



GUIDANCE NOTES

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Guidance Manual for Additional Requirements for Bulk Carriers

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Chapter 1 General

Section 1 Introduction

As a result of concern regarding the high casualty rate of single side skin dry bulk carriers and the associated loss of life and cargo in the early 90s, the industry carried out comprehensive investigations on bulk carrier accidents. In accordance with IMO's statistics on the loss of bulk carriers, the majority of marine casualties were related to damage of side structure and ship age, among which, damage of side structure accounted for 50% of the casualties, water ingress of cargo hatch accounted for 20%, and most of the ships lost were over 15 years of age. The investigations identified that principal factors contributing to the loss of bulk carriers were structural damage, inappropriate handling of cargo, and so on.

To enhance the safety of bulk carriers, the International Association of Classification Societies (IACS) and the International Maritime Organization (IMO) have developed a set of mandatory requirements for bulk carriers, which have been entered into force and implemented in succession. Along with the industry, China Classification Society (ISC) has endeavored to adopt a series of measures to further enhance the safety of bulk carriers.

This Manual has brought together additional requirements for the survey of bulk carriers including some of the IMO conventions, the IACS uniform requirements and the classification rules of the Society, which will be integrated with the requirements of survey management on the basis of experiences built up during surveys carried out by the Society, so as to offer guidance to field surveys.

This Manual focuses on the introduction of additional requirements for bulk carriers, which shall not be treated as a substitution for relevant requirements of rules and instructions of this Society as well as the Conventions. In case of any doubt or conflict found during the use of this Manual, the rules and Conventions shall prevail.

Section 2 Technical Background

2.1 Category of bulk carriers

From the purpose point of view, bulk carriers, according to their DWT sizes, can be generally divided into the following categories:

(1) *Handysize bulk carrier*: bulk carriers ranging from 20,000 to 50,000 DWT, among which, ships over 40,000 DWT are also known as Handymax bulk carriers. These bulk carriers have a very strong adaptability to waterways, canals and ports.

(2) *Panamax bulk carrier*: the largest bulk carrier that could pass through the Panama Canal under fully loaded conditions, which means compliance with the Canal navigation rules that ships transiting the Canal shall not exceed 274.32 meters in overall length and 32.31 meters in molded breadth. If necessary, the dead weight tonnage may be changed through adjustment of the ship's size, type and structure. Bulk carriers of this category normally range from 55,000 to 85,000 DWT. In this category, ships ranging from 50,000 to 54,999 DWT are known as Baby-Panamax Bulk carriers, and ships ranging from 50,000 to 64,999 DWT are known as Supramax Bulk carriers; while ships with an overall length of 229 meters are referred to as Kamsarmax vessels, the DWT of which is consistent with the bauxite cargo load limit of Port Kamsar, Guinea.

(3) *Capesize bulk carrier*: bulk carriers ranging from 120,000 to 210,000 DWT, which are mainly used to carry iron ore. Due to size limit, this type of bulk carrier cannot pass through the Panama Canal and the Suez Canal, and has to go around Cape of Good Hope and Cape Horn. Bulk carriers with intermediate dead weight tonnage can also be categorized as:

Handy-cape Bulk carriers: DWT $\leq 119,999$, ship beam > 39.5 m;

Post Panamax Bulk carriers: range from 50,000 to 110,500 DWT, ship beam > 32.31 m, but ≤ 39.1 m.

(4) *Very Large Ore Carriers (VLOC)*: bulk carriers with a DWT of 210,000 or above, usually used for long distance transport of coal and iron ore. Compared to conventional bulk carriers, a VLOC has smaller cubic meters of cargo capacity and small hatches.

(5) *Lake bulk carrier*: bulk carrier vessels that ply the Great Lakes at the borders between US and Canada via the Saint Lawrence Seaway, mainly carrying coal, iron ores and grains. The size of this type of bulk carriers has to meet the navigation requirements of the St. Lawrence Seaway, which are, overall length not exceeding 222.50 meters, molded width not exceeding 23.16 meters, any part of the bridge house not extending outside of the hull, draught not exceeding the maximum allows draught of the Great Lakes, and the height from top of the mast to water surface not exceeding 35.66 meters. Lake bulk carriers normally have a DWT of around 30,000 tons, and most of them are equipped with cargo handling equipment.

2.2 Typical structural arrangement for bulk carriers

The most typical structural arrangement for bulk carriers is a single deck vessel with double bottom, hopper tank, topside tank, cargo hold area with single-side skin or double-side skin construction and deck hatches. Figure 1.2-1 (1) and (2) are brief schematics for typical single-side skin and double-side skin bulk carriers.

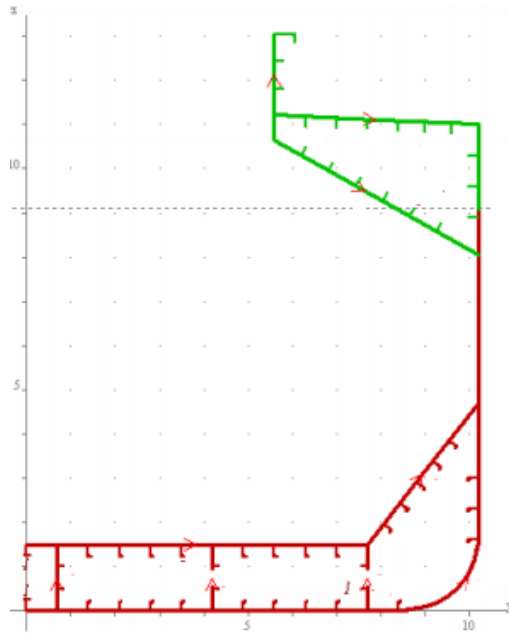
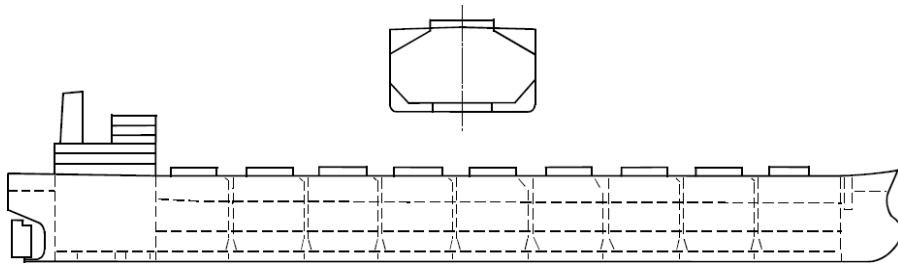


Figure 1.2-1 (1): Typical Single-side Skin Bulk Carrier

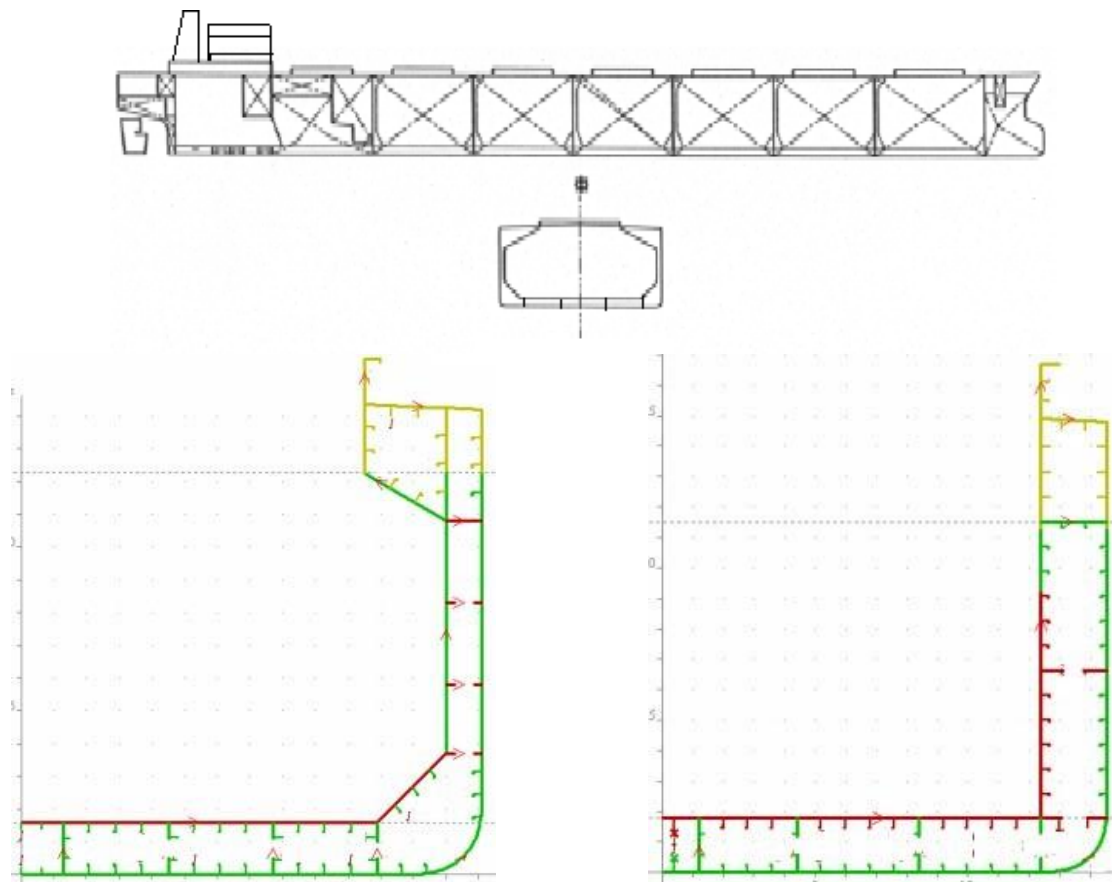


Figure 1.2-1 (2): Typical Double-side Skin Bulk Carrier

As a reference of structure terms used in this Manual, Figure 1.2-2 shows a typical configuration of cargo hold for bulk carriers. In addition, typical traverse section of cargo hold and vertical section of typical corrugated transverse watertight bulkhead are shown respectively in Figure 1.2-3 (1) and (2) as well as Figure 1.2-4. General terms have been given in these schematics.

In general, the platings such as side shell plating, bottom shell plating, strength deck, transverse bulkhead, inner bottom plate, topside tank sloping plating and hopper tank sloping plating provide partial bound of the structure, and bear both static and dynamic pressure loads from cargo, fuel, ballast, sea water and etc. While secondary components such as frame or longitudinal offer support to the platings. These secondary components will transfer loads to main components such as double bottom floors and girders or topside tank and hopper tank transverse web frames. See Figure 1.2-2 and Figure 1.2-3 (1) and (2).

Transverse deck

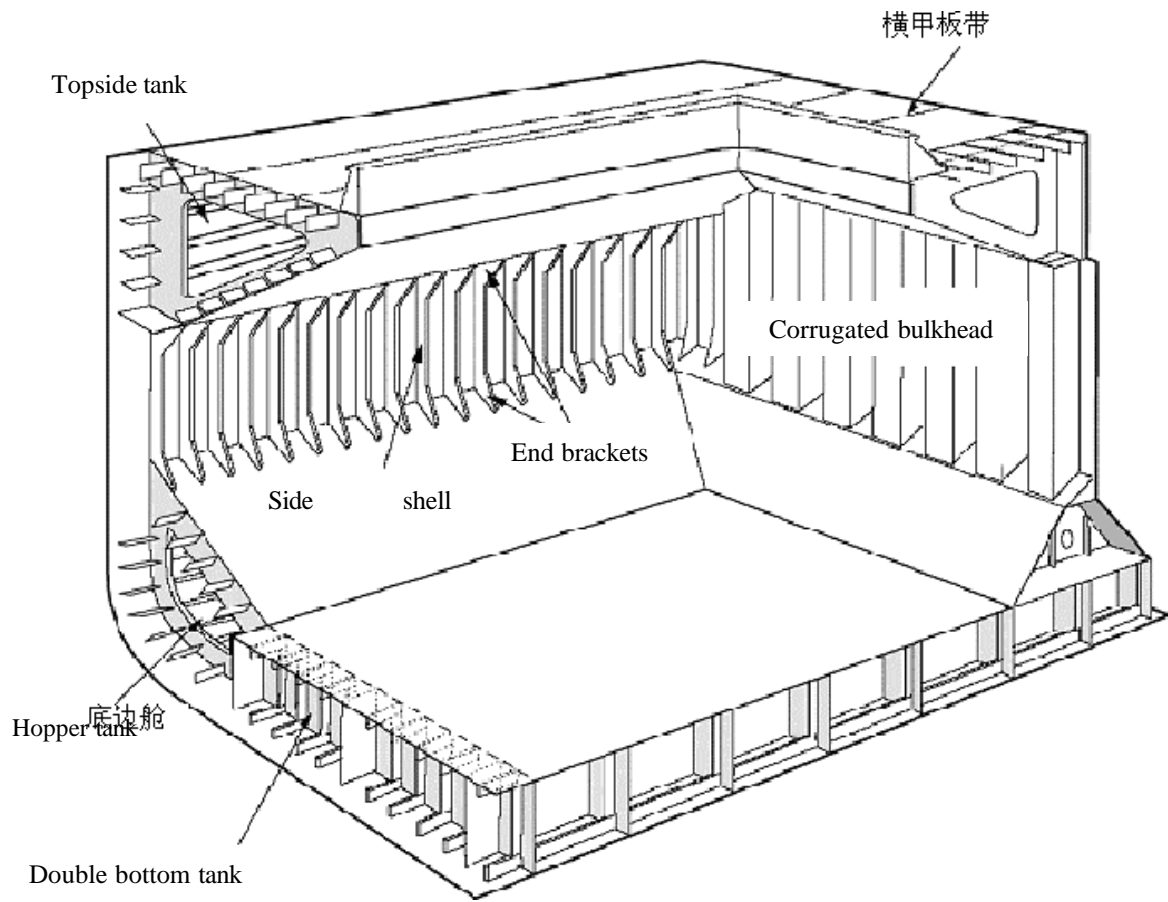


Figure 1.2-2: Single Skin Bulk Carrier — Typical Cargo Hold Structural Configuration

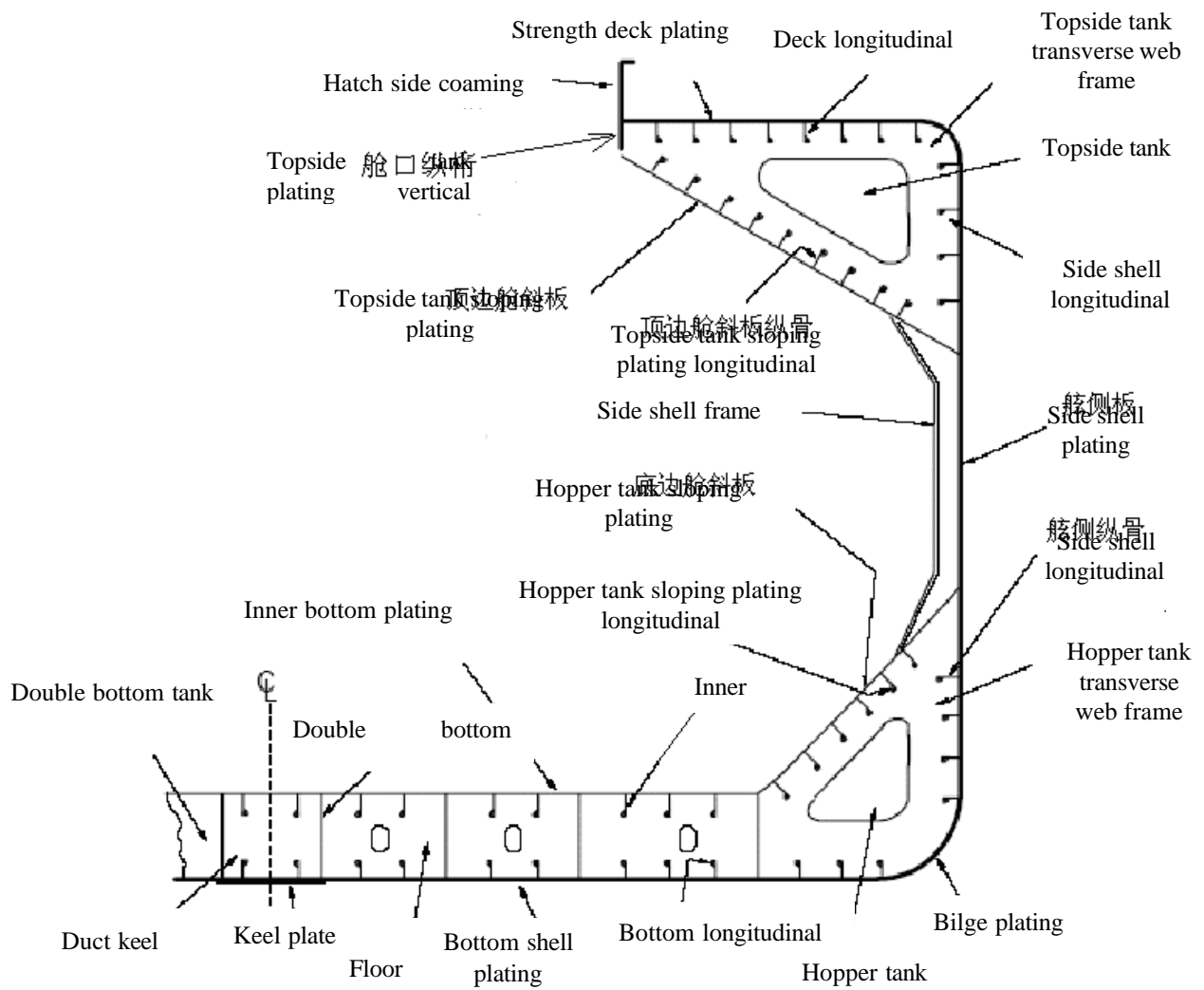


Figure 1.2-3 (1): Single Skin Bulk Carrier — Typical Transverse Section

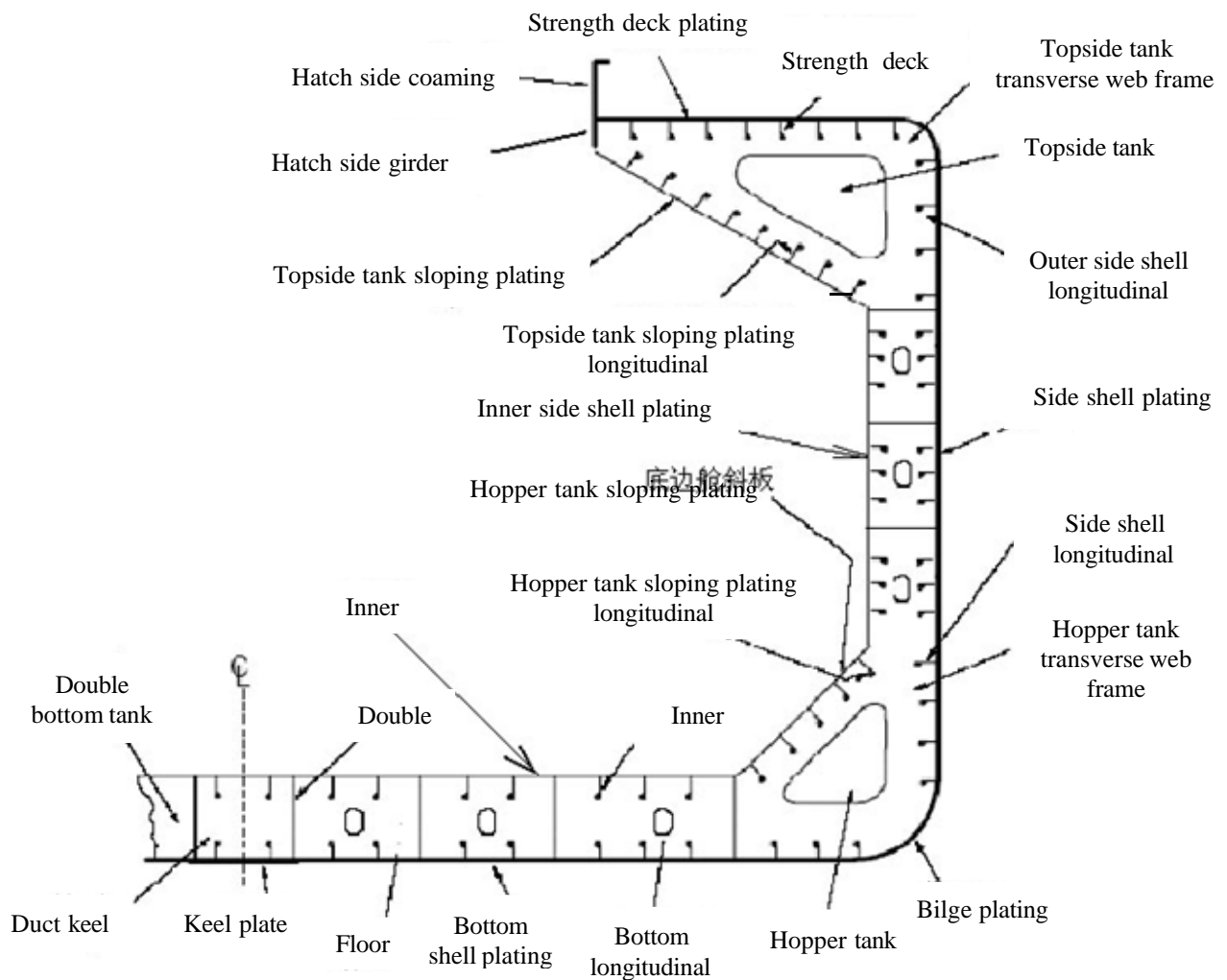


Figure 1.2-3 (2): Double Skin Bulk Carrier — Typical Transverse Section

Transverse bulkhead structure including its upper stool and lower stool (if any, see Figure 1.2-4), together with the deck between hatches as well as the double bottom structure, will provide ships with transverse strength to prevent main structural components from hull profile distortion. In addition, in case of water ingress in a particular cargo hold, the transverse watertight bulkheads of this cargo hold will prevent water from entering other cargo holds.

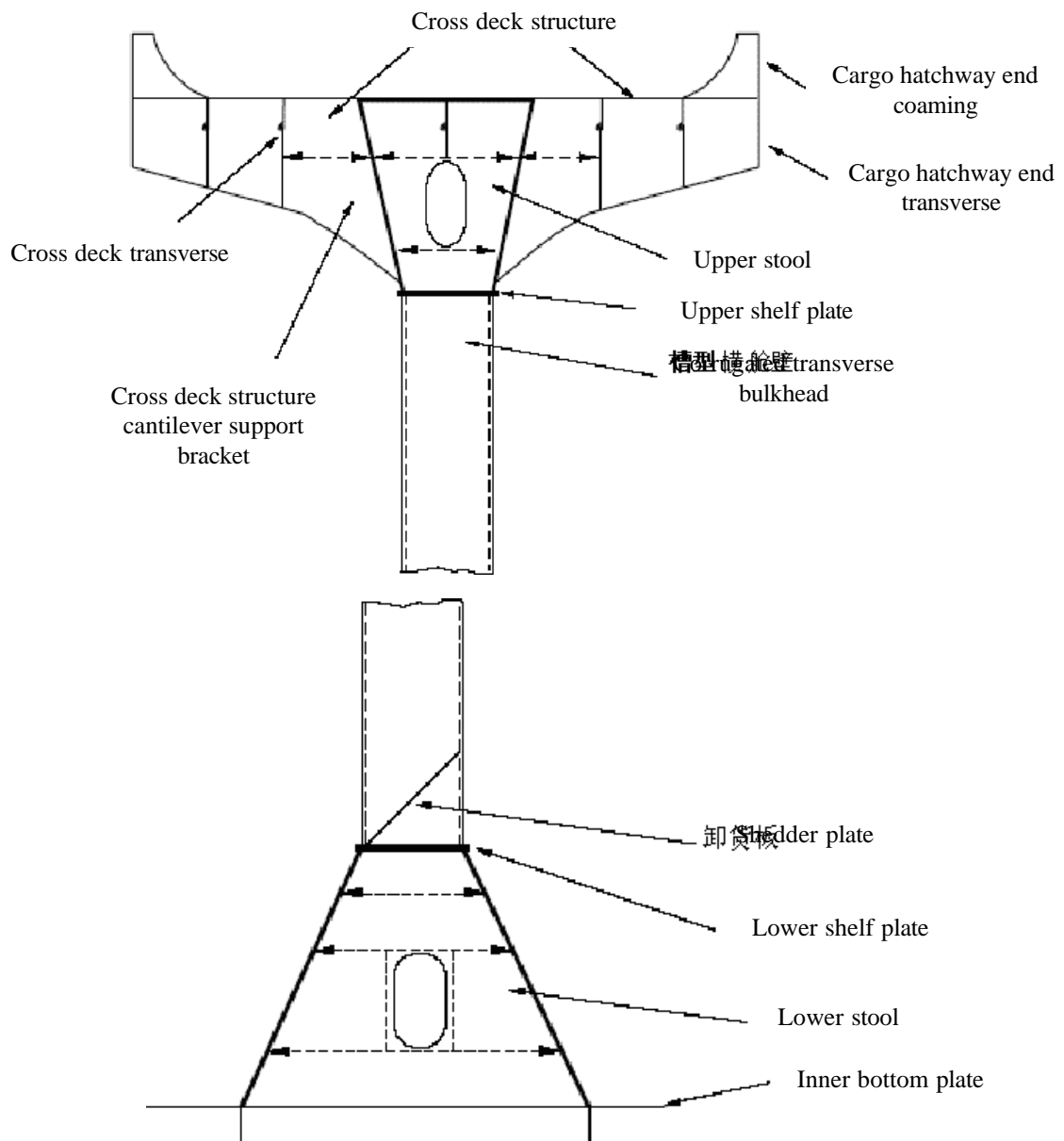


Figure 1.2-4: Typical corrugated transverse watertight bulkhead

2.3 Typical critical structural areas of bulk carriers

In the structural arrangement of bulk carriers, high stresses tend to occur at some parts of the cargo areas, such as deck corner, connection between hopper tank folded corner and floor, connection between longitudinal girder and transverse bulkhead, connection between lower shelf plate and corrugated bulkhead, shedder plate of corrugated bulkhead, areas around floor lightening holes or manholes and etc. For different hull structures, the critical structural areas may vary. Following are some examples of high stress areas of bulk carriers.

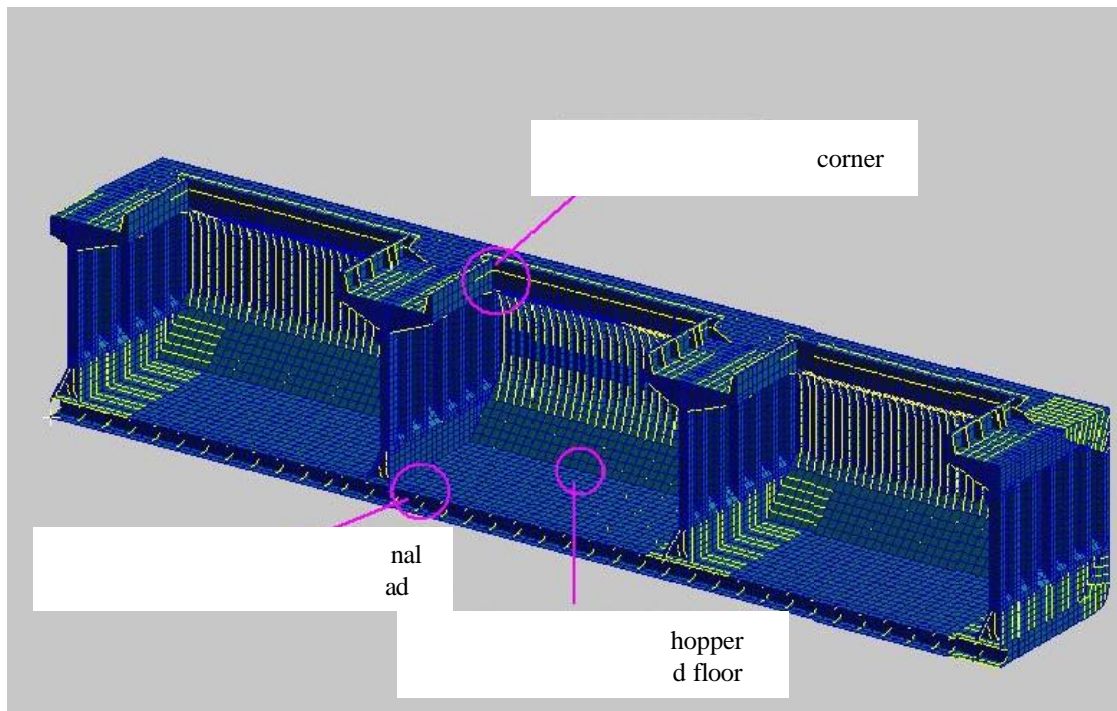


Figure 1.2-5 Typical High Stress Areas

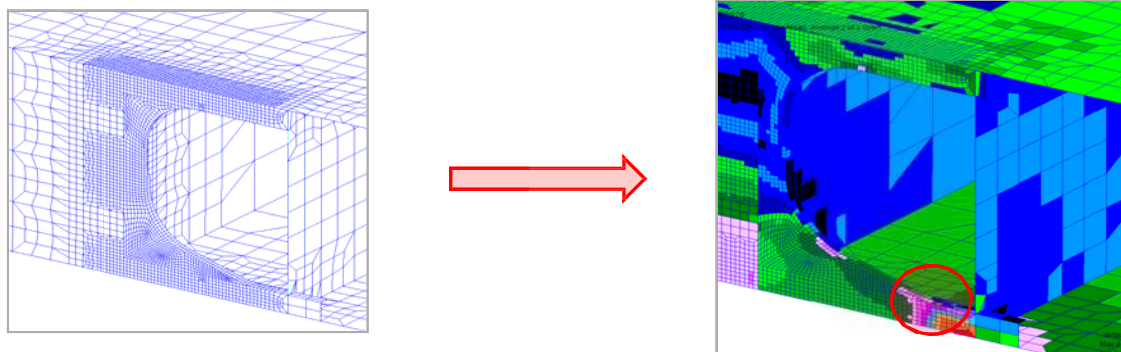


Figure 1.2-6 Typical High Stress Areas (at connection transition end between partial longitudinal girder and outer bottom longitudinal)

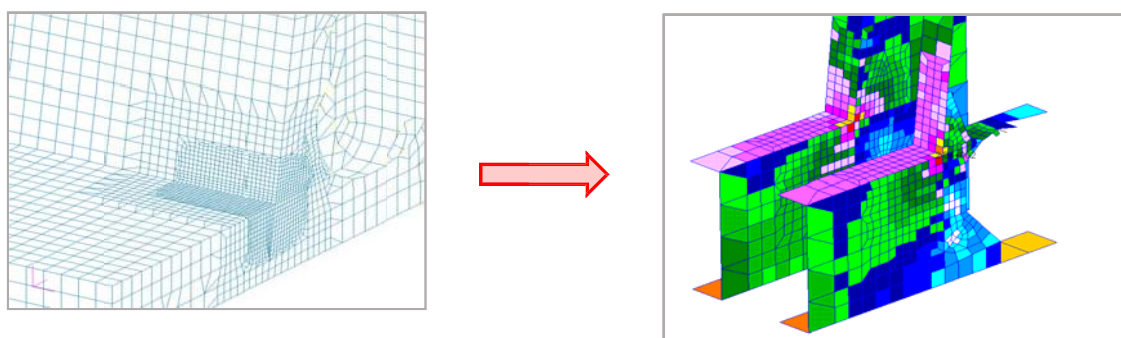
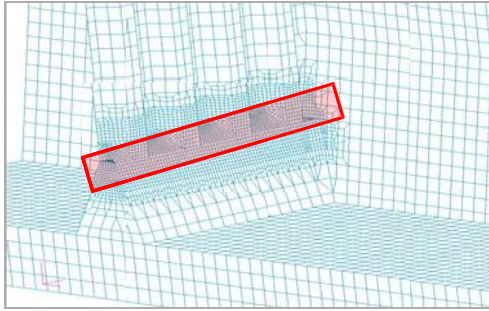
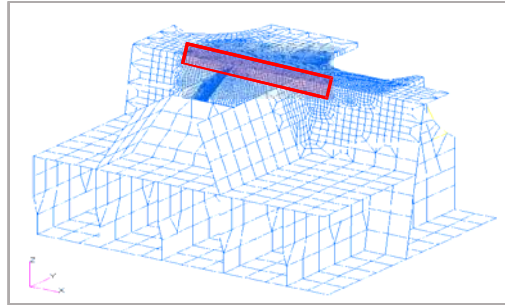


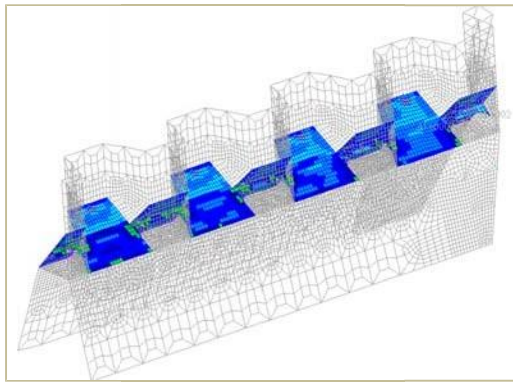
Figure 1.2-7 Typical High Stress Areas (at connection between strength web frame, inner bottom plating and longitudinal bulkhead)



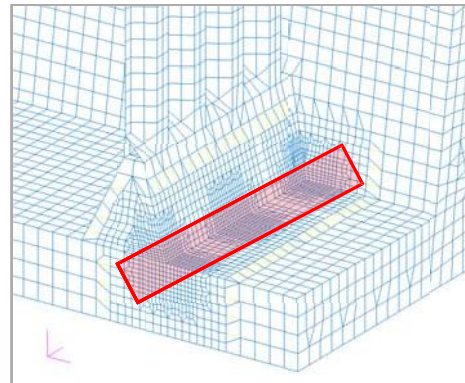
Connection between the bottom end of corrugated bulkhead and the lower shelf plate



Connection between sloping plating of the lower stool and side tank horizontal girder



Shedder plate



Connection between sloping plating/vertical plating of the lower stool and longitudinal girder

Figure 1.2-8 Typical High Stress Areas (transverse bulkhead)

2.4 Additional requirements for bulk carriers

So far, the additional requirements for bulk carriers adopted internationally can be summarized into the follow areas:

(1) Survey requirements

Since early 90s, the International Association of Classification Societies has put forward the requirements of "enhanced surveys" for the cargo hold areas of bulk carriers. In November 1993, IMO adopted the enhanced survey programme (ESP) for oil tankers and bulk carriers in the form of guidelines (Resolution A.744 (18)), and the second session of the SOLAS Conference held in May 1994 adopted Regulation 2 "Enhanced surveys" under Chapter XI of the SOLAS Convention (Chapter XI-1 as amended), requiring the enhanced survey programme (ESP) to be implemented on bulk carriers as a mandatory requirement. This Amendment entered into force on January 1, 1996.

(2) Safety management requirements

At the second session of the SOLAS Conference held in May 1994, IMO adopted a new Chapter IX "Management for the Safe Operation of Ships" of the SOLAS Convention, which requires that bulk carriers should implement International Safety Management (ISM) Code starting from July 1, 1998, aiming to enhance control on bulk carriers from the perspective of ship safety management, and bring down the effects of human factors on the safety of bulk carriers. The definition of bulk carrier is given under regulation IX/1.6, and is referenced by Chapter XI-1 "Special Measures to Enhance Maritime Safety".

(3) Loading operation requirements

IMO adopted the addition of SOLAS regulation VI/7 "Loading, unloading and stowage of bulk cargoes" at the 66th session of Maritime Safety Committee held in 1996. Requirements on the safety of loading and unloading for bulk carriers have been given under regulation VI/7.3 - 7.8, and requirements on documents equipped on bulk carriers such as stowage manual and loading and unloading sequence manual have been provided under regulation VI/7.2.

This Amendment entered into force on July 1, 1998, and provides under regulation XII/8 effective from July 1, 1999 that, the booklet required by regulation VI/7.2 shall be endorsed by the Administration or on its behalf to indicate that regulations 4,5,6 and 7 as appropriate, are complied with. SOLAS regulation VI/1-2 as amended by MSC.269 (85) provides that the carriage of solid bulk cargoes other than grain shall be in compliance with the relevant provisions of the IMSBC Code. This Amendment has incorporated IMSBC Code as a mandatory statutory requirement.

(4) Technical requirements

At the 4th session of the SOLAS Conference held in November 1997, IMO adopted Chapter XII "Additional safety measures for bulk carriers" which is mainly on the structural safety of bulk carriers. This Amendment entered into force on July 1, 1999.

Besides the introduction of IACS structural safety requirements (such as requirements on fitting with loading instrument, requirements on strength of existing ships to withstand flooding of the foremost cargo hold and of the corrugated transverse watertight bulkhead between the two foremost cargo holds and the double bottom of the foremost cargo hold to withstand flooding of the foremost cargo hold, requirements on structure and stability of new ships to withstand flooding of any cargo hold, requirements on strength of cargo hold shell frames for single side skin construction, requirements on strength and locking for hatch cover of the cargo hold, and etc.), SOLAS Chapter XII has adopted in its subsequent amendments the addition of requirements on cargo hold water level detectors, availability of pumping systems at the foremost cargo hold, loading limit when any one cargo hold is empty, and etc.

In addition, SOLAS Chapter II-1 has adopted successively the addition of permanent means of access (PMA) and performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers (PSPC).

The SOLAS 2004 Amendment effective on July 1, 2006 has made a comprehensive revision to the entire Chapter XII, and introduced a new definition of bulk carrier. On December 14, 2005, the IACS Council unanimously adopted the Common Structural Rules for Bulk Carriers, which became effective on April 1, 2006.

Chapter 2 Additional Requirements for Bulk Carriers

Section 1 Definitions

1. Single-side skin bulk carrier¹

Single-side skin bulk carrier normally refers to a single deck vessel of topside tank and hopper tank construction at cargo areas where the cargo holds are bounded by the side shell and which is intended primarily to carry dry cargo in bulk, including such types as combination carriers.

According to the definition given under SLOAS Chapter XII as amended by Resolution MSC. 170 (79), bulk carrier of single-side skin construction means a bulk carrier as afore defined, in which:

- ✧ any part of a cargo hold is bounded by the side shell; or
- ✧ where one or more cargo holds are bounded by a watertight double-side skin, the width of which is less than 760 mm in bulk carriers constructed before 1 January 2000 and less than 1,000 mm in bulk carriers constructed on or after 1 January 2000 but before 1 July 2006, the distance being measured perpendicular to the side shell.

2. Double-side skin bulk carrier²

Double-side skin bulk carrier normally refers to a single deck vessel of topside tank and hopper tank construction at cargo areas where all cargo holds are bounded by a double-side skin (regardless of the width of side tanks) and which is intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers.

According to the *Rules for Classification of Sea-going Steel Ships* of CSS, a double-side skin bulk carrier refers to a bulk carrier of which all cargo holds are bounded by a double-side skin construction with a minimum distance between the two watertight boundaries of more than or equal to 1,000 mm.

3. Rule length L (m)

The length of L is the distance, in metres, on the summer load waterline from the fore side of the stem to the after side of the rudder post, or the centre of the rudder stock if there is no rudder post. L is not to be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline.

4. Load line length L_1 (m)

As defined in Section 3 of Annex I to the *International Convention on Load Lines, 1966*, the length

¹ The definitions of single side skin bulk carrier and double side skin bulk carrier may vary in different periods at levels such as IMO and IACS, ISC. For example, in consideration of the requirements on evaluating scantlings of the corrugated transverse watertight bulkhead between cargo holds no.1 and no.2, with cargo hold no. 1 flooded, for existing bulk carriers, single side skin bulk carrier is defined as follows:

1. a single side skin bulk carrier which was contracted for construction before July 1, 1998, yet not constructed according to the IACS UR S18 requirements; or
2. a bulk carrier of double side skin construction with a double side skin width of less than 760 mm, of which the keel was laid or which was at a similar stage of construction before July 1, 1999, yet not constructed according to the IACS UR S18 (Rev.2/September, 2000) requirements.

For definitions provided by different requirements, further explanation will be given under corresponding sections in this manual.

² See footnote 1

(L_1) shall be taken as 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or as the length from the fore side of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel, the waterline on which this length is measured shall be parallel to the designed waterline.

5. Solid bulk cargo

Solid bulk cargo means any material, other than liquid or gas, consisting of a combination of crystals, particles or larger pieces of material, generally uniform in composition, which is loaded into cargo spaces of a ship, generally without any intermediate form of containment.

Section 2 IMO's Additional Requirements for Bulk Carriers

2.1 SOLAS regulation XII/11 *Loading instrument*

These requirements are applicable to all bulk carriers of 150 m in length and upwards, that is, bulk carriers of 150 m in length and upwards shall be fitted with a loading instrument capable of providing information on hull girder shear forces and bending moments. Bulk carriers of less than 150 m in length constructed on or after 1 July 2006 shall be fitted with a loading instrument capable of providing information on the ship's stability in the intact condition. The computer software shall be approved for stability calculations by the Administration and shall be provided with standard conditions for testing purposes relating to the approved stability information.

2.2 SOLAS regulation XII/4 *Damage stability requirements applicable to bulk carriers*

Bulk carriers of 150 m in length and upwards of single-side skin construction, designed to carry solid bulk cargoes having a density of 1,000 kg/m³ and above, constructed on or after 1 July 1999 shall, when loaded to the summer load line, be able to withstand flooding of any one cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium.

Bulk carriers of 150 m in length and upwards of double-side skin construction in which any part of longitudinal bulkhead is located within B/5 or 11.5 m, whichever is less, inboard from the ship's side at right angle to the centreline at the assigned summer load line, designed to carry solid bulk cargoes having a density of 1,000 kg/m³ and above, constructed on or after 1 July 2006 shall, when loaded to the summer load line, be able to withstand flooding of any one cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium.

The condition of equilibrium after flooding shall satisfy the condition of equilibrium laid down in the annex to resolution A.320 (IX) - *Regulation equivalent to regulation 27 of the International Convention on Load Lines, 1966*, as amended by resolution A.514 (13). The assumed flooding need only take into account flooding of the cargo hold space to the water level outside the ship in that flooded condition. The permeability of a loaded hold shall be assumed as 0.9 and the permeability of an empty hold shall be assumed as 0.95, unless a permeability relevant to a particular cargo is assumed for the volume of a flooded hold occupied by cargo and a permeability of 0.95 is assumed for the remaining empty volume of the hold.

Bulk carriers which have been assigned a reduced freeboard in compliance with the provisions of paragraph (8) of the *Regulation equivalent to regulation 27 of the International Convention on Load Lines, 1966*, adopted by resolution A.320(IX), as amended by resolution A.514(13), may be considered as complying with the aforementioned requirements.

Bulk carriers of 150 m in length and upwards of single-side skin construction, carrying solid bulk cargoes having a density of 1,780 kg/m³ and above, constructed before 1 July 1999 shall, when loaded to the summer load line, be able to withstand flooding of the foremost

cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium. Bulk carriers constructed before 1 July 1999, which have been assigned a reduced freeboard in compliance with regulation 27(7) of the *International Convention on Load Lines, 1966*, as adopted on 5 April 1966, may be considered as complying with the requirements of this paragraph.

2.3 SOLAS regulation XII/5 *Structural strength of bulk carriers*

Bulk carriers of 150 m in length and upwards of single-side skin construction, designed to carry solid bulk cargoes having a density of 1,000 kg/m³ and above constructed on or after 1 July 1999, shall have sufficient strength to withstand flooding of any one cargo hold to the water level outside the ship in that flooded condition in all loading and ballast conditions, taking also into account dynamic effects resulting from the presence of water in the hold.

Bulk carriers of 150 m in length and upwards of double-side skin construction, in which any part of longitudinal bulkhead is located within B/5 or 11.5 m, whichever is less, inboard from the ship's side at right angle to the centreline at the assigned summer load line, designed to carry bulk cargoes having a density of 1,000 kg/m³ and above constructed on or after 1 July 2006, shall have sufficient strength to withstand flooding of any one cargo hold to the water level outside the ship in that flooded condition in all loading and ballast conditions, taking also into account dynamic effects resulting from the presence of water in the hold.

2.4 SOLAS regulation XII/6 *Structural and other requirements for bulk carriers*

These requirements are applicable to bulk carriers of 150 m in length and upwards of single-side skin construction, carrying solid bulk cargoes having a density of 1,780 kg/m³ and above, constructed before 1 July 1999. The transverse watertight bulkhead between the two foremost cargo holds and the double bottom of the foremost cargo hold shall have sufficient strength to withstand flooding of the foremost cargo hold, taking also into account dynamic effects resulting from the presence of water in the hold, in compliance with the Bulk carrier bulkhead and double bottom strength standards.

2.5 SOLAS regulation XII/8 *Information on compliance with requirements for bulk carriers* and SOLAS regulation VI/7.2 *requirements on provision of loading, unloading and stowage booklet*

The booklet required by regulation VI/7.2 shall be endorsed by the Administration or on its behalf, to indicate that regulations 4, 5, 6 and 7, as appropriate, are complied with.

Any restrictions imposed on the carriage of solid bulk cargoes having a density of 1,780 kg/m³ and above in accordance with the requirements of SOLAS regulation XII/6 shall be identified and recorded in the booklet referred to in regulation VI/7.2.

