

# COMMON STRUCTURAL RULES FOR BULK CARRIERS

## JULY 2012

### Corrigenda 1

### Rule Editorials

- Notes:** (1) These Rule Corrigenda enter into force on 1st July 2012.  
(2) These Rule Corrigenda should be read in conjunction with the July 2012 consolidated edition of Bulk Carriers CSR.

Copyright in these Common Structural Rules for Bulk Carriers is owned by:

American Bureau of Shipping

Bureau Veritas

China Classification Society

Det Norske Veritas

Germanischer Lloyd

Korean Register of Shipping

Lloyd's Register

Nippon Kaiji Kyokai

Registro Italiano Navale

Russian Maritime Register of Shipping

Copyright © 2012

The IACS members, their affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as the 'IACS Members'. The IACS Members, individually and collectively, assume no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant IACS Member entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.



For technical background for Rule Corrigenda in this present document, reference is made to separate document Technical Background for Rule Corrigenda.

## List of changes

<b>CHAPTER 2</b>	<b>GENERAL ARRANGEMENT DESIGN .....</b>	<b>1</b>
<b>Section 1</b>	<b>Subdivision Arrangement .....</b>	<b>1</b>
	<b>3. After peak, machinery space bulkheads and stern tubes .....</b>	<b>1</b>
	3.1.5 Stern Tubes.....	1
<b>CHAPTER 6</b>	<b>HULL SCANTLINGS.....</b>	<b>2</b>
<b>Section 3</b>	<b>Buckling and ultimate strength of ordinary stiffeners and stiffened panels ..</b>	<b>2</b>
	Symbols.....	2
<b>CHAPTER 11</b>	<b>CONSTRUCTION AND TESTING.....</b>	<b>3</b>
<b>Section 3</b>	<b>Testing of Compartments.....</b>	<b>3</b>
	<b>2 Testing Method .....</b>	<b>3</b>
	2.3 Hose Testing.....	3
	2.3.1 .....	3
<b>CHAPTER 13</b>	<b>SHIPS IN OPERATION, RENEWAL CRITERIA .....</b>	<b>4</b>
<b>Section 1</b>	<b>Maintenance of Class.....</b>	<b>4</b>
	<b>1 General .....</b>	<b>4</b>
	1.1 Application .....	4
	1.1.2 Void .....	4
	1.1.3 Void .....	4
	1.2 Definitions .....	4
	1.2.3 Deck zone .....	4
	1.2.4 Bottom zone.....	5
	1.2.5 Neutral axis zone .....	5
<b>Section 2</b>	<b>Thickness Measurement and acceptance criteria .....</b>	<b>5</b>
	Symbols .....	5
	<b>1 Application.....</b>	<b>6</b>
	1.1.1 General .....	6
	1.1.1 .....	6
	<b>2 Rule requirements for the extent of measurements and the determination of locations.....</b>	<b>6</b>
	2.1 General .....	6
	2.1.1 .....	6
	2.2 Class renewal survey .....	7
	2.2.1 .....	7
	2.2.2 .....	8
	2.3 Number and locations of measurements.....	8
	2.3.1 Number of measurements .....	8

2.3.2	<i>Locations of measurements</i> .....	8
<b>3.</b>	<b>Acceptance Criteria</b> .....	<b>13</b>
3.1	Definitions .....	13
3.1.1	<i>Deck zone</i> .....	13
3.1.2	<i>Bottom zone</i> .....	14
3.1.3	<i>Neutral axis zone</i> .....	14
3.2	Local strength criteria .....	14
3.2.1	<i>Items for the local strength criteria</i> .....	14
3.2.2	<i>Renewal thickness for corrosion other than local corrosion</i> .....	15
3.2.3	<i>Renewal thickness for local corrosion</i> .....	15
3.3	Global strength criteria .....	16
3.3.1	<i>Items for the global strength criteria</i> .....	16
3.3.2	<i>Renewal thickness</i> .....	16
<b>Section 2</b>	<b>Acceptance criteria</b> .....	<b>17</b>
	<b>Symbols</b> .....	<b>17</b>
<b>1.</b>	<b>Local strength criteria</b> .....	<b>18</b>
1.1	Application .....	18
1.1.1	.....	18
1.2	Renewal thickness for corrosion other than local corrosion .....	18
1.2.1	.....	18
1.3	Renewal thickness for local corrosion .....	18
1.3.1	.....	18
1.4	Global strength criteria .....	19
1.4.1	<i>Items for the global strength criteria</i> .....	19
1.4.2	<i>Renewal thickness</i> .....	19



## Chapter 2 GENERAL ARRANGEMENT DESIGN

### Section 1 Subdivision Arrangement

#### 3. After peak, machinery space bulkheads and stern tubes

PH11005\_IHw

*The following text unintentionally removed from the last revision is reinstated with corrected references:*

##### 3.1.5 Sterntubes

Ref. SOLAS Ch. II-1, Part B-2, Reg.12

Serntubes are to be enclosed in a watertight space (or spaces) of moderate volume. Other measures to minimise the danger of water penetrating into the ship in case of damage to sterntube arrangements may be taken at the discretion of the Society.

## Chapter 6 Hull Scantlings

### Section 3 Buckling and ultimate strength of ordinary stiffeners and stiffened panels

#### Symbols

PH5035e

*The following table is modified as follow:*

**Table 1: Correction factor  $F_1$**

	$F_1^{(2)}$	Edge stiffener
Stiffeners sniped at both ends	1.00	
Guidance values where both ends are effectively connected to adjacent structures <sup>(1)</sup>	1.05	Flat bar
	1.10	Bulb section
	<del>1.20</del> 1.21	Angle and tee-sections
	1.30	Girders of high rigidity (e.g. bottom transverses)
<sup>(1)</sup> Exact values may be determined by direct calculations.		
<sup>(2)</sup> An average value of $F_1$ is to be used for plate panels having different edge stiffeners.		



## Chapter 11 Construction and Testing

### Section 3 Testing of Compartments

#### 2 Testing Method

#### 2.3 Hose Testing

KC 1022

*The following text is modified as follow:*

##### 2.3.1

When hose testing is required to verify the tightness of the structures, as defined in Tab 1, the minimum pressure in the hose, at least equal to  ~~$0.20 \cdot 10^5$~~   $2 \cdot 10^5$  Pa, is to be applied at a maximum distance of 1.5 m. The nozzle diameter is not to be less than 12 mm.

