Correction of Reference Numbers in Accordance with the Comprehensive Revision of Part C of the Rules for the Survey and Construction of Steel Ships

Amended Rules and Guidance

Rules for the Survey and Construction of Steel Ships Parts A, B, U, CSR-B&T, CS, D, GF, H, K, L, M, N, S, I, O, P, PS, Q, and R
Rules for Marine Pollution Prevention Systems
Rules for Cargo Handling Appliances
Rules for High Speed Craft
Rules for the Survey and Construction of Passenger Ships
Rules for the Survey and Construction of Inland Waterway Ships
Rules for the Survey and Construction of Fibreglass Reinforced Plastics
Rules for Floating Docks
Guidance for the Survey and Construction of Steel Ships Parts B, U, V, CS, D, GF, L, M, N, S, O, P, PS, Q, and R
Guidance for Marine Pollution Prevention Systems
Guidance for Safety Equipment
Guidance for Cargo Handling Appliances
Guidance for High Speed Craft
Guidance for the Survey and Construction of Passenger Ships
Guidance for the Survey and Construction of Inland Waterway Ships
Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use

Reason for Amendment

Part C of the Rules for the Survey and Construction of Steel Ships specifies requirements related to hull construction and equipment, and references to these requirements can be found throughout other parts of the Society's Rules and Guidance as well as in its other technical rules.

A comprehensive revision of Part C was recently completed, and this revised version was released on 1 July 2022. As part of this revision, a number of changes were made to the overall structure and formatting of the chapters contained in Part C, and this has made it necessary to update the references to Part C found in the Society's other related rules.

Accordingly, references to Part C in related rules are amended.

Outline of Amendment

Amends relevant requirements of rules other than Part C that make reference to Part C of the Rules and Guidance according to the following (1) to (4) based on the policy that the comprehensive revision of Part C applies to ships not less than 90 *m* in length to which the structural strength requirements in Part C are applied as before, and that Part CS applies to ships of less than 90 *m* in length.

(1) Amends references to of Part C to reflect its comprehensive revision, and revises the associated wording of the requirements as necessary
(2) Moves requirements of the version of Part C before its comprehensive revision.
(3) Delete references to Part C in cases where such are no longer necessary due to the comprehensive revision

(4) Amends other relevant requirements

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

Part A GENERAL RULES

Chapter 1 GENERAL

1.2 Class Notations

1.2.1 General*

Sub-paragraph -2 has been amended as follows.

2 For bulk carriers subject to the application of **Part CSR-B** or **Part CSR-B&T** as required in the provisions of **1.1.2**, notations related to hull construction and equipment are affixed to the Classification Characters in accordance with the provisions in **Part CSR-B** or **Part CSR-B&T** respectively~~, substituting for the provisions of **1.2.4-6 and -22**~~. In this case, the notation of "*CSR*" is affixed at the head of the related notations (e.g. *CSR*, *BC-A*).

3 For double hull oil tankers subject to the application of **Part CSR-T** or **Part CSR-B&T** as required in the provisions of **1.1.2**, the notation of "*CSR*" is affixed to the Classification Characters in accordance with the provisions in **Part CSR-T** or **Part CSR-B&T** respectively, in addition to at the head of the related provisions of **1.2.4** (e.g. *CSR*, *TOB*).

1.2.4 Hull Construction and Equipment, etc.*

Sub-paragraph -1 has been amended as follows.

1 For ships intended for the carriage of liquid cargoes in tank(s) integrated with their hull structures and complying with the provisions of **Part 2-7**, **Part C**, **Part CSR-B&T** or **Chapter 24**, **Part CS** as appropriate, the notation of "*Tanker*" is affixed to the Classification Characters. For such ships intended for carriage of flammable liquid cargoes (except those specified in **-2** or **-3** below) and complying with the appropriate requirements specified in **Part D**, **Part H** and **Part R**, an additional notation corresponding to the flashpoints of the cargoes is affixed as follows.