A bulk carrier with restrictions imposed on the carriage of solid bulk cargoes having a density of 1,780 kg/m³ and above in accordance with the requirements of SOLAS regulation XII/6 shall be permanently marked on the side shell at midships, port and starboard, with a solid equilateral triangle having sides of 500 mm and its apex 300 mm below the deck line, and painted a contrasting colour to that of the hull.

2.6 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

For bulk carriers of 150 m in length and upwards of single-side skin construction, carrying solid bulk cargoes having a density of 1,780 kg/m³ and above, constructed before 1 July 1999, that can no satisfy the damage stability requirements after flooding of the foremost cargo hold, they shall comply with the following requirements:

(1) for the foremost cargo hold, the inspections prescribed for the annual survey in the enhanced programme of inspections during surveys required by SOLAS regulation XI-1/2 shall be replaced by the inspections prescribed therein for the intermediate survey of cargo holds;

(2) are provided with bilge well high water level alarms in all cargo holds, or in cargo conveyor tunnels, as appropriate, giving an audible and visual alarm on the navigation bridge, as approved by the Administration or an organization recognized by it;

(3) are provided with detailed information on specific cargo hold flooding scenarios.

2.7 SOLAS regulation XII/12 *Hold, ballast and dry space water level detectors and water ingress alarms*

This regulation applies to all bulk carriers.

In each cargo hold, giving audible and visual alarms, one when the water level above the inner bottom in any hold reaches a height of 0.5 m and another at a height not less than 15% of the depth of the cargo hold but not more than 2 m. On bulk carriers to which regulation 9.2 applies, detectors with only the latter alarm need be installed. The water level detectors shall be fitted in the aft end of the cargo holds.

For cargo holds which are used for water ballast, an alarm overriding device may be installed. The visual alarms shall clearly discriminate between the two different water levels detected in each hold;

In any ballast tank forward of the collision bulkhead required by regulation II-1/11, giving an audible and visual alarm when the liquid in the tank reaches a level not exceeding 10% of the tank capacity. An alarm overriding device may be installed to be activated when the tank is in use; and

In any dry or void space other than a chain cable locker, any part of which extends forward of the foremost cargo hold, giving an audible and visual alarm at a water level of 0.1 m above the deck. Such alarms need not be provided in enclosed spaces the volume of which does not exceed 0.1% of the ship's maximum displacement volume.

2.8 SOLAS regulation XII/13 *Availability of pumping systems*

This regulation applies to all bulk carriers. On bulk carriers, the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold shall be capable of being brought into operation from a readily accessible enclosed space, the location of which is accessible from the navigation bridge or propulsion machinery control position without traversing exposed freeboard or superstructure decks. Where pipes serving such tanks or bilges pierce the collision bulkhead, valve operation by means of remotely operated actuators may be

accepted, as an alternative to the valve control specified in regulation II-1/12, provided that the location of such valve controls complies with this regulation.

2.9 SOLAS regulation XII/14 *Restrictions from sailing with any hold empty*

Bulk carriers of 150 m in length and upwards of single-side skin construction, carrying cargoes having a density of 1,780 kg/m³ and above, if not meeting the requirements for withstanding flooding of any one cargo hold as specified in regulation 5.1 and *the Standards and Criteria for Side Structures of Bulk Carriers of Single-side Skin Construction*, adopted by resolution MSC.168(79), shall not sail with any hold loaded to less than 10% of the hold's maximum allowable cargo weight when in the full load condition, after reaching 10 years of age. The applicable full load condition for this regulation is a load equal to or greater than 90% of the ship's deadweight at the relevant assigned freeboard.

2.10 SOLAS regulation XI-1/2 *Enhanced surveys* and SOLAS XII/7 *Survey and maintenance of bulk carriers*

Bulk carriers (referring to vessels normally constructed with single deck, top-side tanks and hopper side tanks in cargo spaces, which are intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers) as defined in regulation IX/1.6 shall be subject to an enhanced programmed of inspections.

Bulk carriers of 150 m in length and upwards of single-side skin construction, constructed before 1 July 1999, of 10 years of age and over, shall not carry solid bulk cargoes having a density of 1,780 kg/m³ and above unless they have satisfactorily undergone either:

(1) a periodical survey, in accordance with the enhanced programme of inspections during surveys required by regulation XI-1/2; or a survey of all cargo holds to the same extent as required for periodical surveys in the enhanced programme of inspections during surveys required by regulation XI-1/2.

(2) bulk carriers shall comply with the maintenance requirements provided in SOLAS regulation II-1/3-1 and *the Standards for Owners' Inspection and Maintenance of Bulk Carrier Hatch Covers*, adopted by resolution MSC.169 (79), as may be amended, that ship owners and operators shall institute a programme of maintenance, developing the habit of performing checks whenever hatch covers are opened during voyages.

2.11 SOLAS relevant requirements on carriage of cargoes for bulk carriers

(1) SOLAS regulation VI/1-2 *requirements on carriage of solid bulk cargoes other than grain*:

the carriage of solid bulk cargoes other than grain shall be in compliance with the relevant provisions of the IMSBC Code. SOLAS Chapter VI has set out the principles on the carriage of grain and solid bulk cargoes other than grain.

(2) SOLAS regulation XII/10 *Solid bulk cargo density declaration*: Prior to loading bulk cargo on bulk carriers of 150 m in length and upwards, the shipper shall declare the density of the cargo, in addition to providing the cargo information required by regulation VI/2. For bulk carriers to which SOLAS regulation XII/6 applies, unless such bulk carriers comply with all relevant requirements of this chapter applicable to the carriage of solid bulk cargoes having a density of 1,780 kg/m³ and above, any cargo declared to have a density

within the range 1,250 kg/m³ to 1,780 kg/m³ shall have its density verified by an accredited testing organization.

(3) SOLAS regulation VI/1-2 as amended by MSC.269 (85) provides that the carriage of solid bulk cargoes other than grain shall be in compliance with the relevant provisions of the IMSBC Code. This Amendment has incorporated IMSBC Code as a mandatory statutory requirement.

2.12 SOLAS regulation II-1/3-6 *Access to and within spaces in the cargo area of bulk carriers*

Bulk carriers (referring to vessels normally constructed with single deck, top-side tanks and hopper side tanks in cargo spaces, which are intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers), as defined in regulation IX/1.6, of 20, 000 gross tonnage and over, constructed on or after 1 January 2006, shall be provided with a permanent means of access to enable overall and close-up inspections and thickness measurements of the ship's structures to be carried out by the Administration, the Company and the ship's personnel and others as necessary.

2.13 SOLAS regulation II-1/3-2 *Protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers*

For ships meeting the following requirements as provided in SOLAS Chapter II-1, all dedicated seawater ballast tanks arranged in ships of not less than 500 gross tonnage and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards shall be coated during construction in accordance with the *Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers*, adopted by the Maritime Safety Committee by resolution MSC.215(82), as may be amended by IMO:

- (1) for which the building contract is placed on or after 1 July 2008; or
- (2) 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 January 2009; or
- (3) the delivery of which is on or after 1 July 2012.

All dedicated seawater ballast tanks arranged in bulk carriers constructed on or after July 1, 1998, for which the aforementioned date restrictions are not applicable, shall comply with the requirements of regulation II-1/3-2 adopted by resolution MSC. 47 (66), which is to meet the performance standard for protective coatings adopted by resolution A.798 (19).

2.14 SOLAS regulation II-1/3-10 *Goal-based ship construction standards for bulk carriers and oil tankers*

This regulation shall apply to bulk carriers of 150 m in length and above, constructed with single deck, top-side tanks and hopper side tanks in cargo spaces, excluding ore carriers and combination carriers:

- (1) for which the building contract is placed on or after 1 July 2016;
- (2) 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 2017; or
- (3) the delivery of which is on or after 1 July 2020.

Ships shall be designed and constructed for a specified design life to be safe and environmentally friendly, when properly operated and maintained under the specified operating and environmental conditions, in intact and specified damage conditions, throughout their life.

The aforementioned requirements shall be achieved through satisfying applicable structural requirements of an organization which is recognized by the Administration in accordance with the provisions of SOLAS regulation XI-1/1, or national standards of the Administration, conforming to the functional requirements of the *Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers*.

A Ship Construction File with specific information on how the functional requirements of the *Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers* have been applied in the ship design and construction shall be provided upon delivery of a new ship, and kept on board the ship and/or ashore and updated as appropriate throughout the ship's service. The contents of the Ship Construction File shall, at least, conform to the guidelines developed by IMO.

2.15 SOLAS regulation III/31 *Survival craft and rescue boats*

Bulk carriers (referring to vessels normally constructed with single deck, top-side tanks and hopper side tanks in cargo spaces, which are intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers) as defined in regulation IX/1.6, constructed on or after July 1, 2006, shall carry one or more free-fall lifeboats, complying with the requirements of the Code, capable of being free-fall launched over the stern of the ship of such aggregate capacity as will accommodate the total number of persons on board.

Section 3 IACS's Additional Requirements for Bulk Carriers

3.1 S12 - Side Structures in Single Side Skin Bulk Carriers

These requirements apply to side structures of cargo holds bounded by the side shell only of bulk carriers (except double-side skin construction) constructed with single deck, topside tanks and hopper tanks in cargo spaces intended primarily to carry dry cargo in bulk, which are contracted for construction on or after 1st July 1998. This UR does not apply to CSR Bulk Carriers.

3.2 S17 - Longitudinal Strength of Hull Girder in Flooded Condition for Bulk Carriers

Revision 7 of UR S17 is to be complied with in respect of longitudinal strength of hull girder in the flooding of any cargo hold of bulk carriers, as defined in UR Z11.2.2, with notation BC-A or BC-B, which are contracted for construction on or after 1 July 2006. Relevant revision of UR S17 is to be applied to bulk carriers, as defined in UR Z11.2.2, of 150 m in length and above, intending to carry solid bulk cargoes having a density of 1,000 kg/m³ and above, which are contracted for construction before July 1, 2006, but on or after July 1, 1998. This UR does not apply to CSR Bulk Carriers.

3.3 S18 - Evaluation of Scantlings of Corrugated Transverse Watertight Bulkheads in Bulk Carriers Considering Hold Flooding

These requirements apply to bulk carriers as defined in UR Z11.2.2, with single deck, topside tanks and hopper tanks, intending to carry solid bulk cargoes having a density of 1.0 t/m³ and above, which are contracted for construction on or after July 1, 2006.

Relevant revision of UR S18 is to be applied to bulk carriers of 150 m in length and upwards, with single deck, topside tanks and hopper tanks, intending to carry solid bulk cargoes having a density of 1.0 t/m³ or above, with vertically corrugated transverse watertight bulkheads, as defined in UR Z11.2.2 (except double-side skin construction), which are contracted for construction before July 1, 2006, but on or after July 1, 1998.

This UR does not apply to CSR Bulk Carriers.

3.4 S19, 22 & 23 - Early Implementation of Requirements on Structure and Stability for Ships with Presence of Water in the Foremost Cargo Hold

These Unified Requirements apply to existing bulk carriers of 150 m in length and upwards, of which the foremost cargo hold is intended to carry solid bulk cargoes having a density of 1.78 t/m³ or above, and:

(1) single side skin bulk carriers contracted for construction before July 1, 1998, of which the foremost cargo hold is not constructed according to the IACS UR S18 and S20 requirements; or

(2) double side skin bulk carriers with a double side skin width of less than 760 mm, of which the keels were laid or which were at a similar stage of construction before July 1, 1999, and of which the foremost cargo hold is not constructed according to the IACS UR S18 (Rev.2/September, 2000) and S20 requirements.

3.5 S20 - Evaluation of Allowable Hold Loading for Bulk Carriers Considering Hold Flooding

These requirements apply to bulk carriers, as defined in UR Z11.2.2 (except double-side skin construction), of 150 m in length and above, intending to carry solid bulk cargoes having a density of 1,000 kg/m³ and above, as well as double side skin bulk carriers of 150 m in length and above designed to carry bulk cargoes have a density of 1,000 kg/m³ and above, which are contracted for construction before on or after July 1, 1998. This UR does not apply to CSR Bulk Carriers.

3.6 S21 - Evaluation of Scantlings of Hatch Covers and Hatch Coamings of Cargo Holds of Bulk Carriers, Ore Carriers and Combination Carriers

These requirements apply to all bulk carriers, ore carriers and combination carriers, and are for all cargo hatch covers and hatch forward and side coamings on exposed decks in position 1, as defined in ILLC. This UR does not apply to CSR Bulk Carriers.

3.7 S26 - Strength and Securing of Small Hatches on the Exposed Fore Deck
Application

(1) For ships that are contracted for construction on or after 1 January 2004 on the exposed deck over the forward 0.25L, applicable to:

All ship types of sea going service of length 80 m or more, where the height of the exposed deck in way of the hatch is less than 0.1L or 22 m above the summer load waterline, whichever is the lesser.

(2) For ships that are contracted for construction before 1 January 2004 only for hatches on the exposed deck giving access to spaces forward of the collision bulkhead, and to spaces which extend over this line aft-wards, applicable to:

Bulk carriers, ore carriers, and combination carriers (as defined in UR Z11) and general dry cargo ships (excluding container vessels, vehicle carriers, Ro-Ro ships and woodchip carriers), of length 100 m or more.

3.8 (3) This UR does not apply to CSR Bulk Carriers.

S27 - Strength Requirements for Fore Deck Fittings and Equipment

This UR S 27 provides strength requirements to resist green sea forces for the following items located within the forward quarter length: air pipes, ventilator pipes and their closing devices, the securing of windlasses. Application:

(1) For ships that are contracted for construction on or after 1 January 2004 on the exposed deck over the forward 0.25L, applicable to: All ship types of sea going service of length 80 m or more, where the height of the exposed deck in way of the item is less than 0.1L or 22 m above the summer load waterline, whichever is the lesser.

(2) For ships that are contracted for construction before 1 January 2004 only for air pipes, ventilator pipes and their closing devices on the exposed deck serving spaces forward of the collision bulkhead, and to spaces which extend over this line aft-wards, applicable to:

Bulk carriers, ore carriers, and combination carriers (as defined in UR Z11) and general dry cargo ships (excluding container vessels, vehicle carriers, Ro-Ro ships and woodchip carriers), of length 100m or more.

(3) The requirements of UR S27 concerning windlasses do not apply to CSR Bulk Carriers.

3.9 S28 - Requirements for the Fitting of a Forecastle for Bulk Carriers

These requirements apply to all bulk carriers contracted for construction after 1 January 2004, which are to be fitted with an enclosed forecastle on the freeboard deck that comply with relevant requirements.

This UR does not apply to CSR Bulk Carriers.

3.10 S30 - Cargo Hatch Cover Securing Arrangements for Bulk Carriers not Built in Accordance with IACS UR S21

3.11 S31 - Renewal Criteria for Side Shell Frames and Brackets in Single Side Skin Bulk Carriers not Built in Accordance with IACS UR S12

3.12 S1A - Additional Requirements for Loading Conditions, Loading Manuals and Loading Instruments for Bulk Carriers, Ore Carriers and Combination Carriers

Bulk Carriers, Ore Carriers and Combination Carriers (see UR Z11) of 150 m length and above, which are contracted for construction before 1 July 1998, are to be provided with an approved loading instrument of a type to the satisfaction of the Society not later than their entry into service or 1 January 1999, whichever occurs later.

In addition, Bulk Carriers of 150 m length and above where one or more cargo holds are bounded by the side shell only, which were contracted for construction before 1 July 1998, are to be provided, with an approved loading manual with typical loading sequences where the vessel is loaded from commencement of cargo loading to reaching full deadweight capacity for homogeneous conditions, relevant part load conditions and alternate conditions where applicable. Typical unloading sequences for these conditions shall also be included. Annex 2 to UR S1A contains guidance for loading and unloading sequences for existing bulk carriers.

Bulk Carriers, Ore Carriers and Combination Carriers of 150 m length and above, which are contracted for construction on or after 1 July 1998, are to be provided with an approved Loading Manual and approved computer-based Loading Instrument, in accordance with S1A.2, S1A.3 and S1A.4. Annex 3 to UR S1A contains guidance for loading and unloading sequences for new bulk carriers.

UR S1A does not apply to CSR Bulk Carriers.

3.13 IACS Common Structural Rules for Bulk Carriers

These Rules apply to the hull structures of single side skin and double side skin bulk carriers with unrestricted worldwide navigation, having length L of 90 m or above, which are contracted for construction on or after 1 April 2006, as well as to hybrid bulk carriers where at least one cargo hold is constructed with hopper tank and topside tank. The Rules contain the IACS requirements for hull scantlings, arrangements, welding, structural details, materials and equipment applicable to all types of bulk carriers having the following characteristics:

- $L < 350\text{m}$
- $L/B > 5$
- $B/D < 2.5$
- $C_B \geq 0.6$

Section 4 Comparison Table of IMO vs IACS Additional Requirements for Bulk Carriers

Note: The definition of length of ship for bulk carriers given in the SOLAS Convention refers to the length as defined in the current *International Convention on Load Lines*, while the definition of length of ship for bulk carriers given in the IACS Unified Requirements refers to the Rule length.

No.	SOLAS Provisions	IACS Unified Requirements/Unified Interpretations	Notes
1	SOLAS regulation XII/11 <i>Loading instrument</i>	UR S1A - Additional Requirements for Loading Conditions, Loading Manuals and Loading Instruments for Bulk Carriers, Ore Carriers and Combination Carriers (UR S1A does not apply to CSR Bulk Carriers, but relevant requirements have already been incorporated into Chapter 4, Section 8 of the CSR for Bulk Carriers)	Bulk carriers are also required to satisfy requirements on fitting with loading instrument prescribed in IACS UR S1.
2	SOLAS regulation XII/4 <i>Damage stability requirements applicable to bulk carriers</i>	UR S23 - Requirements on Stability for Ships with Presence of Water in the Foremost Cargo Hold (UR S23 does not apply to CSR Bulk Carriers)	
3	SOLAS regulation XII/5 <i>Structural strength of bulk carriers</i>	UR S12 - Side Structures in Single Side Skin Bulk Carriers UR S31 - Renewal Criteria for Side Shell Frames and Brackets in Single Side Skin Bulk Carriers not Built in Accordance with IACS UR S12 UR S17 - Longitudinal Strength of Hull Girder in Flooded Condition for Single Side Skin Bulk Carriers UR S18 - Evaluation of Scantlings of Corrugated Transverse Watertight Bulkheads in Bulk Carriers Considering Hold Flooding UR S20 - Evaluation of Allowable Hold Loading for Single Side Skin Bulk Carriers Considering Hold Flooding (The above-mentioned URS do not apply to CSR Bulk Carriers, but relevant requirements have already been incorporated into the CSR for Bulk Carriers)	
4	SOLAS regulation XII/6 <i>Structural and other requirements for bulk carriers</i>	UR S19, 22 - Requirements on Structure for Ships with Presence of Water in the Foremost Cargo Hold (The above-mentioned URS do not apply to CSR Bulk Carriers, but relevant requirements have already been incorporated into the CSR for Bulk Carriers)	
5	SOLAS regulation XII/8 <i>Information on compliance with requirements for bulk carriers</i>	UR S1A - Additional Requirements for Loading Conditions, Loading Manuals and Loading Instruments for Bulk Carriers, Ore Carriers and Combination Carriers	Regarding loading and unloading sequences as well as loading, unloading and stowage booklet for bulk carriers, SOLAS and IACS UR S1S have different scope of

			application.
6	SOLAS regulation XII/9 <i>Requirements for bulk carriers not being capable of complying with regulation 4.3 due to the design configuration of their cargo holds</i>	UR Z10.2 - Hull Surveys of Bulk Carriers	
7	SOLAS regulation XII/12 <i>Hold, ballast and dry space water level detectors and water ingress alarms</i>	UI SC180 - Hold, Ballast and Dry Space Water Level Detectors and Performance Standards for Water Level Detectors on Bulk Carriers	
8	SOLAS regulation XII/13 <i>Availability of pumping systems</i>	UI SC179 - draining of Forward Spaces of Bulk Carriers	
9	SOLAS regulation XII/14 <i>Restrictions from sailing with any hold empty</i>		
10	SOLAS regulation XI-1/2 <i>Enhanced surveys and SOLAS XII/7 Survey and maintenance of bulk carriers</i>	UR Z11 - Mandatory Ship Type and Enhanced Survey Programme (ESP) Notations UR Z10.2 - Hull Surveys of Bulk Carriers UR Z10.2 - Hull Surveys of Double Skin Bulk Carriers	
11	SOLAS relevant requirements on carriage of cargoes for bulk carriers, SOLAS regulation VI/1-2 and regulation XII/10		
12	SOLAS regulation II-1/3-6 <i>Access to and within spaces in the cargo area of bulk carriers</i>	UI SC191 - IACS Unified Interpretations (UI) SC 191 for the application of amended SOLAS regulation II-1/3-6 (resolution MSC.151(78)) and revised Technical provisions for means of access for inspections (resolution MSC.158(78))	
13	SOLAS regulation II-1/3-2 <i>Protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers</i>	UI SC223 - For Application of SOLAS Regulation II-1/3-2 Performance Standard for Protective Coatings (PSPC) for Dedicated Seawater Ballast Tanks in All Types of Ships and Double-side Skin Spaces of Bulk Carriers	
14	SOLAS regulation III/31 <i>Survival craft and rescue boats</i>		
15	Resolution MSC.146 (77) <i>Application of IACS Unified Requirements S26, S27, S30 and S31 to Bulk Carriers</i>	UR S26, 27 - Requirements on enhancing the integrity of fore deck fittings UR S30 - Cargo Hatch Cover Securing Arrangements for Bulk Carriers not Built in Accordance with IACS UR S21 UR S31 - Renewal Criteria for Side Shell Frames and Brackets in Single Side Skin Bulk Carriers not Built in Accordance with IACS UR S12	

		(The requirements of UR S26 and UR S27 concerning windlasses do not apply to CSR Bulk Carriers, but relevant requirements have already been incorporated into the CSR for Bulk Carriers; UR S30/31 do not apply to CSR Bulk Carriers, as the CSR for Bulk Carriers have been incorporated into UR S21/12)	
16		UR S21 - Evaluation of Scantlings of Hatch Covers and Hatch Coamings of Cargo Holds of Bulk Carriers, Ore Carriers and Combination Carriers (UR S21 does not apply to CSR Bulk Carriers, but relevant requirements have already been incorporated into the CSR for Bulk Carriers)	
17		UR S28 - Requirements for the Fitting of a Forecastle for Bulk Carriers, Ore Carriers and Combination Carriers (UR S28 does not apply to CSR Bulk Carriers, but relevant requirements have already been incorporated into the CSR for Bulk Carriers)	
18	SOLAS regulation II-1/3-10 <i>Goal-based ship construction standards for bulk carriers and oil tankers</i>	IACS Common Structural Rules for Bulk Carriers	

Chapter 3 Traceability Requirements

General

The traceability requirements for existing bulk carriers include structure and stability requirements for ships with the foremost cargo hold flooded, i.e. IACS UR S19, S22 and S23 effective from July 1998, as well as other traceability requirements that have already been implemented, such as loading instrument and loading/unloading sequence booklet. Furthermore, corresponding traceability requirements for existing bulk carriers have been also set out in some of the newly effective SOLAS provisions, which mainly include:

1. Early Implementation of Requirements on Structure and Stability for Ships with Presence of Water in the Foremost Cargo Hold (IACS UR S19, S22 & S23)
2. Amendments to ESP requirements (IACS UR Z10.2 & UR Z10.5)
3. Hold, ballast and dry space water level detectors and water ingress alarms (SOLAS regulation XII/12)
4. Availability of pumping systems and draining arrangements of the forward dry spaces and ballast tanks (SOLAS regulation XII/13)
5. Requirements on enhancing the integrity of fore deck fittings (IACS UR S26 & S27)
6. Improvement of cargo hatch cover stoppers and securing arrangements (IACS UR S30)
7. Upgrading of renewal criteria for side shell frames of cargo holds (IACS UR S31)
 8. Restrictions from sailing with any hold empty (SOLAS regulation XII/14)
 9. Relevant requirements regarding the issuance of *Certificate of Compliance for the Carriage of Solid Bulk Cargoes* (SOLAS regulation VI/1-2 and IMSBC Code)

Figure 3.0-1 shows measures taken to further strengthen the safety of existing bulk carriers.

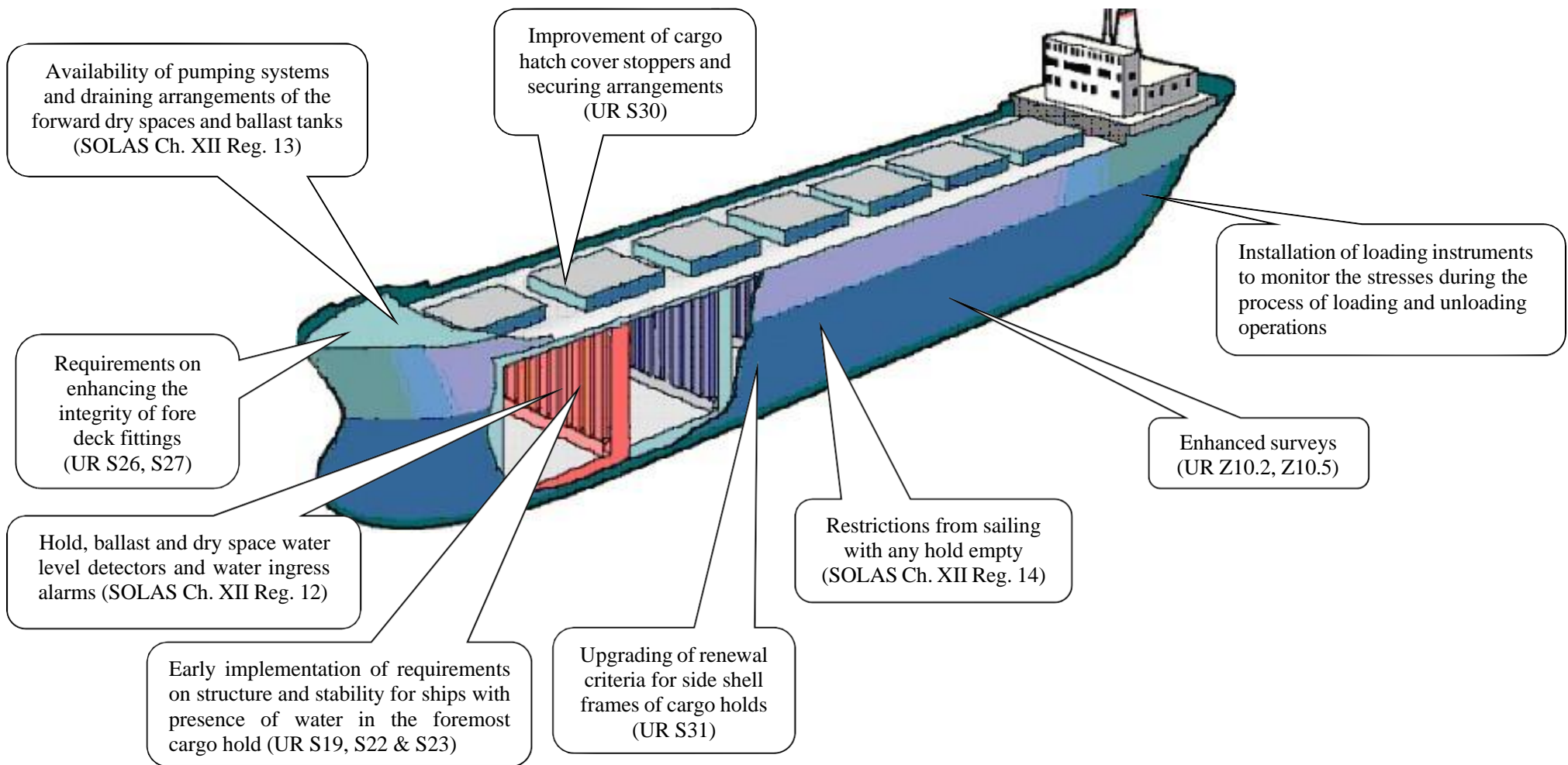


Figure 3.0-1 Schematic illustration of additional requirements for existing bulk carriers

Section 1 Early Implementation of Requirements on Structure and Stability for Ships with Presence of Water in the Foremost Cargo Hold (IACS UR S19, S22 & S23)

1.1 Scope of application

These Unified Requirements apply to existing bulk carriers of 150 m in length and upwards, of which the foremost cargo hold is intended to carry solid bulk cargoes having a density of 1.78 t/m³ or above, and 1) single side skin bulk carriers contracted for construction before July 1, 1998, of which the foremost cargo hold is not constructed according to the IACS UR S18 and S20 requirements; or 2) double side skin bulk carriers with a double side skin width of less than 760 mm, of which the keels were laid or which were at a similar stage of construction before July 1, 1999, and of which the foremost cargo hold is not constructed according to the IACS UR S18 (Rev.2/September, 2000 and subsequent revisions) and S20 requirements.

1.2 Implementation

1.2.1 IACS UR S23 has set out the initial implementation timetable of the additional requirements in chapters IACS UR S19 and S22 for existing bulk carriers. According to the timetable, applicable existing bulk carriers should have already satisfied relevant requirements by now: the transverse watertight bulkhead between the two foremost cargo holds and the double bottom of the foremost cargo hold shall have sufficient strength to withstand flooding of the foremost cargo hold, taking also into account dynamic effects resulting from the presence of water in the hold, in compliance with the Bulk carrier bulkhead and double bottom strength standards; applicable single side bulk carriers shall, when loaded to the summer load line, be able to withstand flooding of the foremost cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium.

1.2.2 Application status

1.2.2.1 The application and implementation status required for all types of ships will be indicated in their survey information. Upon completion of the assessment and verification as required in IACS UR S19, S22 and S23, corresponding notes will be given in the survey information, such as:

MGxx (Class) Evaluation of scantlings of the transverse watertight corrugation bulkhead between cargo holds Nos.1&2 and evaluation of allowable hold loading of cargo hold No.1 with cargo No.1 flooded according to IACS UR S19 and UR S22 completed and the damage stability calculation examined according to IACS UR S23.

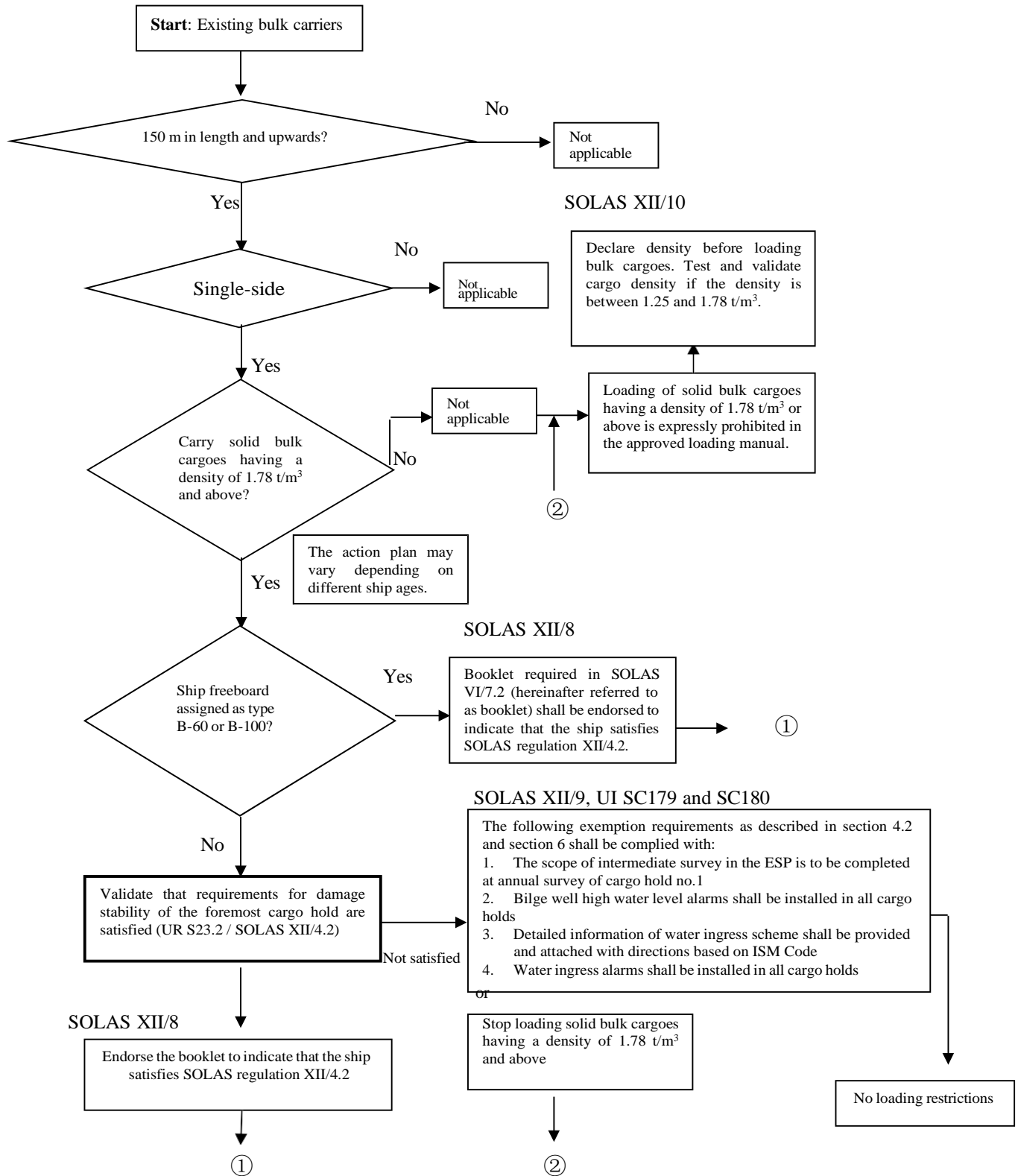
1.2.2.2 Bulk carriers, which have already satisfied the requirements in UR S19 through assessment/reinforcement, shall still need to continue to validate, through thickness gauging during subsequent intermediate or special surveys, that the remaining thickness of the corrugated bulkhead between cargo holds no.1 and no.2 is still compliant with the t_{net} requirements as listed in the assessment report.

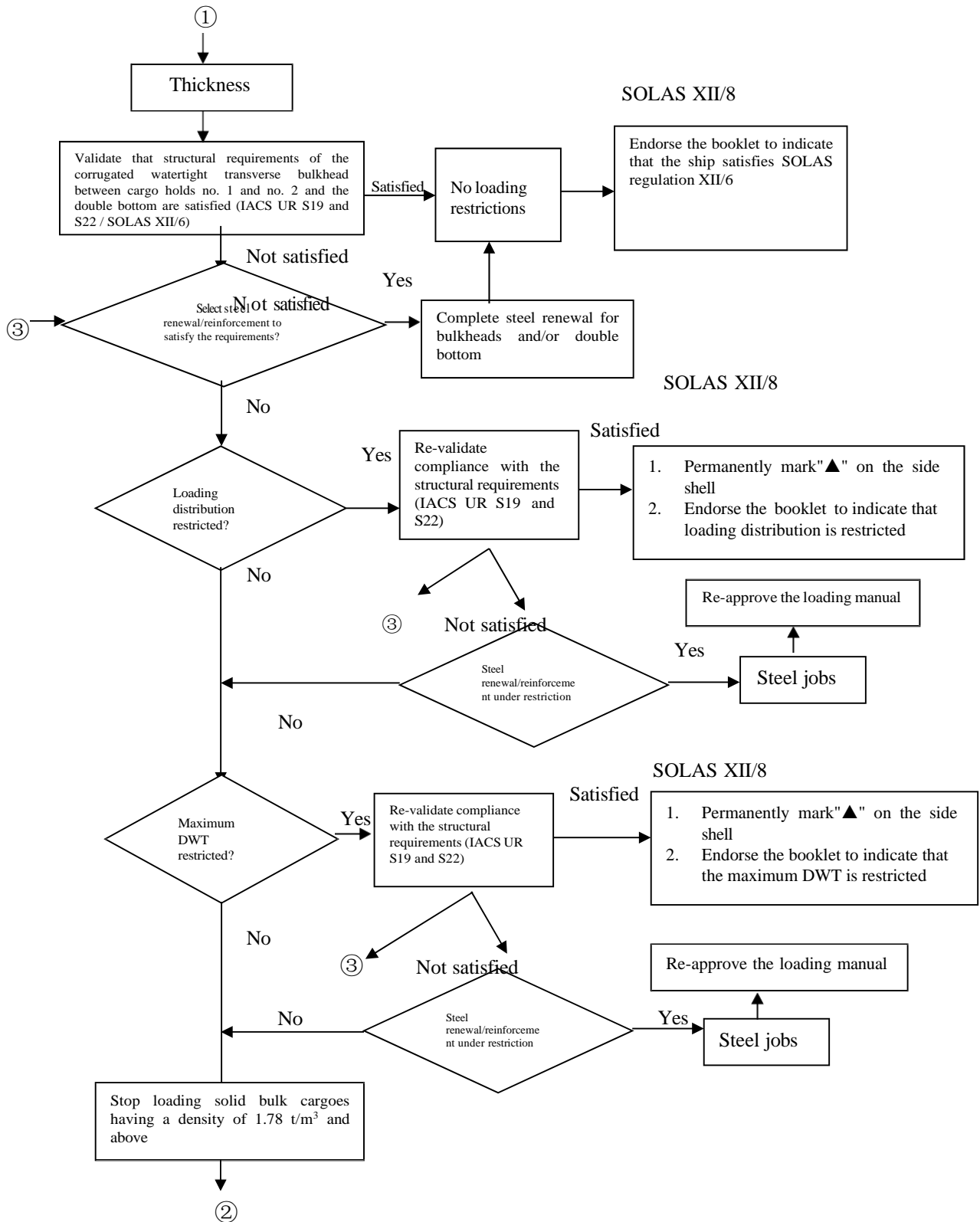
1.2.2.3 Where $t_{net}+0.5\text{mm} < t_{gthk} \leq t_{net}+1.0\text{mm}$ during implementation of IACS UR S19, coating (applied to the corrugated transverse bulkhead in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as means of monitoring, in which cases the surveyor may give the following memorandum:

MG xx (Class) Annual gauging to the transverses watertight corrugation bulkhead between cargo

holds No.1 and 2 to be carried out according to the requirements of IACS UR S19.6a).

1.3 Implementation flow chart





1.4 Implementation requirements

1.4.1 UR S19 and S22 evaluation calculation

UR S19 requires that, for above-mentioned applicable ships, the bending moment and shear force for the corrugated transverse watertight bulkhead between cargo holds no.1 and no.2, with cargo hold no.1 in flooded condition, shall be calculated using the given load model, and compared with the given load criteria, thus to evaluate if the transverse bulkhead construct could satisfy the requirements; while UR S22 requires that, for above-mentioned applicable ships, the shear strength for the double bottom of cargo hold no. 1, with cargo hold no.1 flooded, shall be calculated using the given load model and shear force calculating formulas, thus to evaluate if the strength of the bottom girders and floors could satisfy the given requirements, and in the meantime, evaluation of the shear strength shall only be performed after deducting the corrosion diminution, equal to 2.0 mm, for double bottom girders and floors of the no.1 cargo hold.

The evaluation of URS19 and 22 can be carried out via the calculation software of the Society. The evaluation results will be reviewed for approval by the Plan Approval Center of the Society.

1.4.2 Technical requirements for thickness gauging, criteria and steel renewal or reinforcement

(1) Thickness gauging requirements

Gauging is necessary to determine the general condition of the structure and to define the extent of possible repairs and/or reinforcements.

To perform the strength evaluation as required in UR S22, thickness gauging shall be carried out to the double bottom girders and floors of no. 1 cargo hold. Selection of thickness gauging point shall be able to determine the actual thickness of bottom girders and floors required for calculating the strength. Upon strength evaluation, if the calculated strength is insufficient, partial renewal of double bottom girders and floors or other structural reinforcement measures may be adopted to improve the shear capacity of bottom girders and floors. Such measures shall be submitted to the Plan Approval Center of the Society for review and approval. The surveyor will carry out surveys in accordance with approved plans.

A guidance on thickness gauging for vertically corrugated transverse watertight bulkheads between cargo hold no.1 and no.2 of bulk carriers has been provided in Appendix 3 to Chapter 5 under Part One of *CSS Rules for Classification of Sea-going Steel Ships*. Taking into account the buckling model applied in UR S19 in the evaluation of strength of the bulkhead, it is essential to determine the thickness diminution at the critical levels shown in Figure 3.1-1 and Figure 3.1-2.

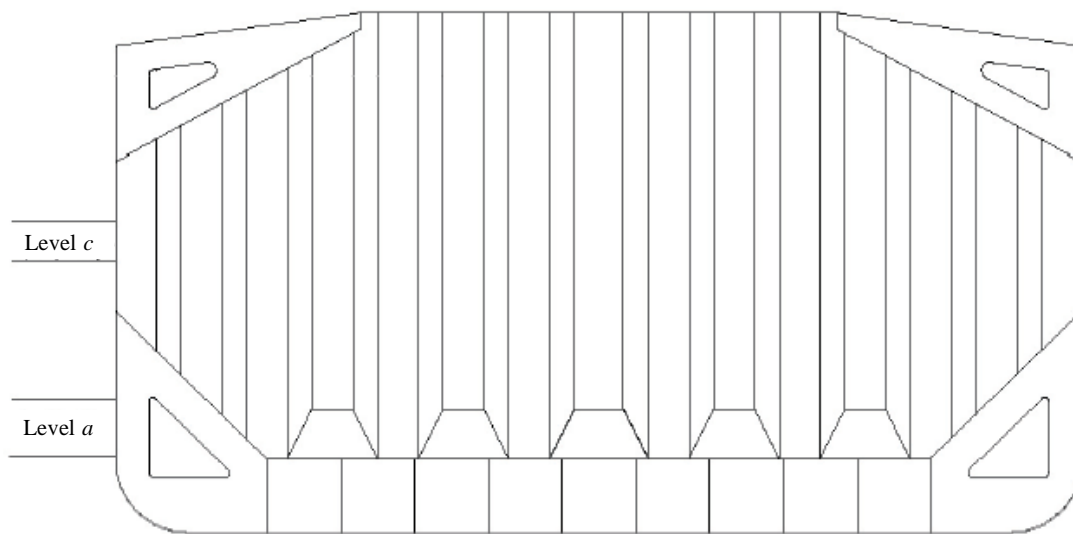


Figure 3.1-1

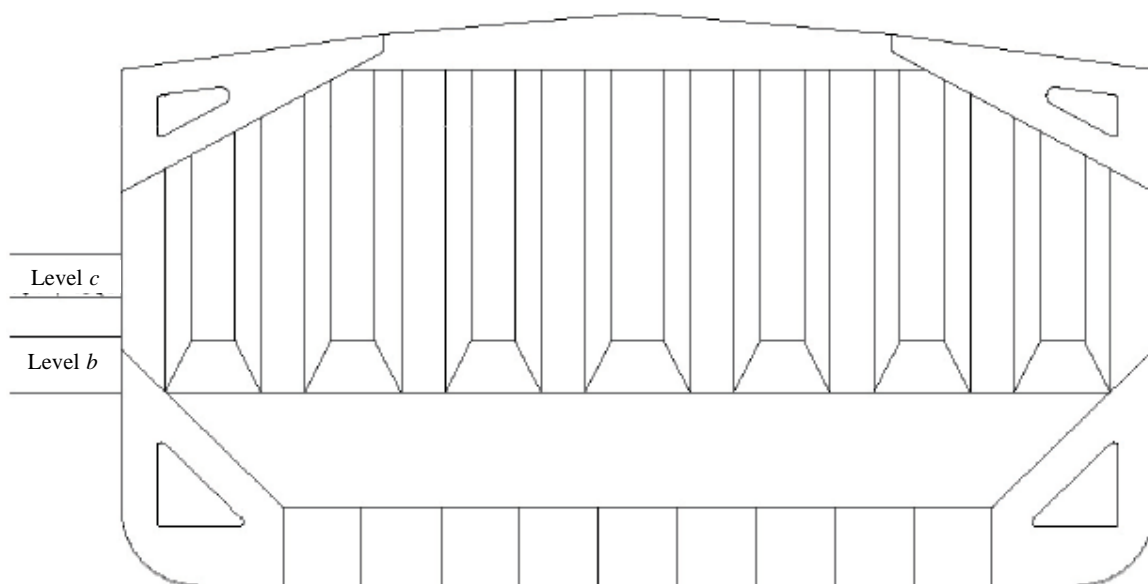


Figure 3.1-2

The gauging is to be carried out at the levels as described below. To adequately assess the scantlings of each individual vertical corrugation, each corrugation flange, web, shedder plate and gusset plate within each of the levels given below are to be gauged.

➤ Locations of level *a* for ships without lower stool, see Figure 3.1-1:

- 1) The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- 2) The middle of gusset plates between corrugation flanges, where fitted;
- 3) The middle of the shedder plates;
- 4) The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder

plates.

➤ Locations of level *b* for ships with lower stool, see Figure 3.1-2:

- 1) The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- 2) The middle of gusset plates between corrugation flanges, where fitted;
- 3) The middle of the shedder plates;
- 4) The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

➤ Locations of level *c* for ships with or without lower stool, see Figure 3.1-1 and Figure 3.1-2:

- 1) The mid-breadth of the corrugation flanges and webs at about the mid-height of the corrugation.

In addition, where the thickness changes within the horizontal levels, the thinner plate is to be gauged.