## Chapter 13      Ships in Operation, Renewal Criteria

### Section 1      Maintenance of Class

#### 1      General

##### 1.1      Application

PH11007

*The following requirement is deleted and replaced by term “void”:*

##### 1.1.2      Void

~~This Chapter is intended to provide Owners, companies performing thickness measurements and Society’s Surveyors with a uniform procedure in order to fulfil rule requirements for thickness measurements. In particular, it will enable all the above mentioned parties to carry out:~~

- ~~• the planning and preparation~~
  - ~~• the determination of extent and location~~
  - ~~• the analysis~~
- ~~of the thickness measurements.~~

PH11007

*The following requirement is deleted and replaced by term “void”:*

##### 1.1.3      Void

~~This Chapter also takes into account specific requirements for thickness measurements relevant to close up surveys within the scope of the Enhanced Survey Program (ESP) of single side skin bulk carriers and double side skin bulk carriers.~~

##### 1.2      Definitions

PH11007

*The following requirement is added:*

##### 1.2.3      Deck zone

The deck zone includes all the following items contributing to the hull girder strength above the horizontal strake of the topside tank or above the level corresponding to 0.9D above the base line if there is no topside tank:

- strength deck plating

- deck stringer
- sheer strake
- side shell plating
- top side tank sloped plating, including horizontal and vertical strakes
- longitudinal stiffeners connected to the above mentioned platings.

PH11007

*The following requirement is added:*

#### 1.2.4 Bottom zone

The bottom zone includes the following items contributing to the hull girder strength up to the upper level of the hopper sloping plating or up to the inner bottom plating if there is no hopper tank:

- keel plate
- bottom plating
- bilge plate
- bottom girders
- inner bottom plating
- hopper tank sloping plating
- side shell plating
- longitudinal stiffeners connected to the above mentioned platings.

PH11007

*The following requirement is added:*

#### 1.2.5 Neutral axis zone

The neutral axis zone includes the plating only of the items between the deck zone and the bottom zone, as for example:

- side shell plating
- inner hull plating, if any.

PH11007

*The following section and its content is deleted:*

## ~~Section 2 — Thickness Measurement and acceptance criteria~~

### ~~Symbols~~

~~For symbols not defined in this Section, refer to Ch 1, Sec 4.~~

~~$t_{renewal}$  : Renewal thickness; Minimum allowable thickness, in mm, below which renewal of structural members is to be carried out~~

~~$$t_{renewal} = t_{as\_built} - t_C - t_{voluntary\_addition}$$~~

~~$t_{reserve}$  : Reserve thickness; Thickness, in mm, to account for anticipated thickness diminution that may occur during a survey interval of 2.5 year. ( $t_{reserve} = 0.5$  mm)~~

~~$t_C$  : Corrosion addition, in mm, defined in Ch 3, Sec3~~

~~$t_{as\_built}$  : As built thickness, in mm, including  $t_{voluntary\_addition}$ , if any~~

~~$t_{voluntary\_addition}$  : Voluntary thickness addition; Thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to  $t_C$~~

~~$t_{gauged}$  : Gauged thickness, in mm, on one item, i.e average thickness on one item using the various measurements taken on this same item during periodical ship's in service surveys.~~

## ~~1 Application~~

### ~~1.1.1 General~~

#### ~~1.1.1~~

~~This section provides the following information:~~

- ~~• references to rule requirements and some additional information on the extent of the thickness measurements to be performed during surveys (see [2.1] and [2.2])~~
- ~~• locations of the measurements for the main parts of the ship (see [2.3])~~
- ~~• how to apply the acceptance criteria (see [3]).~~

~~Tables are also given to detail the above items. The sketches are given as an example to illustrate the requirements.~~

## ~~2 Rule requirements for the extent of measurements and the determination of locations~~

### ~~2.1 General~~

#### ~~2.1.1~~

~~For the maintenance of class, thickness measurements are required during intermediate and class renewal surveys and may be required during annual surveys.~~

Tab 1 gives the references to the minimum requirements for thickness measurements related to the different types of surveys.

**Table 1: — References to rule requirements related to thickness measurements**

<b>Class renewal survey</b>	<b>Intermediate survey</b>	<b>Annual survey</b>
<p><b>Outside the cargo length area:</b> UR Z7:  <ul style="list-style-type: none"> <li>• systematic measurements and suspect areas;</li> <li>• where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor's satisfaction.</li> </ul> </p>	<p><b>Outside the cargo length area:</b> UR Z7:  <ul style="list-style-type: none"> <li>• thickness measurements to be taken if deemed necessary by the Surveyor;</li> <li>• where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor's satisfaction.</li> </ul> </p>	<p><b>Outside the cargo length area:</b> UR Z7:  <ul style="list-style-type: none"> <li>• areas of substantial corrosion identified at previous class renewal or intermediate surveys;</li> <li>• where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor's satisfaction.</li> </ul> </p>
<p><b>Within the cargo length area:</b> a) <u>single side skin bulk carriers:</u> UR Z10.2:  <ul style="list-style-type: none"> <li>• planning and general requirements</li> <li>• measurements of elements subjected to close up survey</li> <li>• extent of systematic thickness measurements</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> </p>	<p><b>Within the cargo length area:</b> a) <u>single side skin bulk carriers:</u> UR Z10.2: <i>Ships 10 years of age or less:</i>  <ul style="list-style-type: none"> <li>• for cargo holds</li> <li>• for salt ballast tanks</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> <i>Ships over 10 years of age:</i>  <ul style="list-style-type: none"> <li>• see references given for class renewal survey</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> </p>	<p><b>Within the cargo length area:</b> a) <u>single side skin bulk carriers:</u> UR Z10.2:  <ul style="list-style-type: none"> <li>• for cargo holds and when deemed necessary by the Surveyor</li> <li>• for salt ballast tanks and when deemed necessary by the Surveyor</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> </p>
<p>b) <u>double side skin bulk carriers:</u> UR Z10.5:  <ul style="list-style-type: none"> <li>• planning and general requirements</li> <li>• measurements of elements subjected to close up survey</li> <li>• extent of systematic thickness measurements</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> </p>	<p>b) <u>double side skin bulk carriers:</u> UR Z10.5: <i>Ships 10 years of age or less:</i>  <ul style="list-style-type: none"> <li>• for cargo holds</li> <li>• for salt ballast tanks</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> <i>Ships over 10 years of age:</i>  <ul style="list-style-type: none"> <li>• see references given for class renewal survey</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> </p>	<p>b) <u>double side skin bulk carriers:</u> UR Z10.5:  <ul style="list-style-type: none"> <li>• for cargo holds and when deemed necessary by the Surveyor</li> <li>• for salt ballast tanks and when deemed necessary by the Surveyor</li> <li>• according to the different locations, where substantial corrosion is found</li> </ul> </p>

