º or 20º if the ship is allowed to heel up to 20º during intermediate stages of flooding.

3.3.1.3 For cargo ships, the angle of list at which operation by hand should be possible is 30º.

[3] Rolling doors are technically identical to sliding doors.

[4] Arrangements for passenger ships should be in accordance with SOLAS regulation II-1/15.7.1.4.

3.3.2 Remote

Where indicated in table 1, doors should be capable of being remotely closed by power from the bridge[5]. Where it is necessary to start the power unit for operation of the watertight door, means to start the power unit is also to be provided at remote control stations. The operation of such remote control should be in accordance with SOLAS regulations II-1/15.8.1 to 15.8.3.

3.4 Indication

3.4.1 Where shown in table 1, position indicators should be provided at all remote operating positions[6] as well as locally, on both sides of the doors[7], to show whether the doors are open or closed and, if applicable, with all dogs/cleats fully and properly engaged.

3.4.2 The door position indicating system should be of self-monitoring type and the means for testing of the indicating system should be provided at the position where the indicators are fitted.

3.4.3 An indication (i.e. red light) should be placed locally showing that the door is in remote control mode ("doors closed mode"). Refer also to SOLAS regulation II-1/15-8.1. Special care should be taken in order to avoid potential danger when passing through the door. Signboard/instructions should be placed in way of the door advising how to act when the door is in "doors closed" mode.

3.5 Alarms

3.5.1 Doors which should be capable of being remotely closed should be provided with an audible alarm, distinct from any other alarm in the area, which will sound whenever such a door is remotely closed. For passenger ships the alarm should sound for at least 5 s but not more than 10 s before the door begins to move and should continue sounding until the door is completely closed. In the case of remote closure by hand operation, an alarm is required to sound only while the door is actually moving.

3.5.2 In passenger areas and areas of high ambient noise, the audible alarms should be supplemented by visual signals at both sides of the doors.

3.6 Notices

As shown in table 1, doors which are normally closed at sea, but are not provided with means of remote closure, should have notices fixed to both sides of the doors stating: "To be kept closed at sea". Doors which should be permanently closed at sea should have notices fixed to both sides stating: "Not to be opened at sea".

3.7 Location

For passenger ships the watertight doors and their controls should be located in compliance with SOLAS regulations II-1/15.6.3 and II-1/15.7.1.2.2.

4 FIRE DOORS

4.1 Watertight doors may also serve as fire doors but need not be fire tested when intended for use below the bulkhead deck. Where such doors are used at locations above the bulkhead deck they should, in addition to complying with the provisions applicable to fire doors at the same

5 Arrangements for passenger ships should be in accordance with SOLAS regulation II-1/15.7.1.5.

6 Indication at all remote control positions (SOLAS regulation II-1/15.6.4).

7 Refer to SOLAS regulation II-1/25-9.3.

locations, also comply with means of escape provisions of SOLAS regulation II-2/13 (2000 SOLAS amendments, resolution MSC.99(73)).

4.2 Where a watertight door is located adjacent to a fire door, both doors should be capable of independent operation, remotely if required by SOLAS regulations II-1/15.8.1 to 15.8.3 and from both sides of each door.

5 TESTING

5.1 Doors which become immersed by an equilibrium or intermediate waterplane or are below the freeboard or bulkhead deck should be subjected to a hydrostatic pressure test.

5.2 For large doors intended for use in the watertight subdivision boundaries of cargo spaces, structural analysis may be accepted in lieu of pressure testing. Where such doors utilize gasket seals, a prototype pressure test to confirm that the compression of the gasket material is capable of accommodating any deflection, revealed by the structural analysis, should be carried out.

5.3 Doors above freeboard or bulkhead deck, which are not immersed by an equilibrium or intermediate waterplane but become intermittently immersed at angles of heel in the required range of positive stability beyond the equilibrium position should be hose tested.