(2) Criteria

Steel renewal and/or reinforcement should meet the requirements of UR S19. For the evaluation calculation as mentioned in 1.4.1, each needed minimum net thickness, i.e. bending net thickness $t_{net, b}$, shear net thickness $t_{net, s}$ and local net thickness $t_{net, l}$, can be calculated respectively from the bending capacity, shear capacity and local strength theories for the corrugated transverse bulkhead, the biggest value of which will be taken as the net thickness t_{net} . If the thickness of a particular position of the corrugated transverse bulkhead has been gauged in accordance with the thickness gauging ranges as described in this paragraph, with the gauged thickness as t_{gthk} , different measures may be taken according to the following cases:

- Where $t_{gthk} \leq t_{net} + 0.5 \text{ mm}$,

- 1) reinforcement is required using doubling strips if the following conditions are met:

$$t_{gthk} \geq t_{net, l} + 0.5 \text{ mm}$$

$$t_{gthk} \geq t_{net, s} + 0.5 \text{ mm}$$

$$t_{gthk} \leq t_{net, b} + 0.5 \text{ mm}$$

- 2) renewal of corrugated transverse bulkhead is required if condition 1) is not met.
- 3) where renewal or reinforcement is required, a minimum thickness of $t_{net} + 2.5 \text{ mm}$ is to be replenished for the renewed or reinforced parts.

- Where $t_{net} + 0.5 \text{ mm} < t_{gthk} \leq t_{net} + 1.0 \text{ mm}$, coating (applied to the corrugated transverse bulkhead in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as means of monitoring.

- Where $t_{gthk} > t_{net} + 1.0 \text{ mm}$, evaluation passes, and it is not necessary to take any reinforcing measures.

In addition, transition at the lower end of the corrugated bulkheads has to meet certain requirements. If the structure of the lower stool or floors (if no lower stool is fitted) is comparatively weaker than that of the lower end of the corrugated bulkheads, i.e. when the following inequality is met, gussets with shedder plates, extending from the lower end of corrugations up to 10% of the bulkhead span,

or reinforcing doubling strips (on bulkhead corrugations and stool side plating) are to be fitted:
 $0.8 \cdot (\sigma_{Ffl} \cdot t_{fl}) \geq \sigma_{Fs} \cdot t_{st}$

where:

σ_{Ffl} = minimum upper yield stress, in N/mm², of the material used for the corrugation flanges

σ_{Fs} = minimum upper yield stress, in N/mm², of the material used for the lower stool side plating or floors (if no lower stool is fitted)

t_{fl} = actual flange thickness, in mm

t_{st} = as built thickness, in mm, of the lower stool side plating or floors (if no lower stool is fitted)

If gusset plates are fitted, the material of such gusset plates is to be the same as that of the corrugation flanges. The gusset plates are to be connected to the lower stool shelf plate or inner bottom (if no lower stool is fitted) by deep penetration welds, as shown in Figure 3.1-3.

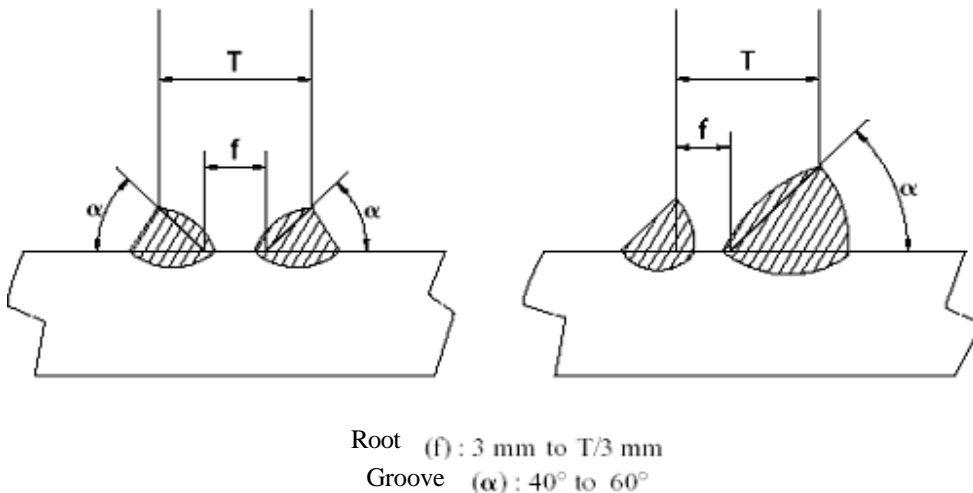


Figure 3.1-3 Connection between gusset plate or BHD plate and inner bottom or lower stool shelf plate

(3) Technical requirements for steel renewal or reinforcement

According to the gaugings, where, upon evaluation in accordance with IACS UR S19, the Plan Approval Center of the Society deems that the transverse bulkheads will satisfy the requirements only after repair and/or reinforcement, the *Guidance on renewal/reinforcement of vertically corrugated transverse watertight bulkhead between cargo holds Nos. 1 and 2* annexed to IACS UR S19 has provided corresponding technical requirements. of which the major point is:

Where steel renewal is required, the bulkhead connections to the lower stool shelf plate or inner bottom (if no lower stool is fitted) are to be at least made by deep penetration welds (see Figure 3.1-3).

The principles of adding reinforcing doubling strips are given as follows:

- 1) Adding reinforcing doubling strips is only an interim measure for the corrugated bulkhead to be compliant with IACS UR S19, which is not a permanent repair scheme.
- 2) For site survey department, gauging is still necessary for the corrugation webs and flanges in accordance with requirements at next intermediate survey or special survey; if the gaugings do not meet $t_{ghk} \geq t_{net,l} + 0.5 \text{ mm}$ or $t_{ghk} \geq t_{net,s} + 0.5 \text{ mm}$, renewal measures must be adopted.

3) For plan approval department, where the use of reinforcing doubling strips is proposed, full account must be taken that, after adding doubling strips, it is necessary to ensure that circumstances such as the bending strength of corrugated bulkheads not compliant will not occur again during future operation of the ship. To this end, the plan approval department shall evaluate the reinforcement strip scheme to ensure that the above-mentioned requirements are to be complied with.

4) Where the reinforcement is accepted by adding strips, the strips are to be attached to the existing bulkhead plating by continuous fillet welds. Minimum thickness of the strips shall not be less than 6 mm. Where reinforcing strips are connected to lower stool shelf plates or the inner bottom (if no lower stool is fitted), one side full penetration welding is to be used.

5) For ships that are fitted with lower stool, to keep the continuity, the reinforcement strips are to be extended over downwards and welded to the lower stool side plating, with their ends tapered. The length of extension shall be no less than the width of the corrugation flange, and thickness and width of the extended section shall be identical with that of the former strips (see Figure 3.1-4).

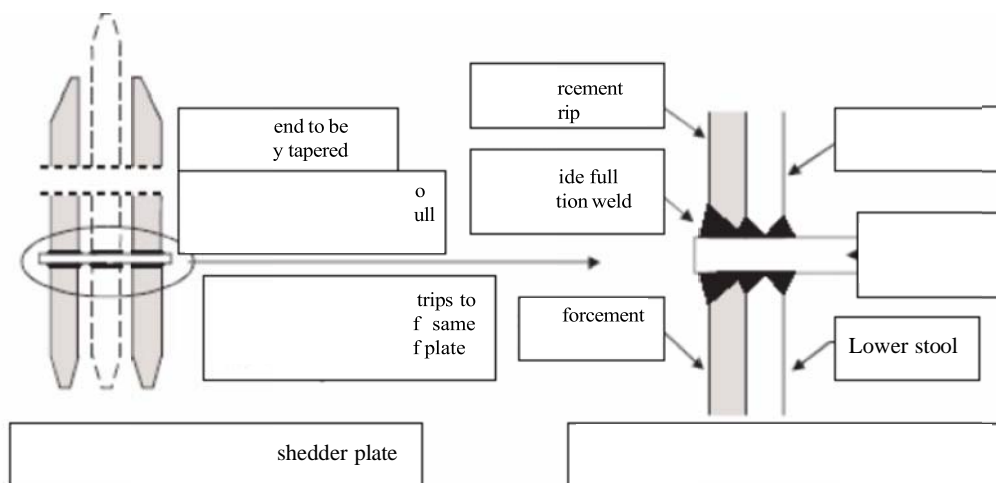


Figure 3.1-4

- 6) Where the requirement of IACS UR S19.6 (c), that is, $0.8 \cdot (\sigma_{FF1} \cdot t_{F1}) \geq \sigma_{FS} \cdot t_{St}$, is satisfied:
- For ships not fitted with lower stool, gusset plate with shedder plate as required in this paragraph shall be fitted at the lower end of the corrugations (see Figure 3.1-5).

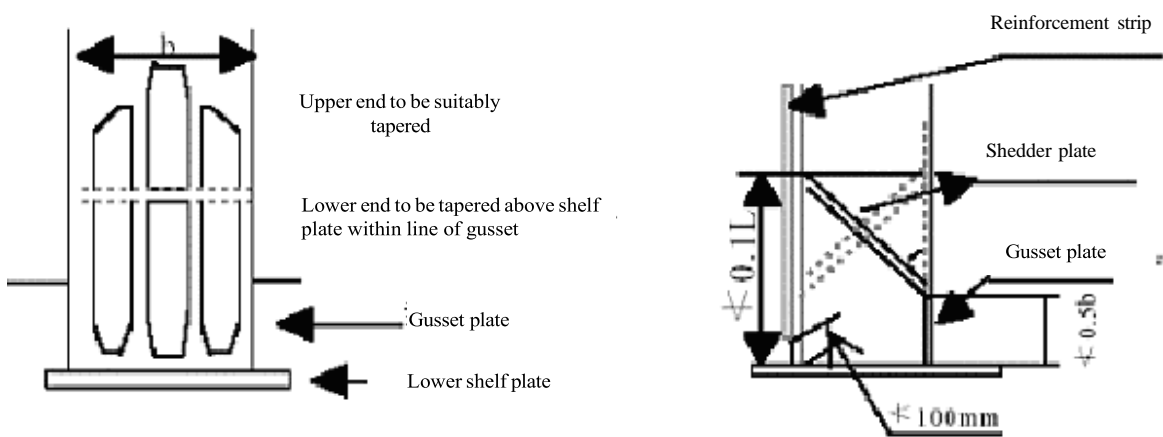


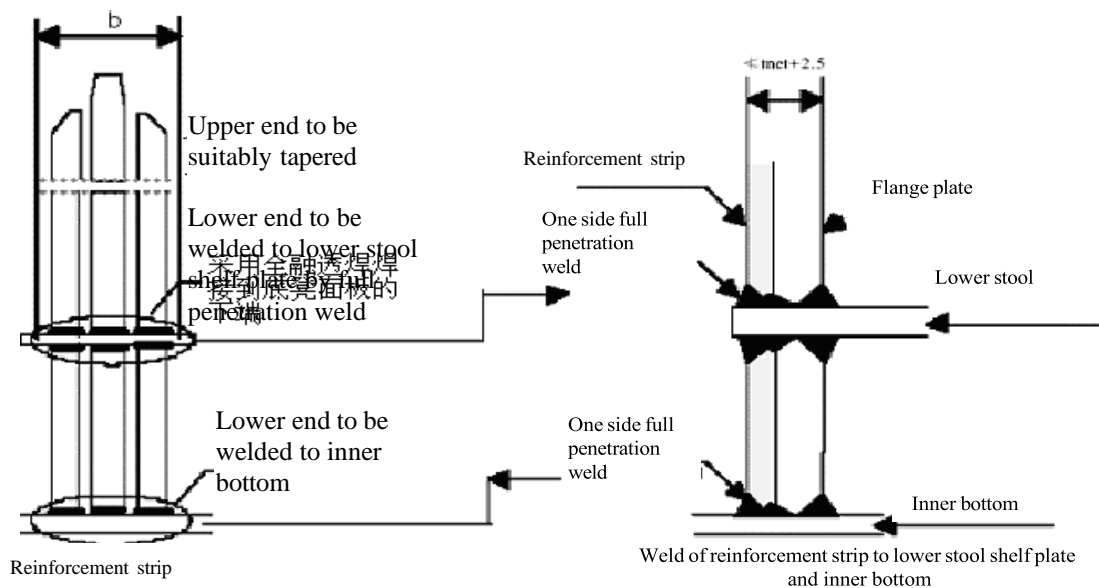
Figure 3.1-5 Reinforcement strips with shedder and gusset plate

➤ For ships fitted with lower stool:

A. gusset plate with shedder plate as required in this paragraph may be fitted at the lower end of the corrugations; or

B. Reinforcement strips may be welded to the lower stool side plating, and the thickness of such strips shall be sufficient to enable the lower stool to meet $0.8 \cdot (\sigma_{Ff1} \cdot t_{f1}) \sigma_{FS} \cdot t_{St}$, but no less than 6mm. Such strips shall be connected to lower stool shelf plates and inner bottom plates by one side full penetration weld, while connection of the strips to lower stool side plating shall be made at least by continuous fillet welds.

① For ships of which the corrugated bulkheads are reinforced using doubling strips, in order to keep the continuity, reinforcement strips on the lower stool side plating are to be aligned with strips on the corrugation flange (see Figure 3.1-6).



For ships of which the bulkheads are reinforced using doubling strips,

Figure 3.1-6

② For ships of which the corrugated bulkheads are reinforced by steel renewal or do not require reinforcement, the reinforcement strips on the lower stool side plating are to be extended over upwards and welded to the corrugation flange, with their ends tapered. The length of extension shall be no less than the width of the corrugation flange, and thickness and width of the extended section shall be identical with that of the former strips (see Figure 3.1-7).

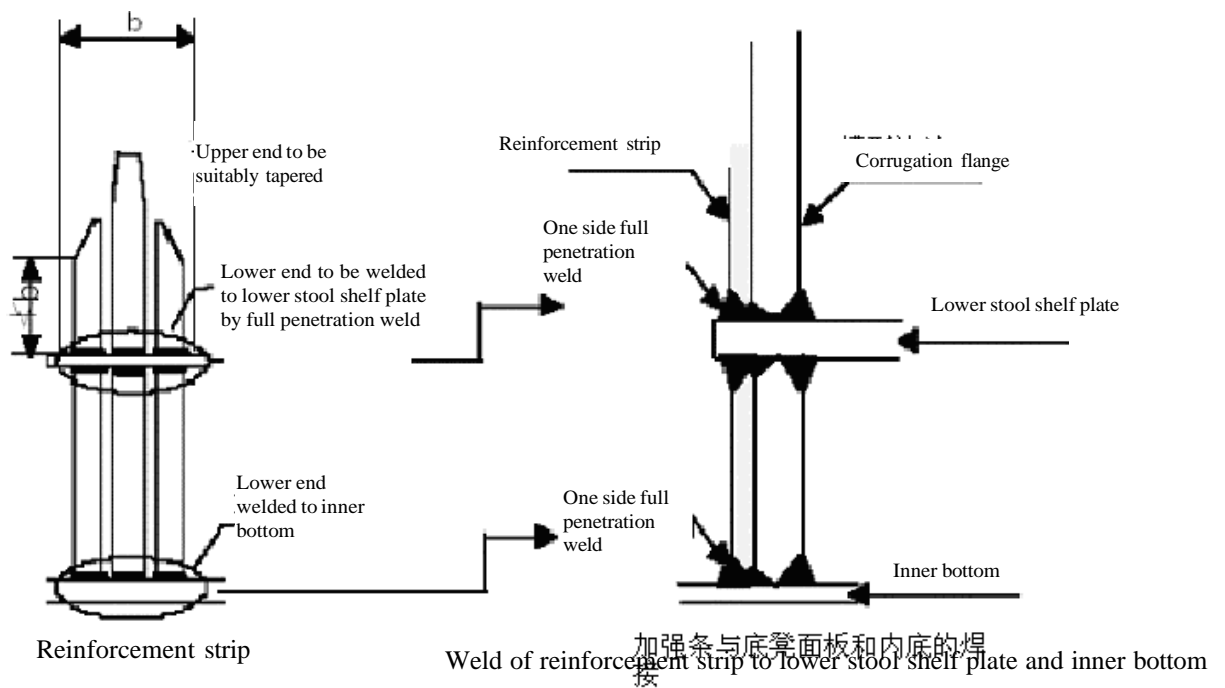
The explanations of above-mentioned symbols are given as follows:

σ_{Ffl} = minimum upper yield stress, in N/mm^2 , of the material used for the corrugation flanges;

σ_{Fs} = minimum upper yield stress, in N/mm^2 , of the material used for the lower stool side plating or floors (if no lower stool is fitted);

t_{fl} = actual flange thickness, in mm;

t_{st} = as built thickness, in mm, of the lower stool side plating or floors (if no lower stool is fitted).



For ships of which the bulkheads are renewed or do not require reinforcement,

Figure 3.1-7

- Where gusset plates with shedder plates are fitted (see Figure 3.1-5), then:
 - A. Gusset plate is to have a minimum height of no less than 10% of the span of corrugation, which shall, on the vertical part, be equal to half of the width of the corrugation flange.
 - B. Shedder and gusset plates are to have a thickness equal to or greater than the original bulkhead thickness, and shedders and gussets are to be same material as flange material.

C. Gusset plate is to be aligned with corrugation flange, ensuring good alignment between gusset plate, corrugation flange and lower stool side plate or floor within the double bottom (if no lower stool is fitted). All connections shall be made at least by deep penetration weld.

D. Where corrugated bulkheads are reinforced using doubling strips, such strips may not be connected to the lower stool shelf plate or inner bottom plate (if no lower stool is fitted). The strips are to extend downwards from top of shedder plate to a length greater than the width of corrugation flange, with their ends suitably tapered. The distance from the reinforcing strip to the lower stool shelf plate or the inner bottom plate (if no lower stool is fitted) shall be no less than 100 mm (see Figures 3.1-5 and 3.1-7).

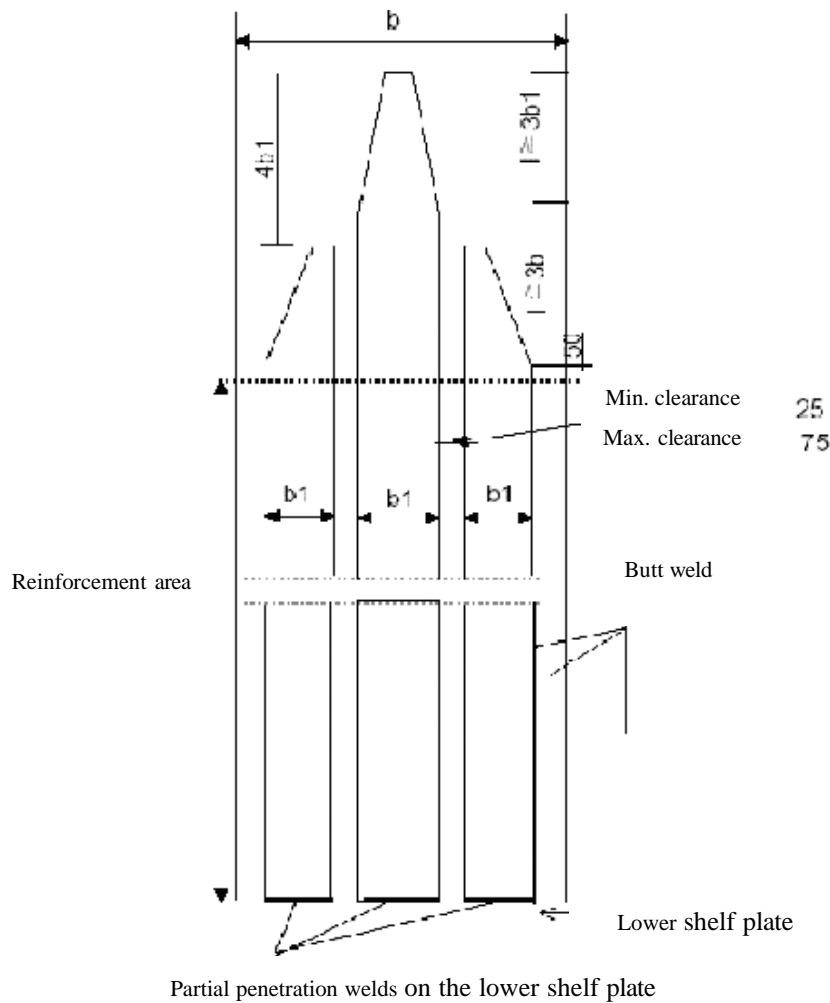


Figure 3.1-8 Reinforcement strip details

(4) Summary table of UR S19 evaluation results is given as follows:

	low fl.	low web	mid fl.	mid web
T_{net} (mm)	(d)	(d)	(d)	(d)
T_{gthk} (mm)	(e)	(e)	(e)	(e)
$T_{net, s+0.5}$ (mm)	—	(a)	—	—
$T_{net, l+0.5}$ (mm)	(b)	(b)	(b)	(b)
$T_{net, b+0.5}$ (mm)	(c)	(c)	(c)	(c)
$T_{net+0.5}$ (mm)	(f)	(f)	(f)	(f)
$T_{net+1.0}$ (mm)	(g)	(g)	(g)	(g)
$T_{gthk} \geq T_{net, l+0.5}$ (mm)	(h)	(h)	(h)	(h)
$T_{gthk} \geq T_{net, s+0.5}$ (mm)	—	(i)	—	—
$T_{gthk} \leq T_{net, b+0.5}$ (mm)	(j)	(j)	(j)	(j)
$T_{net+2.5}$ (mm)	(k)	(k)	(k)	(k)
$T_{net+0.5}$ (mm) < $T_{gthk} \leq T_{net+1.0}$ (mm)	(l)	(l)	(l)	(l)
$T_{gth} \geq T_{net+1.0}$ (mm)	(m)	(m)	(m)	(m)

Note 1: Symbol definitions:

$T_{net, l}$ = thickness required by local strength, in mm; $T_{net, b}$ = thickness required by bending strength, in mm;

$T_{net, s}$ = thickness required by shear strength, in mm; T_{net} = minimum thickness required by strength, in mm;

T_{gthk} = gauged thickness of corrugated bulkhead, in mm;

Note 2: "-" means not applicable.

Here below are the requirements for filling out the above table:

(a) is $T_{net, s+0.5}$, thickness required by shear strength plus 0.5, the value of $T_{net, s}$ can be found in the evaluation calculation; special attention shall be given that this entry is only applicable to "low web";

(b) is $T_{net, l+0.5}$, thickness required by local strength plus 0.5, the value of $T_{net, l}$ can be found in the evaluation calculation;

(c) is $T_{net, b+0.5}$, thickness required by bending strength plus 0.5, the value of $T_{net, b}$ can be found in the evaluation calculation;

(d) is T_{net} , take MAX ((a), (b), (c)) for "low web", and MAX ((b), (c)) for "low fl.", "mid fl." and "mid web";

(e) is T_{gthk} , gauged thickness of corrugated bulkhead, take the minimum gauged thickness of corresponding areas when filling out the table;

(f) is (d) +0.5;

(g) is (d) +1.0;

(h) if (e) \geq (b), fill in YES, otherwise, fill in NO;

(i) if (e) \geq (a), fill in YES, otherwise, fill in NO; special attention shall be given that this entry is only applicable to "low web";

(j) if (e) \geq (c), fill in YES, otherwise, fill in NO;

(k) is (d) +2.5;

(l) if (f) < (e) \leq (g), fill in YES, otherwise, fill in NO;

(m) if (e) \geq (g), fill in YES, otherwise, fill in NO.

1.4.3 Damage stability requirements after flooding of the foremost cargo hold

UR S23 provides that, the above-mentioned applicable bulk carriers shall, when loaded to the summer load line, be able to withstand flooding of the foremost cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium, as specified in SOLAS regulation XII/4.2 to 4.6.

A ship having been built with an insufficient number of transverse watertight bulkheads to satisfy this requirement may be exempted from the application of Unified Requirements S19, S22 and this requirement provided that the ship fulfills the requirement in SOLAS regulation XII/9.

1.4.4 Alternatives and exemptions of IACS Unified Requirements S19, S22 and S23

1.4.4.1 Alternative measures of no implementing UR S19, S22 and S23

If the shipowner decides that the ship will no longer carry solid cargoes in bulk having a density of 1.78 t/m^3 and over, then the implementation of the above three Unified Requirements may not be required, provided that the following alternative measures are taken:

- (1) The Society is to state in class notation the density restriction, namely: Bulk Carrier (S.G. < 1.78 t/m^3);
- (2) The loading manual is to be revised to explicitly state that the ship cannot carry solid bulk cargoes having a density $\geq 1.78 \text{ t/m}^3$, by deleting all information about carrying solid bulk cargoes having a density $\geq 1.78 \text{ t/m}^3$, and re-approved by the Plan Approval Unit of this Society;
- (3) Density restriction is to be stated on the loading information booklet, which is to be re-approved by the Society;
- (4) Before loading, the shipowner should declare cargo density information, such as solid bulk cargoes having a density of $1.25\text{-}1.78 \text{ t/m}^3$, and such cargo density is to be determined by a recognized testing organization.

1.4.4.2 Alternatives and exemptions of not satisfying damage stability requirements with cargo hold no.1 in flooded condition

If a ship cannot satisfy the damage stability requirements with cargo hold no.1 in flooded condition, the following measures can be taken as alternatives:

- (1) The ship will no longer carry solid bulk cargoes having a density of 1.78 t/m^3 , which can be handled in the same way as described in 1.4.4.1;
- (2) Where a ship satisfies the following conditions, the shipowner may apply from the flag State Administration or this Society for exemption of the damage stability and structure strength requirements with cargo hold no.1 in flooded condition.
 - (2.1) The annual survey of the foremost cargo hold (no.1) of the ship is to be carried out in accordance with the requirements of enhanced programme of inspections at intermediate survey; in this case, surveyor of this Society will issue a (full term) memo:

MG xx(class) Enhanced programme of inspections for No.1 cargo hold at annual class survey shall be carried out in accordance with the requirements of intermediate class survey.

(2.2) Bilge well high water level alarms are installed in all cargo holds, or in cargo conveyor tunnels, as appropriate, giving an audible and visual alarm on the navigation bridge. Such alarms shall also be approved by the Administration or the Society.

(2.3) Detailed information on specific cargo hold flooding scenarios is provided according to SOLAS regulation XII/9.3, and such information is attached with evacuation preparation

instructions developed in accordance with the requirements of Section 8 of the ISM Code for crew trainings and exercises.

(3) The summer freeboard is increased or the hull is re-constructed, in such cases all concerning plans shall be submitted to relevant plan approval unit of this Society for approval.

1.4.4.3 Alternative measures of not satisfying structure requirements with cargo hold no.1 in flooded condition

If a ship satisfies damage stability requirements with cargo hold no.1 in flooded condition, but not structure requirements with cargo hold no.1 in flooded condition, the shipowner may adopt the following measures:

(1) The ship no longer carries solid bulk cargoes having a density of 1.78 t/m^3 (to be handled according to 1.4.4.1);

(2) Reinforcement of the structure is adopted according to the evaluation requirements of IACS UR S19 and S22;

(3) Loading method is changed by adopting even loading, and/or reducing cargo hold weight-carrying capacity. In this case, strength evaluation shall be carried out again in accordance with the revised loading information, and the loading manual shall be re-approved. If the loading manual is not revised completely and the International Load Line Certificate is not re-issued, a solid equilateral triangle is to be permanently marked on the side shell at midships in accordance with the requirements of SOLAS regulation XII/8.3.

Section 2 ESP requirements (IACS UR Z10.5 and 10.2)

2.1 Scope of application

The requirements in this section apply to bulk carriers that refer to vessels normally constructed with single deck, top-side tanks and hopper side tanks in cargo spaces, which are intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers.

2.2 History of the development of ESP requirements

(1) The IACS Unified Requirements Z10.2 *Hull Surveys of Bulk Carriers*, effective from 1992, has set out specific provisions on close-up surveys and thickness measurements, establishing unified requirements for the ESP surveys of bulk carriers, and several amendments have been made to meet the need of safety for bulk carriers. UR Z10.5 *Hull Surveys of Double Skin Bulk Carriers*, effective from 2003, has set out unified requirements for the ESP surveys of double skin bulk carriers. IACS requirements of the ESP for bulk carriers have been also included into relevant regulations and resolutions by IMO.

(2) Resolution A.713(17) adopted on 6 November 1991 has put forward the interim measures to be taken to improve the safety of ships carrying solid bulk cargoes, including requirements of cargo hold framing inspection, cargo hold overall inspection, ballast tank inspection, framing gauging and etc. at special surveys and intermediate surveys.

(3) MEPC.52 (32) REG.13G adopted on 6 March 1992 requires that crude oil tankers of 20,000 DWT and over and oil product tankers of 30,000 DWT and over shall implement enhanced survey programme at periodic, intermediate and annual surveys, and sets out requirements for on-board survey documents.

(4) Resolution A.744 (18) *Guidelines on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers*, adopted on 4 November 1993, includes two annexes:

Annex A - *Guidelines on the Enhanced Programme of Inspections during Surveys of Bulk Carriers*

Annex B - *Guidelines on the Enhanced Programme of Inspections during Surveys of Oil Tankers*

which explicitly set out hold overall inspections, close-up surveys, thickness gauging ranges and survey programme at special, intermediate and annual surveys, enabling the "enhanced survey programme" to the most important way of assessing hull structure state for bulk carriers and oil tankers, especially the structures of cargo holds, ballast tanks and adjacent holds.

(5) SOLAS regulation XI/2 effective from 1 January 1996 has incorporated resolution A.744 (18) in the Convention as mandatory requirements. Hence, resolution A.744 (18) has been amended for several times.

(6) On November 30, 2011, IMO undertook a comprehensive revision to resolution A.744 (18), taking into account and coordinating with the latest revisions of relevant IACS Unified Requirements, and released the *International Code on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers, 2011* (2011 ESP Code) in resolution A.1049(27). Resolution MSC.325 (90) has made corresponding revisions to SOLAS regulation XI/2, having incorporated the ESP Code into the Convention as a mandatory requirement, to be effective from 1 January 2014.

2.3 ESP requirements

For specific ESP requirements of bulk carriers, please refer to rules of this Society, IACS Unified Requirements UR Z10.2, UR Z10.5 and A.744 (18) as amended by MSC. resolution as well as

relevant contents of the 2011 ESP Code.

Section 3 Hold, ballast and dry space water level detectors and water ingress alarms (SOLAS regulation XII/12)

3.1 Scope of application

3.1.1 Scope

These requirements apply to all bulk carriers of 500 gross tonnage and over (bulk carriers and ore carriers with ESP class notations).

3.1.2 Implementation

For bulk carriers constructed before 1 July 2004, these requirements shall be implemented at initial periodic survey (annual, intermediate or special surveys) carried out no later than 1 July 2004.

For bulk carriers constructed after 1 July 2004, these requirements must be met during construction of the ship.

3.2 Technical requirements

(1) Water level detectors and water ingress alarms should be able to alarm and display at the navigating bridge, and detect water ingress of cargo holds and forward dry spaces as well as ballast tanks forward of the collision bulkhead. Normally, fore peak tank, hold any part of which extends forward of the foremost cargo hold such as boatswain storeroom, and fore castle space (other than a chain locker) belong to such aforesaid spaces. The system shall be an approved type consisting of two separate power supplies, and should sound an alarm in case of main power supply failure.

(2) For devices of which the approval applications are accepted by the Society on or after 1 October 2003, requirements of IMO resolution MSC.145 (77) and IACS UI SC180 are to be complied with; for bulk carriers contracted for construction on or after 1 January 2007, the performance standard of the installed water level detectors shall also meet relevant requirements of IMO MSC./Circ.1176.

(3) Water level detectors for bulk carriers required by SOLAS XII/12 are also applicable to double side skin bulk carriers.

(4) Any space located forward of the foremost cargo hold and on the freeboard deck, such as boatswain storeroom, paint rooms, tool rooms and etc., if its volume does not exceed 0.1% of the ship's maximum displacement volume, shall also be provided with water level detectors and draining systems.

(5) For ships that have already fitted with bilge well high water level detectors and alarms in accordance with SOLAS regulation XII/9.2, water level detectors and alarms shall also be fitted in each cargo hold, giving audible and visual alarms when the water level in any hold reaches a height not less than 15% of the depth of the cargo hold but not more than 2 m. For bulk carriers that have yet to meet SOLAS regulation XII/9 as of January 1, 2004, arrangements shall be made, according to the date given in SOLAS regulation XII/12, to comply with SOLAS regulation XII/12. Upon compliance with SOLAS regulation XII/12, it is not necessary for such bulk carriers to satisfy the requirements of SOLAS regulation XII/9.2 on fitting with bilge well high water level alarms.

(6) Installation location of water level sensors:

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

For ships constructed before 1 July 2004, if sensors are not placed within a distance less than or equal to $B/6$ (B is width of the ship) from the centreline, sensors are to be located at both the port and starboard sides of the cargo hold.

3.3 Survey

(1) Plan approval shall be conducted by the ISC Plan Approval Center. Following plans are to be submitted to for approval:

- 1) Water level detection and alarm system arrangement
- 2) Line diagrams
- 3) Duplicate copy of the Type Approval Certificate
- 4) Relevant plan and drawings for determining system locations and names as well as calculations (For example: general arrangement plan, table of tank capacities).

(2) Site surveyor is to inspect the water level detection and alarm system in accordance with survey checklist and approved plans.

3.4 Annex

Example of water level detection and alarm system arrangement

3.4 Annex (Example of water level detection and alarm system arrangement)

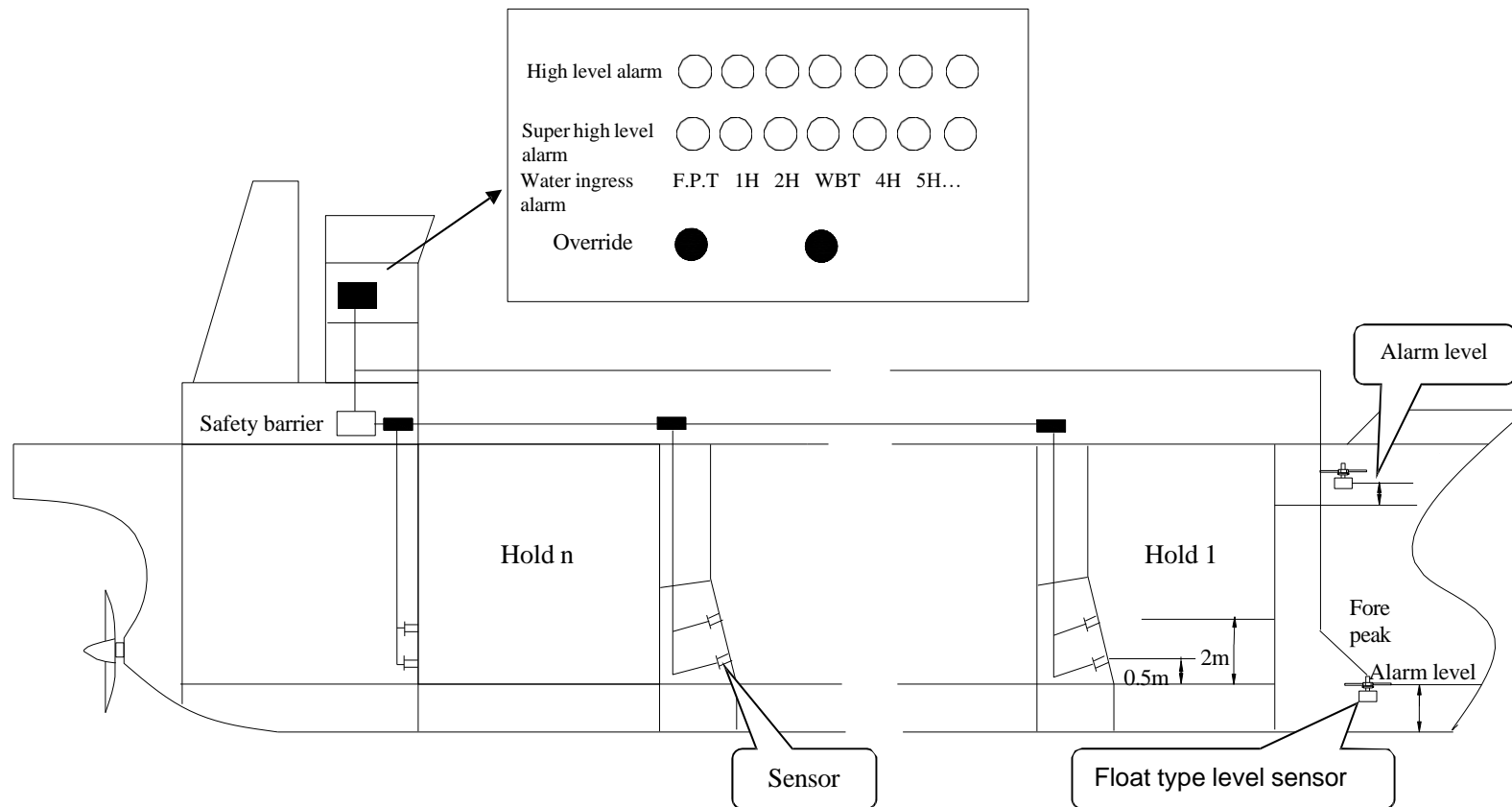


Figure 3.3-1 Water ingress alarm system of cargo holds, fore peak tank and forecastle storeroom (Displacement type level switch)

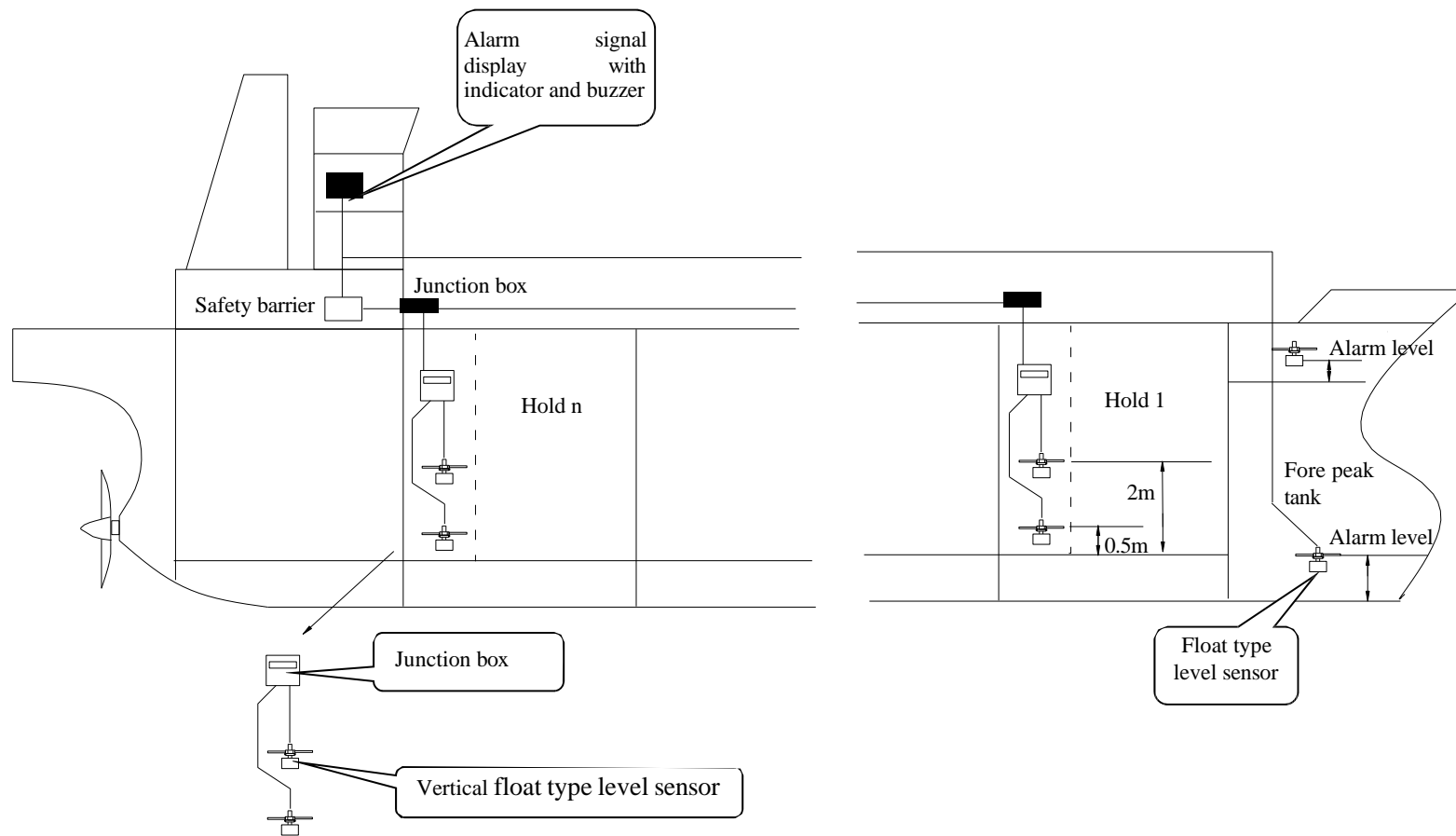


Figure 3.3-2 Water ingress alarm system of cargo holds, fore peak tank and forecastle storeroom (Horizontal float type level switch)

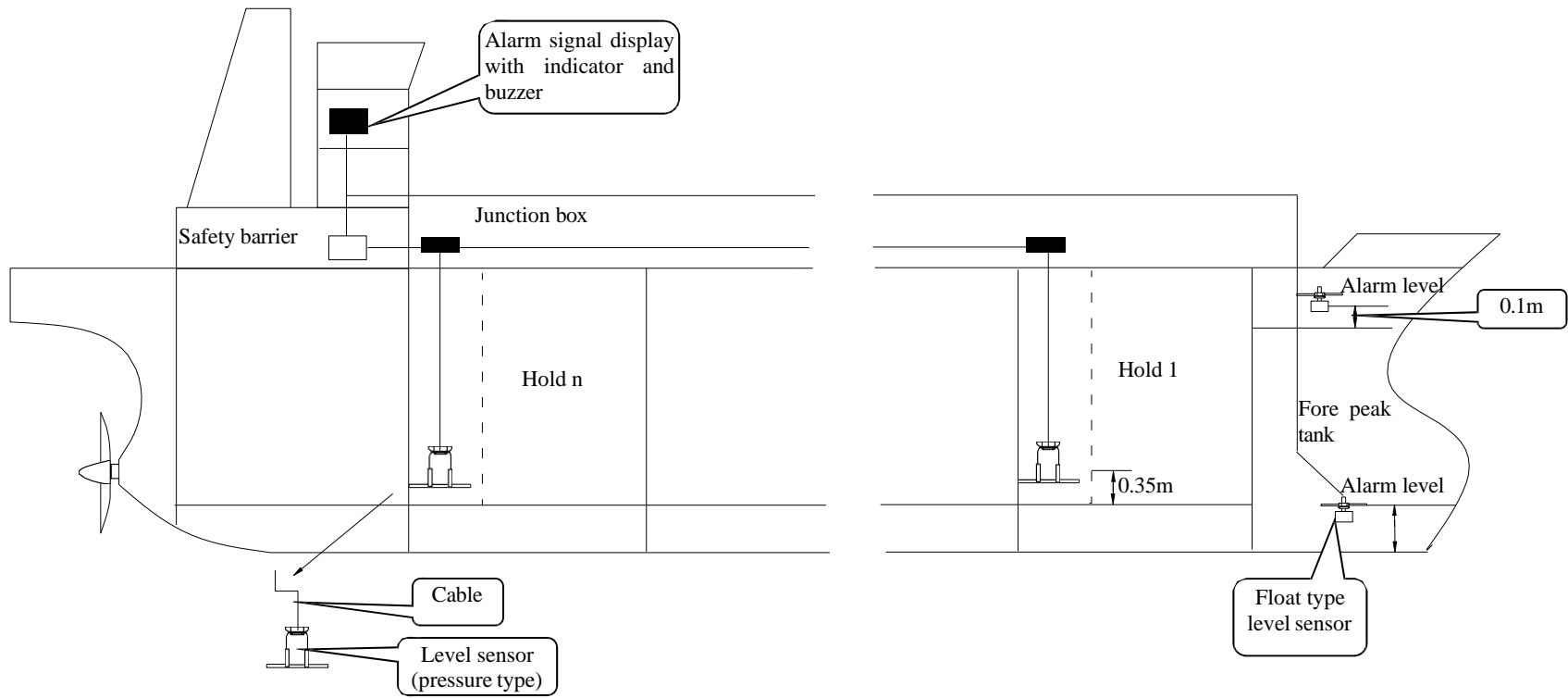


Figure 3.3-3 Water ingress alarm system of cargo holds, fore peak tank and forecastle storeroom (Pressure type level switch)

Section 4 Availability of pumping systems and draining arrangements of the forward dry spaces and ballast tanks (SOLAS XII/13)

4.1 Scope of application

International Maritime Organization adopted the amendment to SOLAS Chapter XII by resolution MSC.134 (76) in December 2002, with the addition of the new regulation 13 Availability of pumping systems, which is applicable to all bulk carriers of 500 GT and over, effective from 1 July 2004. The availability of pumping systems shall be in compliance with the principles explained in circular MSC/Circ.1069, and devices and arrangements, of which the approval applications are accepted by the Society on or after 1 October 2003, shall satisfy the requirements of IACS UI SC179.

4.2 Technical requirements

4.2.1 Draining arrangements:

Pipings, valves and pumping systems, together with appropriate remote controls, shall be used to effectively drain out bilge water and ballast water within the spaces as indicated by the following (1) and (2). Gravity drainage system is not allowed.