## 2.2 — Class renewal survey

### 2.2.1

The thickness measurements required by the Rules consist of:

- systematic thickness measurements in order to assess the global and local strength of the ship
- thickness measurements as indicated in the program of close up survey
- measurements of elements considered as suspect areas

- ~~additional measurements on areas determined as affected by substantial corrosion.~~

## 2.2.2

~~For the determination of close up surveys and relevant thickness measurements as well as the areas considered as suspect areas, reference is to be made to the relevant Sections of the following IACS Unified Requirements:~~

- ~~for the hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks:~~
- ~~UR Z10.2 “Hull surveys of single skin bulk carriers”~~
- ~~UR Z10.5 “Hull surveys of double skin bulk carriers”~~
- ~~for the remainder of the ship outside the cargo length area:~~
- ~~UR Z7.~~

## 2.3 — Number and locations of measurements

### 2.3.1 — Number of measurements

~~Considering the extent of thickness measurements as required by the Rules and indicated in [2.1] and [2.2], the locations of the points to be measured are given for the most important items of the structure.~~

### 2.3.2 — Locations of measurements

~~Tab 2 provides explanations and/or interpretations for the application of those requirements indicated in the Rules which refer to both systematic thickness measurements related to the calculation of global hull girder strength and specific measurements connected to close up surveys.~~

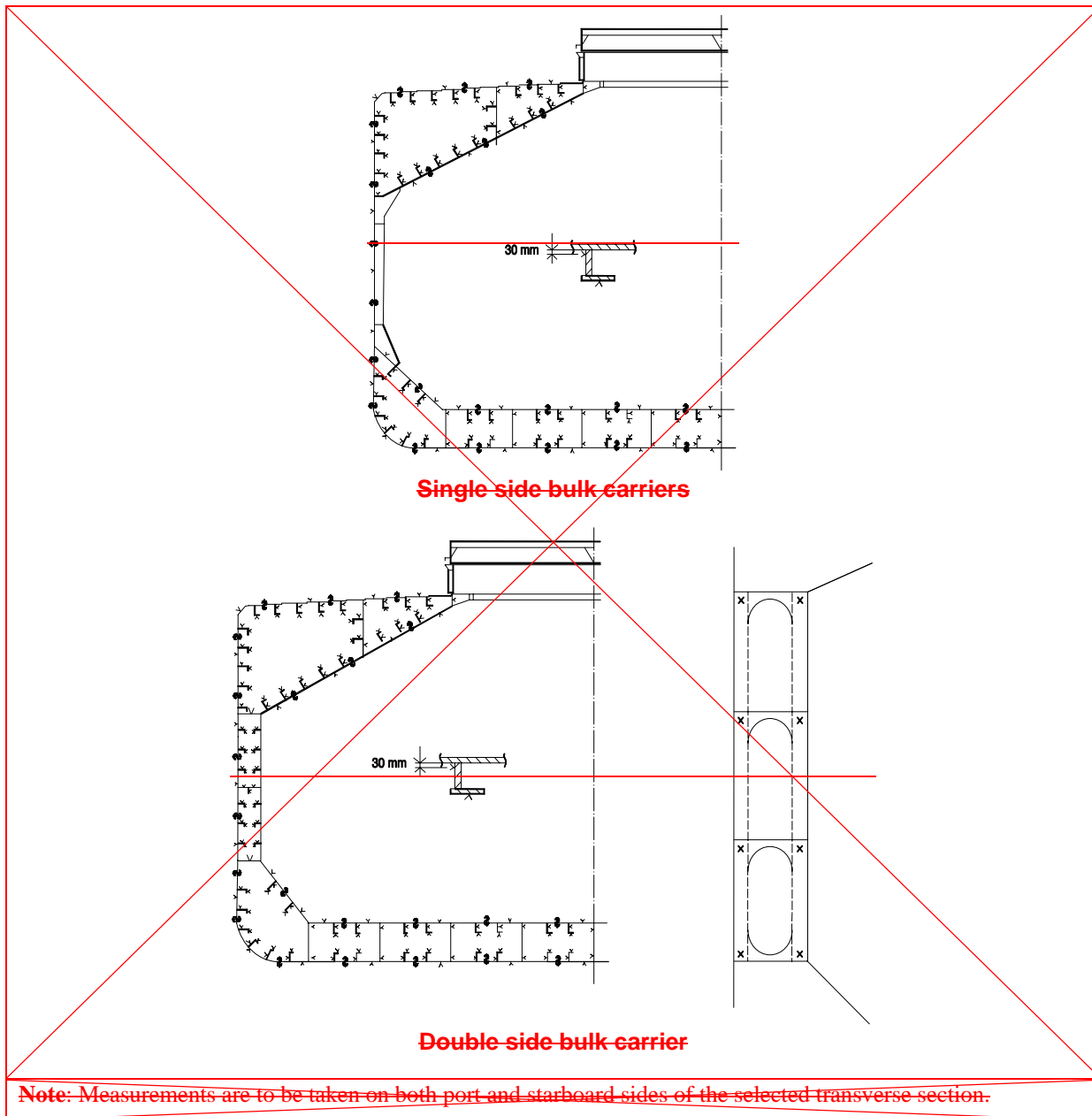
~~Fig 1 to Fig 5 are provided to facilitate the explanations and/or interpretations given in Tab 2, to show typical arrangements of single side skin bulk carriers and double side skin bulk carriers.~~

**Table 2: — Interpretations of rule requirements for the locations and number of points to be measured**

Item	Interpretation	Figure reference
Selected plates on deck, tank top, bottom, double bottom and wind and water area	«Selected» means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion	
All deck, tank top and bottom plates and wind and water strakes	At least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion	
Transverse section	<i>Single side skin bulk carrier:</i> A transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, side, bottom; inner bottom and hopper side plating, longitudinal bulkhead and bottom	Fig 1 for single and double side skin bulk carriers