(1) For ships intended for the carriage of liquid cargoes having a flash point on and below 60℃ other than oils:
Tanker, flammable liquid-flash point on and below 60℃ (abbreviated to *TFLB*)

(2) For ships intended for the carriage of liquid cargoes having a flash point above 60℃ other than oils:
Tanker, flammable liquid-flash point above 60℃ (abbreviated to *TFLA*)

(3) For ships intended for the carriage of oils having a flash point on and below 60℃:
Tanker, oils-flash point on and below 60℃ (abbreviated to *TOB*)

(4) For ships intended for the carriage of oils having a flash point above 60℃:
Tanker, oils-flash point above 60℃ (abbreviated to *TOA*)

Sub-paragraph -4 has been amended as follows.

4 In addition to the requirements in ~~1~~**3** above, for ships carrying liquefied gases in bulk complying with the provisions of **Part N**, an appropriate additional notation corresponding to the type of tanks is affixed as follows.

(1) For independent prismatic tanks of type A:
Independent Prismatic Tanks of Type A (abbreviated to *IPT Type A*) (e.g. *LGC 2G, ~~(~~IPT Type A~~)~~*)

(2) For independent prismatic tanks of type B:
Independent Prismatic Tanks of Type B (abbreviated to *IPT Type B*) (e.g. *LGC 2G, ~~(~~IPT Type B~~)~~*)

(3) For independent spherical tanks of type B:
Independent Spherical Tanks of Type B (abbreviated to *IST Type B*) (e.g. *LGC 2G, ~~(~~IST Type B~~)~~*)

(4) For independent tanks of type C:
Independent Tanks of Type C (abbreviated to *IT Type C*) (e.g. *LGC 2PG, ~~(~~IT Type C)*)

(5) For membrane tanks:
Membrane Tanks (abbreviated to *MT*) (e.g. *LGC 2G, ~~(~~MT~~)~~*)

(6) For others tanks:
Other Tanks (abbreviated to *OT*) (e.g. *LGC 2G, ~~(~~OT~~)~~*)

Part B CLASS SURVEYS

Chapter 1 GENERAL

1.1 Surveys

Paragraph 1.1.7 has been amended as follows.

1.1.7 Bulk Carriers*

~~**1** For ships which are applicable to **Chapter 31B, Part C**, a compliance survey for the requirements of **31B.2, 31B.3 and 31B.4, Part C** is to be carried out by the time specified in **Table C31B.1.3, Part C** and, a compliance survey for the requirements of **31B.5 and 31B.6, Part C** is to be carried out by the time specified in **Table C31B.5.1, Part C** in addition to the surveys required in this chapter. Moreover, a compliance survey for the requirements of **31B.7, Part C** is to be carried out. The thickness measurement examination included in the compliance survey for **31B.3 and 31B.5, Part C**, is to be carried out as deemed appropriate by the Society. In this case, the gauging procedure and submitted report are to comply with the requirements of **5.2.6-1** in addition to the procedures specified separately.~~

~~**2**~~**1** For ships which are applicable to **Chapter 31B** (Requirements related to **Chapter 31B** specified in this Chapter are those which are applied to ships which have been contracted for construction prior to 1 July 2023), continuing compliance with ~~**31B.3 and 31B.5,**~~ **An3.** and **An.5, Annex 1.2, Part 2-2, Part C** is to be verified at Special Surveys and Intermediate Surveys (for ships over 10 years of age) ~~after the compliance survey specified in -1~~. For this purpose, the thickness measurements as deemed appropriate by the Society are to be carried out for the vertical corrugated watertight bulkhead abaft the foremost hold, in addition to those according to **Table B5.15**.

~~**3**~~**2** For ships which are required to carry out the annual thickness measurement for the vertical corrugated watertight bulkhead abaft the foremost hold as a result of the survey specified in **-1** ~~**or -2**~~, the measurement is to be carried out at Annual Surveys in addition to those according to **Table B3.6**.

~~**4**~~**3** For ships which are applicable to **31B.2.1-2, Part C** ~~as a result of the survey specified in -1~~, the following surveys are to be carried out at periodical surveys in addition to the surveys required in this chapter.