- (1) Ballast tanks located at forward of the collision bulkhead, such as fore peak tank;
- (2) Any dry or void space other than a chain cable locker, any part of which extends forward of the foremost cargo hold, with a volume exceeding 0.1% of the ship’s maximum displacement volume, such as the boatswain storeroom and fore castle space.

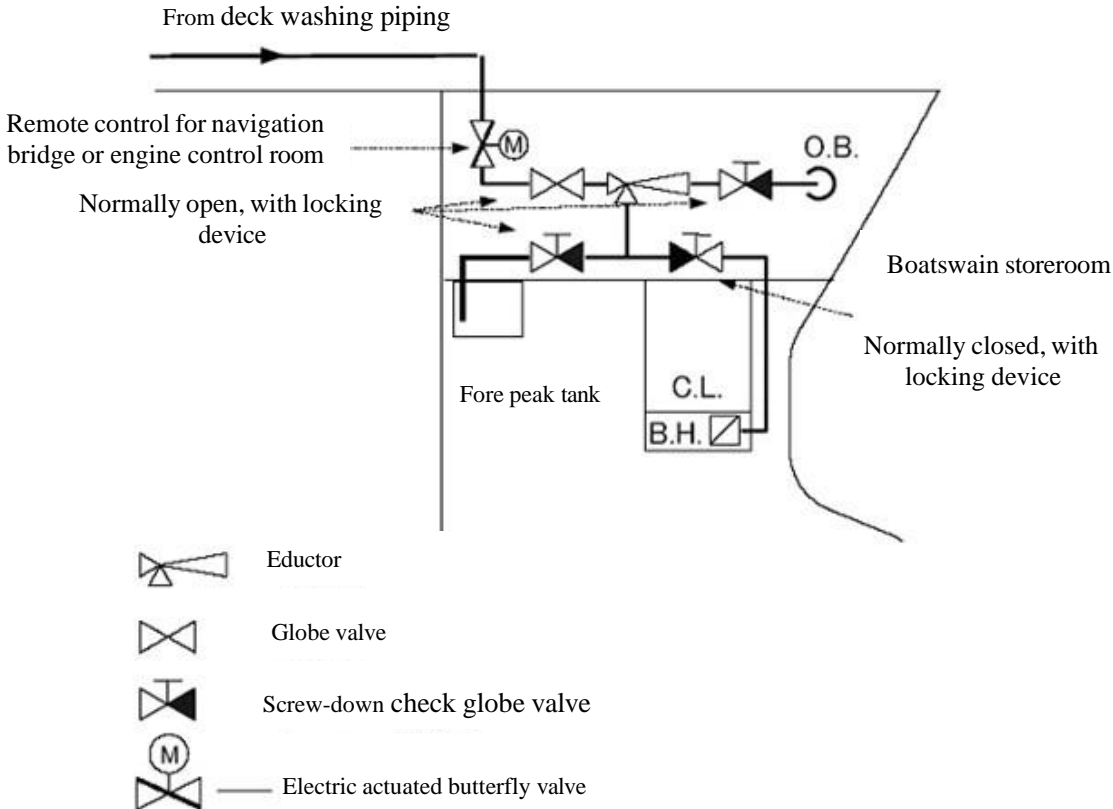


Figure 3.4-1 Pump remote control system within the boatswain storeroom

4.2.2 Remote control

In accordance with the provisions under paragraph 4.2.1, the following components of the bilge or ballast system are to be capable of being controlled from enclosed spaces which are readily accessible from the navigation bridge or the propulsion machinery control position continuously attended without traveling exposed decks:

- (1) Pumps and ejectors used for the draining arrangements in spaces described under paragraph 4.2.1, including driven pumps of the ejectors.
- (2) All valves in the service pipings for equipment listed under paragraph 4.2.2 (1), except valves that are used for maintaining control at open/close position through locking devices during navigation, and positive indication is to be provided at the remote control station to show that the valve is fully open or closed. The valve is not to move from the demanded position in the case of failure of the control system power or actuator power.

A position which is accessible via an under deck passage, a pipe trunk or other similar means of access is not to be taken as being in the "readily accessible enclosed space".

Examples of draining arrangements at ballast and dry spaces are given in Figure 3.4-1 and Figure 3.4-2.

4.2.3 Displacement requirements for the draining arrangements

Pump displacement of the drainage system shall be such that any possible accumulated water in such space can be drained rapidly and effectively. For ships contracted for construction on or after 1 January 2005, the pump displacement shall be equal to or greater than the below calculated value:

$$Q=320A \text{ (m}^3\text{/h)}$$

where A is the cross-sectional area, in m², of the largest ventilator or air pipe.

The displacement requirements are not applicable to existing bilge or ballast system, that is to say, compliance of these requirements can be achieved as long as modification is made to the water ballast system of the fore peak tank and the sewage draining system of the forward spaces so that they can be controlled remotely from the navigation bridge or the engine control room.

4.2.4 Electrical equipment

The enclosures of electrical equipment for the draining system installed in any of the forward dry spaces are to provide protection to IP 68 standard 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 hours. This has to be recognized on the manufacturer's certificate.

4.2.5 Valves installed on the collision bulkhead for the draining system in the forward space of bulk carriers and their remote control

4.2.5.1 Technical requirements for valves installed on the collision bulkhead of bulk carriers

Beside compliance with SOLAS regulation XII/13, valves installed on the collision bulkhead of bulk carriers shall also satisfy corresponding requirements of SOLAS regulation II-1/12:

SOLAS regulation II-1/12 provides that, the collision bulkhead may be pierced below the bulkhead deck by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a screw-down valve capable of being operated from above the bulkhead deck, the valve chest being secured inside the forepeak to the collision bulkhead. The Administration may, however, authorize the fitting of this valve on the after side of the collision bulkhead provided that the valve is readily accessible under all service conditions and the space in which it is located is not a cargo space.

In spite of this, SOLAS regulation XII/13 provides that, "where pipes serving such tanks or bilges pierce the collision bulkhead, valve operation by means of remotely operated actuators may be accepted, as an alternative to the valve control specified in regulation II-1/12, provided that the location of such valve controls complies with this regulation."

SOLAS regulation II-1/12.5.1 as amended by resolution MSC.194 (80) requires that the bulkhead valve installed on the pipe piercing the collision bulkhead shall be a screw-down valve, "12.5.1 (2) the pipe is fitted with a screw-down valve capable of being operated from above the bulkhead deck". This regulation applies to ships having the keels laid on or after 1 January 2009. Therefore, for ships having the keels laid on or after 1 January 2009, valves installed on the collision bulkhead shall be remote control screw-down valve. Where a remote control butterfly valve will be used as an alternative, approval must be gained from the Administration

4.2.5.2 Remote control of valve on the collision bulkhead of bulk carriers

Valve operating from above the freeboard deck as specified in SOLAS regulation II-1/12.5.1 is required to be installed on collision bulkhead in the fore peak tank. An acceptable alternative to such arrangement may be remotely operated actuators as specified in SOLAS regulation XII/13.1 on the condition that all provisions in 13.1 are met.

(1) Acceptable remote control of valve on the collision bulkhead of bulk carriers

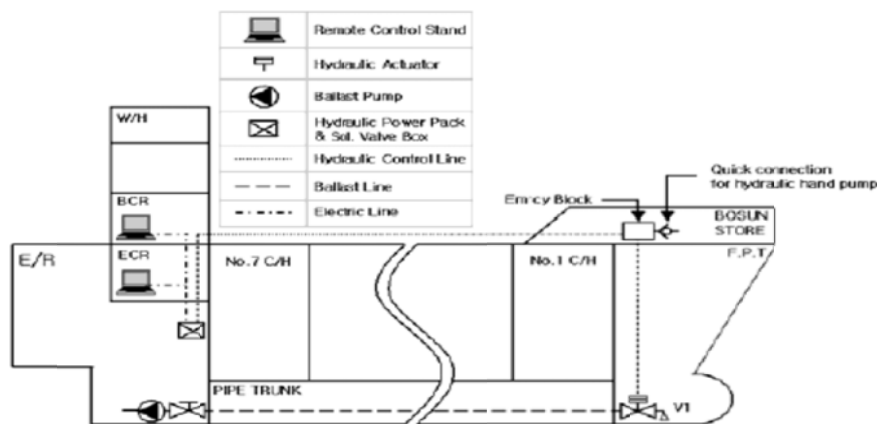


Figure 3.4-2

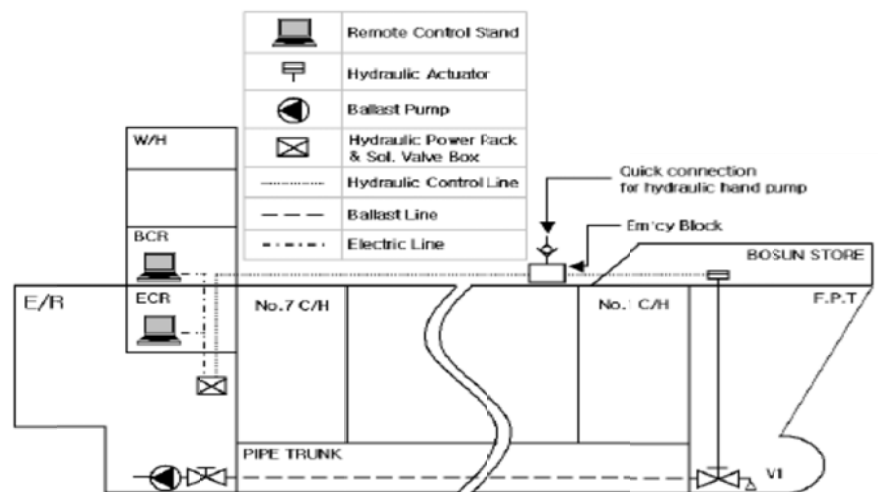


Figure 3.4-3

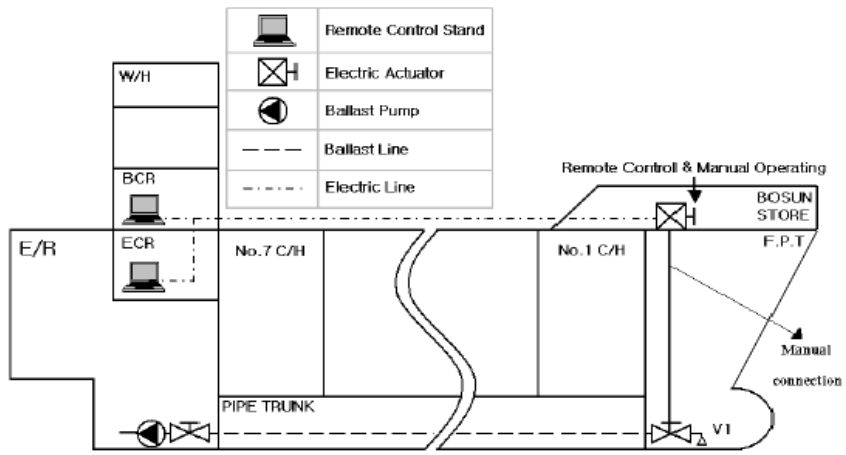


Figure 3.4-4

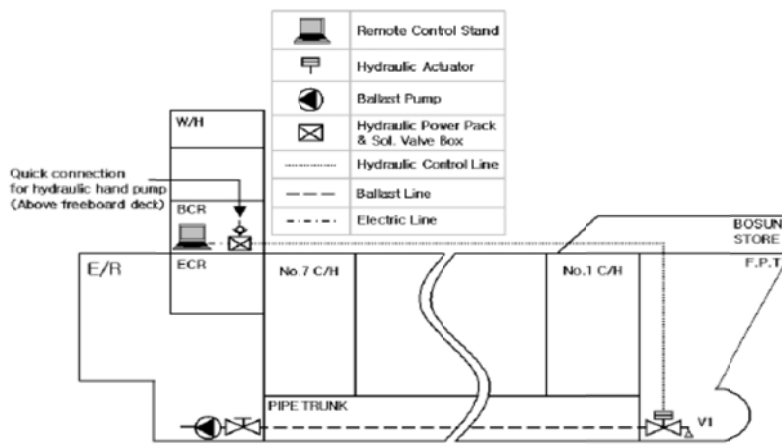


Figure 3.4-5

(2) Unacceptable remote control of valve on the collision bulkhead of bulk carriers

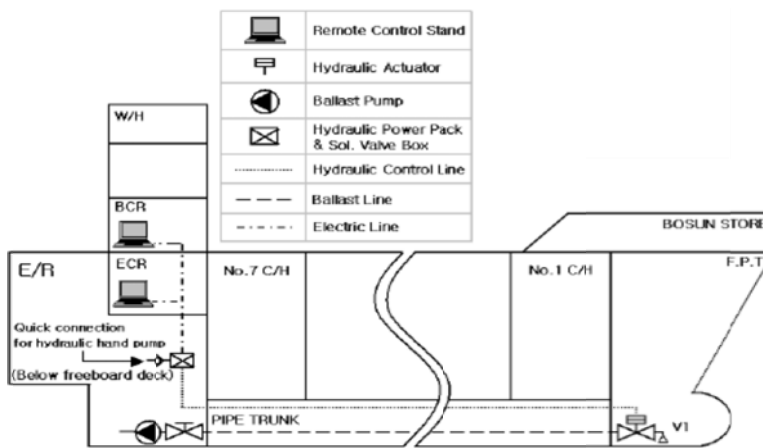


Figure 3.4-6

4.2.6 Other requirements

- (1) The draining arrangements are to 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 are not to be affected by the operation of the draining systems. It must also be possible to immediately start fire pumps and have a ready available supply of fire-fighting water and to be able to configure and use bilge system for any compartment when the draining system is in operation.
- (2) Bilge wells are to be provided with gratings or strainers that will prevent blockage of the draining system with debris.
- (3) The draining system may adopt separate draining arrangements, such as ejector pipes and control valves, or be connected with the ballast system of the ship through pipings and control valves, provided that separate control devices are fitted. Where the piping arrangements for draining closed dry spaces are connected to the piping arrangements for the drainage of water ballast tanks, two non-return valves are to be provided to prevent the ingress of water into dry spaces from those intended for the carriage of water ballast. The non-return valves are to be located in readily accessible positions. One of these non-return valves is to be fitted with shut-off isolation arrangement.
- (4) Control valve of the draining system is to be provided with positive indication, including at the remote control station, to show that the valve is fully open or closed, and is not to move from the demanded position in the case of failure of the control system power or actuator power. When all piping arrangements for the drainage system are connected, the arrangement of control valves shall be able to guarantee that the draining of each hold can be operated independently.
- (5) The enclosures of electrical equipment for the draining system installed in any of the forward dry spaces are to provide protection to IPX8 standard as defined in IEC Publication 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 hours.

4.3 Survey

4.3.1 Plan approval

Where existing water ballast system in the fore peak tank and/or draining arrangements in the forward spaces can be operated from the navigation bridge, engine control room or ballast control room only after modification, the following plans must be submitted to ISC Plan Approval Center for approval.

- (1) Draining arrangements at ballast and dry spaces
- (2) Line diagrams
- (3) Duplicate copy of electrical equipment certificate

4.3.2 Confirmatory survey

The surveyor is to confirm that the above-mentioned components controlled remotely from the navigation bridge, engine control room or ballast control room are modified in accordance with plans and corresponding requirements.

Section 5 Requirements on enhancing the integrity of fore deck fittings (IACS UR S26 & S27)

5.1 Scope of application of UR S26

5.1.1 For ships of sea going service of length 80 m or more that are contracted for construction on or after 1 January 2004 on the exposed deck over the forward 0.25L, where the height of the exposed deck in way of the small hatch is less than 0.1L or 22 m above the summer load waterline, whichever is the lesser, requirements of UR S26 are to be complied with at delivery.

5.1.2 For bulk carriers, ore carriers, and combination carriers (as defined in UR Z11) and general dry cargo ships (excluding container vessels, vehicle carriers, Ro-Ro ships and woodchip carriers), of length 100 m or more that are contracted for construction prior to 1 January 2004 only for small hatches on the exposed deck giving access to spaces forward of the collision bulkhead (including spaces which extend over this line aft-wards), requirements of UR S26 are to be complied with in accordance with the implementation timetable as shown below in table 1.

Table 1 Implementation timetable for existing ships

Ship age	Implementation time
Ship age \geq 15 years on 1 January 2004	By the due date of the first intermediate or special survey after 1 January 2004, whichever is earlier.
Ship age \geq 10 years on 1 January 2004	By the due date of the first special survey after 1 January 2004.
Ship age $<$ 10 years on 1 January 2004	When the ship age reaches 10 years.

5.1.3 UR S26 is not applicable to CSR bulk carriers and oil tankers.

Note 1: The strength L refers to the rule length; hatches in the context of UR S26 are small hatches on the exposed deck over the forward 0.25L, designed for access to spaces below the deck and are capable of being closed weather-tight or watertight, as applicable. Their opening is normally 2.5 square metres or less.

Note 2: For existing ships, as shown in Figure 3.5-1, the small hatches on the exposed deck accessing to spaces no.1, 2 and 3 are to comply with the requirements of UR S26, while small hatches accessing to spaces no. 4 and 5 do not need to satisfy UR S26 requirements. For new ships, small hatches on the exposed deck accessing to no.1 to no.5 spaces, as long as they are within the forward 0.25L, are to comply with UR S26 requirements.

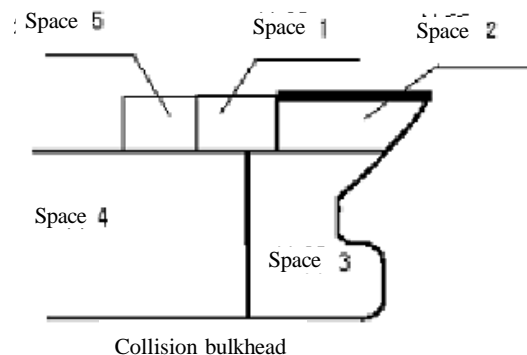


Figure 3.5-1

Note 3: UR S26 (Rev 3.0) added a new regulation 1.4, specifying that securing devices of hatches designed for emergency escape are to be of a quick-acting type (e.g., one action wheel handles are provided as central locking devices for latching/unlatching of hatch cover) operable from both sides of the hatch cover. For ships

contracted for construction on or after 1 July 2007, to which UR S26 is applicable, this requirement is to be complied with no later than the delivery date; and for ships construction before 1 July 2007, to which UR S26 is applicable, this requirement is to be complied with by the date listed in table 1 or at the first special survey after 1 July 2007, whichever is later.

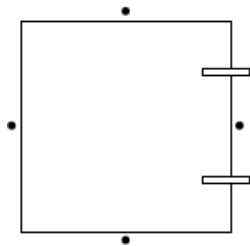
5.1.2 Technical requirements

5.1.2.1 Strength requirements

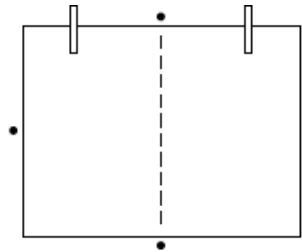
(1) For small rectangular steel hatch covers, the plate thickness, stiffener arrangement and scantlings are to be in accordance with Table 2, and Figure 3.5-2.

Table 2 Scantlings for Small Steel Covers on the Fore Deck

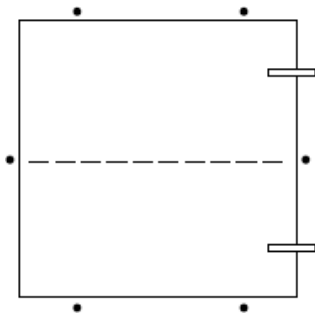
Nominal size (mm x mm)	Cover plate thickness (mm)	Primary stiffeners	Secondary stiffeners
		Flat Bar (mm x mm); number	
630×630	8	—	—
630×830	8	100×8; 1	—
830×630	8	100×8; 1	—
830×830	8	100×10; 1	—
1030×1030	8	120×12; 1	80×8; 2
1330×1330	8	150×12; 2	100×10; 2



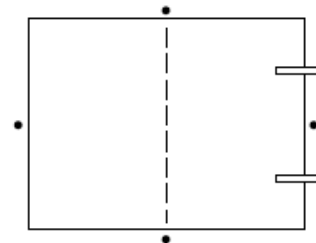
Nominal size 630 x 630



Nominal size 630 x 830



Nominal size 830 x 830



Nominal size 830 x 630

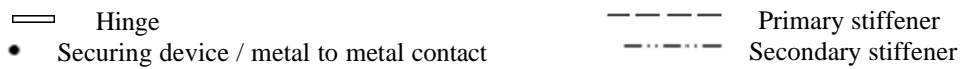
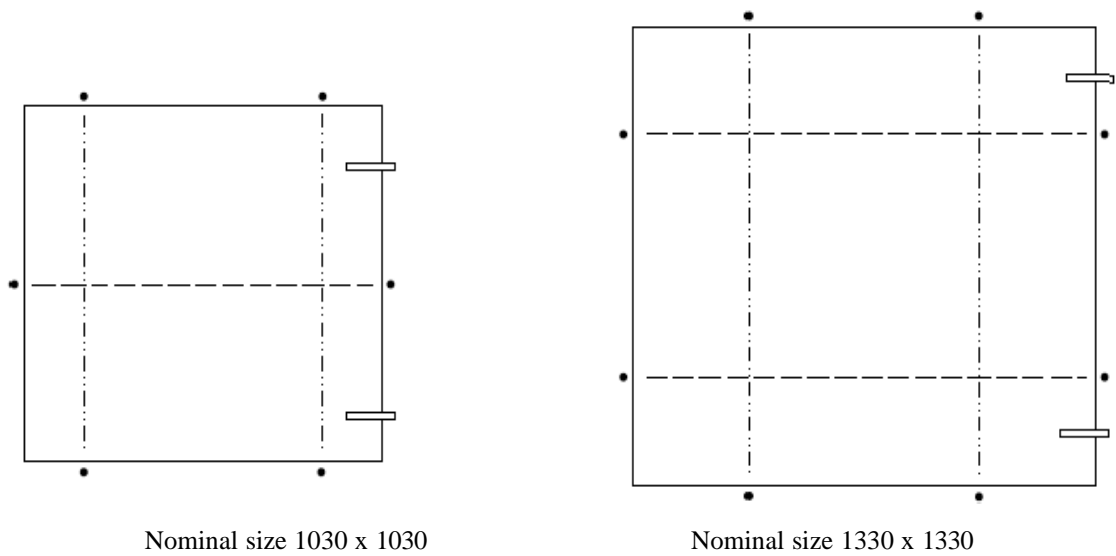


Figure 3.5-2 Arrangement of stiffeners, securing device / metal to metal contact

(2) Stiffeners for small hatch covers, where fitted, are to be aligned with the metal-to-metal contact points, see Figure 3.5-2. Primary stiffeners are to be continuous. All stiffeners are to be welded to the inner edge stiffener. The upper edge of the hatchway coamings is to be suitably reinforced by a horizontal section, normally not more than 170 to 190 mm from the upper edge of the coamings, see Figure 3.5-3.

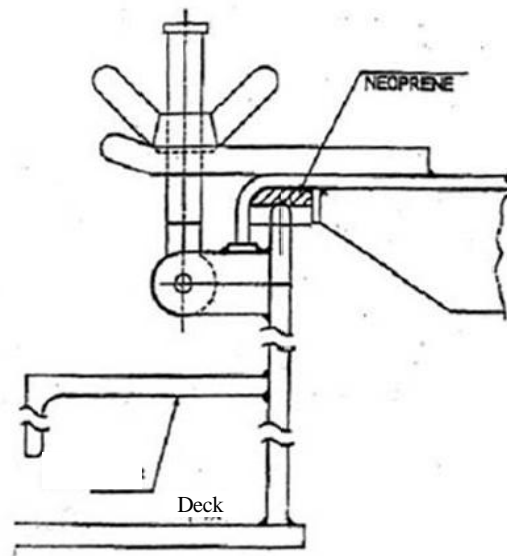


Figure 3.5-3 Reinforcement of hatchway coaming

(3) For existing ships where original plate thickness of the small hatch cover is less than 8 mm, upon special consideration, provision of additional stiffener as shown in Figure 3.5-4 is acceptable as an alternative measure for the renewal of hatch cover.

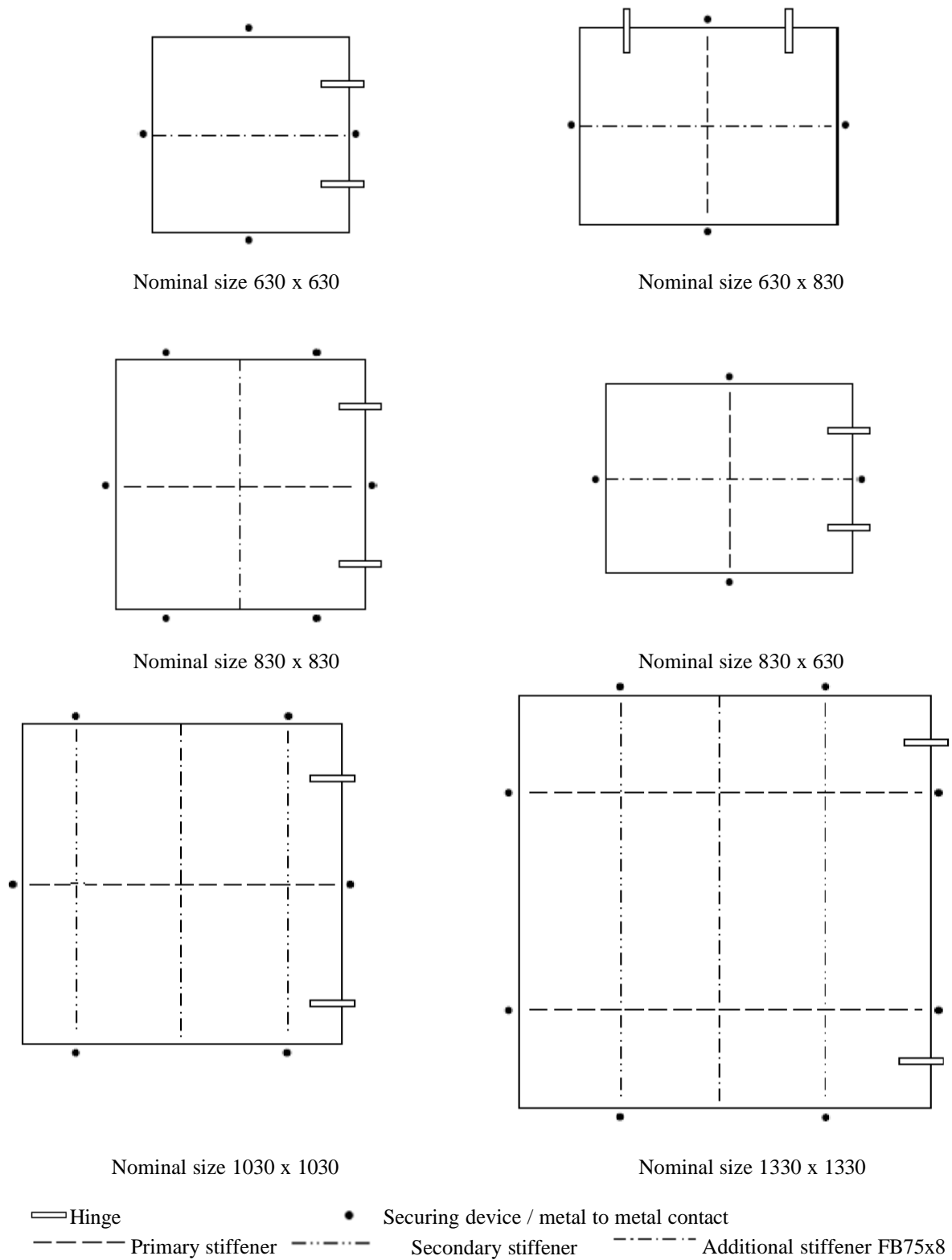


Figure 3.5-4 Arrangement of stiffeners (plate thickness of small hatch cover < 8 mm)

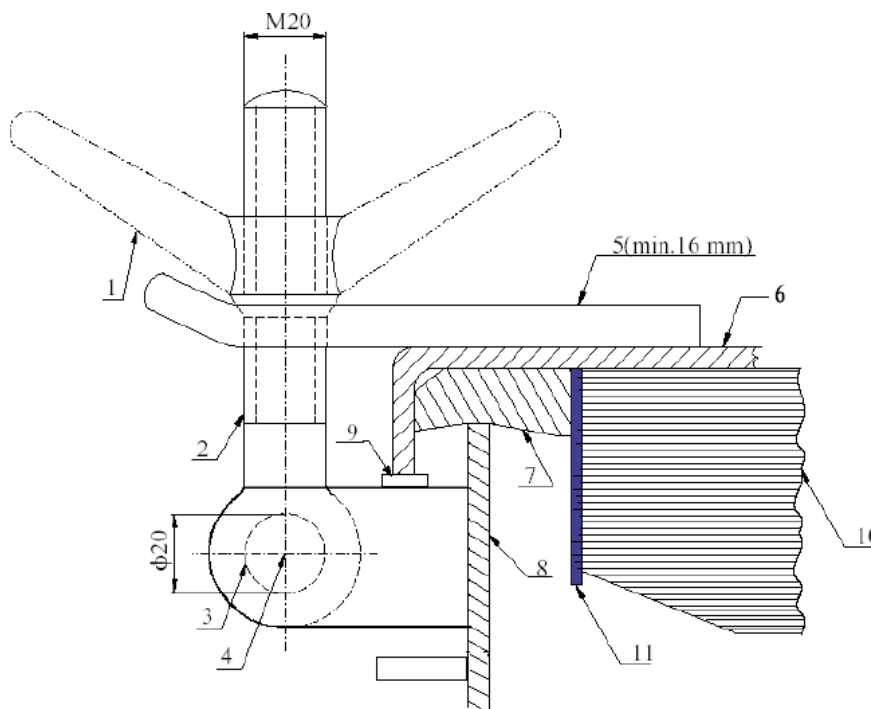
(4) For small hatch covers of circular or similar shape, the cover plate thickness and reinforcement is to provide equal strength to that of the surrounding structures. Where the diameter is 630 mm or less, and the plate thickness is 8 mm or over, the small hatch cover is not subject to above-mentioned paragraphs (1) to (3). Where the diameter of small hatch covers of similar shape is over 630 mm, the cover plate is to be reinforced by measure equivalent to the rectangular hatch cover as specified in paragraph (1). For small hatch covers constructed of materials other than steel, the required scantlings are to provide equivalent strength.

5.1.2.2 Primary securing devices

(1) Small hatches located on exposed fore deck are to be fitted with primary securing devices of a mechanism employing any one of the following methods:

- 1) Butterfly nuts tightening onto forks (see Figure 3.5-5);
- 2) Quick acting cleats; or
- 3) Central locking device (referring to an interlocking device with hand wheel, as shown in Figure 3.5-6).

Dogs (twist tightening handles) with wedges as primary securing devices are not acceptable, as shown in Figure 3.5-7. For applicable small hatch covers, if dogs with wedges are used as primary securing devices, the mechanism of such securing devices is to be modified to any one of the above methods 1), 2) and 3).



- 1: butterfly nut 2: bolt 3: pin 4: center of pin 5: fork (clamp) plate 6: hatch cover 7: gasket
 8: hatch coaming 9: bearing pad (metal to metal contact) 10: stiffener 11: inner edge stiffener

Figure 3.5-5 Example of a primary securing device

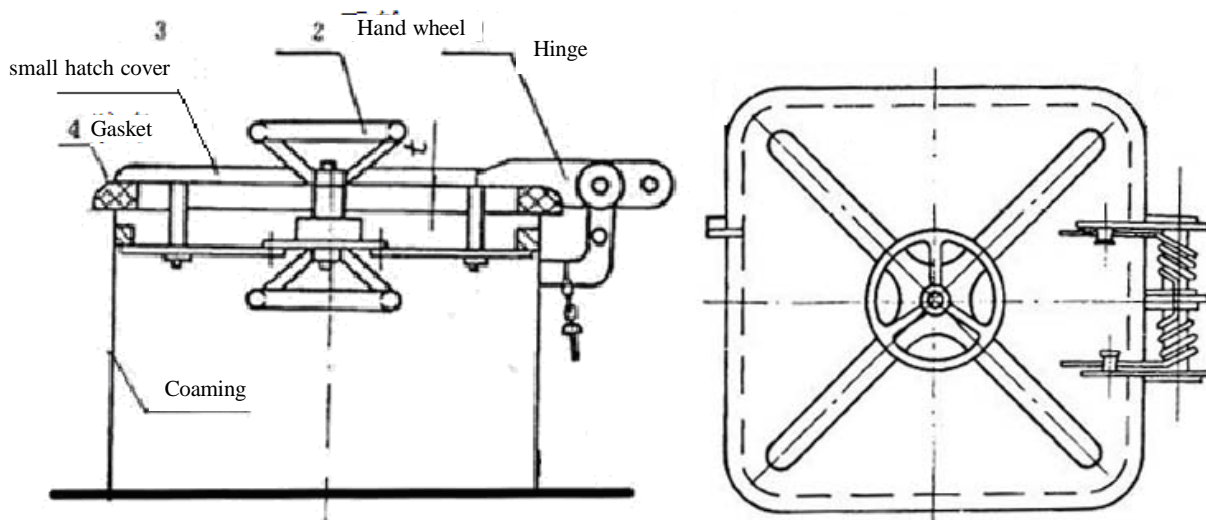


Figure 3.5-6 Interlocking device with hand wheel

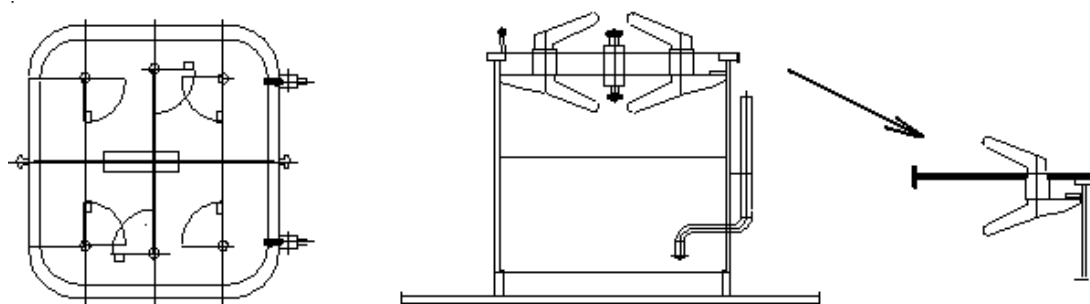


Figure 3.5-7 Unacceptable type of primary securing device

(2) Primary securing devices shall meet the following requirements:

1) The hatch cover is to be fitted with a gasket of elastic material. This is to be designed to allow a metal to metal contact (i.e. limit device) at a designed compression and to prevent over compression of the gasket by green sea forces that may cause the securing devices to be loosened or dislodged. The metal-to-metal contacts shall be of a quantity not less than that as shown in Figure 3.5-2, and are to be arranged close to each securing device and of sufficient capacity to withstand the bearing force. The metal-to-metal contacts are to be fitted on the same plane, and shall ensure that, when hatch covers are closed and secured, the small hatch covers may meet the weathertight requirements and the gasket will not be damaged due to over press-in amount. Depending on different gaskets (solid, hollow, foam core, foam rubber), the recommended press-in amount is 5-10 mm.

2) The primary securing method is to be designed and manufactured such that the designed compression pressure is achieved by one person without the need of any tools.

3) For a primary securing method using butterfly nuts, the forks (clamps) are to be of robust design. They are designed minimize the risk of butterfly nuts being dislodged while in use, by means of curving the forks upward (about 10° – 30°), a raised surface on the free end, or a similar method. The plate thickness of steel forks is not to be less than 16 mm, as shown

in Figure 3.5-5.

4) For small hatch covers forward of the foremost cargo hold (for example hatch of No.1 cargo hold), the hinges are normally to be located on the fore edge, as shown in Figure 3.5-9.

5) On small hatches located between the main hatches, the hinges are to be placed on the fore edge or outboard edge.

5.1.2.3 Secondary securing device

Besides primary securing device as specified above, small hatches on the fore deck are to be fitted with an independent secondary securing device on the side opposite to the hatch cover hinges, e.g. by means of a sliding bolt, a hasp or a backing bar of slack fit, which is capable of keeping the hatch cover in place, even in the event that the primary securing device became loosened or dislodged. For example, a handle with eye ring may be welded to the cover plate and coaming plate with center of the eye ring aligned which may pass through a bolt or pin, secured with a lock nut or retainer pin (as shown in Figure 3.5-8).

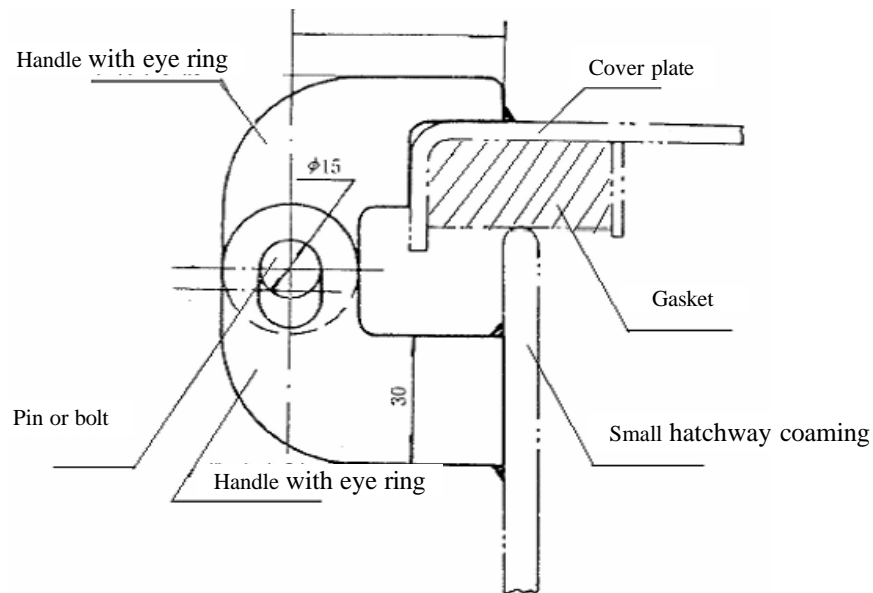


Figure 3.5-8 Secondary securing device

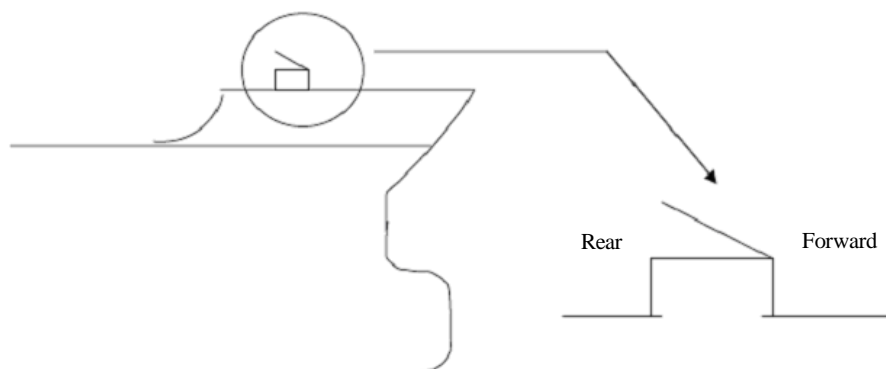


Figure 3.5-9 Hinges of small hatch covers forward of the foremost cargo hold must be located on the fore edge

5.1.2.4 Small hatches for emergency escape

For small hatches designed for emergency escape, the primary securing device shall not use butterfly nuts tightening on the forks or a quick-acting clamp type, and a secondary securing device is not required. But the strength, plate thickness and stiffeners of the primary securing devices are still to meet corresponding requirements as specified in UR S26. For small hatches designed for emergency escape, their secondary securing devices shall be capable of quick latching/unlatching (for example, use of interlocking devices with action wheel handles) operable from both sides of the hatch cover.

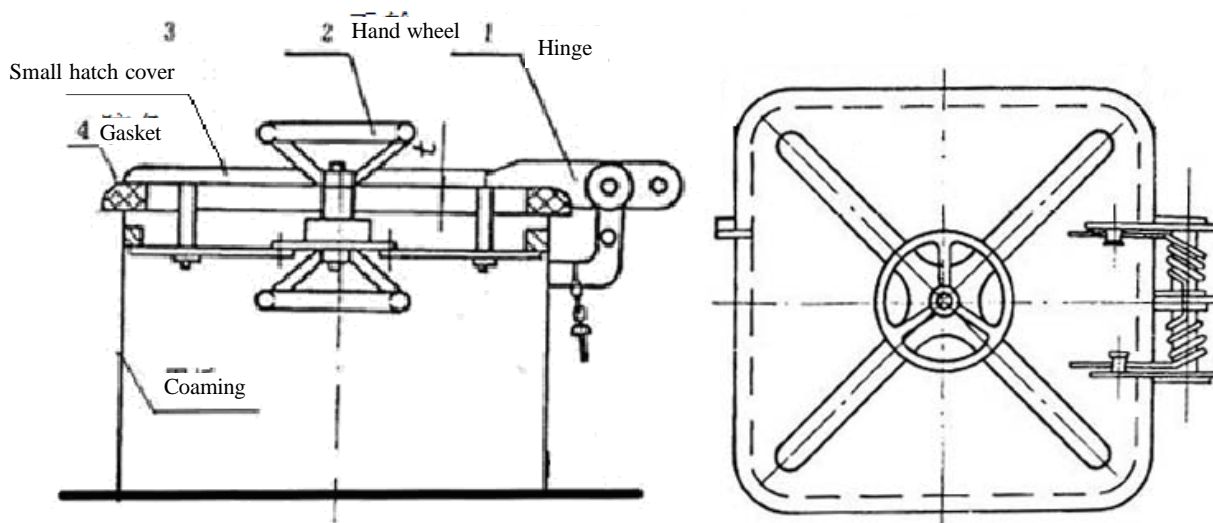


Figure 3.5-10 Small hatch for emergency escape (interlocking device with hand wheel operable from both sides of the hatch cover)

5.1.3 Illustration examples of UR S26 compliance verification

5.1.3.1 Example 1, small hatch that complies with requirements (This is a small hatch for the boatswain storeroom on a bulk carrier of 93,000 DWT. The nominal size of this small hatch is 1200 x 1200 mm, height of the coaming is 610 mm, employing butterfly nut/forks as the primary securing device).



3.5-11-1

1) For small rectangular steel hatch covers, the plate thickness, stiffener arrangement and scantlings are to be in accordance with Table 2, and Figure 3.5-2. Stiffeners, where fitted, are to be aligned with the metal-to-metal contact points, see the following picture. Primary stiffeners are to be continuous. All stiffeners are to be welded to the inner edge stiffener. (UR S26 Reg.4.1)



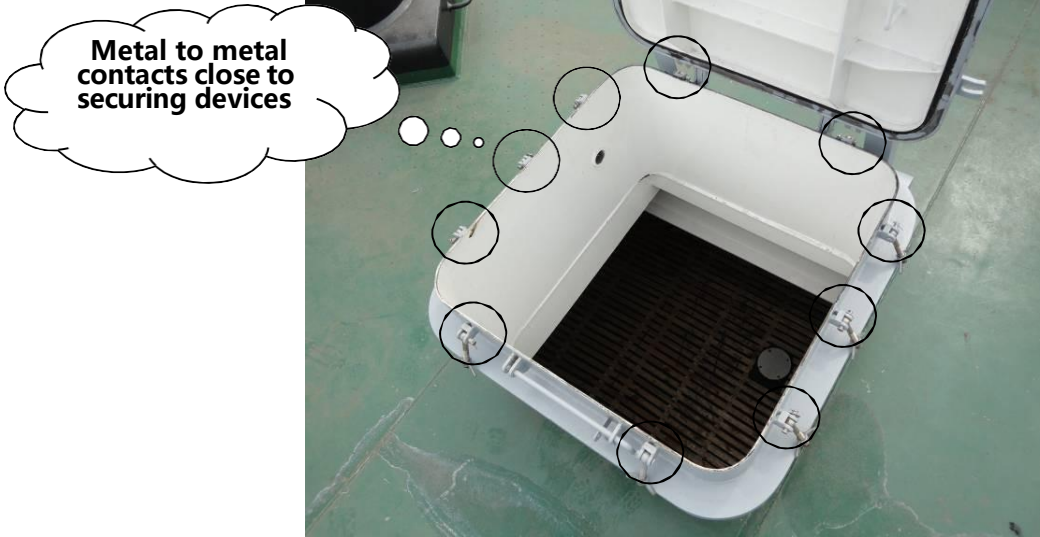
3.5-11-2

2) The upper edge of the hatchway coamings is to be suitably reinforced by a horizontal section, normally not more than 170 to 190 mm from the upper edge of the coamings. (UR S26 Reg.4.2)

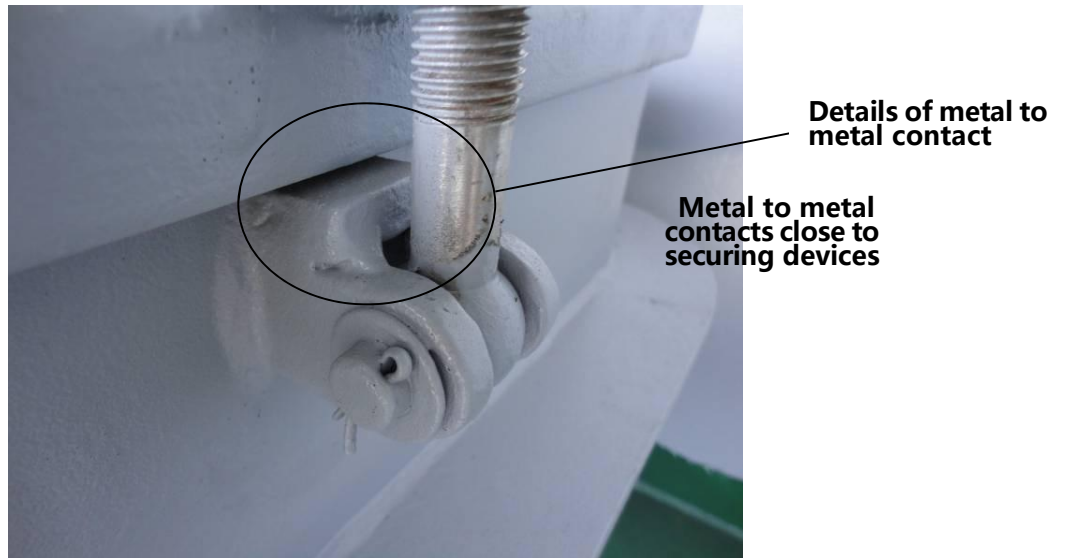


3.5-11-3

3) The hatch cover is to be fitted with a gasket of elastic material. This is to be designed to allow a metal to metal contact at a designed compression and to prevent over compression of the gasket by green sea forces that may cause the securing devices to be loosened or dislodged. The metal-to-metal contacts are to be arranged close to each securing device, and of sufficient capacity to withstand the bearing force. (UR S26 Reg.6.1)



3.5-11-4



3.5-11-5

4) For a primary securing method using butterfly nuts, the forks (clamps) are to be of robust design. They are to be designed to minimize the risk of butterfly nuts being dislodged while in use; by means of curving the forks upward, a raised surface on the free end, or a similar method. The plate thickness of unstiffened steel forks is not to be less than 16 mm. (UR S26 Reg.6.3)



3.5-11-6

5) For small hatch covers located on the exposed deck forward of the fore-most cargo hatch, the hinges are to be fitted such that the predominant direction of green sea will cause the cover to close, which means that the hinges are normally to be located on the fore edge. (UR S26 Reg.6.4)

6) Small hatches on the fore deck are to be fitted with an independent secondary securing device e.g. by means of a sliding bolt, a hasp or a backing bar of slack fit, which is capable of keeping the hatch cover in place, even in the event that the primary securing device became loosened or dislodged. It is to be fitted on the side opposite to the hatch cover hinges. (UR S26 Reg.7)



Secondary securing device

3.5-11-7

5.1.3.2 Example 2, small watertight hatch that complies with requirements (the watertight hatchway employed by type A ships uses a central locking device as primary securing device).