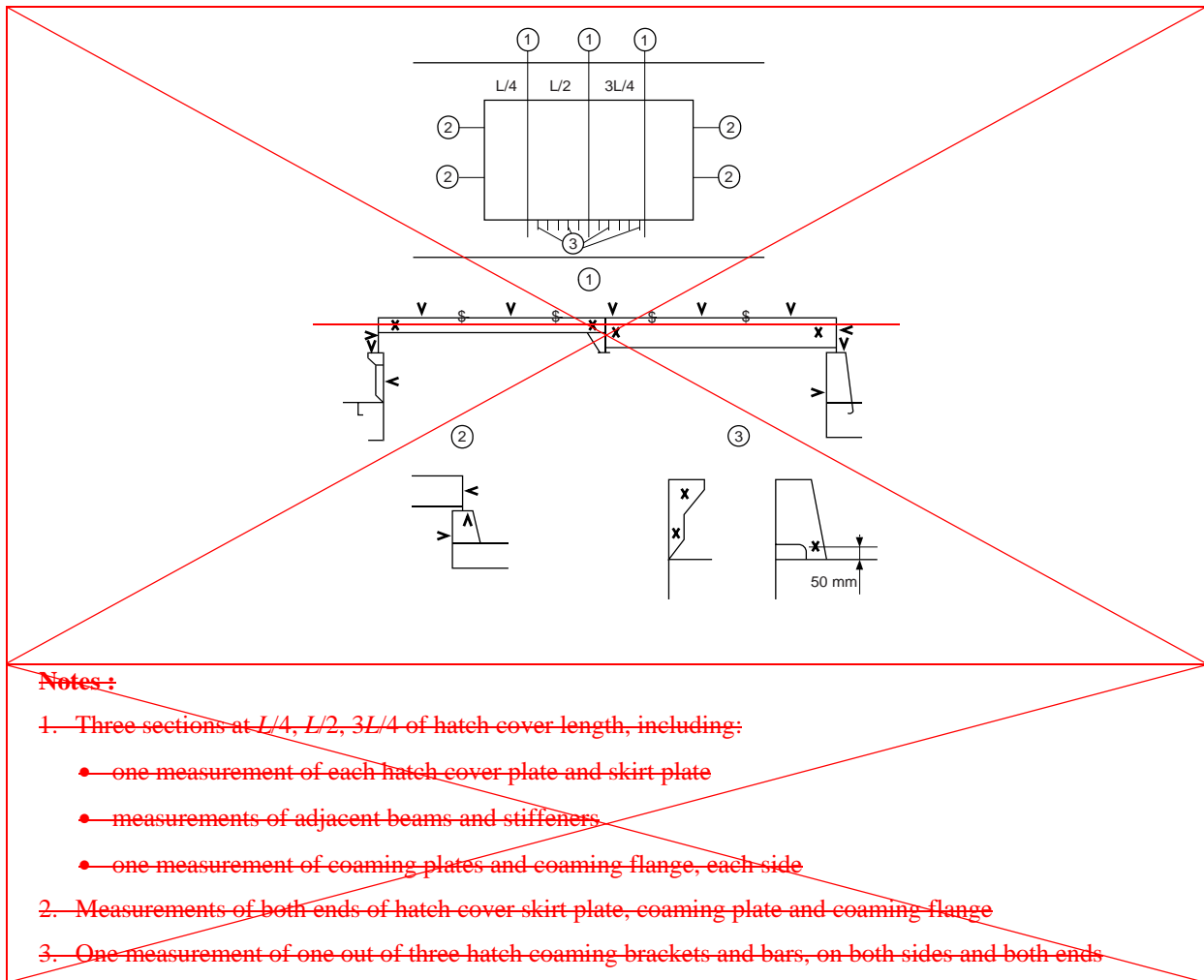
Item	Interpretation	Figure reference
	<p>plating in top wing tanks.</p> <p><i>Double side skin bulk carrier:</i> A transverse section includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom, hopper sides, inner sides and top wing inner sides.</p>	
Cargo hold hatch covers and coamings		Fig 2
Selected internal structure such as floors and longitudinals, transverse frames, web frames, deck beams, girders	The internal structural items to be measured in each space internally surveyed are to be at least 10% outside the cargo length area	
Transverse section of deck plating outside line of cargo hatch openings	Two single points on each deck plate (to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion) between the ship sides and hatch coamings in the transverse section concerned	
Selected areas of all deck plating inside line of hatch openings	<p>«Selected» means at least a single point on one out of three plates, to be chosen on representative areas of average corrosion</p> <p>«All deck plating» means at least two points on each plate to be taken either at each 1/4 extremity of plate or at representative areas of average corrosion</p>	Extent of areas is shown in UR Z10.2 for single side skin bulk carriers and UR Z10.5 for double side skin bulk carriers
Selected side shell frames in cargo holds for single side skin bulk carriers	<p>25% of frames: one out of four frames should preferably be chosen throughout the cargo hold length on each side</p> <p>«Selected frames» means at least 3 frames on each side of cargo holds</p>	<p>Extent of areas is shown in UR Z10.2 for single side skin bulk carriers.</p> <p>Locations of points are given in Fig 3 for single side skin bulk carriers</p>
Transverse frame in double skin tank		Fig 1
Transverse bulkheads in cargo holds	<p>Includes bulkhead plating, stiffeners and girders, including internal structure of upper and lower stools, where fitted.</p> <p>Two selected bulkheads: one is to be the bulkhead between the two foremost cargo holds and the second may be chosen in other positions</p>	<p>Areas of measurements are shown in UR Z10.2 for single side skin bulk carriers and UR Z10.5 for double side skin bulk carriers.</p> <p>Locations of points are given in Fig 4.</p>
One transverse bulkhead in each cargo hold	This means that the close-up survey and related thickness measurements are to be performed on one side of the bulkhead; the side is to be chosen based on the outcome of the overall survey of both sides. In the event of doubt, the Surveyor may also require (possibly partial) close-up survey on the other side	<p>Areas of measurements are shown in UR Z10.2 for single side skin bulk carriers and UR Z10.5 for double side skin bulk carriers.</p> <p>Locations of points are given in Fig 4.</p>
Transverse bulkheads in one topside/side ballast tank	The ballast tank is to be chosen based on the history of ballasting among those prone to have the most severe conditions	Locations of points are given in Fig 5

Item	Interpretation	Figure reference
Transverse webs in ballast tanks	One of the representative tanks of each type (i.e. topside or hopper or side tank) is to be chosen in the forward part	Extent of areas is shown in UR Z10.2 for single side skin bulk carriers and in UR Z10.5 for double side skin bulk carriers. Locations of points are given in Fig 3.