(1) At annual surveys, in addition to the requirements stipulated in **Chapter 3**, the following items are to be carried out for the foremost hold.
   (a) For ships over 5 *years* and up to 15 *years* of age
      i) An overall survey of the cargo hold
      ii) A close-up survey of transverse bulkheads and a minimum of 25% of hold frames (including their upper and lower brackets and adjacent shell plating)
      Where considered necessary by the Surveyor as a result of the survey, the survey is to be extended to include a close-up survey of all of the hold frames (including their upper and lower brackets and adjacent shell plating).
      iii) A survey of suspect areas identified at previous surveys
   (b) For ships over 15 *years* of age
      i) An overall survey of the cargo hold
      ii) A close-up survey of transverse bulkheads and all hold frames (including their upper and lower brackets and adjacent shell plating)
      iii) A survey of suspect areas identified at previous surveys
   (c) The thickness measurement is to be carried out to the minimum extent specified in **(a)ii)** and **iii)** or **(b)ii)** and **iii)** above as applicable. This thickness measurement may be dispensed

with provided the Surveyor is satisfied by the close-up survey, there is no structural diminution and the protective coating, where applied, remains effective. However, where substantial corrosion is found as a result of such thickness measurements, additional thickness measurements are to be taken in accordance with **Tables B5.16** through **B5.20** for the structural members in which such corrosion is found.

(2) Function tests of the bilge well high level alarms and hold water ingress alarms as stated in **(2)** and **(4)** of **C31B.2.1-2 of the Guidance for the Survey and Construction of Steel Ships** are to be carried out in addition to those required at periodical surveys as stated in **3.2.3**, **4.2.3** and **5.2.3**.

1.3 Definitions

1.3.1 Terms*

Sub-paragraph (6) has been amended as follows.

The definitions of terms which appear in this Part are as specified in the following. Terms not defined here are as defined in other parts of the Rules.

((1) to (5) are omitted.)

(6) "Substantial corrosion" is an extent of corrosion such that assessment of corrosion pattern indicates wastage in excess of 75% of allowable margins, but within acceptable limits. Notwithstanding the above, for the following (a) to (c), "substantial corrosion" is an extent of corrosion such that the assessment of the corrosion pattern indicates a gauged (or measured) thickness which is within the range of 0.5*mm* to the renewal thickness stipulated in the relevant provisions. "Renewal thickness" refers to the minimum allowable thickness below which the renewal of structural members is to be carried out.

(a) For ships complying with the provisions of **Part CSR-B, Part CSR-T** or **Part CSR-B&T**.

(b) For hatch covers and hatch coamings for cargo holds of the ships stipulated otherwise by the Society.

(c) For transverse watertight bulkheads in cargo hold complying with the provision of ~~**Chapter 31A, Part C**~~ **Annex 1.1, Part 2-2, Part C** or **Chapter 31B, Part C.**

((7) to (28) are omitted.)

1.4 Preparation for Survey and Other Items

1.4.5 Procedure for Tests, Wear and Tear, etc.

Sub-paragraph -3 has been amended as follows.

3 Repairs for Wear and Tear

Where the thicknesses of materials of hull structure, scantlings of equipment, etc. become less than the stipulated wear and tear limits, these are to be replaced by new ones having either the original scantlings at the time of construction or the scantlings deemed appropriate by the Society. ~~As regards to structural members with scantlings that have been reduced by virtue of an approved system of corrosion control under **1.1.21, Part C**, the reduction is to be included as part of the corrosion when taking measurements.~~ Where, however, the original scantlings were larger than the required ones, or where deemed appropriate by the Surveyor, allowances may be made in regards to location, extent, kind, etc. of the wear and tear.

Chapter 2 CLASSIFICATION SURVEYS

2.1 Classification Survey during Construction

Paragraph 2.1.2 has been amended as follows.

2.1.2 Submission of Plans and Documents for Approval*

1 When it is intended to build a ship for classification by the Society, the following plans and documents are to be submitted for the approval by the Society before the work is commenced. The plans and documents may be submitted for examination by the Society prior to making an application for the classification of the ship as stipulated otherwise by the Society.

(1) Hull

(a) General arrangement

(b) Midship section (cross sections of the hold, machinery space, and areas containing wing tanks (if fitted); intended classification characters and notations, designed maximum load draught, and for ships complying with the requirements in ~~**1.1.12-1 or -2 of**~~ **3.2.2.2** and **3.2.2.3, Part 1, Part C**, design temperature are to be indicated in this plan.)

((c) to (j) are omitted.)

(k) Shell expansion (Dimensions and arrangements of freeing ports and draught at ballast condition (for ships which comply with the requirements in ~~**1.1.12-1 of**~~ **3.2.2.2, Part 1, Part C**) are to be indicated in this plan.