3.5-12-1



Half embedded sealing material

3.5-12-2

5.1.3.3 Small hatch that does not comply with requirements (stiffeners are not aligned with the metal to metal contacts in accordance with requirements).

Stiffeners not aligned with metal to metal contacts



3.5-13-1

5.1.3.1 Example 4, small hatch that does not comply with requirements (This is a small hatch for the boatswain storeroom on an oil product tanker of 4,200 DWT, with a nominal size of 600 x 600 mm, designed for emergency escape).

- 1) The upper edge of the hatchway coamings is not suitably reinforced by a horizontal section (UR S26 Reg.4.2).



3.5-13-2

- 2) Hatches designed for emergency escape need not to fit with a secondary securing device. (UR S26 Reg.1.3)



3.5-13-3

5.2 Requirements and implementation of UR S27

5.2.1 Implementation

5.1.1 For all ship types of sea going service of length 80 m or more that are contracted for construction on or after 1 January 2004, where the height of the exposed deck in way of the small hatch is less than 0.1L or 22 m above the summer load waterline, whichever is the lesser, all air pipes, ventilator pipes and their closing devices, the securing of windlasses on the exposed deck over the forward 0.25L are to comply with the requirements of UR S27.

5.1.2 For bulk carriers, ore carriers, and combination carriers (as defined in UR Z11) and general dry cargo ships (excluding container vessels, vehicle carriers, Ro-Ro ships and woodchip carriers), of length 100m or more, that are contracted for construction prior to 1 January 2004, air pipes, ventilator pipes and their closing devices on the exposed deck serving spaces forward of the collision bulkhead (and also to spaces which extend over this line aft-wards) are to comply with the requirements of this paragraph in accordance with the implementation timetable given in Table 1, but not necessary to examine the strength of the securing device of windlasses.

Table 1 Implementation timetable for existing ships

Ship age	Implementation timetable
Ship age \geq 15 years on 1 January 2004	By the due date of the first intermediate or special survey after 1 January 2004, whichever is earlier.
Ship age \geq 10 years on 1 January 2004	By the due date of the first special survey after 1 January 2004.
Ship age $<$ 10 years on 1 January 2004	When the ship age reaches 10 years.

Note 1: Completion prior to 1 January 2004 of an intermediate or special survey with a due date after 1 January 2004 cannot be used to postpone compliance with relevant requirements in accordance with the implementation timetable as required in this section. However, completion prior to 1 January 2004 of an intermediate survey the window for which straddles 1 January 2004 can be accepted.

Note 2: The due date of the intermediate survey refers to the anniversary date of the third annual survey; the window for an intermediate survey refers to a period of time from three months before the anniversary date of the second annual survey to three months after the anniversary date of the third annual survey.

Note 3: The requirements of UR S27 concerning windlasses do not apply to CSR Bulk Carriers.

5.2.2 Survey requirements

Part 2, Chapter 1, Section 7 of the Rules for Classification of Sea-going Steel Ships can be referenced for thickness of air pipes and ventilator pipes, as well as numbers and scantlings of brackets.

Table 2 760 mm Air Pipe Thickness and Bracket Standards

Pipe diameter (mm)	Minimum wall thickness (mm)	Maximum projected area of head (cm ²)	Height ⁽¹⁾ of brackets (mm)
40 ⁽³⁾	6.0	-	520
50 ⁽³⁾	6.0	-	520
65	6.0	-	480
80	6.3	-	460
100	7.0	-	380

125	7.8	-	300
150	8.5	-	300
175	8.5	-	300
200	8.5 ⁽²⁾	1900	300 ⁽²⁾
250	8.5 ⁽²⁾	2500	300 ⁽²⁾
300	8.5 ⁽²⁾	3200	300 ⁽²⁾
350	8.5 ⁽²⁾	3800	300 ⁽²⁾
400	8.5 ⁽²⁾	4500	300 ⁽²⁾

(1) Brackets need not extend over the joint flange for the head.

(2) Brackets are required where the as fitted (gross) thickness is less than 10.5 mm, or where the tabulated projected head area is exceeded.

(3) Not permitted for new ships.

Table 3 900 mm Ventilator Pipe Thickness and Bracket Standards

Pipe diameter (mm)	Minimum wall thickness (mm)	Maximum projected area of head (cm ²)	Height of brackets (mm)
80	6.3	-	460
100	7.0	-	380
150	8.5	-	300
200	8.5	550	-
250	8.5	880	-
300	8.5	1200	-
350	8.5	2000	-
400	8.5	2700	-
450	8.5	3300	-
500	8.5	4000	-

Where brackets are required, three or more radial brackets are to be fitted, on the forward and rear ends of the ship direction and inner side of the shipboard. Such type of brackets as shown in Figure 3.5-14 can be used. Where there lacks of proper support from the deck at the connection between the deck and the bracket, a base plate is to be added underneath the foot of the bracket. Brackets are to be of gross thickness 8 mm or more, of minimum length 100 mm.

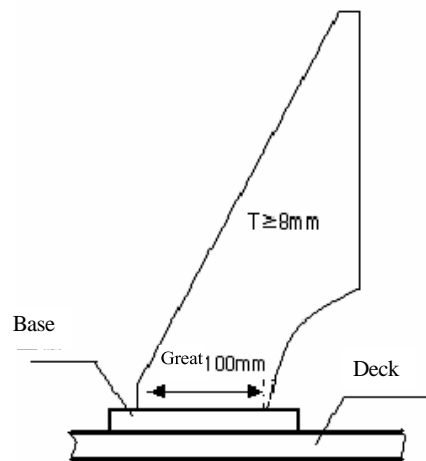


Figure 3.5-14

For air pipes higher than 760 mm, scantlings of their brackets shall be increased by the difference value of the standard height. For ventilator pipes higher than 900 mm, scantlings of their brackets shall be increased by the difference value of the standard height, while thickness of the brackets may still be 8 mm. However, when the increase of height exceeds 500 mm, proper consideration is to be given to increase of bracket thickness or extra face plate to prevent from loss of stability.

For rectangular or oval-shaped ventilator pipes, brackets are to be fitted in accordance with requirements for the length of their shorter sides versus the diameter of the oval-shaped ventilator pipes.

Type A rotary mushroom-shaped ventilator pipes (internally open/close type, of which the ventilator pipe is closed by turning the ventilation cap) are not allowed for areas as described in paragraph 5.2.1, see the following figure:

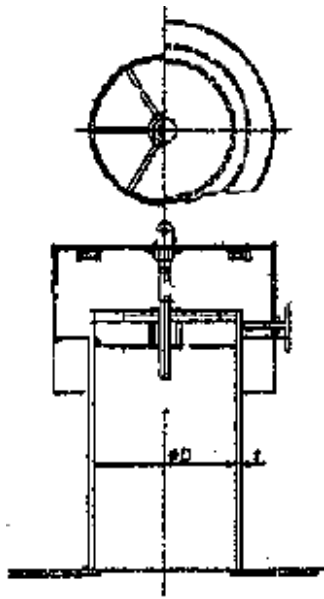


Figure 3.5-15 Type A rotary mushroom-shaped ventilator pipe not allowed for areas described in paragraph 5.2.1

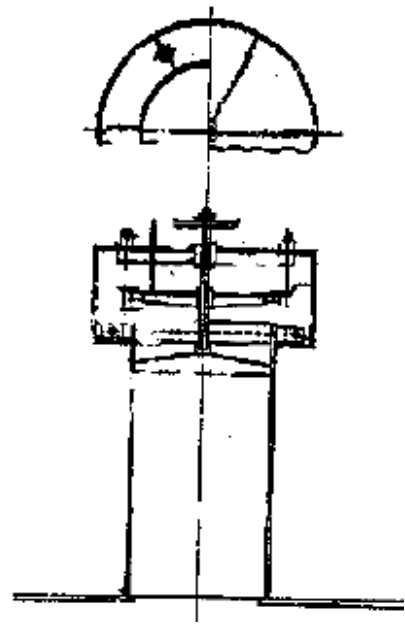
While type B rotary mushroom-shaped ventilator pipes (externally open/close type, of which the ventilator pipe is closed by turning the hand wheel on the ventilation cap) are acceptable, as shown in Figure 3.5-16.



Figure 3.5-16 Type B rotary mushroom-shaped ventilator pipe allowed for areas described in paragraph 5.2.1



Type A (not allowed)



Type B (allowed)

Figure 3.5-17 Rotary type mushroom-shaped ventilator pipe

Section 6 Improvement of cargo hatch cover stoppers and securing arrangements - Cargo Hatch Cover Securing Arrangements for Bulk Carriers not Built in Accordance with IACS UR S21 (Rev. 3) (IACS UR S30)

6.1 Scope of application

All bulk carriers which were not built in accordance with UR S21 (Rev.3) and are for steel hatch cover securing devices and stoppers for cargo hold hatchways No.1 and No.2 which are wholly or partially within 0.25L of the fore perpendicular, except pontoon type hatch cover, are to comply with the requirements of IACS UR S30 in accordance with the implementation timetable given below. Pontoon type hatch cover, as referred to herein, generally refers to a hatch cover with portable hatch beam and its seating, secured weathertight by devices such as tarpaulins, cleats and wedges.

Ship age by 1 January 2004	Implementation timetable
15 years ≤ ship age	By the due date of the first intermediate or special survey after 1 January 2004
10 years ≤ ship age < 15 years	By the due date of the first special survey after 1 January 2004, but no later than the first intermediate survey after the ship age reaches 15 years
ship age < 10 years	When the ship age reaches 10 years. Where the due date of the first intermediate or special survey between 1 January 2004 and the date when the ship age reaches 10 years, the completion date may be the due date of the first intermediate or special survey after the ship age reaches 10 years.

This UR does not apply to CSR Bulk Carriers.

6.2 Survey requirements

6.2.1 Securing devices

(1) Panel hatch covers are to be secured by appropriate devices (bolts, wedges or similar) suitably spaced alongside the coamings and between cover elements. Arrangement and spacing are to be determined with due attention to the effectiveness for weather-tightness, depending upon the type and the size of the hatch cover, as well as on the stiffness of the cover edges between the securing devices. Rods or bolts are to have a net diameter not less than 19 mm for hatchways exceeding 5 m² in area.

(2) The following formula can be used to calculate the net sectional area of each securing device of the hatch cover, and the calculated value of the net sectional area is not to be less than:

$$A = 1.4a/f \quad \text{cm}^2$$

where: a = spacing between securing devices not to be taken less than 2 meters;

$$f = (\sigma_s/235)^e;$$

σ_s = specified minimum upper yield stress in N/mm² of the steel used for fabrication, not to be

taken greater than 70% of the ultimate tensile strength;

$$e = 0.75, \text{ for } \sigma_s > 235;$$

$$e = 1.0, \text{ for } \sigma_s \leq 235.$$

(3) Between cover and coaming and at cross-joints, a packing line pressure sufficient to obtain weather-tightness is to be maintained by the securing devices. The packing line pressure is to be specified. For packing line pressures exceeding 5 N/mm, the cross section area is to be increased in direct proportion.

(4) The cover edge stiffness is to be sufficient to maintain adequate sealing pressure between securing devices. The moment of inertia, I , of edge elements is not to be less than:

$$I = 6 pa^4 (\text{cm}^4)$$

where: p = packing line pressure in N/mm, minimum 5 N/mm, and a = spacing in m of securing devices.

(5) Securing devices are to be of reliable construction and securely attached to the hatchway coamings, decks or covers. Individual securing devices on each cover are to have approximately the same stiffness characteristics. Where rod cleats are fitted, resilient washers or cushions are to be incorporated. Where hydraulic cleating is adopted, a positive means is to be provided to ensure that it remains mechanically locked in the closed position in the event of failure of the hydraulic system.

6.2.2 Stoppers

(1) IACS UR S30 requirement for stoppers

1) No. 1 and 2 hatch covers are to be effectively secured, by means of stoppers, against the transverse forces arising from a pressure of 175 kN/m².

2) No. 2 hatch cover is to be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 175 kN/m².

3) No. 1 hatch cover is to be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 230 kN/m². This pressure may be reduced to 175 kN/m² if a forecastle is fitted.

4) The equivalent stress:

a) in stoppers and their supporting structures, and

b) calculated in the throat of the stopper welds is not to exceed the allowable value of $0.8 \sigma_s$. σ_s is the upper yield stress, in N/mm², of the material used.

(2) Hatch covers are to be fitted with stoppers in a way as shown in Figure 3.6-1 ; A range of stopper types are available for selection as shown in Figure 3.6-2 to Figure 3.6-7. Stoppers are not to be arranged in such way that will affect the open and close operation of hatch covers, and the clearance for stoppers is to be controlled within 10 mm. The end hinge of hinged covers may be considered as an effective stopper along the open/close direction of such hatch covers.

(3) Arrangement of stoppers

Foldable hatch cover (as shown in Figure 3.6-1 A): numbers of stoppers must be determined according to above-mentioned loads and the projected area of hatch covers, however, there shall be at least one stopper on each cover plate of each side, with a spacing of not greater than 4.5 m,

and at least 2 stoppers at each end with a spacing of not greater than 4.5 m.

Sliding hatch cover (as shown in Figure 3.6-1 B): numbers of stoppers must be determined according to above-mentioned loads and the projected area of hatch covers, however, there shall be at least 3 stoppers on each cover plate of each side, with a spacing of not greater than 4.5 m. And there shall be at least 2 stoppers on each cover plate of each end, with a spacing of not greater than 4.5 m.

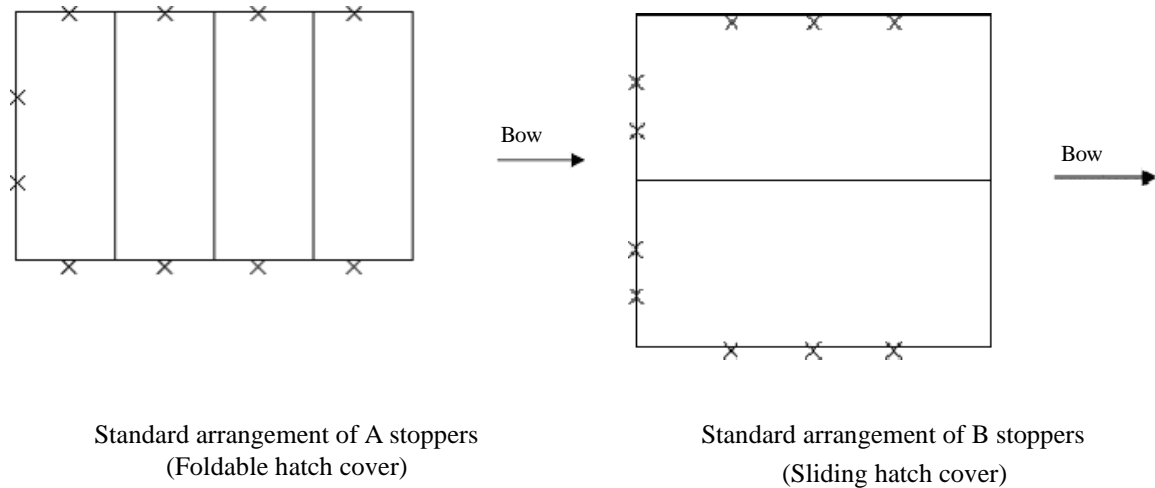


Figure 3.6-1

(4) Stopper types

Block type (as shown in Figures 3.6-2, 3.6-3, 3.6-4): size of horizontal section is not to be less than 350 x 70 mm.

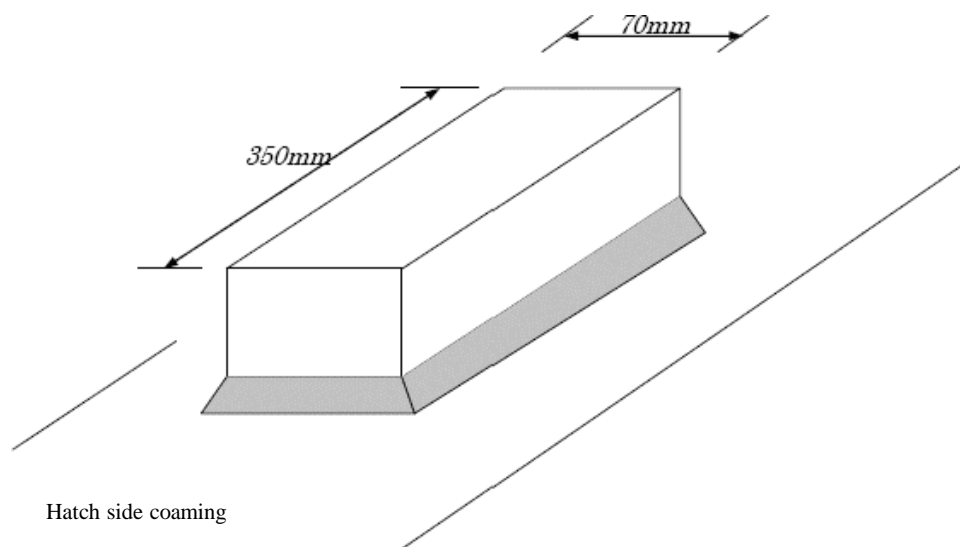


Figure 3.6-2 Block type stopper

Figure 3.6-3

Figure 3.6-4

Wedge type (as shown in Figures 3.6-5, 3.6-6): minimum horizontal section is not to be less than 350 x 70 mm.

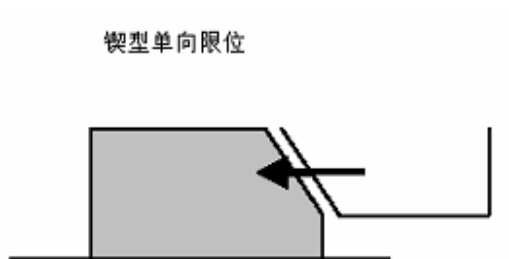


Figure 3.6-5

Figure 3.6-6

Plug-in type (as shown in Figure 3.6-7):

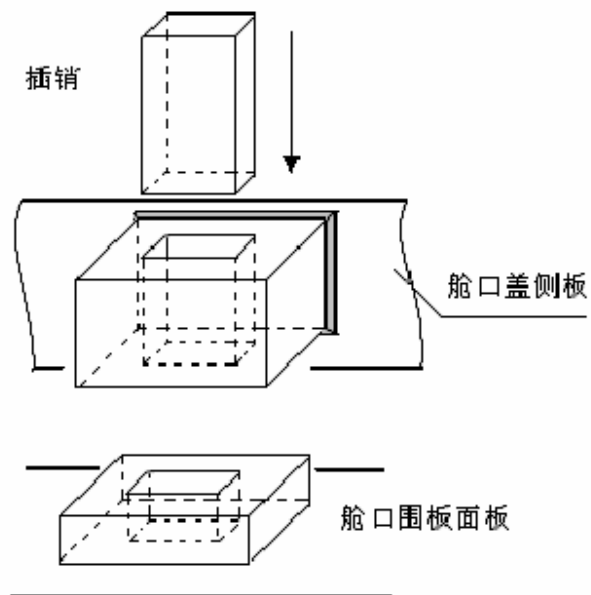


Figure 3.6-7

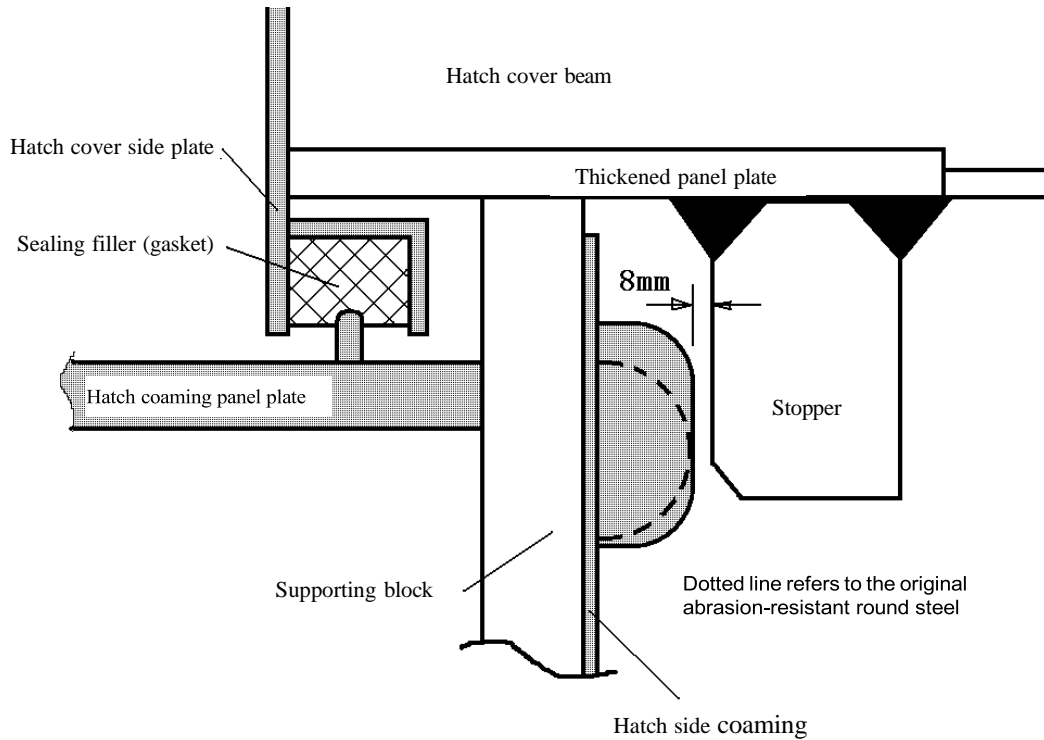


Figure 3.6-8 Schematic of stopper installation in the inner side of hatch cover

(5) Welding of stoppers

Stoppers are to be welded to the hatch side coaming or hatch cover plate by halfway penetration weld (as shown in Figure 3.6-9), taking into account the local strength of the installation position at hatch coamings and cover plates and, if necessary, structure of the installation position is to be suitably reinforced.

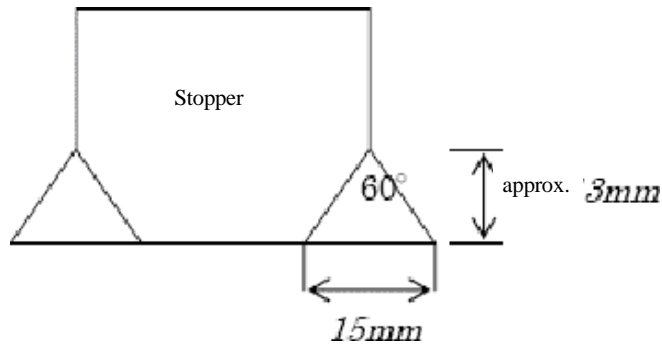


Figure 3.6-9 Welding of stoppers

Stoppers are to be installed at the pillar of the hatch side coaming (see Figure 3.6-10).

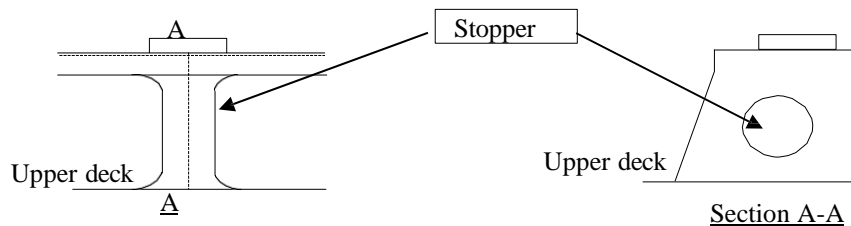


Figure 3.6-10

Where there is difficulty to install stoppers at the pillar position, additional brackets are required to reinforce the hatch side coaming below stoppers (see Figure 3.6-11).

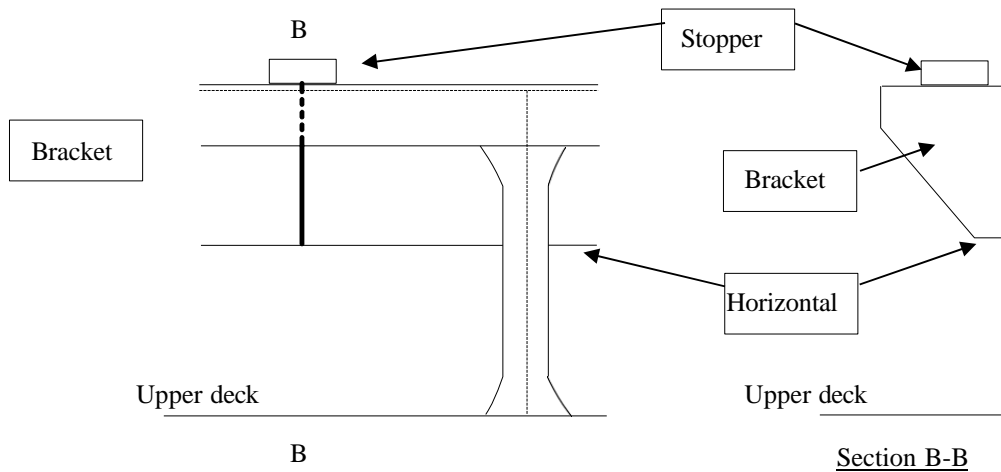


Figure 3.6-11

6.3 Requirements for survey report:

Where the survey unit receives an application from an applicable ship for intermediate, special or initial class survey, where applicable, attention is to be given during review of such application to the requirements of the implementation timetable and scope of application, verifying if this survey concerns the implementation of IACS UR S30. Site surveyor shall carry out the survey according to plans approved by the Plan Approval Center. Where modification is made to the hatch cover securing devices, a tightness test is to be performed for the hatch cover.

Annex 6.1 Implementation of IACS criteria of thickness and corrosion margin for cargo hold hatch covers and hatch coamings (IACS UR S21)

1. Criteria of thickness and corrosion margin for cargo hold hatch covers related to UR S21 (Rev.1) (Evaluation of Scantlings of Hatch Covers of Cargo Holds of Bulk Carriers)

(1) Scope of application:

These requirements apply to bulk carriers engaged in international voyages contracted for construction between 1 July 1998 and 31 December 2003.

(2) According to the provisions in section 11, Chapter 8, Part 2 of *the Rules for Classification of Sea-going Steel Ships*, each hatch cover located at position 1 specified in the *International Convention on Load Lines* is to be assessed, upon which the following table is to be completed:

Summary of assessment results according to UR S21 Rev.1 for "xx Bulk Carrier"

Description of hatch cover	Hatch cover No.1 - panel 1		
Plate no.	Description of members	t_{org} mm	t_{net} mm
1	Top plate 1		
2	Bottom plate 1		
Stiffener no.	Description of members	W_{org} cm ³	W_{net} cm ³
1	L1		
2	L6		
Major supporting member no.	Description of members	W_{org} cm ³	W_{net} cm ³
1	L3		
2	T1		
Description of hatch cover	Hatch cover No.2 - panel x		
Plate no.	Description of members	t_{org} mm	t_{net} mm
1	Top plate 1		
2	Bottom plate 1		
Stiffener no.	Description of members	W_{org} cm ³	W_{net} cm ³
1	L1		
2	L6		
Major supporting member no.	Description of members	W_{org} cm ³	W_{net} cm ³
1	L3		
2	T1		

In the above table, the symbols used are explained as follows:

T_{org} = as built thickness, in mm, of hatch cover members;

T_{net} = net thickness, in mm, as required by URS21 Rev.1;

W_{org} = section modulus, in cm³, calculated according to the as built scantlings of the hatch cover members;

W_{net} = net section modulus, in cm³, as required by URS21 Rev.1.

(3) Criteria of corrosion margin

For all the structure (plating and secondary stiffeners) of single skin hatch covers, the corrosion addition is to be 2.0 mm;

For double skin hatch covers, the corrosion addition is to be 2.0 mm for the top and bottom plating and 1.5 mm for the internal structures.

2. Criteria of thickness and corrosion margin for cargo hold hatch covers and hatch coamings related to UR S21 (Rev.3 and subsequent revisions) (Evaluation of Scantlings of Hatch Covers and Hatch Coamings of Cargo Holds of Bulk Carriers, Ore Carriers and Combination Carriers)

(1) Scope of application: These requirements apply to bulk carriers, ore carriers and combination carriers engaged in international voyages contracted for construction on or after 1 January 2004. The requirements do not apply to CSR Bulk Carriers.

(2) According to the provisions in section 11, Chapter 8, Part 2 of *the Rules for Classification of Sea-going Steel Ships*, each hatch cover located at position 1 specified in the *International Convention on Load Lines* is to be assessed, upon which the following table is to be completed:

Summary of assessment results according to UR S21 Rev.3 for "xx Bulk Carrier"

Description of hatch cover	Hatch cover No.1 - panel 1				
Plate no.	Description of members	t_{org} mm		t_{net} mm	
1	Top plate 1				
2	Bottom plate 1				
Stiffener no.	Description of members	W_{org} cm ³		W_{net} cm ³	
1	L1				
2	L6				
Major supporting member no.	Description of members	W_{org} cm ³		W_{net} cm ³	
1	L3				
2	T1				
Description of hatch cover	Hatch cover No.2 - panel x				
Plate no.	Description of members	t_{org} mm		t_{net} mm	
1	Top plate 1				
2	Bottom plate 1				
Stiffener no.	Description of members	W_{org} cm ³		W_{net} cm ³	
1	L1				
2	L6				
Major supporting member no.	Description of members	W_{org} cm ³		W_{net} cm ³	
1	L3				
2	T1				
Description of hatch cover	Hatch cover No.1 - hatch coaming				
Coaming no.	Description of members	t_{org} mm		t_{net} mm	
1	Transverse hatch coaming 1				
2	Longitudinal hatch coaming 1				
Stiffener no.	Description of members	W_{org} cm ³		W_{net} cm ³	
1	Longitudinal stiffener 1				
2	Transverse stiffener 1				
Coaming support	Description of members	Web plate t_{org} mm	Web plate t_{net} mm	W_{org} cm ³	W_{net} cm ³
1	Coaming support				

In the above table, the symbols used are explained as follows:

T_{org} = as built thickness, in mm, of hatch cover members;

T_{net} = net thickness, in mm, as required by URS21 Rev.3;

W_{org} = section modulus, in cm^3 , calculated according to the as built scantlings of the hatch cover members;

W_{net} = net section modulus, in cm^3 , as required by URS21 Rev.3.

(3) Criteria of corrosion margin

For all the structure (plating and secondary stiffeners) of single skin hatch covers, the corrosion addition is to be 2.0 mm;

For double skin hatch covers, the corrosion addition is to be 2.0 mm for the top and bottom plating and 1.5 mm for the internal structures.

The corrosion addition for the hatch coaming and coaming supports is to be 1.5 mm.

3. Criteria of thickness and corrosion margin for cargo hold hatch covers related to Annex I to Amendments to Annex B to *the Protocol of 1988 Relating to the International Convention on Load Lines, 1966, as amended*, and IACS UI LL70 (Corrosion Margin for Hatch Cover Design).

(1) Scope of application: These requirements are applicable to the hatch cover design of the following ship types the keels of which are laid or which are at a similar stage of construction on or after 1 January 2005:

- 1) bulk carriers, ore carriers and combination carriers as defined in UR Z11.2;
- 2) other types of ships.

(2) Explanation

1) In Annex I *Regulations for determining load lines*, to Amendments to Annex B to *the Protocol of 1988 Relating to the International Convention on Load Lines, 1966, as amended*, regulation 16 (5) reads:

All hatch covers shall be designed such that:

- (a) the product of the maximum stress determined in accordance with the above loads and the factor of 1.25 does not exceed the minimum upper yield point strength of the material in tension and the critical buckling strength in compression;
- (b) the deflection is limited to not more than 0.0056 times the span;
- (c) steel plating forming the tops of covers is not less in thickness than 1% of the spacing of stiffeners or 6 mm if that be greater; and
- (d) an appropriate corrosion margin is incorporated.

2) According to the *Regulations for determining load lines* specified in Annex I to Amendments to Annex B to *the Protocol of 1988 Relating to the International Convention on Load Lines, 1966, as amended*, assessment is to be made for each hatch cover located in position 1 and 2 and above, as described in the *International Convention on Load Lines, 1966, as amended*.

(3) Criteria of corrosion margin (IACS unified interpretation for Regulation 16 (5) (d)):

The “appropriate corrosion margin” for hatch covers of cargo holds in position 1 and 2 and above,

defined as the corrosion addition t_s , is:

1) for Bulk Carriers, Ore Carriers and Combination Carriers, as defined in UR Z11.2:

1.1) single skin hatch covers, a corrosion addition $t_s = 2.0$ mm for all plating and stiffeners;

1.2) double skin hatch covers, a corrosion addition $t_s = 2.0$ mm for top and bottom plating and $t_s = 1.5$ mm for the internal structure.

2) for other vessels:

2.1) single skin hatch covers, a corrosion addition $t_s = 2.0$ mm for all plating and stiffeners;

2.2) double skin hatch covers, a corrosion addition $t_s = 1.5$ mm for top and bottom plating and $t_s = 1.0$ mm for the internal structure. Corrosion addition $t_s = 1.0$ mm for the single skin or double skin hatch covers in way of cellular cargo holds intended for containers.

2.4 Implementation requirements

(1) In accordance with UR S21 (Rev.1 and Rev.3) and relevant requirements of the Regulations for determining load lines specified in Annex I to Amendments to Annex B to *the Protocol of 1988 Relating to the International Convention on Load Lines, 1966, as amended*, the plan approval surveyor of each Plant Approval Center shall calculate and evaluate, using relevant calculation software, the hatch covers and their members as well as the hatch coamings and their members for applicable ships (including approved ships), upon completion of which an evaluation report shall be prepared. Upon completion of the evaluation report, the plan approval surveyor shall endorse and stamp the report with his/her plan approval seal, with one copy kept for archiving, and one copy each mailed respectively to relevant shipping company or management company (for storage on-board) and the Classed Ship In Service Department of Classification Division.

(2) When a site surveyor is conducting relevant survey on site, he or she may obtain the evaluation report from on-board or the Classed Ship In Service Department of Classification Division, and carry out the survey in accordance with the following steel renewal and reinforcement criteria for hatch covers and hatch coamings as well as gauged results at site.

2.5 Steel renewal and reinforcement criteria for hatch covers and hatch coamings are given as follows:

(1) Steel renewal and reinforcement criteria for hatch covers: for the top and bottom plating of double skin hatch covers and all structures of single skin hatch covers that have a corrosion addition $t^s = 2.0$ mm, steel renewal is required where the gauged thickness is less than $t_{net} + 0.5$ mm; where the gauged thickness is within the range $t_{net} + 0.5$ mm and $t_{net} + 1.0$ mm, coating or annual gauging may be adopted as an alternative to steel renewal, as shown in the following table:

$t_{ghk} < t_{net} + 0.5$	Members shall be renewed, and the plate thickness after renewal is to be equal to the original as built thickness
$t_{net} + 0.5 \leq t_{ghk} < t_{net} + 1.0$	Coating applied to the steel members in accordance with the coating manufacturer's requirements or annual gauging may be adopted as means of monitoring
$t_{ghk} \geq t_{net} + 1.0$	Good

Note: t_{ghk} refers to the gauged thickness

(2) For the top and bottom plating of double skin hatch covers and all structures of single skin hatch covers in way of cellular cargo holds intended for containers, in compliance with paragraph 3.2 of section 3, that have a corrosion addition $t_s = 1.0$ mm, steel renewal is required where the gauged

thickness is less than t_{net} ; where the gauged thickness is within the range t_{net} and $t_{net} + 0.5$ mm, coating or annual gauging may be adopted as an alternative to steel renewal, as shown in the following table:

$t_{ghk} < t_{net}$	Members shall be renewed, and the plate thickness after renewal is to be equal to the original as built thickness
$t_{net} \leq t_{ghk} < t_{net} + 0.5$	Coating applied to the steel members in accordance with the coating manufacturer's requirements or annual gauging may be adopted as means of monitoring
$t_{ghk} \geq t_{net} + 0.5$	Good

Note: t_{ghk} refers to the gauged thickness

(3) Steel renewal and reinforcement criteria for hatch coamings: for ships to which UR S21 (Rev.3) is applicable, steel renewal is required where the gauged thickness of hatch coaming members is less than $t_{net} + 0.5$ mm; where the gauged thickness is within the range $t_{net} + 0.5$ mm and $t_{net} + 1.0$ mm, coating or annual gauging may be adopted as an alternative to steel renewal, as shown in the following table:

$t_{ghk} < t_{net} + 0.5$	Members shall be renewed, and the plate thickness after renewal is to be equal to the original as built thickness
$t_{net} + 0.5 \leq t_{ghk} < t_{net} + 1.0$	Coating applied to the steel members in accordance with the coating manufacturer's requirements or annual gauging may be adopted as means of monitoring
$t_{ghk} \geq t_{net} + 1.0$	Good

Note: t_{ghk} refers to the gauged thickness

(4) When a site surveyor performs relevant surveys of hatch covers and hatch coamings for applicable ships, corrosion margin is to be controlled in accordance with the above specified criteria in this annex, rather than the requirements of "Corrosion Control of Hull Structures of Operational Ships" as specified in the *Rules for Classification of Sea-Going Steel Ships*.

(5) Depending on external plating corrosion and deformation conditions, the surveyor shall carry out gauging to the internal structures of double skin hatch covers where plating renewal is required or he/she deems necessary, and renewal of internal structures is required if the gauged thickness is less than t_{net} .

Section 7 Upgrading of renewal criteria for side shell frames of cargo holds - Renewal Criteria for Side Shell Frames and Brackets in Single Side Skin Bulk Carriers not Built in Accordance with IACS UR S12 (IACS UR S31)

7.1 Scope of application

These requirements apply to the side shell frames and brackets of cargo holds bounded by the single side shell of bulk carriers constructed with single deck, topside tanks and hopper tanks in cargo spaces intended primarily to carry dry cargo in bulk, which were not built in accordance with UR S12 Rev. 1 or subsequent revisions, and also apply to the side shell frames and brackets of cargo holds bounded by the single side shell of Oil/Bulk/Ore (OBO) carriers, as defined in UR Z11 but of single side skin construction.

In the case a bulk carrier as defined above does not satisfy above definition in one or more holds, the requirements in UR S31 do not apply to these individual holds.

Bulk Carriers subject to these requirements are to be assessed for compliance with the requirements of IACS UR S31 and steel renewal, reinforcement or coating, where required, of side shell frames and brackets, is to be carried out in accordance with the following schedule and at subsequent intermediate and special surveys.

Ship age by 1 January 2004	Implementation timetable
15 years ≤ ship age	By the due date of the first intermediate or special survey after 1 January 2004
10 years ≤ ship age < 15 years	By the due date of the first special survey after 1 January 2004
ship age < 10 years	When the ship age reaches 10 years.

Single side skin OBO Carriers subject to these requirements are to be assessed for compliance with the requirements of IACS UR S31 and steel renewal, reinforcement or coating, where required, of side shell frames and brackets, is to be carried out in accordance with the following schedule and at subsequent intermediate and special surveys.

Ship age by 1 July 2005	Implementation timetable
15 years ≤ ship age	By the due date of the first intermediate or special survey after 1 July 2005
10 years ≤ ship age < 15 years	By the due date of the first special survey after 1 July 2005
ship age < 10 years	When the ship age reaches 10 years.

Notes:

- (1) Finite element or other numerical analysis or direct calculation procedures cannot be used as an alternative to compliance with the requirements of this UR, except in cases of unusual side structure arrangements or framing to which the requirements of this UR cannot be directly applied.
- (2) Where ships are reinforced to comply with an ice class notation, the intermediate frames may not be required to comply with the requirements of this section. The renewal thicknesses for the additional structure required to meet

the ice strengthening notation, besides side shell frames, are to be based on the Society's requirements.

7.2 Implementation procedures for plan approval and site surveys

7.2.1 For bulk carriers subject to these requirements, the shipowners may apply as soon as possible, according to the timetable, to the Plan Approval Center of this Society for evaluation.

Relevant plans are to be submitted to the Plan Approval Center at least 2 weeks before the ship enters the shipyard. An evaluation report will be prepared upon completion of evaluation and calculation by the Plan Approval Center with preliminary repair recommendations proposed.

Evaluation work is to be carried out in accordance with the procedures of ship plan approval of this Society, and the evaluation report is to be endorsed by the calculating and examining persons respectively, and stamped with the business seal of the unit.

The evaluation report is normally to be prepared in quadruplicate, with two copies to be returned to the shipowner, one to be sent to the survey unit, and one to be kept at the Classification Division of the ISC headquarters for archiving.

The shipowner must submit the following plans to the Plan Approval Center of the Society:

- A. Midship traverse section plans
- B. Typical side shell framing structure plans (including structure plans for topside tanks, hopper tanks and double bottoms)
- C. Shell expansion plans
- D. General arrangement plan
- E. Loading manual
- F. Thickness gauging report of cargo hold side shell frames (This thickness gauging report refers to the old report, which is only used as reference for calculation and evaluation).

7.2.2 The Plan Approval Center shall re-examine compliance with IACS UR S12 (Rev.1 or subsequent revisions) of bulk carriers the keels of which were laid on or after 31 December 1998. Where the requirements of IACS UR S12 (Rev.1 or subsequent revisions) are met, the Plan Approval Center shall notify in written, in the form of plan approval letter, the applicant, the Classification Division of ISC Headquarters and the site survey unit in a timely manner.

7.2.3 Renewal and reinforcement measures

Note 1: Symbol definitions:

t_M = thickness as measured, in mm

t_{REN} = thickness at which renewal is required, in mm

$t_{REN, d/t}$ = thickness criteria based on d/t ratio, in mm

$t_{REN, S}$ = thickness criteria based on shear strength, in mm

$t_{REN, B}$ = thickness criteria based on bending strength, in mm

$t_{COAT} = 0.75 t_{S12}$

t_{S12} = thickness in mm as required by UR S12 (Rev.3) in S12.3 for frame webs and in S12.4 for upper and lower bracket webs

t_{AB} = thickness as built, in mm

t_{REN_Min} = minimum thickness at which renewal is required, in mm

Note 2: Zoning of side shell frames

According to the requirements, the side shell frames and brackets of cargo holds are divided into four zones A, B, C and D, as shown in Figure 3.7-1:

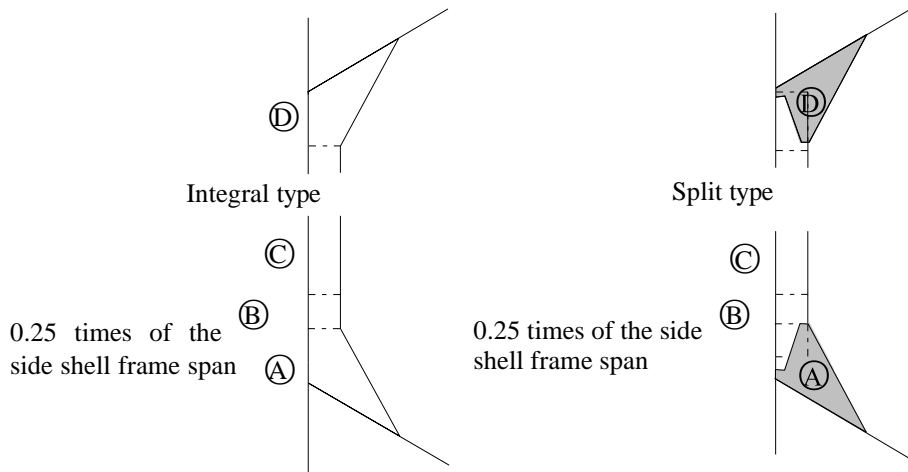


Figure 3.7-1 Zones of side shell frames

7.2.3.1 Renewal criteria and reinforcement measures

(1) When $t_M \leq t_{REN}$, side shell frame and bracket webs are to be renewed, and the minimum plate thickness at which renewal is required is to be no less than t_{REN_Min} .