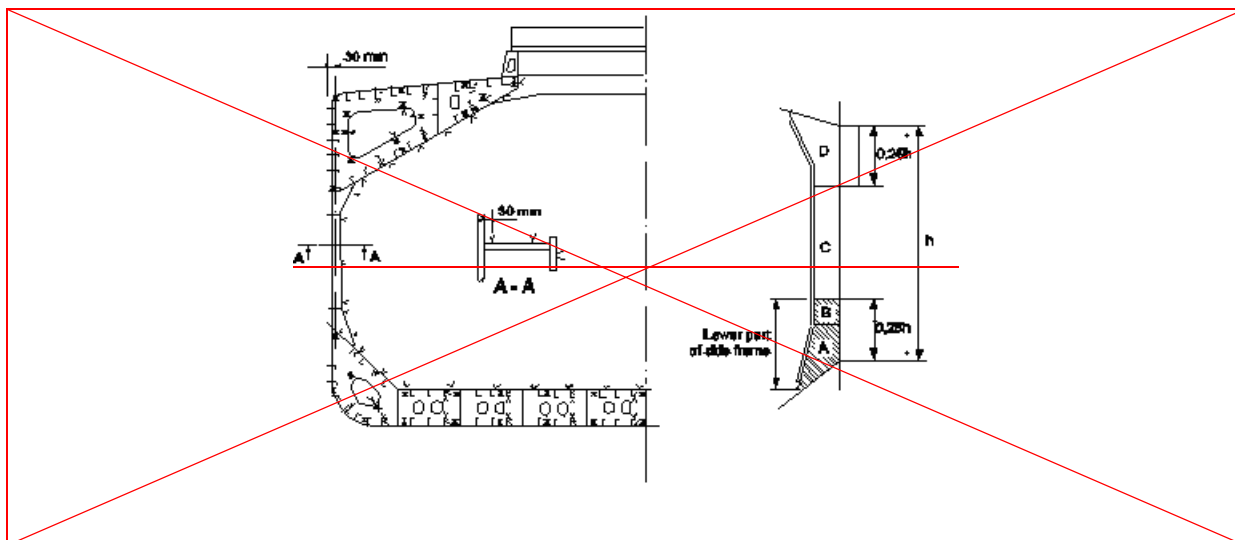


**Figure 1: Transverse section of bulk carrier**



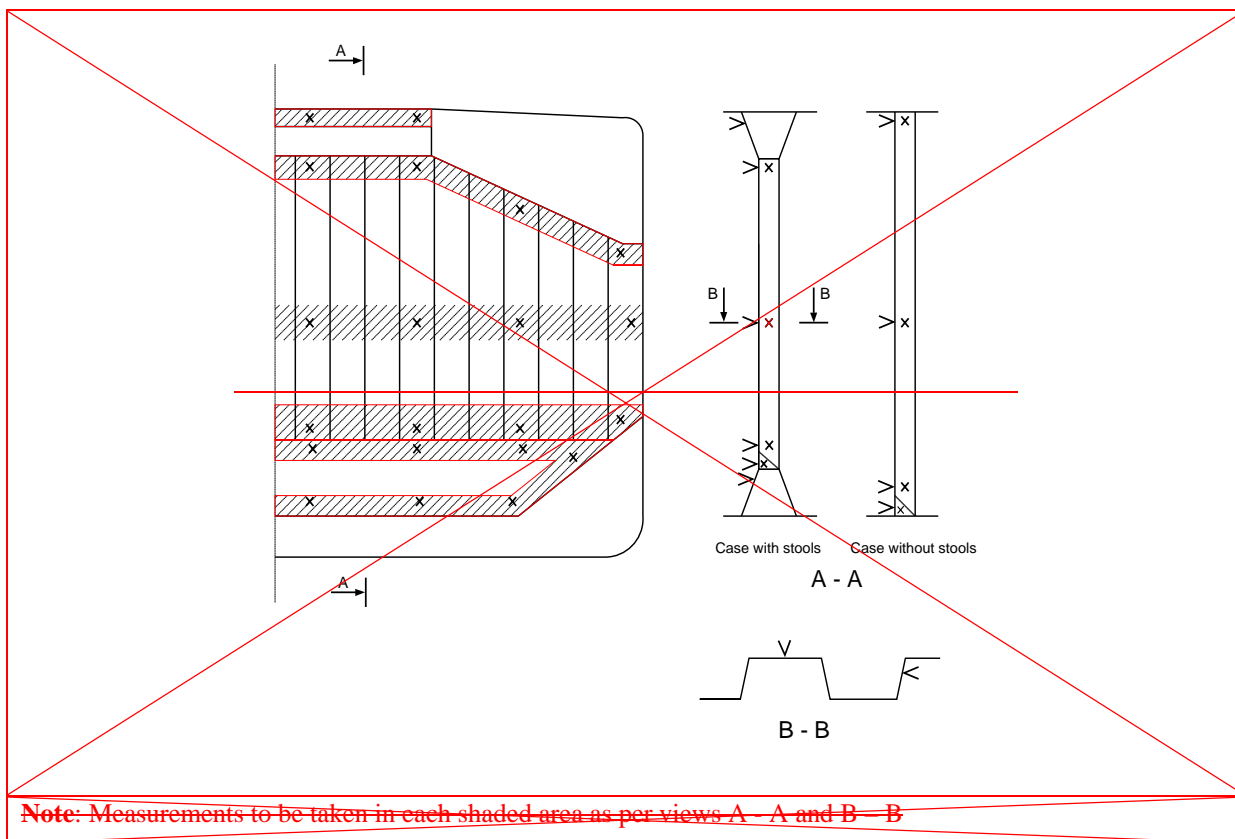


**Figure 2: Locations of measurements on hatch covers and coamings**

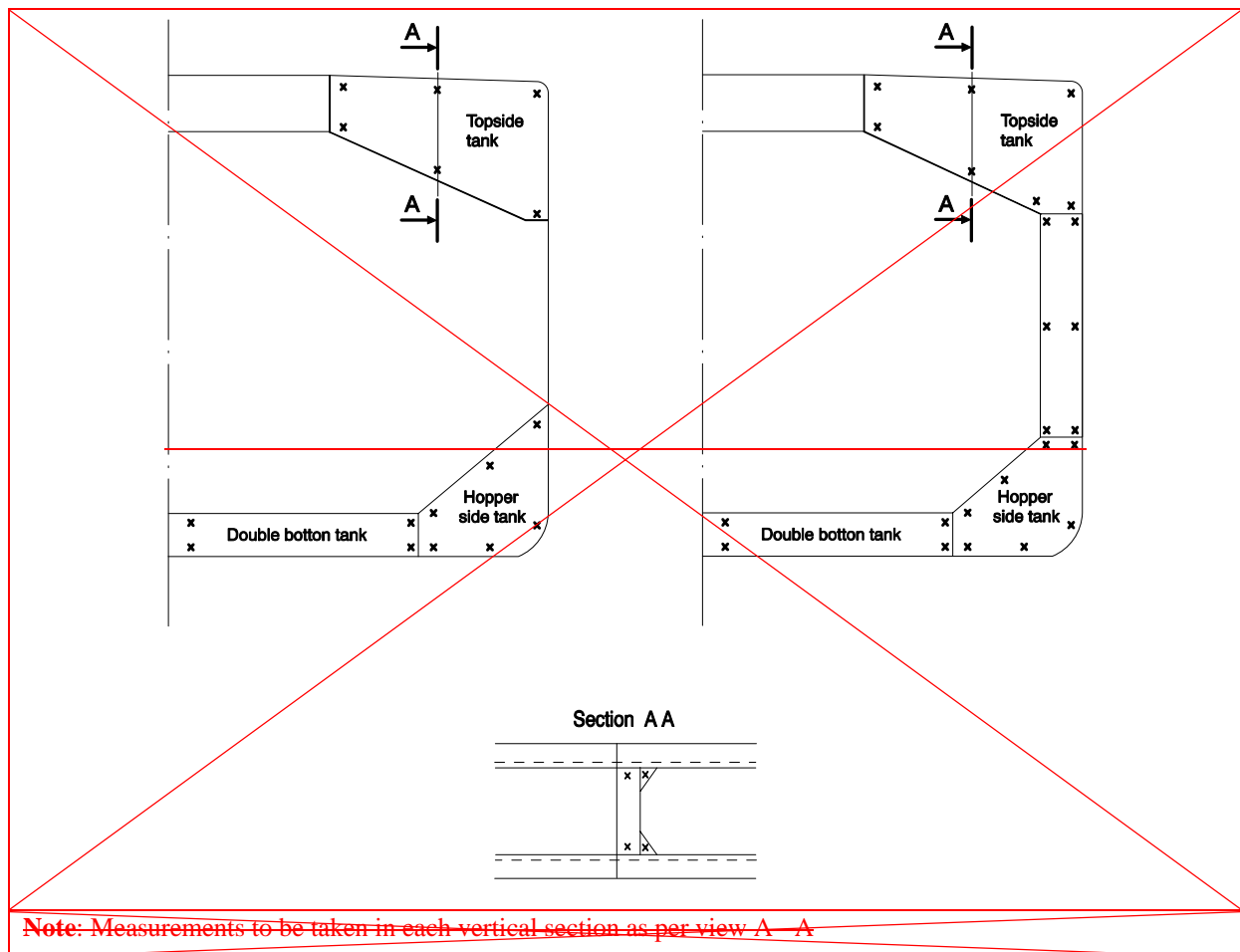


**Note:** The gauging pattern for web plating is to be a three point pattern for zones A, C and D, and a two point pattern for zone B (see figure). The gauging report is to reflect the average reading. The average reading is to be compared with the allowable thickness. If the web plating has general corrosion then this pattern is to be expanded to a five point pattern.

**Figure 3: Locations of measurements on structural members in cargo holds and ballast tanks of single side skin bulk carriers**



**Note:** Measurements to be taken in each shaded area as per views A - A and B - B

**Figure 4: Locations of measurements on cargo hold transverse bulkheads****Figure 5: Locations of measurements on transverse bulkheads of topside, hopper, double hull and double bottom tanks**

### 3. Acceptance Criteria

#### 3.1 Definitions

##### 3.1.1 Deck zone

The deck zone includes all the following items contributing to the hull girder strength above the horizontal stake of the topside tank or above the level corresponding to 0.9D above the base line if there is no topside tank:

- strength deck plating
- deck stringer
- sheer strake

- ~~side shell plating~~
- ~~top side tank sloped plating, including horizontal and vertical strakes~~
- ~~longitudinal stiffeners connected to the above mentioned platings.~~