5.4 Pressure testing

5.4.1 The head of water used for the pressure test should correspond at least to the head measured from the lower edge of the door opening, at the location in which the door should be fitted in the ship, to the bulkhead deck or freeboard deck, as applicable, or to the most unfavourable damage waterplane, if that be greater. Testing may be carried out at the factory or other shore-based testing facility prior to installation in the ship.

5.4.2 Leakage criteria

5.4.2.1 The following acceptable leakage criteria should apply:

Doors with gaskets	No leakage
Doors with metallic sealing	Maximum leakage 1 *l*/min

5.4.2.2 Limited leakage may be accepted for pressure tests on large doors located in cargo spaces employing gasket seals or guillotine doors located in conveyor tunnels, in accordance with the following[8]:

$$\text{Leakage rate } (l/\text{min}) = \frac{(P+4.572)\,h^3}{6568}$$

where: P = perimeter of door opening (metres)
h = test head of water (metres)

5.4.2.3 However, in the case of doors where the water head taken for the determination of the scantling does not exceed 6.1 m, the leakage rate may be taken equal to 0.375 *l*/min if this value is greater than that calculated by the above-mentioned formula.

[8] Published in the ATM F 1196, Standard Specification for Sliding Watertight Door Assemblies and referenced in the Title 46 US Code of Federal Regulations 170.270 Door design, operation installation and testing.

5.4.3 For doors of passenger ships which are normally open and used at sea and which become submerged by the equilibrium or intermediate waterplane, a prototype test should be conducted, on each side of the door, to check the satisfactory closing of the door against a force equivalent to a water height of at least 1 m above the sill on the centre line of the door[9].

5.5 Hose testing after installation

All watertight doors should be subject to a hose test[10] after installation in a ship. Hose testing should be carried out from each side of a door unless, for a specific application, exposure to floodwater is anticipated only from one side. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation, or outfitting items, it may be replaced by means such as an ultrasonic leak test or an equivalent test.

[9] Arrangements for passenger ships should be in accordance with SOLAS regulation II-1/15.6.2.

[10] Refer to IACS URS 14.2.3 IACS Reg. 1996/Rev.2, 2001.

Table 1 – Internal doors in watertight bulkheads in cargo ships and passenger ships

Position relative to equilibrium or intermediate waterplane	1 Frequency of use whilst at sea	2 Type	3 Remote control[6]	4 Indication locally and on bridge[6]	5 Audible alarm[6]	6 Notice	7 Comments	8 Regulation
I. Passenger ships								
A. At or below	Normally closed	POS	Yes	Yes	Yes	No	Certain doors may be left open, see SOLAS II-1/15.9.3	SOLAS II-1/15.9.1, 15.9.2 and 15.9.3
	Permanently closed	S, H	No	No	No	Yes	See Notes 1 + 4	SOLAS II-1/15.10.1 and 15.10.2
B. Above	Normally open	POS, POH	Yes	Yes	Yes	No		SOLAS II-1/15.9.3 SOLAS II-1/20.1 MSC/Circ.541
	Normally closed	S, H	No	Yes	No	Yes	See Note 2	
		S, H	No	Yes	No	Yes	Doors giving access to ro-ro deck	SOLAS II-1/20-2
II. Cargo ships								
A. At or below	Used	POS	Yes	Yes	Yes	No		SOLAS II-1/25-9.2
	Normally closed	S, H	No	Yes	No	Yes	see Notes 2 + 3 + 5	SOLAS II-1/25-9.3
	Permanently closed	S, H	No	No	No	Yes	see Notes 1 + 4	SOLAS II-1/25-9.4 SOLAS II-1/25-10
B. Above	Used	POS	Yes	Yes	Yes	No		SOLAS II-1/25-9.2
	Normally closed	S, H	No	Yes	No	Yes	See Notes 2 + 5	SOLAS II-1/25-9.3 SOLAS II-1/25-10

Notes:

1 Doors in watertight bulkheads subdividing cargo spaces.
2 If hinged, this door should be of quick-acting or single-action type.
3 SOLAS requires remotely operated watertight doors to be sliding doors.
4 The time of opening such doors in port and closing them before the ship leaves port should be entered in the logbook.
5 The use of such doors should be authorized by the officer of the watch.
6 Cables for control and power systems to power-operated watertight doors and their status indication should comply with the requirements of IACS UR E15.