((l) to (v) are omitted.)

(w) Plans showing arrangement for means of access or ship structure access manuals as applicable, as defined in ~~**Chapter 35,**~~ **14.16, Part 1, Part C** and **Chapter 26, Part CS**

((x) and (y) are omitted.)

(z) Plans showing arrangement of the ship's identification number specified in ~~**1.1.24,**~~ **14.2, Part 1, Part C**

(aa) Towing and mooring fittings arrangement plan specified in ~~**27.2,**~~ **14.4, Part 1, Part C** or **23.2, Part CS**

(ab) Arrangement of the means of embarkation and disembarkation specified in ~~**23.8,**~~ **14.14, Part 1, Part C** or **21.8, Part CS**

(ac) (Omitted)

((2) to (7) are omitted.)

2 (Omitted)

3 (Omitted)

4 For ships that are required to have a loading manual in accordance with the requirements of ~~**34.1.1,**~~ **3.8.1.1, Part 1, Part C**, and **25.1.1, Part CS**, the loading manual is to include conditions for loading and other necessary information and is to be submitted for approval by the Society, in addition to the plans and documents listed in **-1**.

5 For ships that are required to have a loading computer in accordance with the requirements of ~~**34.1.1,**~~ **3.8.1.1, Part 1, Part C**, lines (provided with offset table), light load hydrostatic curves, tank capacity plan (finished plan), and the results of inclining tests are to be submitted to the Society, in addition to the plans and documents specified in **-1**. However, part or whole of these plans and documents may be omitted in cases where the requirements are separately provided by the Society.

(-6 to -8 are omitted.)

9 For ships that are required to have a damage control plan in accordance with the requirement of ~~**Chapter 33**~~**2.3.4, Part 1, Part C**, the damage control plan is to be submitted for approval by the Society, in addition to the plans and documents as listed in **-1**.

10 For ships that are required to have emergency towing arrangements in accordance with the

requirements of ~~27.3~~14.5.2, Part 1, Part C, drawings indicating locations of emergency towing arrangements and construction of the part of the hull where the emergency towing arrangements are installed are to be submitted for approval by the Society, in addition to the plans and documents listed in -1.

11 For ships that are required to have an operating and maintenance manual for the door and inner door in accordance with the requirements of ~~23.3.10-1~~14.10.1.10-1 and ~~23.4.9-1~~14.10.2.9-1, Part 1, Part C or 21.3.10-1 and 21.4.9-1, Part CS, the operating and maintenance manual is to be submitted for approval by the Society.

12 For ships required to have a Coating Technical File for dedicated seawater ballast tanks, etc. in accordance with the requirements of ~~25.2.2~~3.3.5.3, Part 1, Part C, 22.4.2, Part CS, 1.2.2 Section 5 Chapter 3, Part CSR-B or 2.1.1.2 Section 6, Part CSR-T, this file is to be submitted for review by the Society.

13 For ships required to have a Coating Technical File and/or a Corrosion Resistant Steel Technical File for cargo oil tanks in accordance with the requirements of ~~25.2.3~~3.3.5.4, Part 1, Part C or 22.4.3, Part CS, these files are to be submitted for review by the Society.

14 For ships whose surveys for construction monitoring are carried out in accordance with the requirements in 1.1.12, drawings indicating critical structural areas are to be submitted to the Society for approval prior to the commencement of the survey.

2.1.3 Submission of Other Plans and Documents

Sub-paragraphs -1(13) and (14) have been amended as follows.

1 When it is intended to build a ship to the classification with the Society the following plans and documents are to be submitted, in addition to those required in 2.1.2:

((1) to (12) are omitted.)

(13) Strength calculation sheets (noting design loads) associated with various supporting hull structures of towing and mooring fittings, including towing and mooring fittings which are not selected from standards approved by the society, for ships complying with ~~27.2,~~ 14.4, part 1, Part C or 23.2, Part CS

(14) For ships that are required to have emergency towing arrangements in accordance with the requirements of ~~27.3,~~ 14.5.2, Part 1, Part C, an operation manual of the emergency towing arrangements.

((15) and (16) are omitted.)

2.1.4 Presence of Surveyor*

Sub-paragraph -1 has been amended as follows.