### 3.1.2 ~~Bottom zone~~

~~The bottom zone includes the following items contributing to the hull girder strength up to the upper level of the hopper sloping plating or up to the inner bottom plating if there is no hopper tank:~~

- ~~keel plate~~
- ~~bottom plating~~
- ~~bilge plate~~
- ~~bottom girders~~
- ~~inner bottom plating~~
- ~~hopper tank sloping plating~~
- ~~side shell plating~~
- ~~longitudinal stiffeners connected to the above mentioned platings.~~

### 3.1.3 ~~Neutral axis zone~~

~~The neutral axis zone includes the plating only of the items between the deck zone and the bottom zone, as for example:~~

- ~~side shell plating~~
- ~~inner hull plating, if any~~

## 3.2 ~~Local strength criteria~~

### 3.2.1 ~~Items for the local strength criteria~~

~~The items to be considered for the local strength criteria are those of the deck zone, the bottom zone and the neutral axis zone, as defined in [0], and the additional following items:~~

- ~~hatch coaming plating~~
- ~~hatch coaming brackets~~
- ~~hatch cover top plating~~
- ~~hatch cover skirt plating~~
- ~~hatch cover stiffeners~~
- ~~transverse bulkheads plating~~
- ~~transverse bulkheads stiffener web~~
- ~~transverse bulkheads stiffener flange~~
- ~~side shell frames web~~
- ~~side shell frames flange~~
- ~~side shell frames brackets~~

- web of topside and hopper tank web frames
- flange of topside and hopper tank web frames
- floors plating and stiffeners
- forward and aft peak bulkheads plating
- forward and aft peak bulkheads stiffener web
- forward and aft peak bulkheads stiffener flange
- stringers and girders.