9 SOLAS REGULATION XII/9 – REQUIREMENTS FOR BULK CARRIERS NOT BEING CAPABLE OF COMPLYING WITH REGULATION 4.3 DUE TO THE DESIGN CONFIGURATION OF THEIR CARGO HOLDS

Bulk carriers not complying with SOLAS XII/9 as of 1 January 2004

Interpretation

Bulk carriers subject to SOLAS regulation XII/9, but which have not been brought into compliance with the regulation as of 1 January 2004, should comply with SOLAS regulation XII/12 in accordance with the compliance schedule of that regulation (i.e. not later than the date of the annual, intermediate or renewal survey of the ship to be carried out after 1 July 2004, whichever comes first).

10 SOLAS REGULATION XII/12 – HOLD, BALLAST AND DRY SPACE WATER INGRESS ALARMS

When water level detectors are installed on bulk carriers in compliance with SOLAS regulation XII/12, the *Performance standards for water level detectors on bulk carriers and single hold cargo ships other than bulk carriers*, annexed to resolution MSC.188(79) adopted on 5 June 2003 should be applied, taking into account the following interpretations to the paragraphs of the Performance standards.

10.1 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, PARAGRAPH 3.2.3

Interpretation

Detection equipment includes the sensor and any filter and protection arrangements for the detector installed in cargo holds and other spaces as required by SOLAS regulation XII/12.1.

10.2 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, PARAGRAPH 3.2.5

Interpretation

1 In general, the construction and type testing should be in accordance with publication IEC 60079: Electrical Equipment for Explosive Gas Atmospheres to a minimum requirement of EX(ia). Where a ship is designed only for the carriage of cargoes that cannot create a combustible or explosive atmosphere then the requirement for intrinsically safe circuitry should not be insisted upon, provided the operational instructions included in the Manual required by 4.1 of the appendix to the annex specifically exclude the carriage of cargoes that could produce a potential explosive atmosphere. Any exclusion of cargoes identified in the annex should be consistent with the ship's Cargo Book and any Certification relating to the carriage of specifically identified cargoes.

2 The maximum surface temperature of equipment installed within cargo spaces should 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 should not exceed 85ºC.

3 Where intrinsically safe equipment is installed, it should be of a certified safe type.

4 Where detector systems include intrinsically safe circuits, plans of the arrangements should be appraised/approved by individual classification societies.

10.3 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, PARAGRAPH 3.3.2

Interpretation

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

10.4 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, PARAGRAPH 3.3.7

Interpretation

Fault monitoring should address faults associated with the system that include open circuit, short circuit, as well as arrangement details that would include loss of power supplies and CPU failure for computer based alarm/monitoring system, etc.

10.5 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, PARAGRAPH 3.3.8

Interpretation

1 The electrical power supply should be from two separate sources, one should be the main source of electrical power and the other should 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 (18 h). The battery supply may be an internal battery in the water level detector system.

2 The changeover arrangement of supply from one electrical source to another need not be integrated into the water level detector system.

3 Where batteries are used for the secondary power supply, failure alarms for both power supplies should be provided.

10.6 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, FOOTNOTE TO PARAGRAPH 3.4.1

Interpretation

1 IACS UR E10 may be used as an equivalent test standard to IEC 60092-504.

2 The range of tests should include the following:

For alarm/monitoring panel:

.1 functional tests in accordance with resolution MSC.188(79) – *Performance standards for water level detectors on bulk carriers and single hold cargo ships other than bulk carriers*;

.2 electrical power supply failure test;

.3 power supply variation test;

.4 dry heat tests;

.5 damp heat tests;

.6 vibration test;

.7 EMC tests;

.8 insulation resistance test;

.9 high-voltage test; and

.10 static and dynamic inclinations tests, if moving parts are contained.