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

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

(8) When performance tests are carried out on closing appliances of openings, remote control devices, steering gears, anchoring and mooring equipment, emergency towing arrangements, means of embarkation and disembarkation (specified in ~~23.8,~~ 14.14, Part 1, Part C or 21.8, Part CS), fire fighting systems, piping, water level detection and alarm systems (specified in 13.8.5 and 13.8.6, Part D), dewatering arrangements (specified in 13.5.10, Part D), etc.

(9) (Omitted)

(10) When a loading computer is installed on board ships that require it in accordance with the requirements of ~~34.1.1,~~ 3.8.1.1, Part 1, Part C.
((11) to (13) are omitted.)
(14) When emergency towing arrangements are installed on board ships that require them in accordance with the requirements of ~~27.3,~~ 1.4.5.2, Part 1, Part C.
((15) to (17) are omitted.)

Paragraph 2.1.6 has been amended as follows.

2.1.6 Documents to be Maintained On Board*

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

(1) Documents approved by the Society or their copies
  (a) Operating and maintenance manuals for the door and inner door (~~23.3.10~~14.10.1.10 and ~~23.4.9,~~ 14.10.2.9, Part 1, Part C or 21.3.10 and 21.4.9, Part CS)
  (b) Damage control plans (~~33.3.1,~~ 2.3.4.3, Part 1, Part C)
  (c) Loading manuals (~~Chapter 34,~~ 3.8, Part 1, Part C or Chapter 25, Part CS)
  (d) Ship structure access manuals (~~35.2.6,~~ 14.16.3.6, Part 1, Part C or 26.2.6, Part CS)
  ((e) to (q) are omitted.)
  (r) Coating Technical File for dedicated seawater ballast tanks, etc. (~~25.2.2~~3.3.5.3, Part 1, Part C, 22.4.2, Part CS, 1.2.2 Section 5 Chapter 3, Part CSR-B and 2.1.1.2 Section 6, Part CSR-T)
  (s) Coating Technical File and/or Corrosion Resistant Steel Technical File for cargo oil tanks (~~25.2.3,~~ 3.3.5.4, Part 1, Part C and 22.4.3, Part CS)
  (t) Plans and documents for in-water surveys (6.1.2-3)
(2) Other documents
  (a) Towing and mooring fitting arrangement plans (~~27.2.9,~~ 14.4.1.4, Part 1, Part C or 23.2.9, Part CS)
  (b) Operation manuals for the emergency towing arrangement (~~27.3,~~ 14.5.2, Part 1, Part C)
  (c) Booklets for damage control and Damage Stability Information (~~33.3.2, Part C and 33.3.3, Part C~~ 2.3.4.4 and 2.3.4.5, Part 1, Part C)
  (d) Operation manuals for the loading computer (~~34.1.3-3,~~3.8.3.1-3, Part 1, Part C)
  (e) Plans for means of access (~~35.1.5,~~14.16.2.5, Part 1, Part C or 26.1.5, Part CS)
  ((f) to (p) are omitted.)
  (q) Emergency Towing Procedures (~~27.4,~~ 14.5.3, Part 1, Part C or 23.3, Part CS)
  ((r) to (x) are omitted.)
(3) Finished plans specified in 2.1.7

2 In addition to the requirements in -1 above, for ships engaged on international voyages, the Surveyor confirms that the Ship Construction File contains the necessary documents from the following drawings, plans, manuals and documents, and that the Construction File is on board the ship. Duplicate documents as in -1 are not required.

(1) Finished plans of hull structural drawings specified in 2.1.7
(2) The following manuals and documents
  (a) Operating and maintenance manuals for the door and inner door (~~23.3.10~~14.10.1.10 and ~~23.4.9,~~ 4.10.2.9, Part 1, Part C or 21.3.10 and 21.4.9, Part CS)
  (b) Damage control plans (~~33.3.1,~~ 2.3.4.3, Part 1, Part C)
  (c) Loading manuals (~~Chapter 34,~~ 3.8, Part 1, Part C or Chapter 25, Part CS)
  (d) Stability information booklets (1.2.1, Part U, 2.2.3, Part N and 2.2.2, Part S)
(3) Ship structure access manuals (~~35.2.6,~~14.16.3.6, Part 1, Part C or 26.2.6, Part CS)
(4) Copies of certificates of forgings and castings welded into the hull structures