### 3.2.2 Renewal thickness for corrosion other than local corrosion

For each item, steel renewal is required when the gauged thickness  $t_{gauged}$  is less than the renewal thickness, as specified in the following formula:

$$t_{gauged} < t_{renewal}$$

Where the gauged thickness  $t_{gauged}$  is such as:

$$t_{renewal} < t_{gauged} < t_{renewal} + t_{reserve}$$

coating applied in accordance with the coating manufacturer's requirements or annual gauging may be adopted as an alternative to the steel renewal. The coating is to be maintained in good condition.

### 3.2.3 Renewal thickness for local corrosion

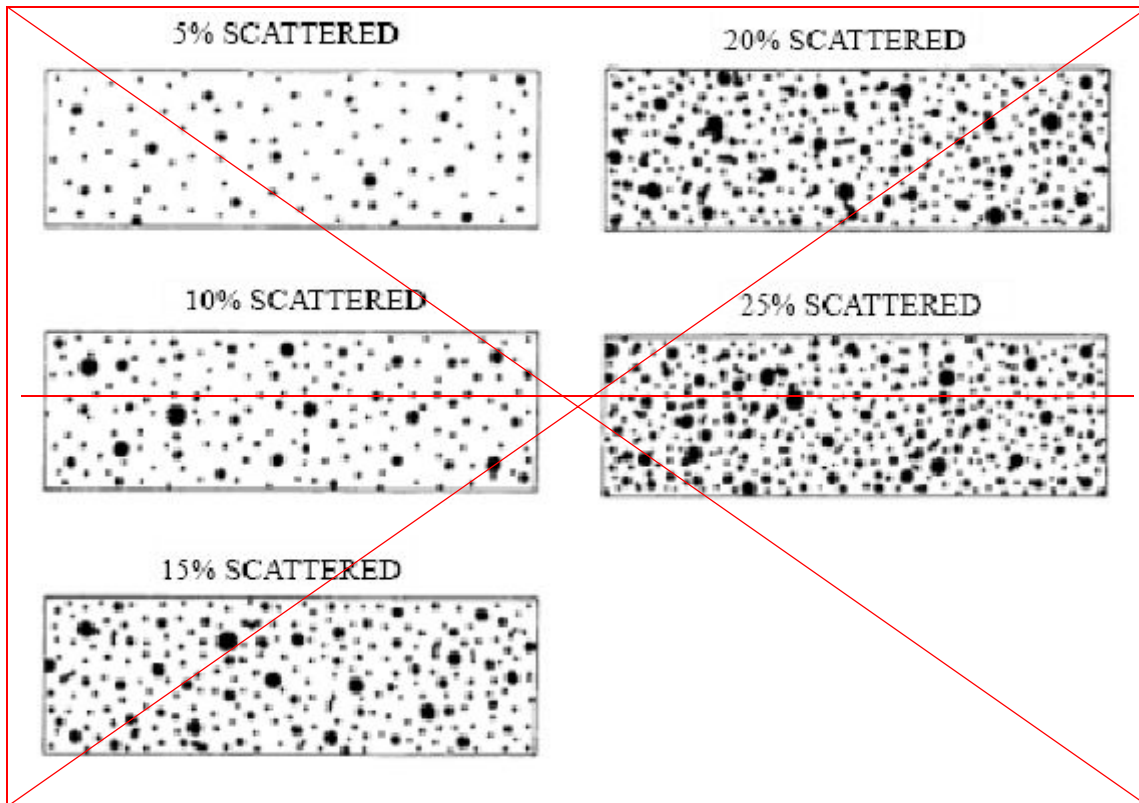
If pitting intensity in an area where coating is required, according to Ch 3, Sec 5, is higher than 15% (see Fig 6), thickness measurements are to be performed to check the extent of pitting corrosion. The 15% is based on pitting or grooving on only one side of a plate.

In cases where pitting is exceeding 15%, as defined above, an area of 300 mm or more, at the most pitted part of the plate, is to be cleaned to bare metal and the thickness is to be 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 remaining thickness in pits, grooves or other local areas as defined in Ch 13, Sec 1, [1.2.1] is to be greater than:

- 75% of the as built thickness, in the frame and end brackets webs and flanges
- 70% of the as built thickness, in the side shell, hopper tank and topside tank plating attached to the each side frame, over a width up to 30 mm from each side of it,

without being greater than  $t_{renewal}$ .



**Figure 6: Pitting intensity diagrams (from 5% to 25% intensity)**

### **3.3 Global strength criteria**

#### **3.3.1 Items for the global strength criteria**

The items to be considered for the global strength criteria are those of the deck zone, the bottom zone and the neutral axis zone, as defined in [0].

#### **3.3.2 Renewal thickness**

The global strength criteria is defined by the assessment of the bottom zone, deck zone and neutral axis zone, as detailed below:

##### **a) bottom zone and deck zone:**

The current hull girder section modulus determined with the thickness measurements is not to be less than 90% of the section modulus calculated according to Ch 5, Sec 1 with the gross offered thicknesses.

Alternatively, the current sectional areas of the bottom zone and of the deck zone which are the sum of the gauged items area of the considered zones, are not to be less than 90% of the sectional area of the corresponding zones determined with the gross offered thicknesses.

##### **b) neutral axis zone:**

~~The current sectional area of the neutral axis zone, which is the sum of the gauged platings area of this zone, is not to be less than 85% of the gross offered sectional area of the neutral axis zone.~~

~~If the actual wastage of all items, of a given transverse section, which contribute to the hull girder strength is less than 10% for the deck and bottom zones and 15% for the neutral axis zone, the global strength criteria of this transverse section is automatically satisfied and its checking is no more required.~~

PH11007

*The following section and its content are added (in addition, references are updated):*

## Section 2 Acceptance criteria

### Symbols

For symbols not defined in this Section, refer to Ch 1, Sec 4.