For IS barrier unit, if located in the wheelhouse: in addition to the certificate issued by a competent independent testing laboratory, EMC tests should also be carried out.

For water ingress detectors:

.1 functional tests in accordance with resolution MSC.188(79) – *Performance standards for water level detectors on bulk carriers and single hold cargo ships other than bulk carriers*;

.2 electrical power supply failure test;

.3 power supply variation test;

.4 dry-heat test;

.5 damp-heat test;

.6 vibration test;

.7 enclosure class in accordance with resolution MSC.188(79) – *Performance standards for water level detectors on bulk carriers and single hold cargo ships other than bulk carriers*;

.8 insulation resistance test;

.9 high-voltage test; and

.10 static and dynamic inclinations tests (if the detectors contain moving parts).

10.7 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, APPENDIX, PARAGRAPH 2.1.1

Interpretation

The test procedure should satisfy the following criteria:

.1 the type tests should be witnessed by a classification society surveyor if the tests are not carried out by a competent independent test facility;

.2 type tests should be carried out on a prototype or randomly selected item(s) which are representative of the manufactured item that is being type tested; and

.3 type tests should be documented (type test reports) by the manufacturer and submitted for review by classification societies.

10.8 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, APPENDIX, PARAGRAPH 2.1.1.1

Interpretation

1 The submerged test period for electrical components intended to be installed in ballast tanks and cargo tanks used as ballast tanks should be not less than 20 days.

2 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 should be not less than 24 h.

3 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 should satisfy the requirements of IP68 for a water head equal to the hold depth for a period of 20 days or 24 h on the basis of whether or not the cargo hold is intended to be used as a ballast tank as described in the previous paragraphs.

10.9 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, APPENDIX, PARAGRAPH 2.1.1.2

Interpretation

1 The type test required for the sensor should be in accordance with the following:

.1 The test container for the cargo/water mixture should be dimensioned so that its height and volume are such that the sensor and any filtration fitted can be totally submerged for the repeated functionality tests required by paragraph 2.1.1.2 and the static and dynamic inclination tests identified in the previous interpretation.

.2 The sensor and any filtration fitted that should be submerged and should be arranged in the container as they would be installed in accordance with the installation instructions required by paragaph 4.4.

.3 The pressure in the container for testing the complete detector should 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.

.4 The cargo/water mixture should 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 should not affect the operation of the sensor and filter arrangements.

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

.6 The test container should then be drained and the deactivation of the alarm condition observed.

.7 The test container and sensor with any filter arrangement should be allowed to dry without physical intervention.

.8 The test procedure should be repeated consecutively ten times without cleaning any filter arrangement that may be fitted in accordance with the manufacturer's installation instructions (see also 2.1.1.2).

.9 Satisfactory alarm activation and deactivation at each of the 10 consecutive tests will demonstrate satisfactory type testing.

2 The cargo/water mixture used for type testing should be representative of the range of cargoes within the following groups and should include the cargo with the smallest particles expected to be found from a typical representative sample:

.1 iron ore particles and seawater;

.2 coal particles and seawater;

.3 grain particles and seawater; and

.4 aggregate (sand) particles and seawater.

The smallest and largest particle size together with the density of the dry mixture should be ascertained and recorded. The particles should 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.

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

.1 Iron ore particles should mainly consist of small loose screenings of iron ore and not lumps of ore (dust with particle size <0.1 mm).

.2 Coal particles should mainly consist of small loose screenings of coal and not lumps of coal (dust with particle size <0.1 mm).