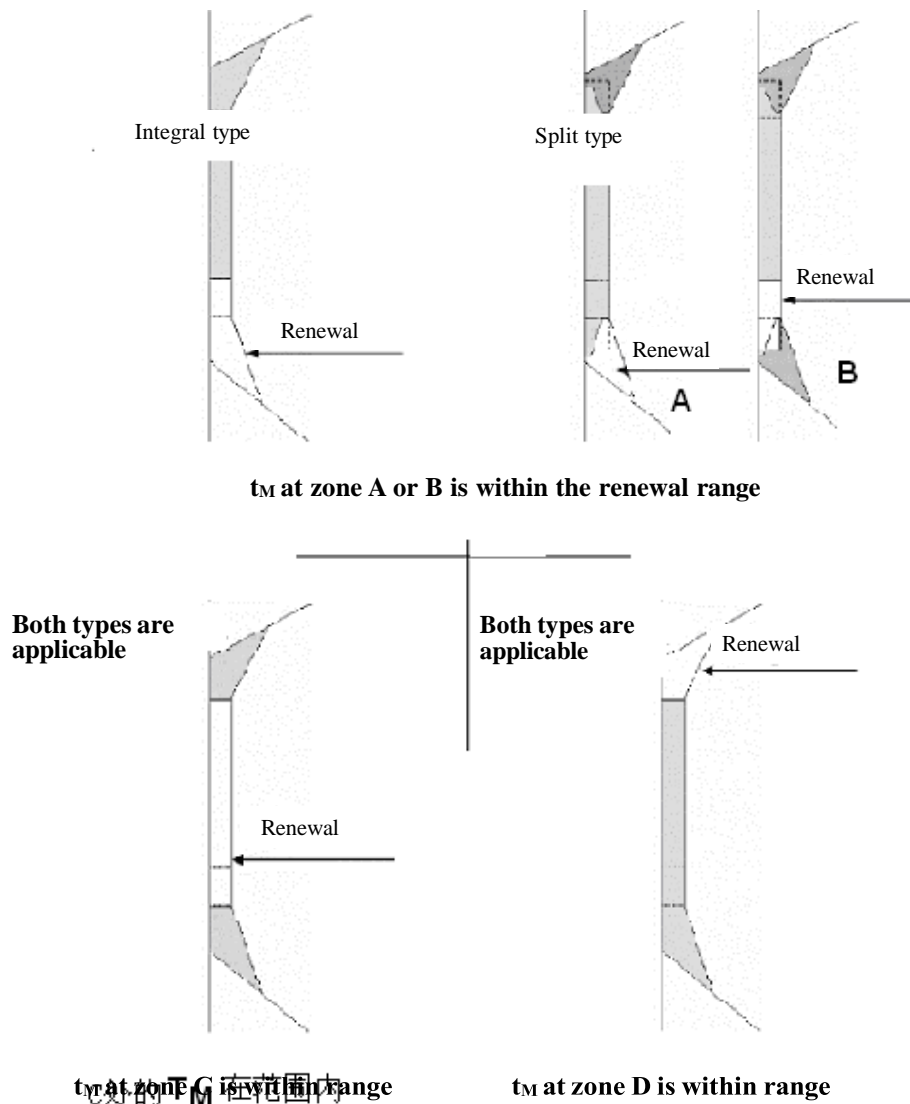


Figure 3.7-2 Schematic of side shell frame renewal

(2) When $t_{REN} < t_M \leq t_{COAT}$, unless there is no thickness diminution when structure members are compared to the as built thickness and the coating is in “as-new” condition (i.e. without breakdown or rusting), measures are to be taken, consisting of all the following:

- 1) Sand blasting, or equivalent, and coating;
- 2) Fitting tripping brackets in accordance with section 4 (5), when the above condition occurs for any of the side frame zones A, B, C and D. Tripping brackets not connected to flanges are to have soft toe, and the distance between the bracket toe and the frame flange is not to be greater than about 50 mm;
- 3) Maintaining the coating in "as-new" condition (i.e. without breakdown or rusting) at Special and Intermediate Surveys.

When the coating is in GOOD condition, sand blasting and coating as required in 1) above may be waived even if not found in “as-new” condition, provided that tripping brackets are fitted and the coating damaged in way of the tripping bracket welding is repaired.

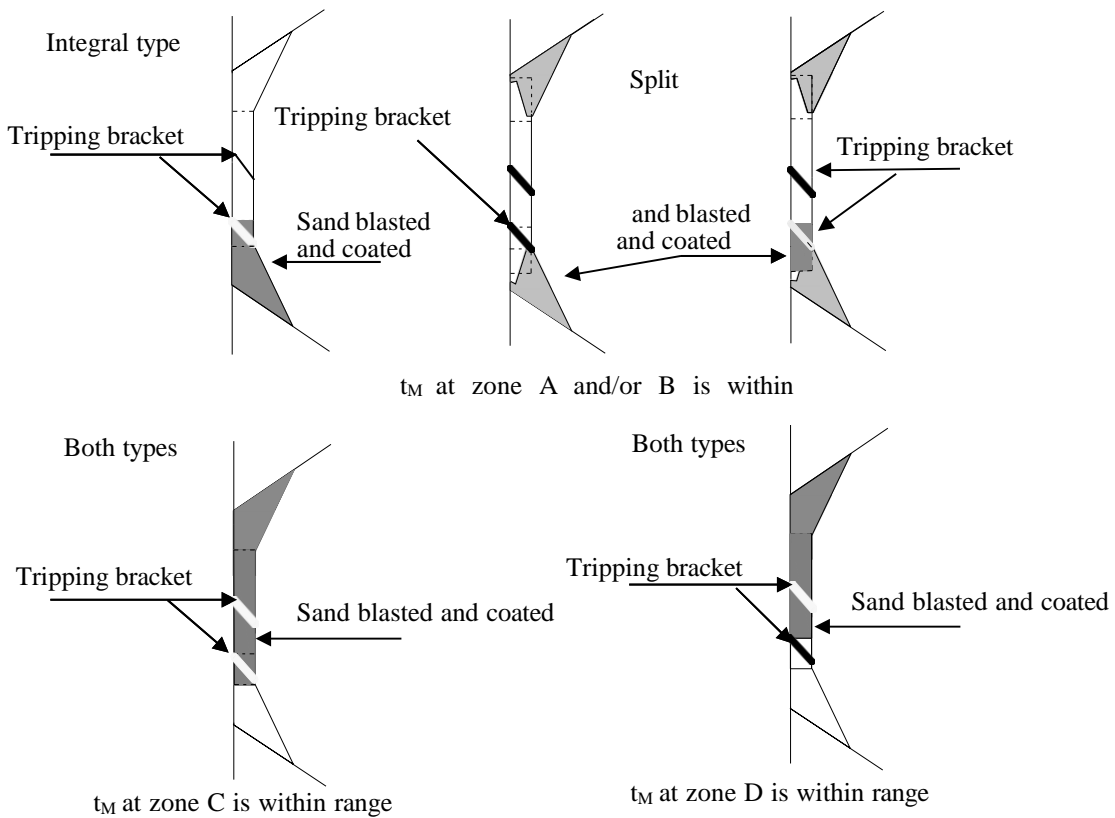


Figure 3.7-3 Measures to be taken when $t_{REN} < t_M \leq t_{COAT}$

(3) When the measured thickness t_M for the lower web of side shell frame is less than $t_{REN, d/t}$:

1) Where the measured thickness t_M of section b) at zone B is less than $t_{REN, d/t}$, tripping brackets are to be fitted to meet the requirements for the ratio of web width to thickness of the side shell frame, see Figure 3.7-6.

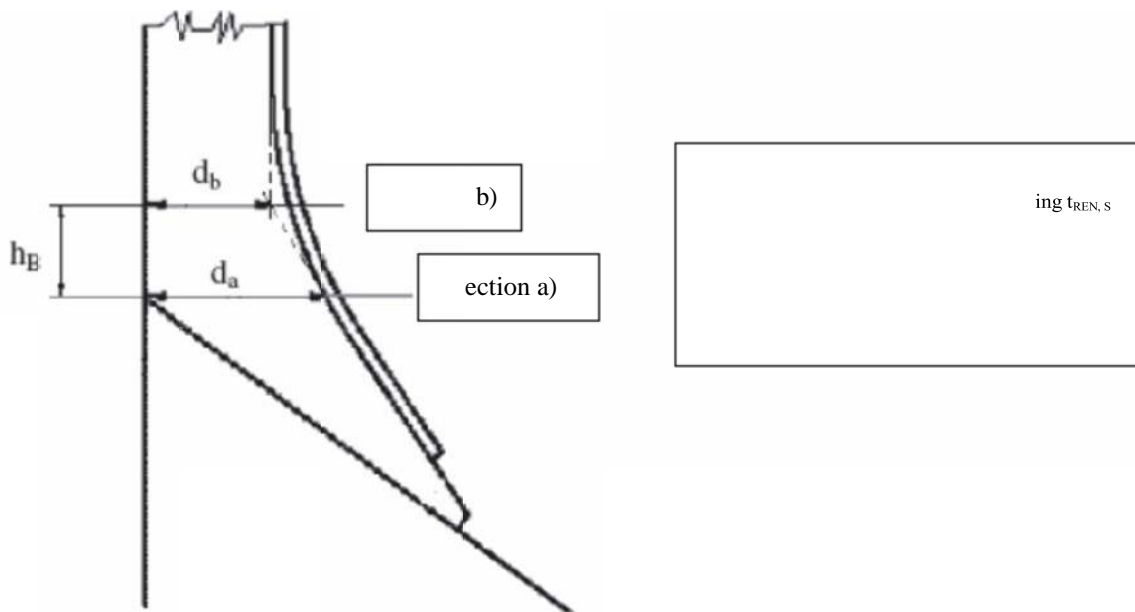


Figure 3.7-4

2) Where the measured thickness t_M of the bracket at zone A is less than $t_{REN, d/t}$, stiffeners are to be fitted so that the ratios of maximum width between plating and stiffener, stiffener and stiffener, stiffener and face plate to thickness meet requirements. For width measurement of integral bracket webs, see Figure 3.7-5.

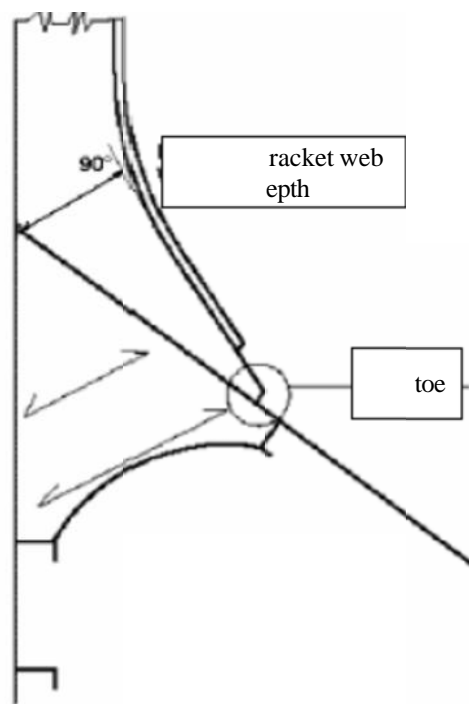


Figure 3.7-5 Definition of the lower bracket web depth for determining $t_{REN, d/t}$

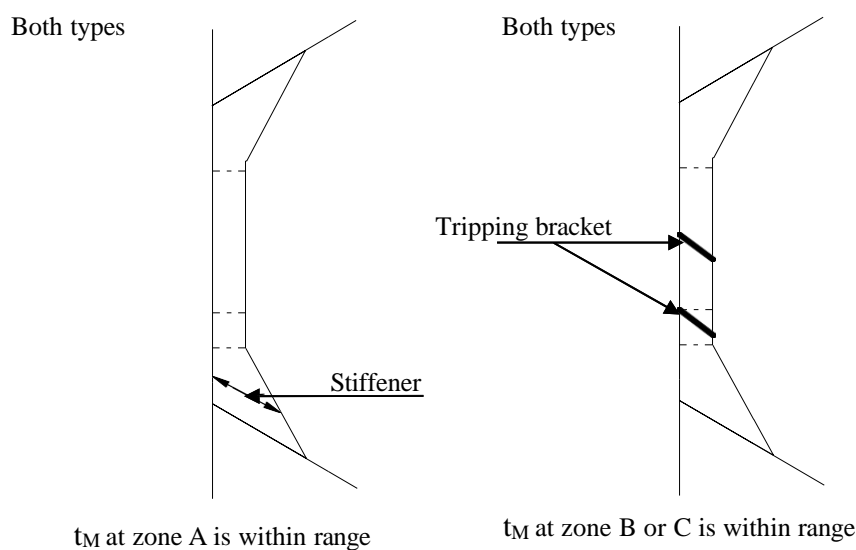


Figure 3.7-6 Reinforcement when $t_M < t_{REN, d/t}$

(4) When the lower bracket web depth does not comply with requirements of section 8.3.4.3 under Part 2 of the *Rules for Classification of Sea-Going Steel Ships*, see Figure 3.7-7, the actual measured section modulus of section a) and b) is not to be less than the required value: $Z_a = \frac{1000P_{fr,a}h}{m\sigma_a}$ and

$$Z_b = \frac{1000P_{fr,a}h}{m\sigma_b}, \text{ that is, } t_M \geq t_{REN, B}.$$

Where the calculated value of $t_{REN, B}$ in the evaluation report prepared by the Plan Approval Center is "*", it indicates that the bending strength complies with requirements, and further evaluation is not necessary. Where the measured thickness of webs at zone A or B is within the range $T_{REN} < t_M < T_{REN, B}$ (Or the actual measured section modulus is less than Z_a and Z_b respectively), any one of the following measures is to be taken for the side shell frame and bracket: ① renewal; ② face plate reinforcement by doubling plate.

After adoption of renewal or reinforcement measures, the section modulus of side shell frame and bracket shall be no less than 1.2 Z_a and 1.2 Z_b respectively. However, if corrosion margin of face plate at zone A or B areas is greater than 25% of the original as built thickness, renewal measures must be taken for face plate at corresponding zone.

Where doubling strips are used to reinforce face plate at zone A and B to ensure bending strength, width of the used doubling strips is to be no less than 80% of the face plate width, and thickness of the strips is to be no less than the as built thickness of the face plate, see Figure 3.7-8. Where the shape of lower bracket is corrected or the face plate is replaced to thick plate, the plans shall be approved by the ISC Plan Approval Center in advance, see Figure 3.7-9.

When lower end brackets were not fitted with flanges at the design stage, flanges are to be fitted so as to meet the bending strength requirements. The full width of the bracket flange is to extend up beyond the point at which the frame flange reaches full width. Adequate back-up structure in the hopper is to be ensured, and the bracket is to be aligned with the back-up structure.

The bending check needs not to be carried out in the case the bracket geometry is modified so as to comply with S12 (Rev.3) requirements.

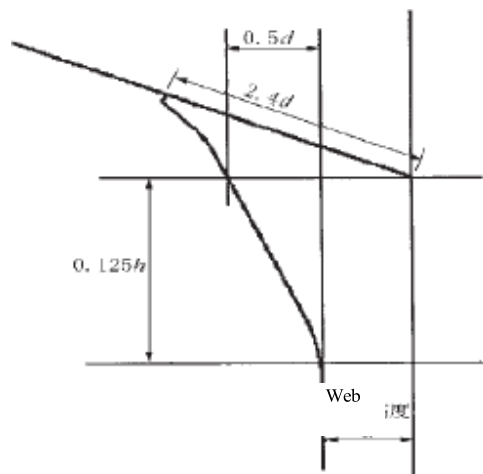


Figure 3.7-7 Bracket web depth as required by section 8.3.4.3 under Part 2 of the *Rules for*

Classification of Sea-Going Steel Ships

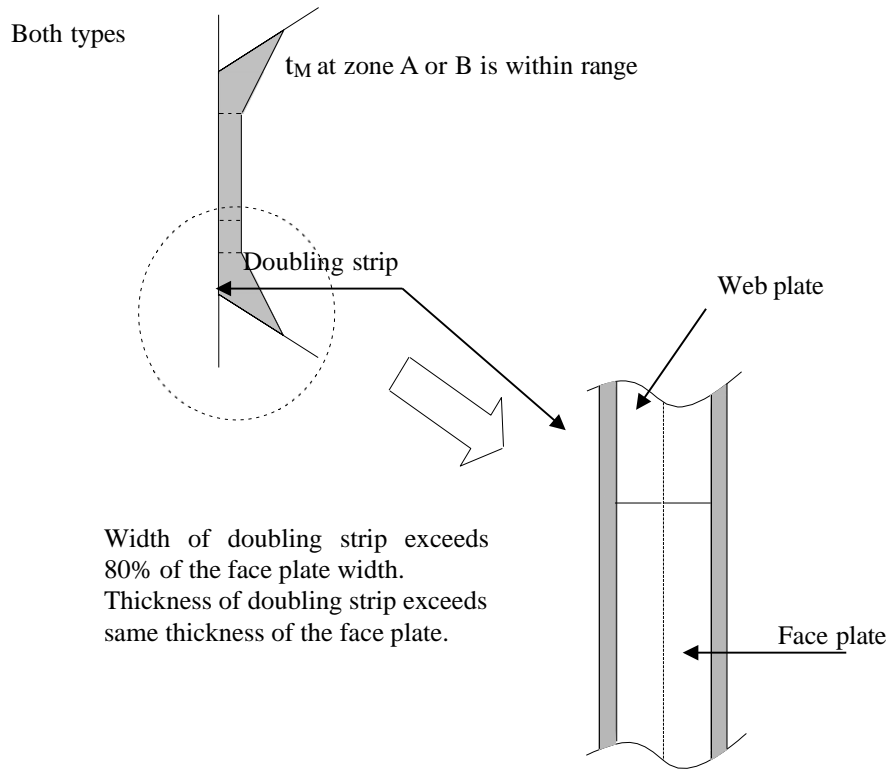


Figure 3.7-8

- Where renewal at Zone A and/or B is required, web thickness is not to be less than the t_{new} value according to the preliminary evaluation.
- Split type face plate width and integral face plate width/thickness is equal to the original value.

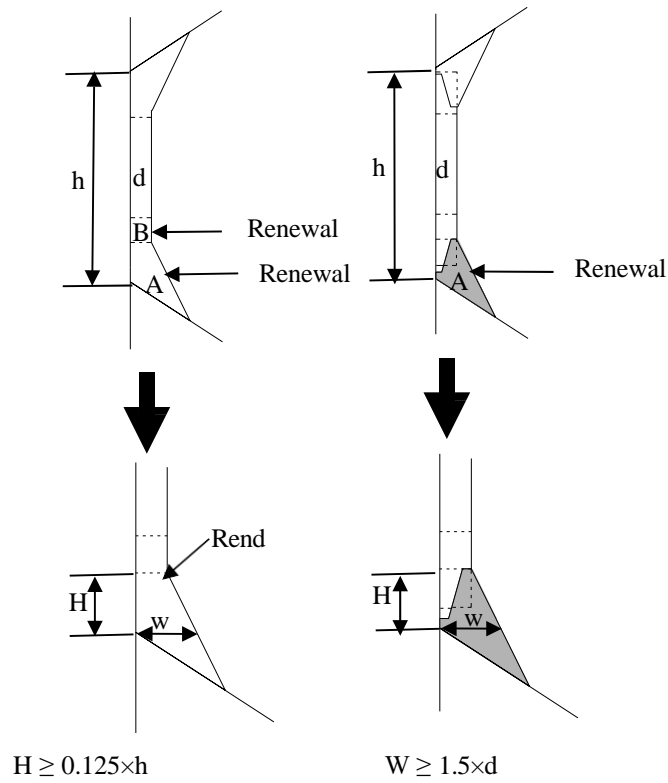


Figure 3.7-9 Lower bracket shape correction for compliance with UR S12 Rev.3

(5) partial renewal of the side shell webs in cargo holds is not allowed (see Figure 3.7-10). At UR S31 confirmatory survey, partial renewal as shown in Figure 3.7-10 is not acceptable, even if it is caused by mechanical damage or local corrosion. The renewed plate thickness is not to be less than t_{REN} .

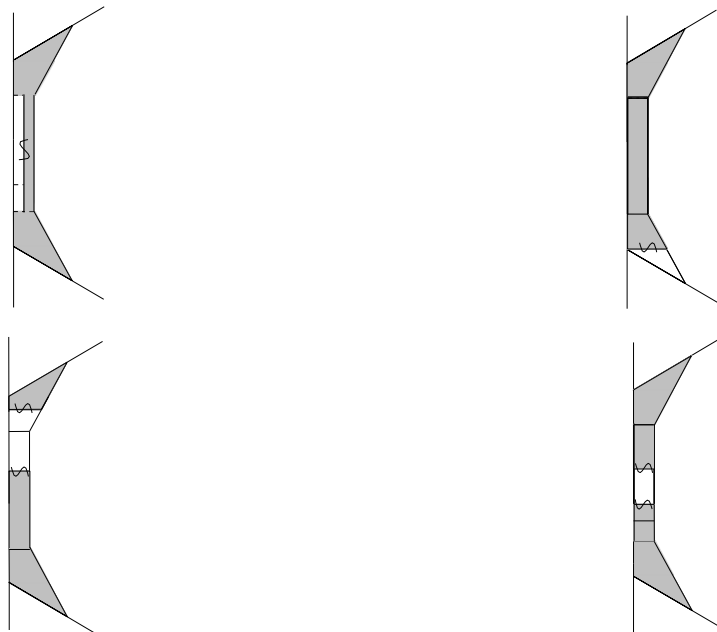


Figure 3.7-10 Example of improper repair (insufficient renewal)

7.2.3.2 Specific technical requirements

(1) In accordance with IACS UR S31 requirements, for the purpose of steel renewal, sand blasting and coating, four zones A, B, C and D are defined, and representative thickness measurements are to be taken for each zone, to check if they meet the criteria. When zone B is made up of different plate thicknesses, the lesser thickness is to be used for the application of the requirements in S31. Where a particular zone does meet the criteria, and steel renewal, sand blasting and coating is required, the following provisions shall be complied with:

- ①. In case of integral brackets, when the criteria are not satisfied for zone A or B, steel renewal, sand blasting and coating, as applicable, are to be done for both zones A and B;
- ②. In case of separate brackets, when the criteria are not satisfied for zone A or B, steel renewal, sand blasting and coating is to be done for each one of these zones, as applicable;
- ③. When steel renewal is required for zone C, it is to be done for both zones B and C. When sand blasting and coating is required for zone C, it is to be done for zones B, C and D;
- ④. When steel renewal is required for zone D, it needs only to be done for this zone. When sand blasting and coating is required for zone D, it is to be done for both zones C and D.

(2) Special consideration for thickness gauging may be given by the Society to zones previously renewed or re-coated, if found in “as-new” condition (i.e., without breakdown or rusting). (Upon completion of survey by the survey unit, digital pictures of corresponding members are to be emailed to the Classification Division of the ISC headquarters.)

(3) When renewal is adopted, surface treatment and coating is to be applied in compliance with the requirements of UR Z9 for cargo holds of newly built ships. The scope of coating is to cover corresponding areas of close-up survey and thickness gauging.

(4) Where, according to the requirements of evaluation, a limited number of side frames and brackets are shown to require coating over part of their length, the following criteria apply:

- ① The part to be coated includes:
 - the web and the face plate of the side frames and brackets;
 - the hold surface of side shell, hopper tank and topside tank plating, as applicable, over a width not less than 100 mm from the web of the side frame;
- ② Epoxy coating or equivalent is to be applied;
- ③ All the surfaces to be coated are to be sand blasted prior to coating application.

(5) When flanges of frames or brackets are to be renewed according to URS31, the outstanding breadth to thickness ratio is to comply with the requirements in Chapter 8, Part 2 of the *Rules for Classification of Sea-Going Steel Ships*.

(6) Reinforcing measures of adding tripping brackets

Where it is deemed necessary to fit tripping brackets upon assessment, tripping brackets (flat plate) can be located at the lower part and at midspan of side frames. Tripping brackets may be located at every two frames, but lower and midspan brackets are to be fitted in line between alternate pairs of frames. The thickness of the tripping brackets is to be not less than the as-built thickness of the side frame webs to which they are connected. Double continuous welding is to be adopted for the connections of tripping brackets to the side shell frames and shell plating.

Where side frames and side shell are made of Higher Strength Steel (HSS), Normal Strength Steel (NSS) tripping brackets may be accepted, provided the electrodes used for welding are those required for the particular HSS grade, and the thickness of the tripping brackets is equal to the frame web thickness, regardless of the frame web material.

(7) Weld throat thickness

In case of side shell renewal or reinforcement by tripping brackets, the welded connections are to comply with requirements of the Society's rules.

Annex 7.1 Guidelines for the Thickness Measurements of Side Shell Frames and Brackets in Single-side Skin Bulk Carriers Required to Comply with UR S31

1 General

Thickness measurements should be conducted to determine the general condition of the structure and to define the extent of possible steel renewals or other measures for the webs and flanges of side shell frames and brackets for verification of the compliance with UR S31.

2 Zones of side shell frames and brackets

For the purpose of steel renewal, sand blasting and coating, four zones A, B, C and D are defined as shown in figure 1. Zones A and B should be considered the most critical zones.

3 Pitting and grooving

Pits can grow in a variety of shapes, some of which should be ground before assessment. Pitting corrosion may be found under coating blisters, which should be removed before inspection.

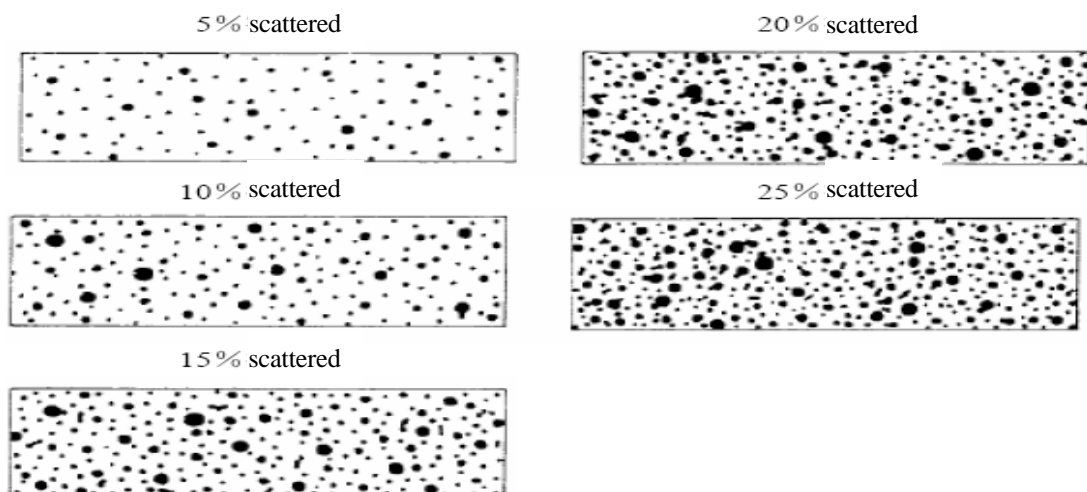
To measure the remaining thickness of pits or grooving the normal ultrasonic transducer (generally 10 mm diameter) will not suffice. A miniature transducer (3 ~ 5 mm diameter) should be used. Alternatively the firm conducting the thickness measurement should use a pit gauge to measure the depth of the pits and grooving and calculate the remaining thickness.

In cases where pitting intensity is higher than 15%, then an area of 300 mm diameter or more at the most pitted part, should be cleaned, where applicable, to bare metal, and the thickness measured in way of the five deepest pits within the cleaned area. The least thickness measured in way of any of these pits is to be taken as the thickness to be recorded.

The minimum acceptable remaining thickness in any pit or groove is equal to:

- 75 per cent of the as built thickness, for pitting or grooving in the cargo hold side frame webs and flanges.
- 70 per cent of the as built thickness, for pitting or grooving in the side shell, hopper tank and topside tank plating attached to the cargo hold side frame, over a width up to 30 mm from each side of it.

Pitting intensity diagrams (from 5 to 25% intensity)



4 Thickness measurement methodology

Representative thickness measurements should be taken for each zone as specified below.

Special consideration to the extent of the thickness measurements may be given by ISC HQ, if the structural members show no thickness diminution with respect to the as built thicknesses and the coating is found in "as new" condition (i.e. without breakdown or rusting).

Where thickness measurement readings close to the criteria are found, the number of hold frames to be measured should be increased. If renewal or other measures according to UR S31 should be applied on individual frames in a hold, then all frames in that hold should have thickness measurements taken. Thickness measurements for planned renewal of hold frames may be exempted.

4.1 Gaugings for Zones A, B and D

Web plating

The pattern for thickness measurements in Zones A, B and D should be a five-point pattern. The five-point pattern should be over the depth of the web and the same area vertically. The thickness measurement report should reflect the average reading. See Figure 3.7-11.

4.2 Thickness measurements for Zone C

Web plating

Depending on the condition of the web in way of Zone C, the web may be measured by taking three readings over the length of Zone C and averaging them. The average reading should be compared with the allowable thickness. If the web plating has general corrosion then this pattern should be expanded to a five-point pattern as noted above. See Figure 3.7-11.

5 Report on thickness measurement of cargo hold frames required by UR S31

Use form TM7-BC S31 to record thickness measurement results.

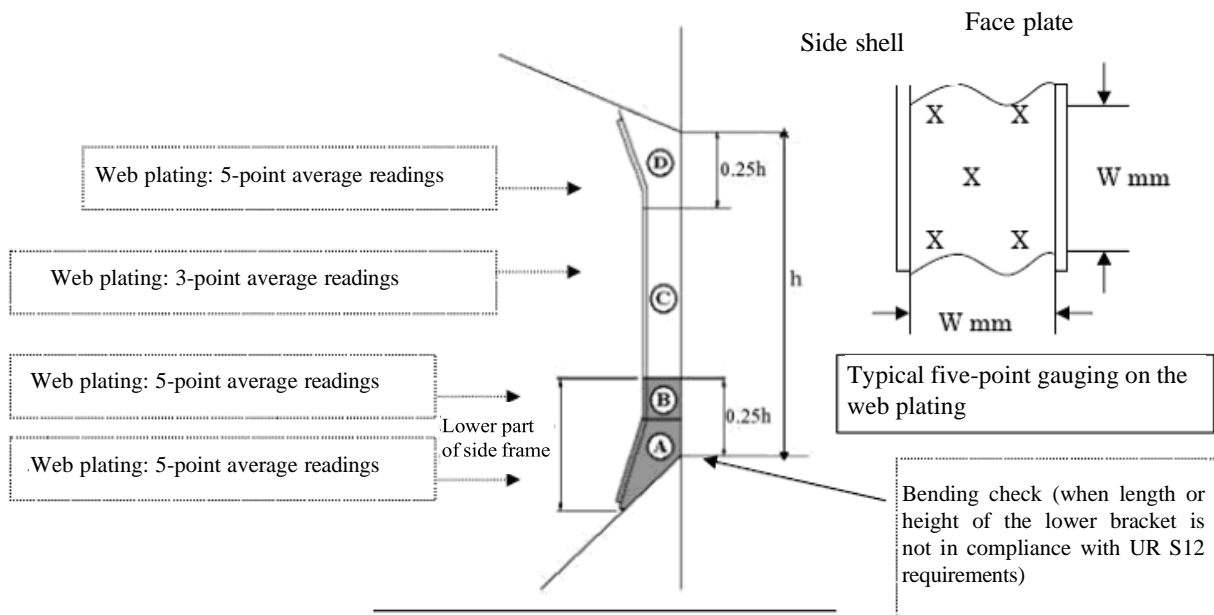


Figure 3.7-11

Section 8 Restrictions from sailing with any hold empty - SOLAS regulation XII/14

Relevant requirements concerning restrictions on carriage of heavy loads for bulk carriers

8.1 Application

(1) Scope of application (see Annex 8.1):

These requirements apply to bulk carriers that meet all of the following conditions:

- (a) Bulk carriers of 150 m in load line length and upwards of single-side skin construction, carrying cargoes having a density of 1.78 t/m³ and above;
- (b) Ships contracted for construction before 1 July 1998 and the keels of which were laid or which were at a similar stage of construction before 1 July 1999; and
- (c) Ships not meeting the requirements for withstanding flooding of any one cargo hold as specified in SOLAS regulation XII/5.1 and the standards and criteria for side structures of bulk carriers of single-side skin construction as specified in IACS UR S12 (Rev.3) or UR S31.

(2) Implementation

For ships reaching 10 years or more of age on 1 July 2006: to be implemented by July 1, 2006.

For ships less than 10 years of age on 1 July 2006: to be implemented by the date when the ships reaches 10 years of age.

8.2 Specific requirements

Bulk carriers subject to paragraph 8.1(1) shall not sail with any hold loaded to less than 10% of the hold's maximum allowable cargo weight when in the full load condition after the implementation date as specified in paragraph 8.1(2). The applicable full load condition mentioned in this regulation is a load equal to or greater than 90% of the ship's deadweight at the relevant assigned freeboard. (see Annex 8.2)

8.3 Implementation flow chart

For implementation flow chart of SOLAS regulation XII/14, please refer to Annex 8.1 Implementation flow chart of restrictions from sailing with any hold empty. For applicable ships, which are bulk carriers of 150 m in length and upwards of single-side skin construction, carrying cargoes having a density of 1,780 kg/m³ and above, ISC HQ will give the following corresponding memo in the SSMIS system:

MGxx: Effected on July 1, 2006 of SOLAS Reg. XII/14, the vessel, after reaching 10 years of age, is not allowed to sail in full load condition with any cargo hold loaded to less than 10% of the hold's Max. allowable cargo weight unless meeting the structural strength requirements in SOLAS Reg. XII/5.1 and the standards and criteria for side structures of bulk carriers of single-skin construction, Res. MSC.168 (79). The applicable full load condition is a load equal to or greater than 90% of the ship's deadweight at the relevant assigned freeboard.

(1) Ships already constructed or assessed in accordance with IACS UR S17, S18 and S20 may be deemed as compliance with structure strength requirements with any one hold in flooded condition as specified in SOLAS regulation XII/5.1. Bulk carriers designed according to IACS UR S12 and complying with its requirements, or ships failed to comply with UR S12 upon evaluation,

yet assessed and reinforced according to UR S31, may be deemed as compliance with requirements of structure strength standards and renewal criteria for single-side skin construction adopted by resolution MSC. 168 (79). For such bulk carriers (according to IACS unified requirements, normally bulk carriers contracted for construction on or after 1 July 1998), the shipowners shall contact the HQ of this Society or corresponding Plan Approval Center for compliance verification. For ships complying with structure strength requirements with any one hold in flooded condition as specified in SOLAS regulation XII/5.1 and requirements of structure strength standards and renewal criteria for single-side skin construction adopted by resolution MSC. 168 (79), or of which compliance with these requirements is verified, the Plan Approval Center of the Society will issue a certification document. Such certification document must be attached to the cover page of the load manual, and one copy is to be sent to the Classification Division of the ISC HQ by the Plan Approval Center. The document shall include the following contents:

THIS IS TO CERTIFY that, the vessel is evaluated as per requirements of SOLAS Reg. XII/14 and the results is in compliance with structural strength requirements both of SOLAS Reg. XII/5.1 and IMO Res. MSC.168(79). The vessel, while carrying cargoes of density 1.78 t/m^3 or greater, is allowed to sail with no restriction of any cargo hold loaded to less than 10% of the hold's maximum allowable cargo weight when the ship is loaded to a load equal to or greater than 90% of the ship's deadweight at the relevant assigned freeboard.

(2) For ships not meeting requirements as specified in SOLAS regulation XII/5.1 and resolution MSC.168 (79), or the above-mentioned equivalent UR S requirements, following methods as specified in (3) load restrictions or (4) modification assessment may be adopted to eliminate the memo item. It is usually difficult for bulk carriers constructed before 1 July 1998 to meet structure strength requirements with any one hold in flooded condition as specified in SOLAS regulation XII/5.1 and requirements of structure strength standards and renewal criteria for single-side skin construction adopted by resolution MSC. 168 (79). Considering modification costs may be higher than the economic benefits it may bring, the method of (3) load restriction is recommended to shipowners of such ships. In case that the owners prefer structure assessment and modification, relevant plans are to be submitted to the Plan Approval Center of the Society according to requirements specified under paragraph (4). Upon assessment and calculation and/or compliance of the modification with relevant requirements, procedures specified under paragraph (1) will be handled. Approved assessment or verification results and relevant certification documents are to be kept on-board for future inspection.

(3) Load restriction

If not meeting structure strength requirements with any one hold in flooded condition as specified in SOLAS regulation XII/5.1 and requirements of structure strength standards and renewal criteria for single-side skin construction adopted by resolution MSC. 168 (79), on or after 1 July 2006 or when the ship reaches 10 years of age, whichever is later, such ships are not allowed to sail with any hold loaded to less than 10% of the hold's maximum allowable cargo weight when in the full load condition. The shipowners may, before the above-mentioned schedule, apply to the Society for an interim survey (or in combination with other surveys), upon completion of which the surveyor of the Society will attach a label with the following contents onto the cover pages of load manual and booklet as required by SOLAS regulation VI/7.2 and stamp with the survey seal:

From July 1, 2006 or at ten years of age, whichever is later, the vessel, while carrying cargoes of density 1.78 t/m^3 or greater, shall not sail with any cargo hold loaded to less than 10% of the hold's

maximum allowable cargo weight when the ship is loaded to a load equal to or greater than 90% of the ship's deadweight at the relevant assigned freeboard.

In the meantime, such ships shall be permanently marked (welded or chiseled) on the side shell at midships, port and starboard, with a solid equilateral triangle having sides of 500 mm and its apex 300 mm below the deck line, and painted a contrasting colour to that of the hull. During survey, the surveyor of the Society shall confirm this triangle symbol.

For ships with reinforced for heavy cargoes notation that alternate hold loading is allowed, the survey unit shall also issue an Interim Certificate of Classification, re-assigning corresponding class notations:

“Holds Nos. xxx May Be Empty With Restrictions Imposed By SOLAS XII/14”

(4) Assessment and modification of bulk carriers not constructed in accordance with IACS UR S12, S17, S18 and S20 (normally refers to bulk carriers contracted for construction before 1 July 1998)

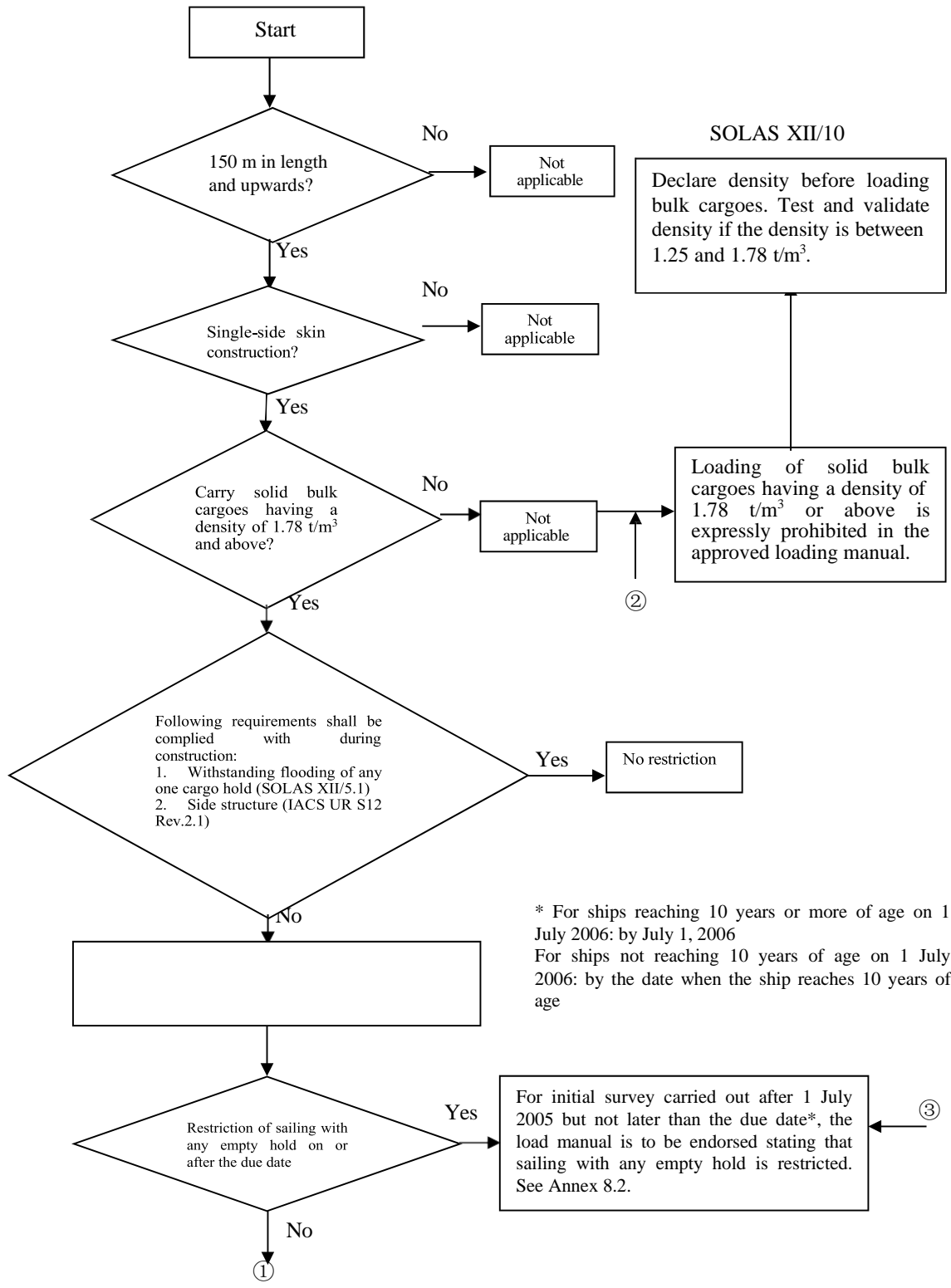
The following are to be complied with by the shipowners and design units:

- IACS UR S17, S18 and S20
- IACS UR S12 or S31
- Damage stability requirements with any one cargo hold in flooded condition

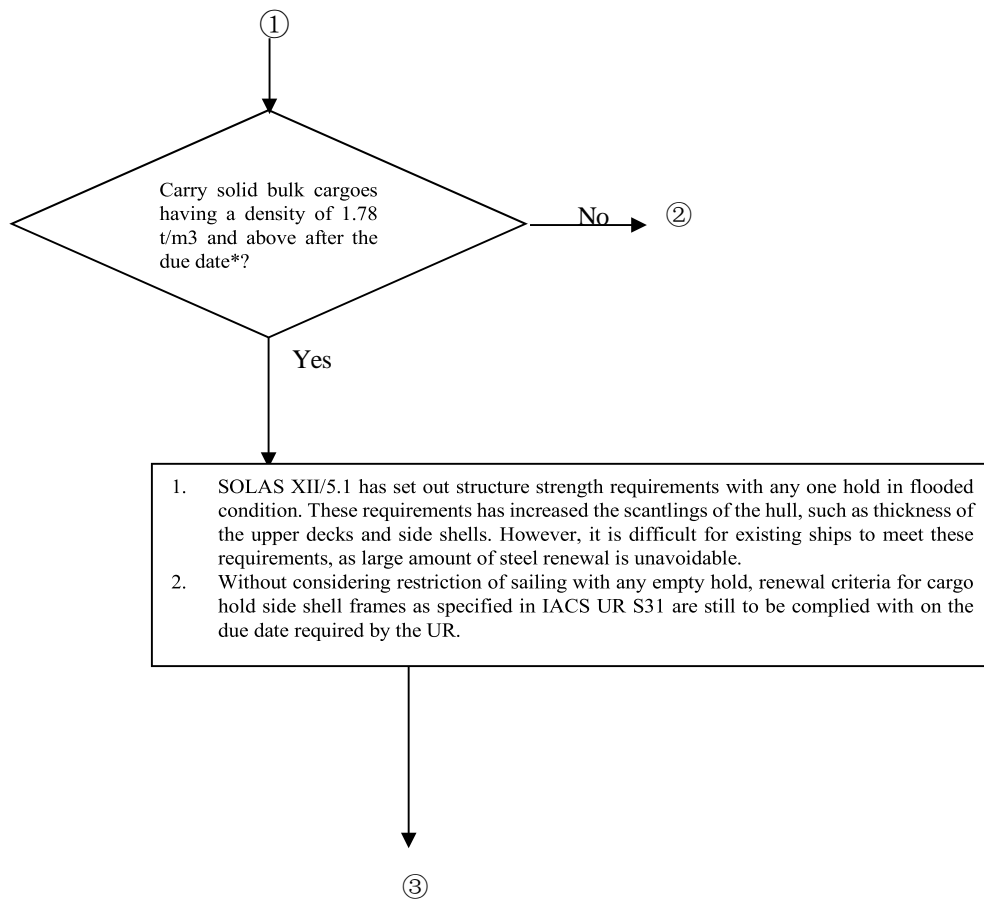
The required assessment report and the accepted modification scheme as well as relevant plans are to be submitted to the Plan Approval Center of the Society for approval.