- $t_{renewal}$  : Renewal thickness; Minimum allowable thickness, in mm, below which renewal of structural members is to be carried out
- $$t_{renewal} = t_{as\_built} - t_C - t_{voluntary\_addition}$$
- $t_{reserve}$  : Reserve thickness; Thickness, in mm, to account for anticipated thickness diminution that may occur during a survey interval of 2.5 year. ( $t_{reserve} = 0.5$  mm)
- $t_C$  : Corrosion addition, in mm, defined in Ch 3, Sec3
- $t_{as\_built}$  : As built thickness, in mm, including  $t_{voluntary\_addition}$ , if any
- $t_{voluntary\_addition}$  : Voluntary thickness addition; Thickness, in mm, voluntarily added as the Owner's extra margin for corrosion wastage in addition to  $t_C$
- $t_{gauged}$  : Gauged thickness, in mm, on one item, i.e average thickness on one item using the various measurements taken on this same item during periodical ship's in service surveys.

## 1. Local strength criteria

### 1.1 Application

#### 1.1.1

The items to be considered for the local strength criteria are those defined in UR Z10.2 for single side skin bulk carriers and UR Z10.5 for double side skin bulk carriers.

### 1.2 Renewal thickness for corrosion other than local corrosion

#### 1.2.1

For each item, steel renewal is required when the gauged thickness  $t_{gauged}$  is less than the renewal thickness, as specified in the following formula:

$$t_{gauged} < t_{renewal},$$

Where the gauged thickness  $t_{gauged}$  is such as:

$$t_{renewal} < t_{gauged} < (t_{renewal} + t_{reserve})$$

coating applied in accordance with the coating manufacturer's requirements or annual gauging may be adopted as an alternative to the steel renewal. The coating is to be maintained in good condition.

### 1.3 Renewal thickness for local corrosion

#### 1.3.1

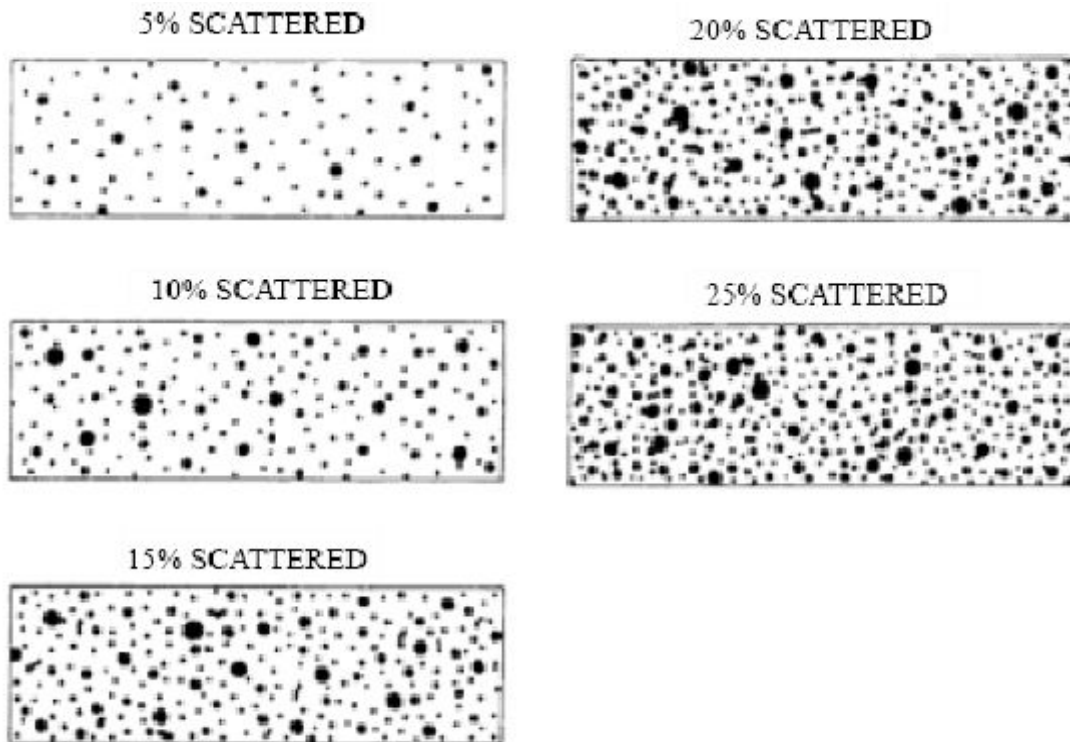
If pitting intensity in an area where coating is required, according to Ch 3, Sec 5, is higher than 15% (see Fig 1), thickness measurements are to be performed to check the extent of pitting corrosion. The 15% is based on pitting or grooving on only one side of a plate.

In cases where pitting is exceeding 15%, as defined above, an area of 300 mm or more, at the most pitted part of the plate, is to be cleaned to bare metal and the thickness is to be 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 remaining thickness in pits, grooves or other local areas as defined in Ch 13, Sec 1, [1.2.1] is to be greater than:

- 75% of the as-built thickness, in the frame and end brackets webs and flanges
- 70% of the as-built thickness, in the side shell, hopper tank and topside tank plating attached to the each side frame, over a width up to 30 mm from each side of it, without being greater than  $t_{renewal}$ .





**Figure 1: Pitting intensity diagrams (from 5% to 25% intensity)**

## **1.4 Global strength criteria**

### **1.4.1 Items for the global strength criteria**

The items to be considered for the global strength criteria are those of the deck zone, the bottom zone and the neutral axis zone, as defined in Ch 13, Sec 1, [1.2].

### **1.4.2 Renewal thickness**

The global strength criteria is defined by the assessment of the bottom zone, deck zone and neutral axis zone, as detailed below.

#### **a) bottom zone and deck zone:**

The current hull girder section modulus determined with the thickness measurements is not to be less than 90% of the section modulus calculated according to Ch 5, Sec 1 with the gross offered thicknesses.

Alternatively, the current sectional areas of the bottom zone and of the deck zone which are the sum of the gauged items area of the considered zones, are not to be less than 90% of the sectional area of the corresponding zones determined with the gross offered thicknesses.

#### **b) neutral axis zone:**

The current sectional area of the neutral axis zone, which is the sum of the gauged platings area of this zone, is not to be less than 85% of the gross offered sectional area of the neutral axis zone.

If the actual wastage of all items, of a given transverse section, which contribute to the hull girder strength is less than 10% for the deck and bottom zones and 15% for the neutral axis zone, the global strength criteria of this transverse section is automatically satisfied and its checking is no more required.