.3 Grain particles should mainly consist of small loose grains of free-flowing grain (grain having a size >3 mm, such as wheat).

.4 Aggregate particles should mainly consist of small loose grains of free-flowing sand and without lumps (dust with particle size <0.1 mm).

10.10 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, APPENDIX, PARAGRAPH 3.1.1

Interpretation

The test procedure should satisfy the following criteria:

.1 The type tests should be witnessed by a classification society surveyor if the tests are not carried out by a competent independent test facility.

.2 Type tests should be carried out on a prototype or randomly selected item(s) which are representative of the manufactured item that is being type tested.

.3 Type tests should be documented (type test reports) by the manufacturer and submitted for review by classification societies.

10.11 PERFORMANCE STANDARDS FOR WATER LEVEL DETECTORS ON BULK CARRIERS AND SINGLE HOLD CARGO SHIPS OTHER THAN BULK CARRIERS, APPENDIX, SECTION 4 – MANUALS

Interpretation

For each ship, a copy of the manual should be made available to the surveyor at least 24 hours prior to survey of the water-level detection installation. Each classification society should ensure that any plans required for classification purposes have been appraised/approved as appropriate.

11 SOLAS REGULATION XII/13 – AVAILABILITY OF PUMPING SYSTEMS

SOLAS regulation XII/13.1 and MSC/Circ.1069

Dewatering of forward spaces of bulk carriers

Interpretation

1 Where the piping arrangements for dewatering closed dry spaces are connected to the piping arrangements for the drainage of water ballast tanks, two non-return valves should be provided to prevent the ingress of water into dry spaces from those intended for the carriage of water ballast. One of these non-return valves should be fitted with a shut-off isolation arrangement. The non-return valves should be located in readily accessible positions. The shut-off isolation arrangement should be capable of being controlled from the navigation bridge, the propulsion machinery control position or enclosed space which is readily accessible from the navigation bridge or the propulsion machinery control position without travelling exposed freeboard or superstructure decks. In this context, a position which is accessible via an under-deck passage, a pipe trunk or other similar means of access should not be taken as being in the "readily accessible enclosed space".

2 Under SOLAS regulation XII/13.1:

.1 the valve specified under SOLAS regulation II-1/12.5.1 should be capable of being controlled from the navigation bridge, the propulsion machinery control position or enclosed space which is readily accessible from the navigation bridge or the propulsion machinery control position without travelling exposed freeboard or superstructure decks. In this context, a position which is accessible via an under-deck passage, a pipe trunk or other similar means of access should not be taken as being in the "readily accessible enclosed space";

.2 the valve should not move from the demanded position in the case of failure of the control system power or actuator power;

.3 positive indication should be provided at the remote control station to show that the valve is fully open or closed; and

.4 local hand-powered valve operation from above the freeboard deck, as permitted under SOLAS regulation II-1/12.5.1, is required. An acceptable alternative to such arrangement may be remotely operated actuators as specified in SOLAS regulation XII/13.1, on the condition that all of the provisions of regulation 13.1 are met.

3 The dewatering arrangements should be such that any accumulated water can be drained directly by a pump or eductor.

4 The dewatering arrangements should be such that when they are in operation, other systems essential for the safety of the ship including fire-fighting and bilge systems remain available and ready for immediate use. The systems for normal operation of electric power supplies, propulsion and steering should not be affected by the operation of the dewatering systems. It should also be possible to immediately start fire pumps and have a readily available supply of fire-fighting water and to be able to configure and use the bilge system for any compartment when the dewatering system is in operation.

5 Bilge wells should be provided with gratings or strainers that will prevent blockage of the dewatering system with debris.

6 The enclosures of electrical equipment for the dewatering system installed in any of the forward dry spaces should provide protection to IPX8 standard as defined in publication IEC 60529 for a water head equal to the height of the space in which the electrical equipment is installed for a time duration of at least 24 h.