Depending on the assessment of the specific ship, the Plan Approval Center of the Society will determine the scope of the plans for approval, including re-approval of the revised loading manual, as well as if a tilting test is necessary due to increase of the hull steel. Where relevant requirements are met upon review by the Plan Approval Center and the modification survey is found satisfactory by the surveyor of the Society, where applicable, the Plan Approval Center will proceed with the procedures as specified in paragraph (1).

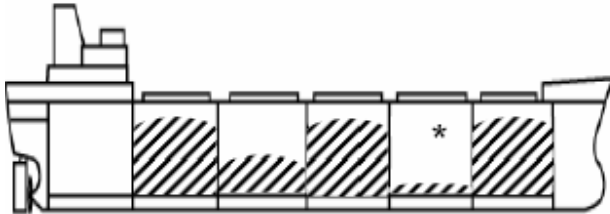
Annex 8.1 Implementation flow chart of restrictions from sailing with any hold empty (SOLAS regulation XII/14)



* For ships reaching 10 years or more of age on 1 July 2006: by July 1, 2006
For ships not reaching 10 years of age on 1 July 2006: by the date when the ship reaches 10 years of age

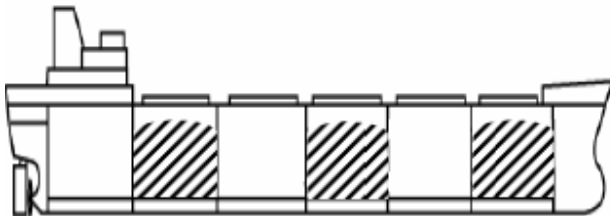


Annex 8.2 Example of restrictions from sailing with any hold empty (loading of solid bulk cargoes having a density of 1.78 t/m³ or above)



Draft \cong draft equivalent to 90% of the weight-carrying capacity *
* any hold loaded to less than 10% of the hold's maximum allowable cargo weight

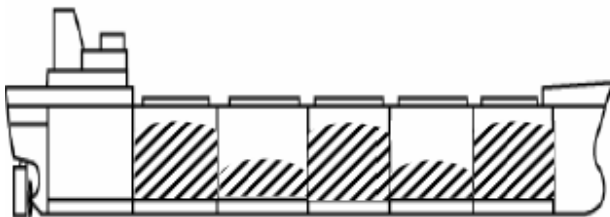
Example 1 not acceptable



Draft $<$ draft equivalent to 90% of the weight-carrying capacity

Example 2 acceptable

(Other restrictions specified in the loading manual/stability documents are to be followed)



Draft \cong draft equivalent to 90% of the weight-carrying capacity.
Any hold loaded to equal to or greater than 10% of the hold's maximum allowable cargo weight.

Example 3 acceptable

(Other restrictions specified in the loading manual/stability documents are to be followed)

Section 9 Relevant requirements regarding the issuance of *Certificate of Compliance for the Carriage of Solid Bulk Cargoes*

9.1 Scope of application

SOLAS regulation VI/1-2 as amended by MSC.269 (85) provides that the carriage of solid bulk cargoes other than grain shall be in compliance with the relevant provisions of the IMSBC Code. This Amendment has incorporated IMSBC Code as a mandatory statutory requirement.

IMSBC Code is applicable to all ships carrying solid bulk cargoes, and there is no requirement for the date of having keels laid. After the new amendments to IMSBC Code enter into force, the Code as amended will be applied to all applicable ships. These amendments may have different requirements on cargoes, and could affect the validity of the certificate of compliance for the carriage of cargoes.

9.2 Technical requirements

9.2.1 Category of cargoes

Solid bulk cargoes to which IMSBC Code is applicable are divided into three categories:

Group A consists of cargoes which may liquefy if shipped at a moisture content in excess of their transportable moisture limit;

Group B consists of cargoes which possess a chemical hazard which could give rise to a dangerous situation on a ship;

Group C consists of cargoes which are neither liable to liquefy nor to possess chemical hazards.

9.2.2 Targeting on major hazards for carriage of solid bulk cargoes such as structure damage caused by improper stowage of cargoes, stability diminution or loss during voyage, chemical reactions between cargoes, the IMSBC Code is aimed to promote the safety of stowage and navigation through provision of hazard information of solid bulk cargo transportation and procedural guidelines for expected carriage of solid bulk cargoes.

9.2.3 General loading, carriage and unloading precautions

To handle with major hazards for carriage of solid bulk cargoes, the IMSBC Code has provided the general principles of preventing the structure being overstressed and aiding stability during operation as well as precautions such as preparation and inspection during loading and unloading.

9.2.4 Safety of personnel and ship

(1) For certain chemical hazards from solid bulk cargoes, including poisoning, corrosive, dust and asphyxiation hazards, the Code has set out personal safety measures, which are also general principles, specific details can be referred to in corresponding measures for each cargo with different hazards.

(2) The Code has also set out ventilation measures for different hazards. It is to be noted that, when continuous ventilation is required for the cargo, the ventilators shall comply with relevant requirements of not shutting down the ventilators for installations as specified in the Load Line Convention.

9.2.5 Cargoes which may liquefy

Cargoes which may liquefy refers to group A cargoes as listed in Appendix 1 Individual

schedules of solid bulk cargoes to the IMSBC Code, including concentrates, coals and other substances with similar physical properties. When the moisture content exceeds their transportable moisture limit (TML), cargoes may move due to liquefaction, forming extra torque that could sabotage ship stability.

Ships that are specially equipped or constructed may carry cargoes with a moisture content in excess of their transportable moisture limit (TML), provided that corresponding requirements for plan approval and survey are met.

Except ships that are specially equipped or constructed, other ships are only allowed to carry cargoes with a moisture content no exceeding their transportable moisture limit (TML), and relevant preventive measures are also specified in the IMSBC Code. Prior to or during carriage of cargoes, the ship side is to monitor the moisture content of the cargoes. Besides relevant moisture content certificates provided the owner of cargoes, the crew members may adopt simple methods to determine the moisture content. Attention shall be also given to the variation of moisture content caused by bad weather.

9.2.6 Substances with chemical hazards

Group B substances as listed in Appendix 1 Individual schedules of solid bulk cargoes to the IMSBC Code have chemical hazards that may cause danger on-board. Some of these substances have already been categorized as dangerous goods in accordance with *the International Maritime Dangerous Goods Code* (IMDG Code), while others belong to materials hazardous only in bulk (MHB).

Chapter 4 Additional Requirements for New-building Bulk Carriers

General

In recent years, IMO and IACS have issued a series of regulations for bulk carriers, setting out additional requirements for further enhancing the safety of bulk carriers from areas such as structure, survey, loading, management and etc. Some of these additional requirements, such as revision of the definition of bulk carrier, also bring an enforcement that lacks uniformity. Here below is a brief summary of the additional requirements for bulk carriers issued by IMO and IACS in recent years.

Section 1 Access to and within spaces in, and forward of, the cargo area

1.1 Scope of application

This section applies to bulk carriers of 20,000 GT and over, as defined in SOLAS regulation IX/1, constructed on or after January 1, 2006.

1.2 Technical requirements

1.2.1 Means of access to cargo and other spaces

1.2.1.1 Each space shall be provided with means of access to enable, throughout the life of a ship, overall and close-up inspections and thickness measurements of the ship's structures to be carried out by the Administration, the company, as defined in regulation IX/1, and the ship's personnel and others as necessary. Such means of access shall comply with the requirements of paragraph 1.2.4 and with the *Technical provisions for means of access for inspections*, adopted by the Maritime Safety Committee by resolution MSC.133 (76), as may be amended by the International Maritime Organization.

1.2.1.2 Where a permanent means of access may be susceptible to damage during normal cargo loading and unloading operations or where it is impracticable to fit permanent means of access, the Administration may allow, in lieu thereof, the provision of movable or portable means of access, as specified in the Technical provisions, provided that the means of attaching, rigging, suspending or supporting the portable means of access forms a permanent part of the ship's structure. All portable equipment shall be capable of being readily erected or deployed by ship's personnel.

1.2.1.3 The construction and materials of all means of access and their attachment to the ship's structure shall be to the satisfaction of the Administration. The means of access shall be subject to survey prior to, or in conjunction with, its use in carrying out surveys in accordance with SOLAS regulation I/10.

1.2.2 Safe access to cargo holds, cargo tanks, ballast tanks and other spaces

1.2.2.1 Safe access to cargo holds, cofferdams, ballast tanks, cargo tanks and other spaces in the cargo area shall be direct from the open deck and such as to ensure their complete inspection. Safe access to double bottom spaces or to forward ballast tanks may be from a pump-room, deep

cofferdam, pipe tunnel, cargo hold, double hull space or similar compartment not intended for the carriage of oil or hazardous cargoes.

1.2.2.2 Each cargo hold shall be provided with at least two means of access as far apart as practicable. In general, these accesses should be arranged diagonally, for example one access near the forward bulkhead on the port side, the other one near the aft bulkhead on the starboard side.

1.2.3 Documents

1.2.3.1 Ship structure access manual

An updated copy of Ship structure access manual shall be kept on board, and as a minimum the English version should be provided. All permanent and alternate means of access to carry out overall and close-up inspections and thickness measurements shall be described in a Ship structure access manual approved by the Administration.

The so-called "permanent means of access" means an access that is an integral part of the hull structure. "Alternate means of access" means portable or movable means of access that can be used for inspections and thickness measurement at areas that a permanent means of access cannot lead to. Portable facilities such as ladders, ramps, scaffolds and etc. that do not exceed 5 m in length are called portable means of access.

Movable means of access normally refers to hydraulic arm fitted with a stable base, wire lift platform, rafting, and etc. Portable means of access shall be stored on board. Movable means of access normally are provided by shore-based suppliers, rather than kept on-board.

The Ship structure access manual shall include the following for each space:

- (1) plans showing the means of access to the space, with appropriate technical specifications and dimensions;
- (2) plans showing the means of access within each space to enable an overall inspection to be carried out, with appropriate technical specifications and dimensions;
- (3) the plans shall indicate from where each area in the space can be inspected;
- (4) plans showing the means of access within the space to enable close-up inspections to be carried out, with appropriate technical specifications and dimensions. The plans shall indicate the positions of critical structural areas, whether the means of access is permanent or portable and from where each area can be inspected;
- (5) instructions for inspecting and maintaining the structural strength of all means of access and means of attachment, taking into account any corrosive atmosphere that may be within the space;
- (6) instructions for safety guidance when rafting is used for close-up inspections and thickness measurements;
- (7) instructions for the rigging and use of any portable means of access in a safe manner;
- (8) an inventory of all portable means of access;
- (9) records of periodical inspections and maintenance of the ship's means of access.

1.2.3.2 Requirements for contents of the ship structure access manual

The manual shall contain at least the following two parts:

Part 1: Plans, instructions and inventory required by paragraphs (1) to (8). This part is to be approved by the Administration or the Classification Societies 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 is to be approved for its form only at new building.

The following matters are to 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 Manual, i.e. any changes of the PMA, 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 classification societies recognized by the Administration.
- (3) Verification of PMA be part of safety construction survey for continued effectiveness of the PMA in that space, which is subject to the statutory survey.
- (4) Inspection of PMA by the crew and/or a competent inspector of the company as a part of regular inspection and maintenance.
- (5) Actions to be taken if PMA is found unsafe to use.
- (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.

Special attention is to be given that, "critical structural areas" as mentioned in Ship structure access manual are locations which have been identified from calculations to require monitoring or from the service history of similar or sister ships to be sensitive to cracking, buckling, deformation or corrosion which would impair the structural integrity of the ship.

1.2.4 Technical requirements

1.2.4.1 General technical specifications for access openings

(1) For access through horizontal openings, hatches or manholes, the dimensions shall be sufficient to allow a person wearing a self-contained air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also provide a clear opening to facilitate the hoisting of an injured person from the bottom of the space. The minimum clear opening shall not be less than 600 mm x 600 mm. When access to a cargo hold is arranged through the cargo hatch, the top of the ladder shall be placed as close as possible to the hatch coaming. Access hatch coamings having a height greater than 900 mm shall also have steps on the outside in conjunction with the ladder.

(2) For access through vertical openings, or manholes, in swash bulkheads, floors, girders and web frames providing passage through the length and breadth of the space, the minimum opening shall be not less than 600 mm x 800 mm. If a vertical opening is at a height of more

than 600 mm steps and handgrips are to be provided. The minimum clear opening of not less than 600 mm x 800 mm may also include an opening with corner radii of 300 mm. For members such as the longitudinals and brackets of the double bottom, where large opening may not be advantageous to the structural strength, an opening of 600 mm x 800 mm may be adopted.

(3) Subject to verification of easy evacuation of 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 acceptable alternative to the traditional opening of 600 mm x 800 mm with corner radii of 300 mm. See the figure below.

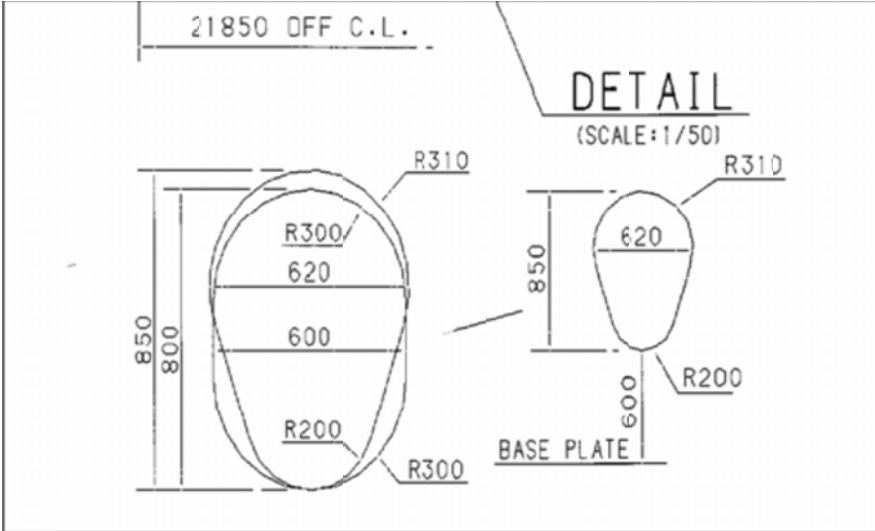


Figure 4.1-1

1.2.4.2 Technical requirements for permanent means of access

Please refer to relevant technical provisions as specified in MSC resolutions MSC.134 (76), MSC.133 (76), MSC.151 (78), MSC. 158(78), MSC.194 (80) and MSC circulars MSC /circ.1107 as well as the unified interpretations of IACS UI SC 191.

Here below is a PMA structure arrangement for reference:

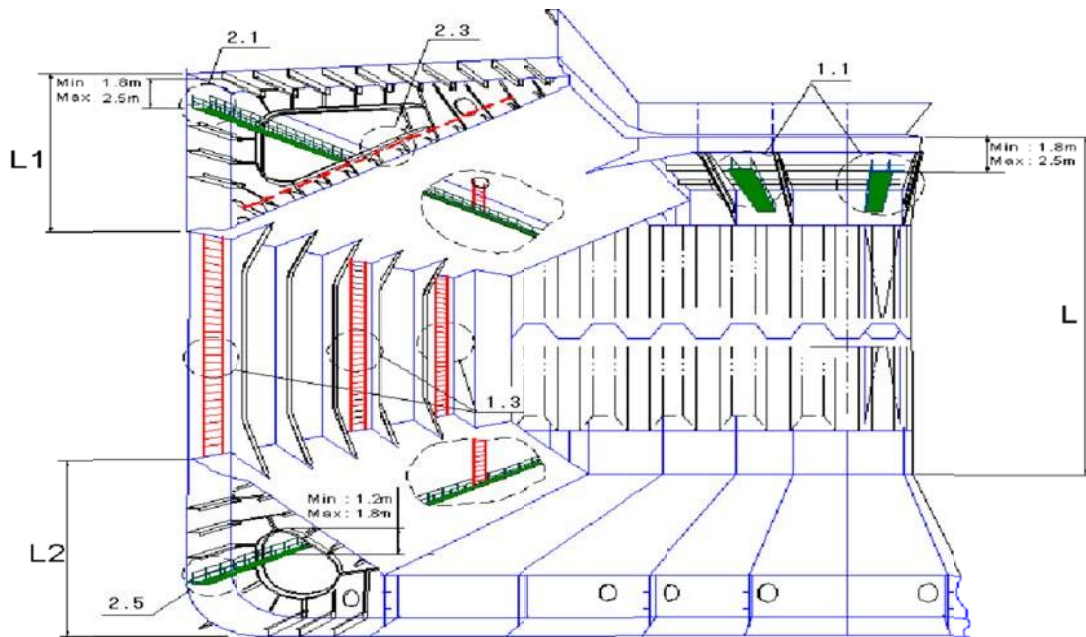
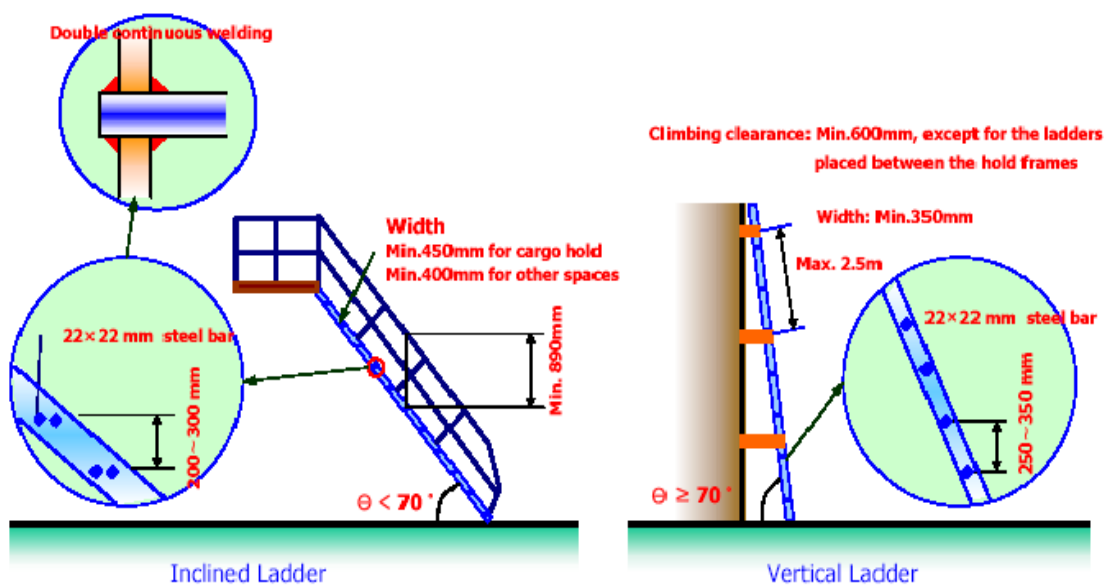


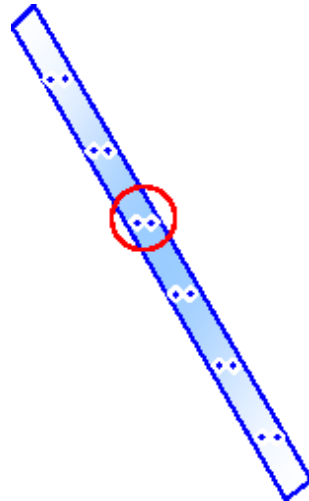
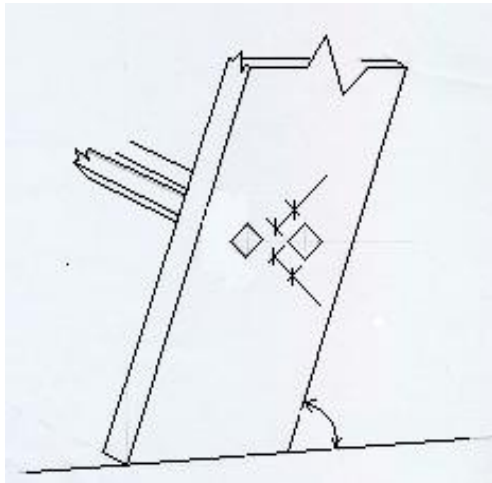
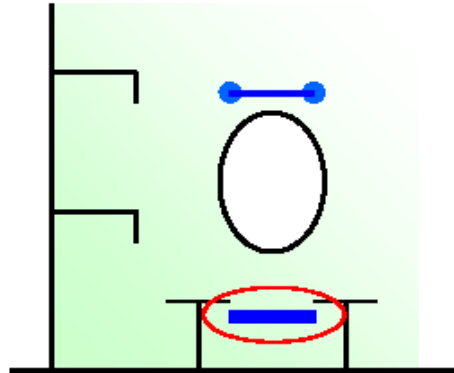
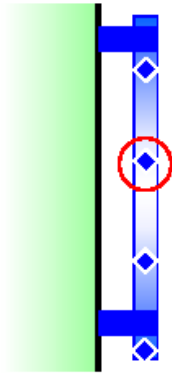
Figure 4.1-2 Cargo hold PMA arrangement



1. Rung



2. Tread



3. Flight of an inclined ladder

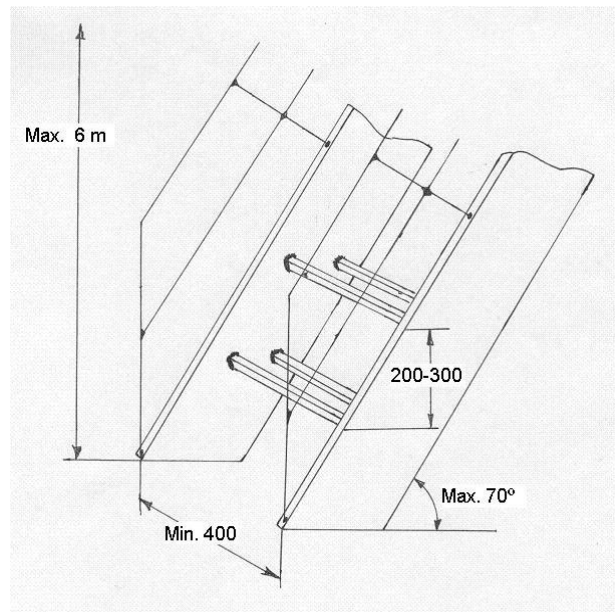
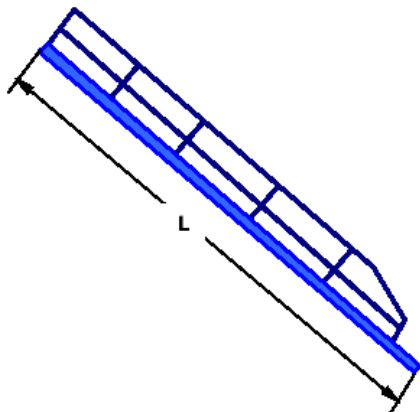


Figure 4.1-3 Typical technical details of stairs and ladders

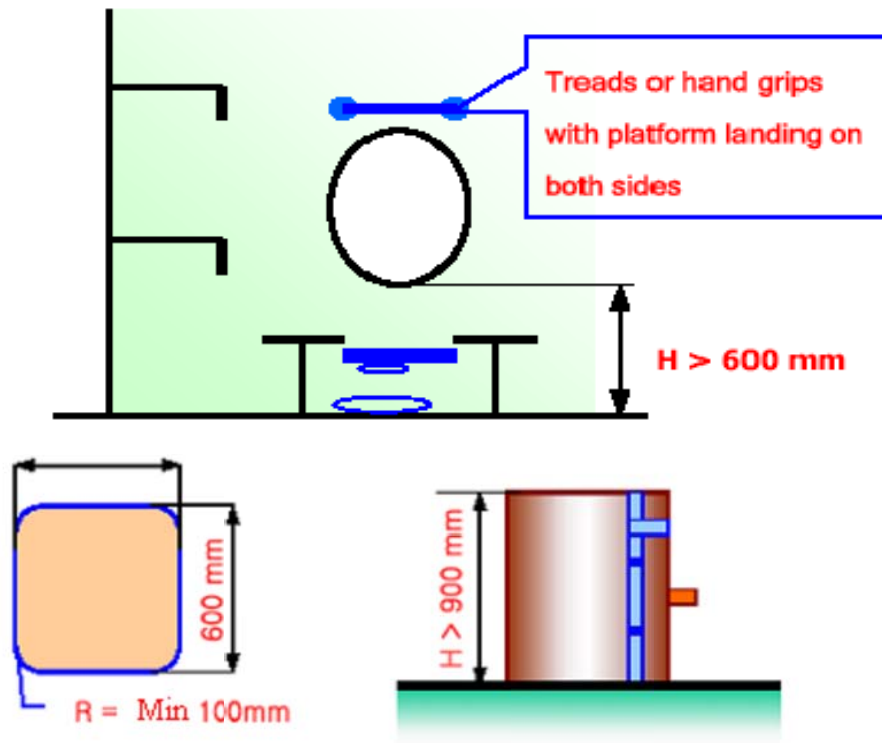


Figure 4.1-4 Typically means of access through vertical opening

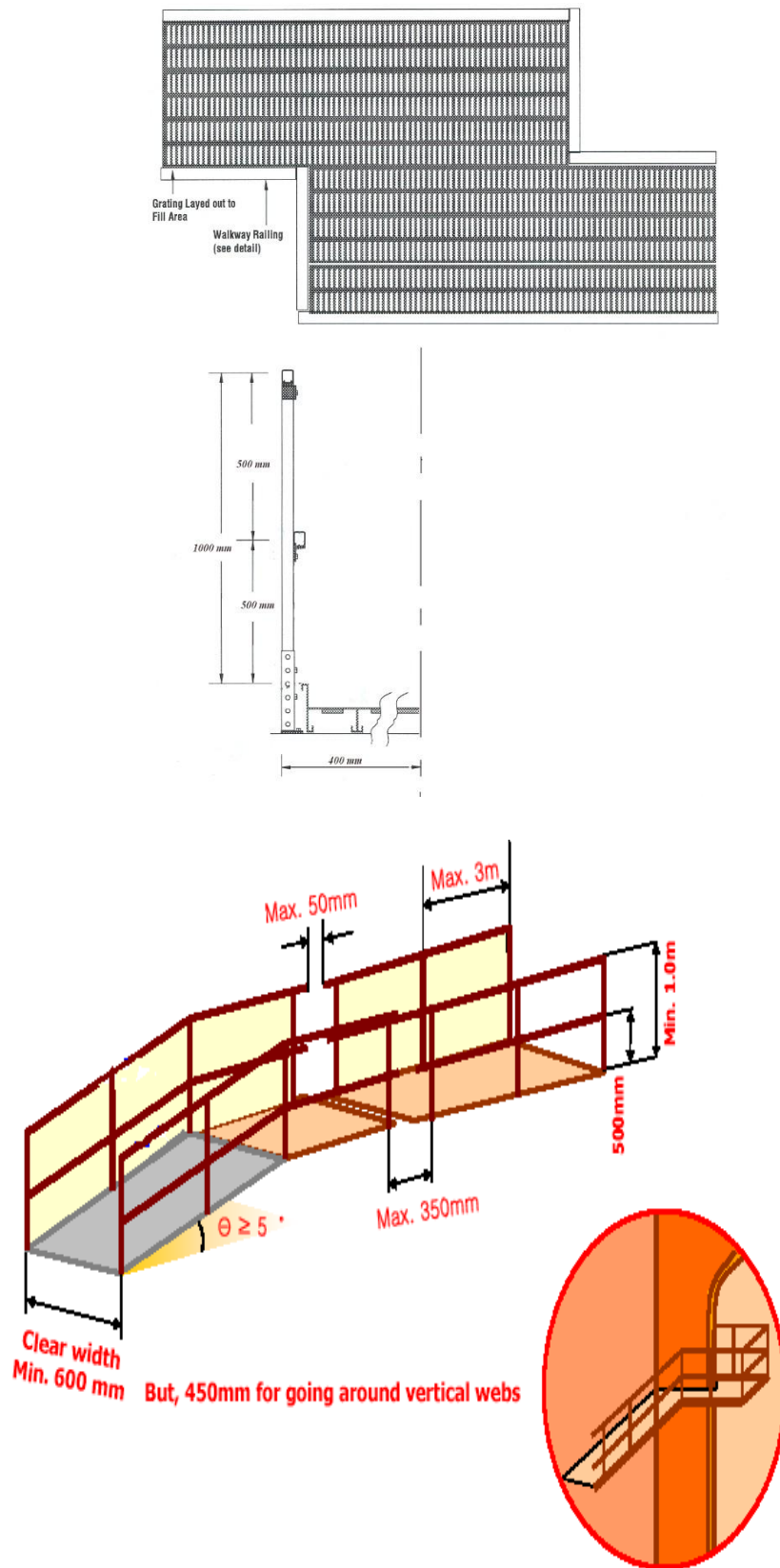


Figure 4.1-5 Typical non-slip oblique walkway

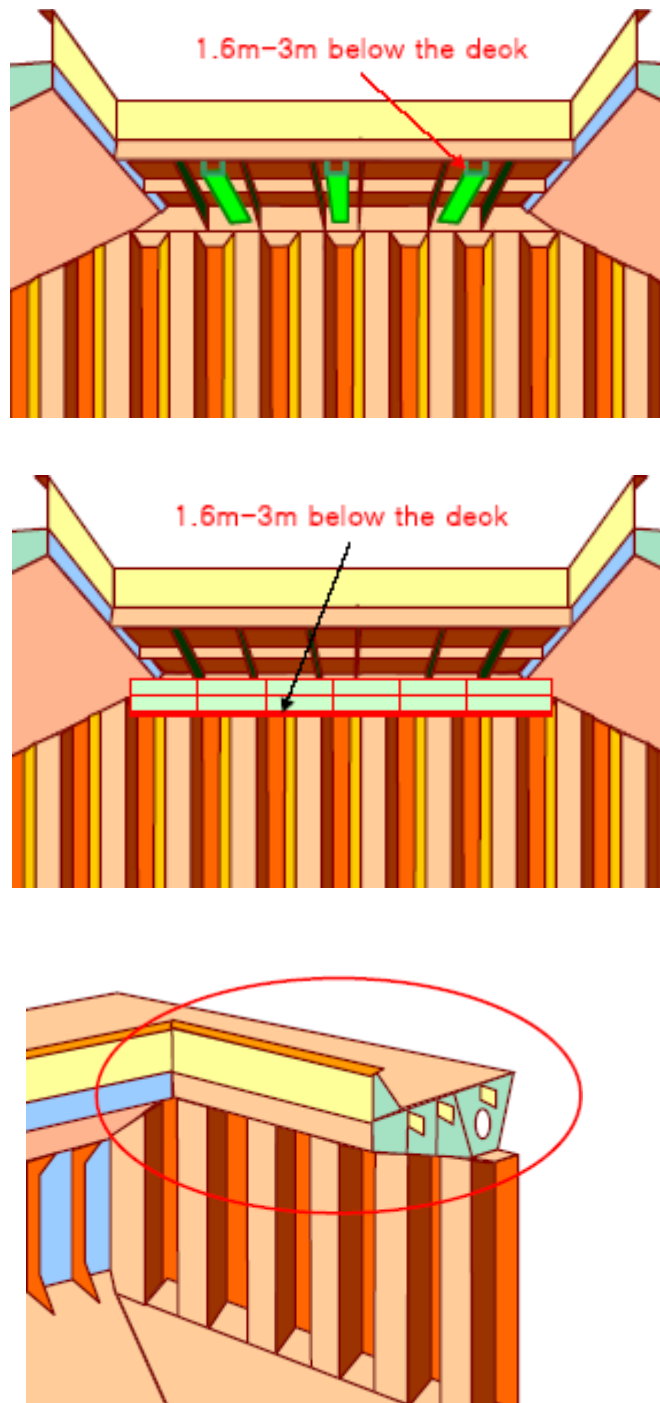


Figure 4.1-6 PMA applicable to reverse structure of cargo hold deck

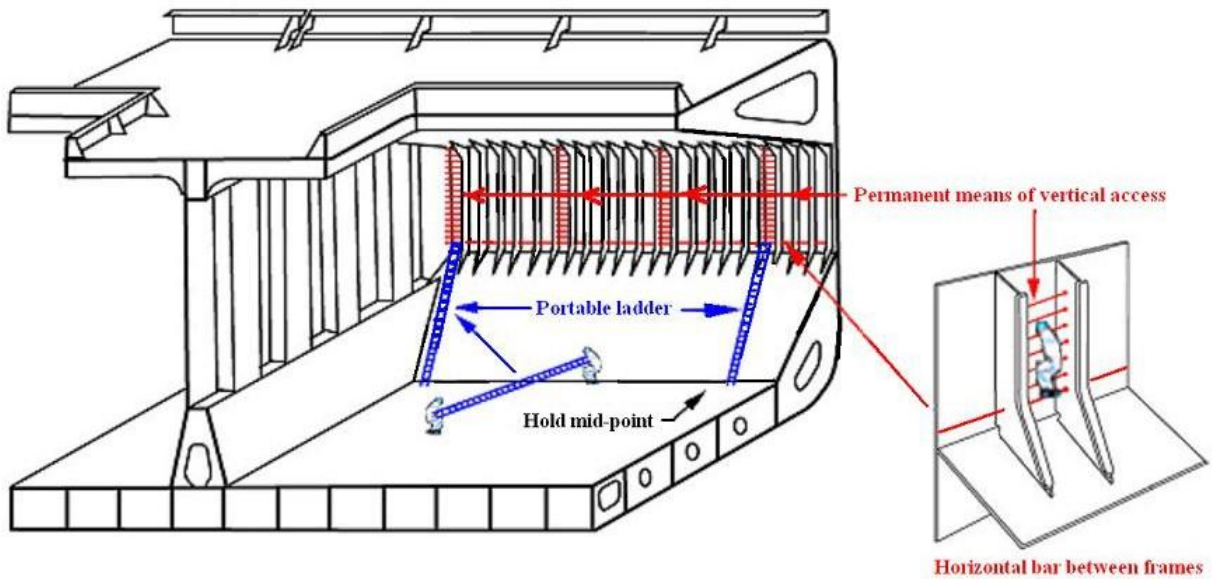


Figure 4.1-7 PMA applicable to cargo hold frames

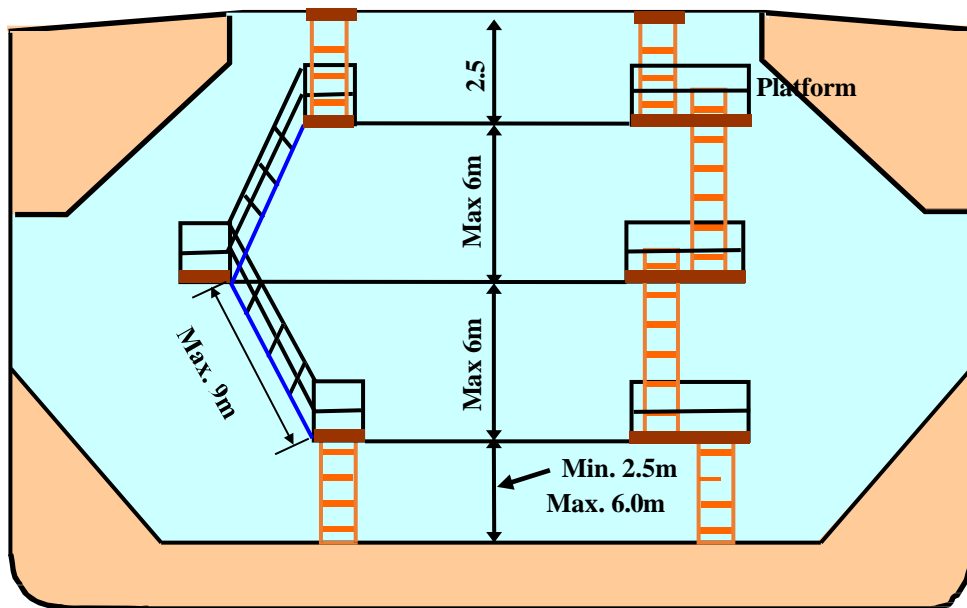


Figure 4.1-8 The vertical distance of stairs or ladders used between platforms shall be equal to or less than 6 m

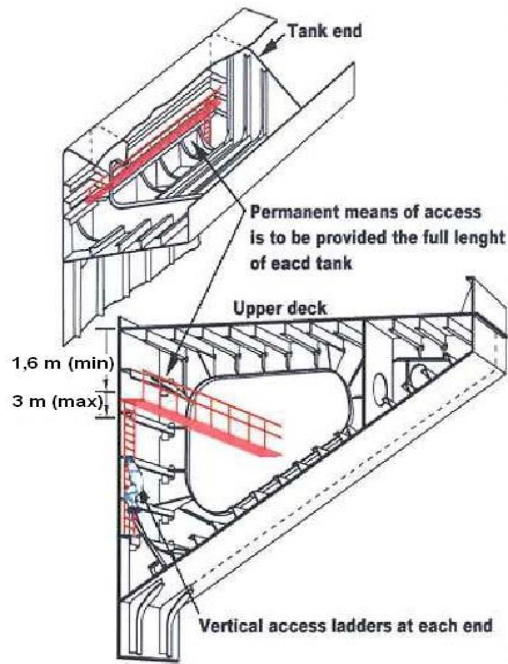


Figure 4.1-9 Topside tank (height ≥ 6 m) is to set 1 vertical PMA

(Along the side shell plating; located under the deck ceiling structure $1.6 < d < 3.0$ m; vertical access is fitted adjacent to the entrance of each topside tank)

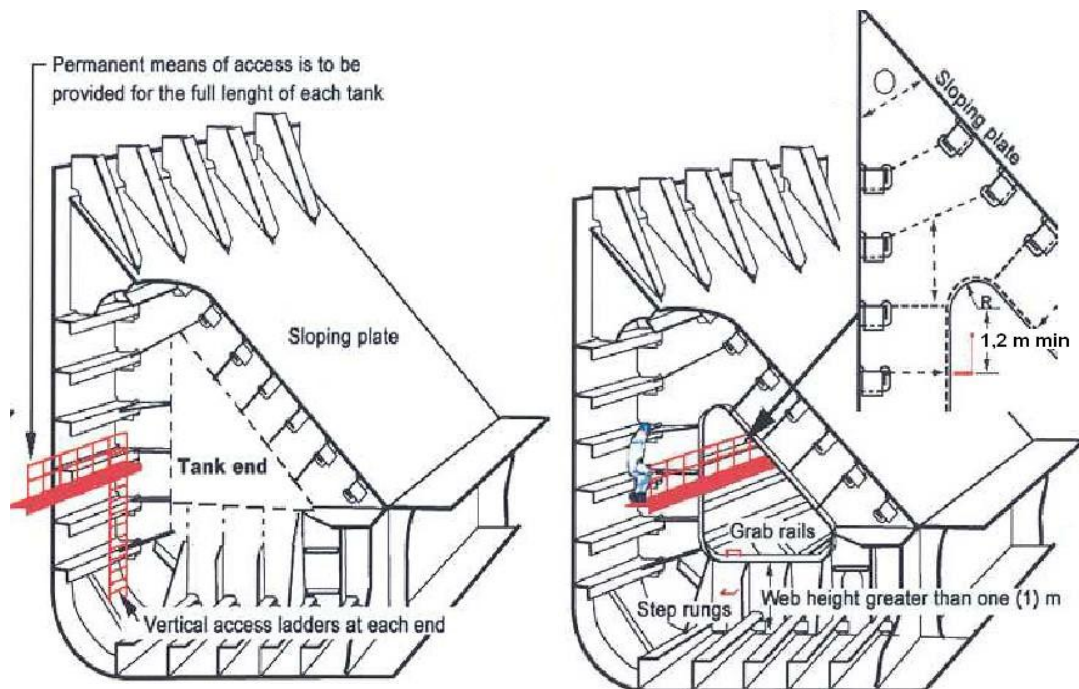


Figure 4.1-10 Hopper tank (height ≥ 6 m) is to set 1 vertical PMA

(Along the side shell plating; located minimum 1.2 m below from peak of the transverse web frame, or on the transverse web frame minimum 1.2 m below the deck ceiling; at the end of each hopper tank an access ladder to the tank bottom is fitted, steps and handgrips are to be provided on the transverse frame webs and flanges, if there is no entry/exit access in the range 600 mm from the tank bottom upwards to the transverse frame webs, and the web height is greater than 1 m.)

1.2.5 Survey requirements

1.2.5.1 Survey during construction

Besides inspection of all material and welding quality of the access, survey during construction is also to check if the actual arrangement and dimensions of the PMA as well as the configuration of portable means of access are consistent with what have been shown in the approved plans of the Ship structure access manual. Particular attention shall be paid to:

- (1) no barriers on the PMA.
- (2) effectiveness of the welding between handgrips, rails, rest platforms on the PMA and hull structure as well as access structure, check if the connections are secured, and if there is cracks and breaks of the welds.
- (3) check if there is any cracks on the double-sided fillet welds on the square steel of stair steps.
- (4) Check the securing of both ends of the vertical ladders fitted on the PMA if there is any excessive vibration between securing points.
- (5) separate portable ladders shall not exceed 5 meters in length. Portable ladders of more than 5 m shall only be used when there is remote control mechanical device fitted that can secure the top end of the ladders. Check if there is proper securing device fitted on the top end of the ladders and if the securing area is suitable.

1.2.5.2 Survey after construction (in operation)

Survey after construction is to be carried out in consideration that PMA may deteriorate after a long time presence in corrosive environment, under actions from external forces and liquid vibration within cargo holds. PMA is to check each time the surveyor enters a hold/space, confirming that the access is kept in good working condition. Here below is the survey procedure:

- (1) Inspections of all accesses used by the ship must be recorded in accordance with the requirements of the Ship Safety Management System. The surveyor shall check these records before inspecting the PMA. The format of such records is attached to the Ship structure access manual. The latest records of the inspected section of access shall at least include inspection date, name and title of the inspection person, signature, sections of access inspected, approval of continuous use or any deterioration or substantial damage found. Permits issued must be kept for verification.
- (2) The state of the access shall be checked carefully, and in case of any damage, corrosion or deterioration, the level of damage or deterioration shall be estimated to see if the safety of continuous use of the access is affected or not. Deterioration that affects the safe use is called "substantial damage", for which measures must be taken to prevent the affected area from being used before proper repair is done.

1.2.6 Alternate means of access (see IACS REC No.91 (Rev.1) "Guidelines for Approval / Acceptance of Alternative Means of Access")

Alternate means of access (including portable and movable types) normally include but not

limited to the following equipment:

- (1) hydraulic arm fitted with a stable base
- (2) wire lift platform;
- (3) portable platforms;
- (4) scaffolds;
- (5) rafting;
- (6) Portable ladders more than 5 m long shall only be utilized if fitted with a mechanical device to secure the upper end of the ladder ;
- (7) other means of access, approved by and acceptable to the administration.

Section 2 IACS Common Structural Rules for Bulk Carriers

This CSR has 13 chapters, please refer to Part 10 of the Rules for Classification of Sea-going Steel Ships for detailed information.

2.1 Scope and Application

2.1.1 These Rules apply to ships classed with the Society and contracted for construction on or after 1 April 2006.

2.1.2 These Rules apply to the hull structures of single side skin and double side skin bulk carriers with unrestricted worldwide navigation, having length L of 90 m or above.

With bulk carrier is intended sea going self-propelled ships which are constructed generally with single deck, double bottom, hopper side tanks and topside tanks and with single or double side skin construction in cargo length area and intended primarily to carry dry cargoes in bulk, excluding ore and combination carriers.

Hybrid bulk carriers, where at least one cargo hold is constructed with hopper tank and topside tank, are covered by the present Rules. The structural strength of members in holds constructed without hopper tank and/or topside tank is to comply with the strength criteria defined in the Rules.

2.1.3 The present Rules contain the IACS requirements for hull scantlings, arrangements, welding, structural details, materials and equipment applicable to all types of bulk carriers having the following characteristics:

- $L < 350\text{m}$
- $L/B > 5$
- $B/D < 2.5$
- $CB \geq 0.6$

2.2 Functional requirements

This section defines the set of requirements relevant to the functions of the ship structures to be complied with during design and construction, to meet the following objectives.

2.2.1 Design life

Unless otherwise specifically stated, the ship's expected design life is assumed to be equal to 25 years (the actual service life may exceed 25 years).

2.2.2 Environmental conditions

The ship's structural design is to be based on the assumption of trading in the North Atlantic environment for the entire design life.

2.2.3 Structural safety

The ship is to be designed and constructed, and subsequently operated and maintained by its builders and operators, to minimize the risk for the safety of life at sea and the pollution of the

marine environment as the consequence of the total loss of the ship due to structural collapse and subsequent flooding, loss of watertight integrity.

2.2.4 Structural accessibility

The ship is to be designed and constructed to provide adequate means of access to all spaces and internal structures to enable overall and close-up inspections and thickness measurements.

2.2.5 Quality of construction

As an objective, ships are to be built in accordance with controlled quality production standards using approved materials as necessary.

2.3 Structural design principle - net scantling approach

2.3.1 Symbols and definitions

t_{as_built} : *As-built Thickness*: the actual thickness, in mm, provided at the newbuilding stage, including $t_{voluntary_addition}$, if any.

$t_{gross_offered}$: *Gross Thickness Offered*: the actual gross (full) thickness, in mm, provided at the newbuilding stage, excluding $t_{voluntary_addition}$, the owner's extra margin for corrosion wastage, if any.

$$t_{gross_offered} = t_{as_built} - t_{voluntary_addition}$$

$t_{gross_required}$: *Gross Thickness Required*: the gross (full) thickness, in mm, obtained by adding t_C to the Net Thickness Required.

$$t_{gross_required} = t_{net_required} + t_C$$

$t_{net_offered}$: *Net Thickness Offered*: the net thickness, in mm, obtained by subtracting t_C from the Gross Thickness Offered.

$$t_{net_offered} = t_{gross_offered} - t_C = t_{as_built} - t_{voluntary_addition} - t_C$$

$t_{net_required}$: *Net Thickness Required*: the net thickness, in mm, as required by the Rules that satisfy all the structural strength requirements, rounded to the closest half millimeter.

$t_{voluntary_addition}$: *Thickness for Voluntary Addition*: the thickness, in mm, voluntarily added as the owner's extra margin for corrosion wastage in addition to t_C .

t_C : *Corrosion Addition Thickness*, in mm.

t_{C1}, t_{C2} : *Corrosion addition*, in mm, on one side of the considered structural member.

$t_{reserve}$: *Reserve thickness*, in mm, taken as: $t_{reserve} = 0.5$.

2.3.2 General philosophy

Net Scantling Approach is to clearly specify the "net scantling" that is to be maintained right from the newbuilding stage throughout the ship's design life to satisfy the structural strength requirements. This approach clearly separates the net thickness from the thickness from added for corrosion that is likely to occur during the ship-in-operation phase.

2.3.3 Corrosion additions

The corrosion addition for each of the two sides of a structural member, t_{C1} or t_{C2} , is specified in

table 3-11.

The total corrosion addition t_C , in mm, for both sides of the structural member is obtained by the following formula:

$$t_C = \text{Roundup}_{0.5}(t_{C1} + t_{C2}) + t_{\text{reserve}}$$

For an internal member within a given compartment, the total corrosion addition t_C is obtained from the following formula:

$$t_C = \text{Roundup}_{0.5}(2t_{C1}) + t_{\text{reserve}}$$

where t_{C1} is the value specified in table 3-11 for one side exposure to that compartment.

It should be noted that BC-A or BC-B ships and other bulk carriers with $L \geq 150$ m may have different corrosion addition values.

2.4 Construction and testing

2.4.1 Construction

2.4.1.1 Structural details

2.4.1.1.1 Cut-outs, plate edges

2.4.1.1.1.1 The free edges (cut surfaces) of cut-outs, hatch corners, etc. are to be properly prepared and are to be free from notches. As a general rule, cutting draglines, etc. are not to be welded out, but are to be smoothly ground. All edges are to be broken or in cases of highly stressed parts, be rounded off.

Free edges on flame or machine cut plates or flanges are not to be sharp cornered and are to be finished off as laid down in above. This also applies to cutting drag lines, etc., in particular to the upper edge of shear strake and analogously to weld joints, changes in sectional areas or similar discontinuities.

2.4.1.1.1.2 The hatch opening corners are to be machine cut.

2.4.1.1.2 Cold forming

2.4.1.1.2.1 For cold forming (bending, flanging, beading) of corrugated bulkhead the inside bending radius is to be not less than $2t$ (t = as-built thickness).

In order to prevent cracking, flame cutting flash or sheering burrs are to be removed before cold forming. After cold forming all structural components and, in particular, the ends of bends (plate edges) are to be examined for cracks. Except in cases where edge cracks are negligible, all cracked components are to be rejected. Repair welding is not permissible.

2.4.1.1.3 Assembly, alignment

2.4.1.1.3.1 The use of excessive force is to be avoided during the assembly of individual structural components or during the erection of sections. As far as possible, major distortions of individual structural components are to be corrected before further assembly.

Structural members are to be aligned following the IACS recommendation No.47 provisions given in Tab 11-1 or according to the requirements of a recognized fabrication standard that has

been accepted by the Classification Society. In the case of critical components, control drillings are to be made where necessary, which are then to be welded up again on completion.

After completion of welding, straightening and aligning are to be carried out in such a manner that the material properties are not influenced significantly. In case of doubt, the Society may require a procedure test or a working test to be carried out.

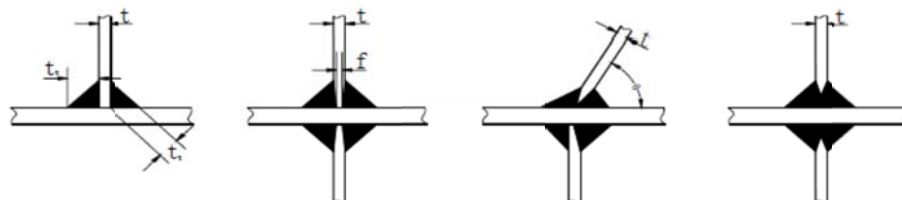
2.4.2 Welding

2.4.2.1 The type of welded connections and the edge preparation are to be appropriate to the welding procedure adopted. Butt connections of plating are to be full penetration, welded on both sides except where special welding procedures approved by the Society is applied. In the case of welding of plates with a difference in as-built thickness greater than 4 mm, the thicker plate is normally to be tapered. The taper has to have a length of not less than 3 times the difference in as-built thickness.

Edge preparations and root gaps are to be in accordance with the adopted welding procedure and relevant bevel preparation

2.4.2.2 Tee or cross joints

The connections of primary supporting members and stiffener webs to plating as well as plating abutting on another plating, are to be made by fillet welding or deep penetration weld, as shown in Fig 4.2-1.



- Notes:
- t = As-built thickness of abutting plate, in mm;
 - f = Unwelded root face, in mm, taken as $f \leq t/3$;
 - t_l = Leg length of the fillet weld, in mm;
 - t_t = Throat thickness, in mm.

Figure 4.2-1 Tee or cross joints

2.4.2.3 Full penetration welds are to be used in the following connections:

- rudder horns and shaft brackets to shell structure
- rudder side plating to rudder stock connection areas
- vertical corrugated bulkhead to inner bottom plating that are situated in the cargo area and arranged without transverse lower stool
- vertical corrugated bulkhead to top plating of transverse lower stool

- pillars to plating member, in case the stress acting on the pillar is tension (i.e. engine room, fore peak and deckhouses)
- edge reinforcement or pipe penetrations both to strength deck, sheer strake and bottom plating within 0.6L amidships, when the dimension of the opening exceeds 300 mm
- abutting plate panels with as-built thickness less than or equal to 12mm, forming boundaries to the sea below the summer load water line

2.4.2.4 Equivalent

- (1) In case where shedder plates are fitted at the lower end of corrugated bulkhead, the shedder plates are to be welded to the corrugation and the top plate of the transverse lower stool by one side penetration welds or equivalent.
- (2) The transverse lower stool side plating is to be connected to the transverse lower stool top plating and the inner bottom plating by full penetration welds. Deep penetration welds may be accepted
- (3) The supporting floors are to be connected to the inner bottom plating by full penetration welds. Deep penetration welds may be accepted
- (4) Generally, adequate groove angle between 40 and 60 degrees and root opening is to be taken and if necessary back gouging for both side welding is required.

2.4.2.5 Deep penetration weld is defined as Figure 4.2-2.



Note: Root face (f): 3 mm to T/3 mm
Groove angle (α): 40° to 60°

Figure 4.2-2 Deep penetration weld

2.4.2.6 Fillet welds

2.4.2.6.1 Kinds and size of fillet welds and their applications may refer to Chapter 11 of this Rules.

2.4.2.6.2 Intermittent welds

Where double continuous fillet welds in lieu of intermittent welds are applied, leg length of fillet welds is to be of category F3.

2.4.2.6.3 Size of fillet weld for abutting plating with small angle

Where the angle between an abutting plate and the connected plate is not 90 degrees as shown in Fig 4.2-3, the size of fillet welds for the side of larger angle is to be increased in accordance with the following formula:

$$t'_t = t_t \frac{1}{\sqrt{2} \sin(\phi/2)}$$

where t_t = Leg length of the fillet weld, in mm, as defined in [4.2.2].

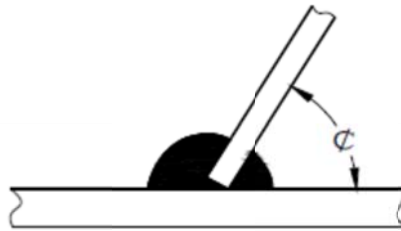


Figure 4.2-3 Connecting angle

2.4.2.6.4 Deep penetration welds

The leg length of fillet welds of deep penetration type may be reduced by 15% of that required in Tab 1, depending on the welding procedure test.

2.4.2.7 Lap joint welds

Lap joint welds may be adopted in very specific cases subject to the approval of the Society. Lap joint welds may be adopted for the followings:

- peripheral connections of doublers
- internal structural elements subject to very low stresses.

Lap joints are to have the fillet size of category F1.

Lap joints are to use in connections of secondary members. Careful consideration must be given if there is connection by lap joints in the construction plan. This is normally not allowed. If any, approved plans must be consulted to check for consistency, and the Plan Approval Center is to be reminded. For example, engine room frames and inner bottom plating brackets are connected by lap joints; in accordance with the CSR rules, the lower end connection of this structure will bear high stresses. Therefore, lap joints must be handled very carefully.

2.4.2.8 Slot welds

Slot welds may be adopted in very specific cases subject to the approval of the Society. However, slot welds of doublers on the outer shell and strength deck are not permitted within 0.6L amidships.

The size of fillet welds is to be category F1. The slot welds are to have adequate shape to permit a thoroughly fused bead to be applied all around the bottom edge of the opening. The length of slots normally is not less than 75 mm (90 mm). The width of slots is to be twice of the overall plate thickness.

Spacing of slots is to be 2 to 3 times of their length, but not greater than 250mm (150mm). Note: Data in brackets () is non CSR data.

2.4.3 Bilge keel connection

2.4.3.1 The bilge keel is not to be directly connected to the side shell. The intermediate flat is to be welded to the side shell plating. The end of the bilge keel is to be tapered or with a large radius transition. The end of the bilge keel is to be located on the transverse bilge stiffeners at inner side of the side shells. The intermediate flat is not to be located on the joints at the parting section.

Bilge keel and intermediate flat shall be made with steel with the same yield stress as the bilge strake. Bilge keel with a length greater than 0.15L shall be made with steel of the same grade as the bilge strake.

Net thickness of the intermediate flat shall equal to that of the bilge strake. This thickness is generally to be not greater than 15mm.

Scallop holes are to be avoided on the bilge keel.

2.4.3.2 The butt welds of the intermediate flat and bilge keel are to be full penetration and shifted from the shell butts.

The butt welds of the bilge plating and those of the intermediate flat are to be flush in way of crossing, respectively, with the intermediate flat and with the bilge keel.

2.4.3.3 Along the longitudinal edges, the intermediate flat is to be continuously fillet welded with a throat thickness "a" of 0.3 times its thickness. At the ends of intermediate flat, the throat thickness "a" at the end faces is to be increased to 0.5 times the intermediate flat thickness but is to be less than the bilge plating thickness, see Fig 4.2-4. The welded transition at the end faces of the doubling plates to the plating should form with the latter an angle of 45° or less.

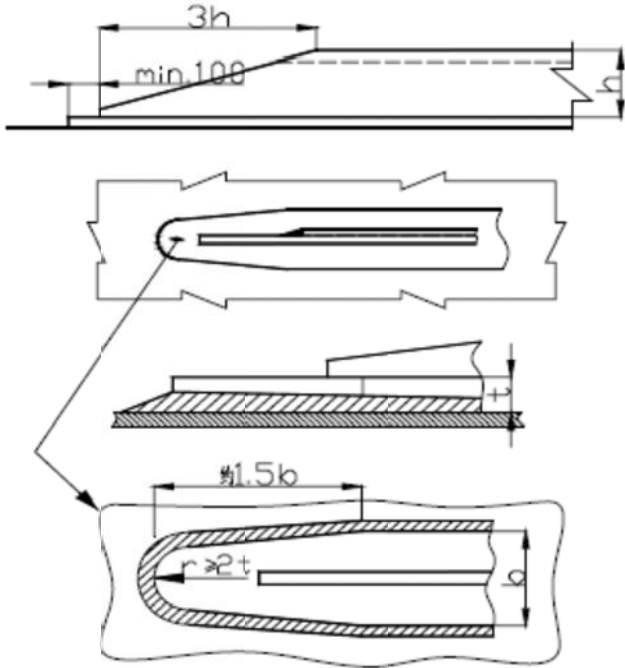


Figure 4.2-4

2.4.4 Testing of compartments

2.4.4.1 The technical requirements of testing of compartments for CSR Bulk Carriers and non-CSR Bulk Carriers are the same, but the scope of application of the testing of compartments for CSR Bulk Carriers has included all separate liquid compartments.

2.4.4.2 Where a liquid compartment of each type has been selected for testing according to the approved design and passes, then it is acceptable to go for leaking testing or hydropneumatic testing according to conditions as specified in section 2.2 of the CSR. Generally structural testing is not necessary to be repeated for subsequent newbuilding ships of the same series. Such exemption does not apply to the cargo hold boundaries of liquid tankers and combination carriers as well as liquid compartments carrying special goods or pollutive goods. Where the structural testing finds that weak points or major deficiencies cannot be detected through leaking testing, then structural testing must be done for all liquid compartments.

2.4.5 Additional survey requirements

2.4.5.1 During construction of bulk carriers according to the CSR rules, attention should be paid to:

- (1) monitor construction of critical structural areas;
- (2) add 50% non-destructive testing requirements to all full penetration fillet welds at critical structural areas, and verify the results;
- (3) check mechanical cutting such as hatch corner opening on the strength deck;
- (4) check finished off free edges such as M.E base plate, and sheer strake;
- (5) check edges of cold roll formed members;
- (6) In case of changes in hull members or materials, relevant plans are required to be submitted for re-approval, and correctly marked on the as-constructed plans.

2.4.5.2 For operation survey requirements for bulk carriers built according to the CSR rules, please refer to *the Guidelines for Operation Surveys of CSR Ships* published by the Society.

Section 3 Protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers (PSPC)

3.1 Overview

Protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers (PSPC) was adopted at the 82nd session of IMO MSC meeting on 8 December 2006. PSPC performance standards are referenced by the amendments to SOLAS regulation II-1/3-2, effective from July 1, 2008 as mandatory requirements for ships of 500 gross tonnage and above engaged in international voyages.

3.2 Scope of application

For ships meeting the following requirements as provided in SOLAS Chapter II-1, all dedicated seawater ballast tanks arranged in ships of not less than 500 gross tonnage and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards shall be coated during construction in accordance with the *Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers*:

- (1) for which the building contract is placed on or after 1 July 2008; or
- (2) 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 January 2009; or
- (3) the delivery of which is on or after 1 July 2012.

3.3 Definitions

3.3.1 Ballast tanks are those as defined in the *Guidelines for the selection, application and maintenance of corrosion prevention systems of dedicated seawater ballast tanks* (resolution A.798(19)) and *the International Code on the enhanced programme of inspections during surveys of bulk carriers and oil tankers, 2011* (2011 ESP Code).

3.3.2 Dedicated seawater ballast tank refers to dedicated tanks for which sea-going ships use seawater as ballast water, but the following tanks are not to be identified as dedicated seawater ballast tanks, which can be exempted for the PSPC requirements:

- (1) Ballast tank identified as "Spaces included in Net Tonnage" in the 1969 ITC Certificate;
- (2) Sea water ballast tanks in passenger vessels also designated for the carriage of grey water or black water;
- (3) Sea water ballast tanks in livestock carriers also designated for the carriage of the livestock dung.

3.3.3 Double side skin spaces of bulk carrier means the double side skin spaces of bulk carriers where the cargo holds are bounded by double side skin (regardless of the side tank width).

3.3.4 Void spaces of bulk carrier means confined spaces (no access or ventilation) located under bulkhead deck within or forward of the cargo length area of a bulk carrier. Cargo area and cargo length area refer to the same meaning as defined in resolution A.744 (18). However, such

spaces do not include dedicated seawater ballast tanks, cargo loading spaces, spaces for storing provisions (including fuel, fresh water, spare supplies, etc.), machinery (including cargo pumps, ballast pumps, bow thrusters, etc.) installation spaces, spaces normally used by the crew as well as double-side skin spaces of bulk carriers.

3.3.5 Category I void spaces refers to category I void spaces, including double-side skin void spaces, of bulk carriers and oil tankers as defined in the 2009 Guidelines for Survey of Corrosion Protection of Ship Structure, including empty side tanks, bottom/double skin void spaces for protection of cargo oil tanks, cargo area or topside empty tank spaces, hopper empty tank spaces and double bottom void spaces.

3.3.6 Dew point is the temperature at which air is saturated with moisture.

3.3.7 Relative humidity refers to the ratio, in %, of absolute air humidity to absolute saturated humidity at the same temperature.

3.4 General

3.4.1 Inspection of coating application by the shipyard for compliance with IMP PSPC standard is the responsibility of the coating inspector, while the Society is to be responsible for reviewing product approval certificate of the coating, qualification of the coating inspector and Coating Technical File, as well as for monitoring inspection carried by the surveyor through sampling.

3.4.2 This Standard is based on specifications and requirements which intend to provide a target useful coating life of 15 years, which is considered to be the time period, from initial application, over which the coating system is intended to remain in “GOOD” condition. The ability of the coating system to achieve the target useful life depends on coating system type, steel preparation, application as well as inspection and maintenance of the coating. The actual useful life will vary, depending on numerous variables including actual conditions encountered in service. Application during ship construction will greatly affect the achievement of this target.

3.4.3 Upon survey which verifies compliance with relevant PSPC standards according to application from the applicant, following notations may be assigned respectively depending on the spaces that are have been coated:

- | | | |
|---|----------|-----------------|
| (1) Dedicated sea water ballasts (as defined in 3.3.2) | PSPC (B) | (mandatory) |
| (2) Double-side skin spaces of bulk carrier (as defined in 3.3.3) | PSPC (D) | (mandatory) |
| (3) Void spaces of bulk carrier (as defined in 3.3.4) | PSPC (B) | (non-mandatory) |

3.4.4 Corrosion protection of outfitting in the above-mentioned spaces is to meet the following requirements:

3.4.4.1 PMAs that are integral to the ship structure should be coated in accordance with the Performance standard for protective coatings for the spaces where such PMAs are located.

3.4.4.2 For PMAs that are not integral to the ship structure, it is suggested that hot dip galvanizing should be employed as the primary means. Hot dip galvanizing shall be carried out in accordance with ISO 1461:1999. After hot dip galvanizing, workpieces are to be coated at least in accordance with ISO 12944-5: 2007 or recommendations from the coating manufacturer.

Selection of coating types shall be carried out in accordance with coating manufacturer's recommendations, taking into account compatibility of the galvanized surfaces.

3.4.4.3 Where protective coating is applied as the sole means of corrosion protection for PMAs that are not integral to the ship structure, the Performance standard for protective coatings for spaces where such PMAs are located should be applied to the extent possible. In such case, the protective coating should at least comply with the requirements for the coating system (epoxy-based system) and total NDFT of that standard.

3.4.4.4 It is also recommended that supports for piping, measuring devices, etc., be coated in accordance with requirements for the non-integral items indicated in paragraph 3.4.4.2 and 3.4.4.3.

3.5 PSPC Coating Standard

3.5.1 Coating manufacturers shall provide a specification of the protective coating system to satisfy the following requirements. The site surveyor shall verify the Technical Data Sheet and Statement of Compliance or Type Approval Certificate for the protective coating system. The shipyard shall apply the protective coating in accordance with the verified Technical Data Sheet and its own verified application procedures.

3.5.2 Design of coating system

The selection of the coating system shall be considered by the parties involved with respect to the service conditions and planned maintenance. Coating manufacturers shall have products with documented satisfactory performance records and technical data sheets. The following aspects, among other things shall be considered:

- (1) location of space relative to heated surfaces;
- (2) frequency of ballasting and deballasting operations;
- (3) required surface conditions, surface cleanliness and dryness; and
- (4) supplementary cathodic protections, if any (where coating is supplemented by cathodic protection, the coating shall be compatible with the cathodic protection system).

3.5.3 Selection of coating system color

Coating jobs should select multiple layer coating system, with contrast color for each layer. The finish coating is to be lighter in color for easier check in operation. Coats used for the finish of ballast tank coating system should be light colors that are conducive to recognizing rusts and cracks. They shall be usually colors such as light grey, beige, greyish-white, swimming pool blue or green, etc.

3.5.4 Job specification

3.5.4.1 There shall be a minimum of two stripe coats and two spray coats, except that the second stripe coat, by way of welded seams only, may be reduced in scope where it is proven that the NDFT can be met by the coats applied, in order to avoid unnecessary over-thickness. Any reduction in scope of the second stripe coat shall be fully detailed in the CTF.

3.5.4.2 Stripe coats shall be applied by brush or roller. Roller is to be used for scallops, ratholes,

etc., only, but not for edges and welding seams.

3.5.4.3 Each main coating layer shall be appropriately cured before application of the next coat, in accordance with coating manufacturer's recommendations. Surface contaminants such as rust, grease, dust, salt, oil, etc., shall be removed prior to painting with proper method according to the paint manufacturer's recommendation. Abrasive inclusions embedded in the coating shall be removed. The shipyard is to, according to manufacturers' recommendation, develop Job specifications, which shall include the dry-to-recoat times and walk-on time given by the manufacturer, coating protection, scaffolding, and fouling control.

3.5.5 NDFT (nominal total dry film thickness)

Nominal total dry film thickness shall at least meet the value as prescribed in the coating specification (NDFT 320 mm with 90/10 rule for epoxy-based coatings; other systems to coating manufacturer's specifications).

3.5.5.2 Maximum total dry film thickness according to manufacturer's detailed specifications. Care shall be taken to avoid increasing the thickness in an exaggerated way. The pachometer shall be controlled. Thinner shall be limited to those types and quantities recommended by the manufacturer.

3.5.6 Steel surface preparation

3.5.6.1 After primary surface preparation, the steel shall reach Sa 2½, with roughness profiles between 30-75 mm, and water soluble salt limit equivalent to NaCl equal to or less than 50 mg/m² of sodium chloride.

3.5.6.2 Blasting shall not be carried out when the relative humidity is above 85% or the surface temperature of steel is less than 3° C above the dew point.

3.5.6.3 Checking of the steel surface cleanliness and roughness profile as well as measurement of surface salinity shall be carried out at the end of the surface preparation and before the application of the primer, in accordance with the manufacturer's recommendations. (After complete cleaning, quality of the preparation of steel surface shall be controlled according to ISO 8501-1:1988/Suppl: 1994. While roughness profile shall be controlled according to ISO 8503-1/2:1988, and the measurement of water soluble salt limit according to ISO 8502-9:1998 or NACE SP0508-2010 NO.21134.)

3.5.6.4 It is recognized that the inspection requirements of PSPC 6.2 may be difficult to apply to an automated shop primer plant and a Quality Control approach would be a more practical way of enabling compliance with the requirements of PSPC. As required in PSPC, it is the responsibility of the coating inspector to confirm that the quality control procedures are ensuring compliance with PSPC.

When reviewing the Quality Control for automated shop primer plants the following procedures should be included.

- i. Procedures for management of the blasting grit including measurement of salt and contamination;
- ii. Procedures recording the following: steel surface temperature, relative humidity, dew point;

iii. Procedures for controlling or monitoring surface cleanliness, surface profile, oil, grease, dust and other contamination;

iv. Procedures for recording/measuring soluble salts;

v. Procedures for verifying thickness and curing of the shop primer conforms to the values specified in the Technical Specification.

3.5.6.5 Shop primer shall be zinc containing inhibitor free zinc silicate based or equivalent.

3.5.7 Secondary surface preparation

3.5.7.1 Sa 2½ on damaged shop primer and welds.

3.5.7.2 Where the ISC Product Approval Certificate proves that the primer is compatible with the main coating system to be applied, intact shop primer may be retained.

The retained shop primer shall be cleaned by sweep blasting, high-pressure water washing or equivalent method. Otherwise, at least 70% of intact shop primer is to be removed to achieve Sa 2.

3.5.7.3 The steel surface shall be prepared before application of the main coating system so that the coating selected can achieve an even distribution at the required NDFT and have an adequate adhesion by removing sharp edges, grinding weld beads and removing weld spatter and any other surface contaminant. The steel condition after preparation shall reach P2 as specified in ISO8501-3. Edges shall be treated to a rounded radius of minimum 2 mm, or subjected to three pass grinding or at least equivalent process before painting. When using special grinding tools, one pass grinding can be considered as equivalent.

3.5.7.4 Profile requirements: in case of full or partial blasting, 30-75 mm, otherwise as recommended by the coating manufacturer.

3.5.7.5 Dust control: dust quantity rating "1" for dust size class "3", "4" or "5". Lower dust size classes to be removed if visible on the surface to be coated without magnification. Distribution of dust particles and measurement shall be carried out according to ISO 8502-3:1993. Lower dust size means dust sizes under class "3" according to the above measurement standard. When dust accumulation is visible to the naked eye, it shall also be removed.

3.5.7.6 Water soluble salt limit: water soluble salts limit equivalent to NaCl after blasting/grinding equal to or less than 50 mg/m² of sodium chloride. The measurement of water soluble salt is to be carried out according to ISO 8502-9:1998 or NACE SP0508-2010 NO.21134, and then converted into the water soluble salt density of the steel surface. Frequency of salinity measurement and procedures for handling non-conformances found shall be in accordance with the coating inspection protocol, generally no less than one spot per block.

3.5.7.7 Miscellaneous: confirmation is to be made that there is no oil stains, water, marks, zinc based primer, smudge or other contaminants.

3.5.8 Treatment of erection joint area

3.5.8.1 Erection joint area refers to coating damages and heat affected areas at butt and fillet welding seam areas caused by erection of blocks after block coating. Normally the width

between both sides of the erection butt welds shall not be more than 200 mm (see the fitting area of the below figure). For the fillet welds reserved for erection, normally the single edge is not to exceed 300 mm, and both sides are not to be over 100 mm respectively (as shown in 4.3-1).

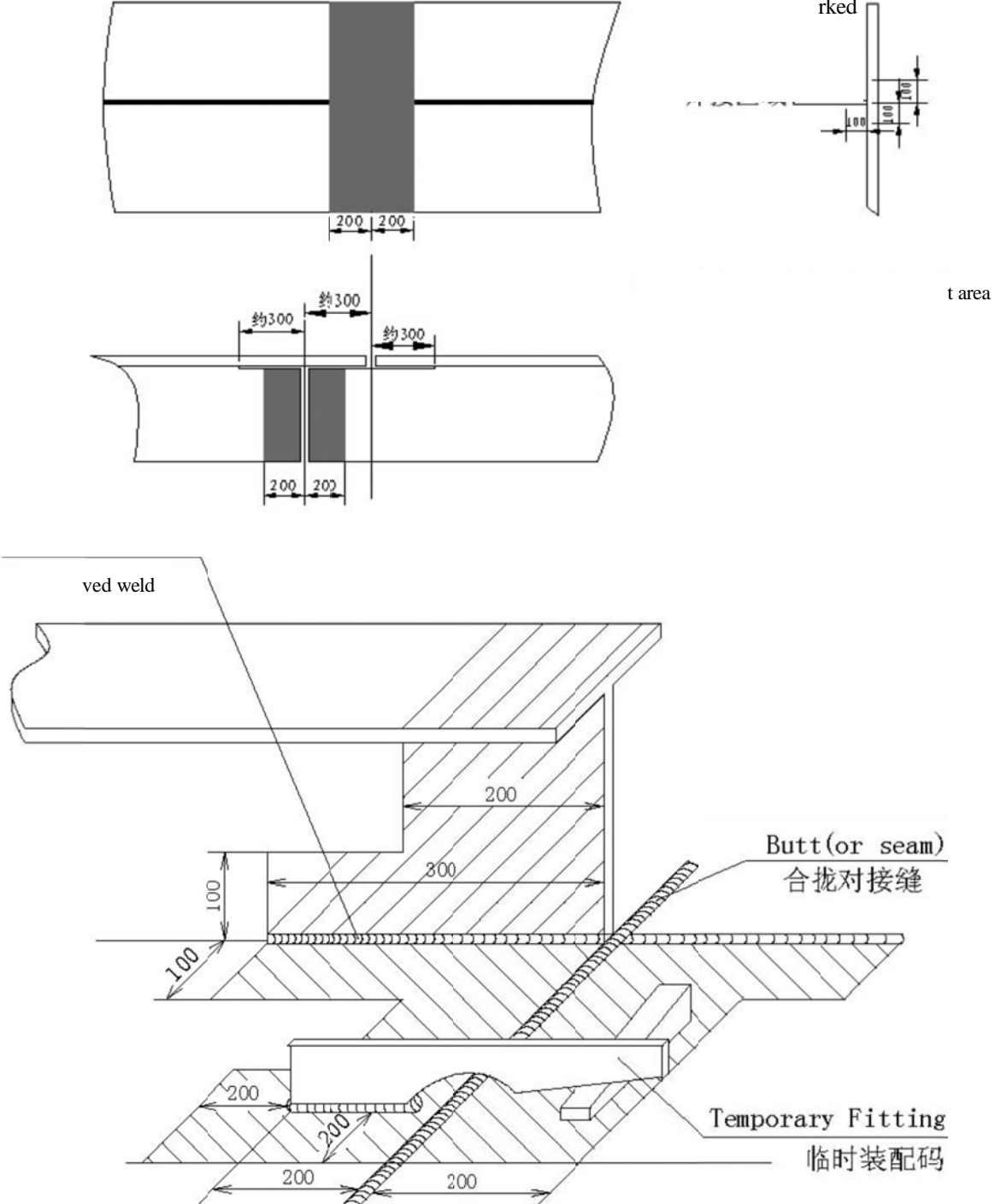


Figure 4.3-1

3.5.8.2 Surface treatment of erection joint area

- (1) Butts St 3 or better or Sa 2½ where practicable;
- (2) Other requirements same as secondary surface preparation.

3.5.9 Treatment of tank coating damages

3.5.9.1 When damages is up to 2% of total area, St 3 shall be applied. For contiguous damages over 25 m² or over 2 % of the total area of the tank, Sa 2½ shall be applied. The surface at the butts is to be treated into a slope, while other requirements are same as secondary surface preparation.

3.5.9.2 Coating damages means areas where the primer coating is damaged (i.e. damages reached steel surface).

3.5.9.3 Contiguous damages means coating damages with a minimum distance between each damaged areas of less than 100 mm.

3.5.9.4 Damage area ratio calculation refers to the ratio of damage area taken into account at repair stage to the total tank area after the coated structural blocks being erected into a whole tank, without considering the erection joint area.

3.5.9.5 Damage area is to be determined by the coating inspector as appointed in the coating inspection agreement by the shipowner, builder and coating manufacturer.

If there is any dispute, a photo-marking approach is to be used to determine large-area damages, while direct length measuring is to be used for linear damages.

3.5.9.6 Coating damages of the fillet welding on tank boundary watertight bulkhead means the fillet welds at where tightness testing has not been carried out at the block stage and the bare steel surface beside the welding seams, which is not to be included in the coating damage calculation.

3.6 Precautions

3.6.1 Adequate ventilation must be ensured in order to enable proper drying and curing of the coatings. Ventilation is to be maintained during the whole coating application process and for a period of time upon completion of the application, in accordance with coating manufacturer's recommendations.

3.6.2 Coating must be applied under controlled humidity and surface condition in accordance with coating manufacturer's Technical Specification.

Coating shall not be carried out in the following cases:

- (1) the relative humidity is above 85%;
- (2) the surface temperature of steel is less than 3° C above the dew point.

3.6.3 Destructive testing is to be avoided during the inspection process.

3.6.4 The dry film thickness of each layer shall be measured for quality control. And an appropriate pachometer shall be used to measure the maximum total dry film thickness after completion of the last coating layer. When measurement of dry film thickness for previous layer is taken as a quality control measure, representative spots are to be selected for measurement and

the measured findings may be not necessary to be recorded in the Coating Technical File, provided that the measuring of total dry film thickness is controlled in accordance with the measurement requirements as specified in the shipyard's inspection procedures.

3.6.5 Any defective area, such as pinhole, air bubble, and bare surface and so on, shall be marked and the affected areas shall be properly repaired. All such repairs are to be re-inspected and documented by the coating inspector.

3.6.6 Emphasis shall be placed on initiation of each stage of surface preparation and coatings application as improper work is extremely difficult to correct later in the coating progress. Where defects, missing inspection, minor defects of surface treatment and coating are found at approved items such as structure, welding and outfitting during routing inspection, the coating inspector should be notified.

3.6.7 Where substantial or severe defects are found at surface treatment and coating during coating inspection, relevant parties shall immediately coordinate to develop a repair action plan and document such plan into the Coating Technical File (CTF). Where any dispute occurred due to disagreement with the coating inspection result among the shipowner, builder and coating manufacturer, it is to be handled according to the dispute resolution procedure as specified in the Coating Inspection Agreement.

The whole dispute process and the final result is to be recorded in the CTF.

3.6.8 For sampling inspection frequency, once a month routing inspection is to be carried out. At least one routing inspection shall be carried out for the three stages covered by the implementation of PSPC: steel preparation, block and erection. Sampling inspection items shall include surface salinity, surface profile, surface cleanliness, dust control, dry film thickness, blasting/coating environment control, coating log, coating damage assessment after erection. (Note: Several blocks can be inspected during one routing inspection so as to cover more items in the sampling process. The ratio of block sampling is 5% of the total blocks involving PSPC coating.)

3.7 PSPC work flow is given as below:

PSPC Work Flow

Stages	Items for PSPC Stages	Requirements	Notes
Before construction	1. Shipyard PSPC Implementation Capability Assessment (if applicable)	Reporting to HQ	
	2. Three-Party Agreement	Review ^①	Provided by the Shipyard
	3. Record of Three-Party Agreement Review	Fill out	
	4. Coating System Type Approval Certificate	Collective validation	Provided by the Coating Manufacturer
	5. Coating Technical Data Specification (TDS)	Collective validation	Provided by the Coating Manufacturer
	6. Coating Safety Data Sheet MSDS	Collective validation	Provided by the Coating Manufacturer
	7. Coating Technical Specification (CTS)	Review	Provided by the Shipyard

	8. Coating Inspector Certificate	Collective validation	
	9. Assistant Inspector Qualifications	Collective validation	
	10. Coating Inspection Organization Accreditation Verification (if applicable)	Collective validation	
Preparation of steel surface stage	1. Shop Primer Type Approval Certificate	Collective validation	
	2. Compatibility of shop primer with the main coating system	Verify and record	
	3. Steel surface dust, grease and other contaminants	Spot check ²	
	4. Steel surface cleanliness and profile	Spot check	
	5. Steel surface salinity (where measurement is necessary)	Spot check	
	6. Environment control (relative humidity, dew point)	Spot check	
	7. Coat film thickness	Spot check	
	8. Coating log	Spot check	
	7. Primer inspection done by the coating inspector when shop primer is not applied by the shipyard itself (if applicable)	Spot check	
	10. Deviation rectification corrective measures (if applicable)	Verify and record	Responsibility of the coating inspector
Block stage	1. Edge treatment (grinding)	Spot check	
	2. Treatment of shop primer (removal retained)	Spot check	
	3. Steel surface grease and other contaminants	Spot check	
	4. Steel surface salinity	Spot check	
	5. Dust	Spot check	
	6. Steel surface cleanliness and profile	Spot check	
	7. Coating environment control (relative humidity, dew point)	Spot check	
	8. Film thickness control	Spot check	
	9. Coating log	Spot check	
	10. Deviation rectification corrective measures (if applicable)	Verify and record	Responsibility of the coating inspector
Erection stage	1. Coating damage assessment and surface treatment	Spot check	
	2. Steel surface grease and other contaminants, dust control	Spot check	
	3. Steel surface salinity and surface profile of areas to be coated	Spot check	
	4. Water soluble salt limit	Spot check	
	5. Steel surface cleanliness and profile	Spot check	
	6. Coating environment control (relative humidity, dew point), and film thickness control	Spot check	

	7. Film thickness control coating log	Spot check	
	8. Coating process	Spot check	
	9. Coating log	Spot check	
	10. Deviation rectification corrective measures (if applicable)	Verify and record	Responsibility of the coating inspector
Completion document review	1. Coating Technical File (CTF)	Review	Provided by the Shipyard
	2. Record of CTF Review	Fill out	
	3. Deviation rectification corrective measures (if applicable)	Verify and record	Responsibility of the Shipyard
Information file	1. Fill out corresponding fields of PSPC requirements in Form RH or Form N-PH	Fill out	
	2. Upload and archive according to procedure documents	Upload, and archiving at the survey unit	
Mailing and Archiving	1. Form RH and Form N-PH	Archiving at the survey unit	
	2. Cover page of Coating Technical File (CTF)	Upload, and archiving at the survey unit	
	3. Coating Technical File (CTF)	Archiving at the survey unit	
	4. Review form of Coating Inspection Agreement	Archiving at the survey unit	
	5. Review form of Coating Technical File (CTF)	Archiving at the survey unit	
	6. Construction/substantial alteration routing inspection item list, item 6 - coating control	Archiving at the survey unit	

Notes:

- ① Where requirements are met upon review, the cover page is to be stamped with inspection business seal, and endorsed by the surveyor with signature and date.
- ② In a spot check, the surveyor is not required to record measurements during the process of routing inspection; the responsibility of the surveyor is to perform a sampling inspection of the status of the coating inspector's using of correct equipment, technology and reporting method required in the inspection procedure as approved by the Society. Spot check means carrying out a compliance validation inspection of items that the routing inspection schedule applies.

Section 4 New definitions of bulk carriers and relevant requirements

4.1 Discrepancy of bulk carrier definitions

Resolution MSC.170 (79) has amended the definition of bulk carrier as specified in SOLAS regulation XII/1.1 (2004 Amendments to SOLAS 1974). There is a big discrepancy between the definitions of bulk carrier specified in SOLAS regulation XII/1.1, as amended, and SOLAS regulation IX/1.6, which are described as below:

The definition of bulk carrier in regulation IX/1.6 reads "*Bulk carrier means a ship which is constructed generally with single deck, top-side tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk, and includes such types as ore carriers and combination carriers*"; while SOLAS regulations III/31, XI-1/2 and XI-2/1.1 also refer to this definition;

The definition of bulk carrier in regulation XII/1.1 reads "*Bulk carrier means a ship which is intended primarily to carry dry cargo in bulk, including such types as ore carriers and combination carriers*"; while SOLAS regulation II-1/2.24 also refers to this definition.

4.2 IMO MSC.277 (85) clarification of the term "bulk carrier"

In order to ensure compliance with bulk carrier requirements specified in SOLAS Chapters II-1, IX, XI-1 and XI in a consistent and unified manner, IMO adopted resolution MSC.277(85) *CLARIFICATION OF THE TERM "BULK CARRIER" AND GUIDANCE FOR APPLICATION OF REGULATIONS IN SOLAS TO SHIPS WHICH OCCASIONALLY CARRY DRY CARGOES IN BULK AND ARE NOT DETERMINED AS BULK CARRIERS IN ACCORDANCE WITH REGULATION XII/1.1 AND CHAPTER II-1* on 28 November 2008 at its 85th session of MSC, which clarifies the terms "*primarily to carry dry cargo in bulk*", "*includes such types as ore carriers and combination carriers*" and "*constructed generally with single deck, top-side tanks and hopper side tanks in cargo spaces*" used in the definitions of bulk carrier under SOLAS Chapters II-1, IX and XII, and specifies that all ships primarily to carry dry cargo in bulk, regardless of their forms of construction, belong to bulk carriers as defined in SOLAS, and are to comply with applicable requirements concerning bulk carriers as specified under SOLAS chapters II-1, III, IX, XI-1 and XII. Meanwhile, the resolution also defines that certain dedicated ship types for carrying dry cargoes such as wood chips, cement, fly ash and sugar (hereinafter referred to as dedicated ships) are not to be deemed as bulk carrier defined in SOLAS, as well as that ships other than dedicated ships, which do not satisfy SOLAS bulk carrier requirements, are permitted to occasionally carry dry cargoes in bulk (hereinafter referred as ships occasionally carrying dry cargoes in bulk), provided that they meet specific technical requirements.

4.3 MSC.277 (85) implementation requirements

4.3.1 Resolution MSC.277(85) *CLARIFICATION OF THE TERM "BULK CARRIER" AND GUIDANCE FOR APPLICATION OF REGULATIONS IN SOLAS TO SHIPS WHICH OCCASIONALLY CARRY DRY CARGOES IN BULK AND ARE NOT DETERMINED AS BULK CARRIERS IN ACCORDANCE WITH REGULATION XII/1.1 AND CHAPTER II-1* consists of two parts: operational measures and structural requirements, specifying 3 types of ships, i.e. bulk carriers defined in SOLAS, ships occasionally carrying dry cargoes in bulk and dedicated ships carrying bulk cargo, as well as applicable requirements for all ships types in each chapter of

SOLAS respectively.

4.3.1.1 Bulk carriers defined in SOLAS

(1) "*primarily to carry dry cargo in bulk*" means primarily designed to carry dry cargoes in bulk and to transport cargoes which are carried, and loaded or discharged, in bulk, and which occupy the ship's cargo spaces exclusively or predominantly; and

(2) "*includes such types as ore carriers and combination carriers*" and "*constructed generally with single deck, top-side tanks and hopper side tanks in cargo spaces*" means that ships are not considered outside the definition of bulk carriers on the grounds that they are not ore or combination carriers or that they lack some or all of the specified constructional features.

This interpretation applies to bulk carriers the keels of which are laid or which are at a similar stage of construction on or after 1 July 2010, which are required to comply with provisions concerning bulk carriers specified in SOLAS chapters II-1, III, XI-1, XII and etc.

4.3.1.2 Dedicated ships carrying certain bulk cargo

Dedicated ships carrying certain bulk cargo refers to ships dedicated for the carriage of wood chips, cement, fly ash and sugar, which do not use grab buckets and power shovels over 10 ton or other equipment that may damage cargo hold structure for loading and unloading.

Such ships do not need to satisfy provisions applicable to bulk carriers as specified in SOLAS chapters II-1, III, XI-1 and XII (This interpretation applies to such ships the keels of which are laid or which are at a similar stage of construction on or after 1 January 2009.) According to the provisions of paragraph 1.10 in resolution MSC.277 (85), such ships shall be issued with a statement attesting to the application of paragraph 1.5 under the provisions of this resolution.

4.3.1.3 Ships occasionally carrying dry cargoes in bulk

Ships other than the above-mentioned two types that occasionally carry dry cargoes in bulk, provided:

(1) they are of double-side skin construction, and the freeboard assigned is type B without reduced freeboard

And they comply with SOLAS regulations II-1/3-2.2, XII/6.2, XII/6.3, XII/6.4, XII/10, XII/11, XII/12 and XII/13 as applicable to bulk carriers to the extent indicated below:

- Regulation II-1/3-2.2 (Protective coatings of dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers)^①Double-side skin void spaces of ships in accordance with paragraph 1.6 should be treated in the same manner as double-side skin spaces of bulk carriers.
- Regulations XII/6.2, 6.3 and 6.4 (Structural and other requirements for bulk carriers)
- Regulation XII/10 (Solid bulk cargo density declaration)
- Regulation XII/11 (Loading instrument)
- Regulation XII/12 (Hold, ballast and dry space water ingress alarms)
- Regulation XII/13 (Availability of pumping systems)

This interpretation applies to such ships the keel of which are laid or which are at a similar stage

of construction on or after 1 July 2010. According to the provisions of paragraph 1.10 in resolution MSC.277 (85), such ships shall be issued with a statement attesting to the application of paragraph 1.6 under the provisions of this resolution.

(2) they are of single-side skin construction of less than 100 m in length, and the freeboard assigned is type B without reduced freeboard

And they comply with SOLAS regulations XII/11, XII/12 and XII/13 as applicable to bulk carriers to the extent indicated below:

- Regulation XII/11 (Loading instrument)
- Regulation XII/12 (Hold, ballast and dry space water ingress alarms)
- Regulation XII/13 (Availability of pumping systems)

This interpretation applies to such ships the keel of which are laid or which are at a similar stage of construction on or after 1 July 2010.

According to the provisions of paragraph 1.10 in resolution MSC.277 (85), such ships shall be issued with a statement (Form CSB-2 (BC1)) attesting to the application of paragraph 1.7 under the provisions of this resolution.

4.3.2 Resolution MSC.277 (85) is non-mandatory, and only applies to newbuilding ships. For its application, attention shall also be given to special provisions of the flag State.

China flag ships are to implement in accordance with requirements specified under Part 4, Chapter 1, Section 2.4 in *2008 Amendments to the Technical Regulations for Statutory Surveys of Ships Engaged on International Voyages*, which has already incorporated the requirements of resolution MSC.277 (85) and is applicable to China flag ships the keel of which are laid or which are at a similar stage of construction on or after 1 May 2010.

For non-China flag ships, the application of resolution MSC.277 (85) to dedicated ships, the keel of which are laid on or after 1 January 2009, and ships the keel of which are laid on or after 1 July 2010 occasionally carrying dry cargoes in bulk, depends on the acceptance status of this resolution by the flag State