(5) Plans showing locations, sizes and details of equipment forming part of the watertight and weather-tight integrity of the ship, including piping (**2.1.2-1(1)(q)**)
(6) Corrosion prevention scheme (**2.1.3-1(3)**)
(7) Plans and documents for in-water surveys (**6.1.2-3**)
(8) Docking plan including locations and other necessary information of all penetrations specified in item 3 in **Table B6.1**
(9) Coating Technical File for dedicated seawater ballast tanks, etc. (~~**25.2.2,**~~ **3.3.5.3, Part 1, Part C** and **22.4.2, Part CS, 1.2.2 Section 5 Chapter 3, Part CSR-B** and **2.1.1.2 Section 6, Part CSR-T**)
(10) Coating Technical File and/or Corrosion Resistant Steel Technical File for cargo oil tanks (~~**25.2.3,**~~**3.3.5.4, Part 1, Part C** and **22.4.3, Part CS**)
(11) Plans and documents for Anti-Fouling Systems (**2.2.2, Rules for Anti-Fouling Systems on Ships**)
(12) Watertight cable penetration register
(13) Test plans, test records, measurement records, etc.
(-3 to -8 are omitted.)

Paragraph 2.1.8 has been amended as follows.

2.1.8 Verification of Coating Application*
1 The following items will be carried out by the Society prior to reviewing the Coating Technical File for dedicated seawater ballast tanks, etc. for the coatings of internal spaces subject to ~~**25.2.2**~~**3.3.5.3, Part 1, Part C**, **22.4.2**, **Part CS**, **1.2.2 Section 5 Chapter 3**, **Part CSR-B** or **2.1.1.2 Section 6, Part CSR-T**:
((1) to (5) are omitted.)
2 The following items will be carried out by the Society prior to reviewing the Coating Technical File for cargo oil tanks for the coatings of internal spaces subject to ~~**25.2.3,**~~ **3.3.5.4, Part 1, Part C** or **22.4.3, Part CS**:
((1) to (5) are omitted.)

2.2 Classification Survey of Ships Not Built under Survey

Paragraph 2.2.1 has been amended as follows.

2.2.1 General*
1 (Omitted)
2 (Omitted)
3 For ships that are required to have a loading manual in accordance with the requirements of ~~**34.1.1 and 34.3.1, Part C**~~ **3.8.1.1, Part 1, Part C**, and **25.1.1, Part CS**, the loading manual (including the conditions for loading and other necessary information) is to be submitted for approval by the Society.
4 (Omitted)
5 (Omitted)
6 For ships that are required to have a damage control plan in accordance with the requirements of ~~**Chapter 33,**~~ **2.3.4, Part 1, Part C**, the damage control plan is to be submitted for approval by the Society.
7 For ships that are required to have emergency towing arrangements in accordance with the requirements of ~~**27.3,**~~ **14.5.2, Part 1, Part C**, drawings indicating locations of emergency towing arrangements and construction of the part of the hull where the emergency towing arrangements are installed are to be submitted for approval by the Society.

8 For ships that are required to have an operating and maintenance manual for the door and inner door in accordance with the requirements of ~~**23.3.10-1**~~ **14.10.1.10-1** and ~~**23.4.9-1,**~~**14.10.2.9-1, Part 1, Part C** or **21.3.10-1** and **21.4.9-1, Part CS**, the operating and maintenance manual is to be submitted for approval by the Society.

Chapter 3 ANNUAL SURVEYS

3.2 Annual Surveys for Hull, Equipment, Fire Extinction and Fittings

Table B3.1 has been amended as follows.

Table B3.1 Examination of Plans and Documents

Items	Examination
1 Loading Manual	(1) For ships required to have the manual on board in accordance with the requirements of ~~*34.1.1 and 34.3.1,*~~ **3.8.1.1, Part 1, Part C**, and **25.1.1, Part CS**, confirmation that the manual is kept on board is to be made.
2 Stability Information Booklet	(1) Confirmation as to whether the booklet is kept on board is to be made.
3 Damage Control Plan, Booklet and Damage Stability Information	(1) For ships required to have the damage control plan on board in accordance with the requirement in ~~**Chapter 33,**~~ **2.3.4, Part 1, Part C**, confirmation that the approved plan is exhibited and the booklet containing the information shown in the plan and the damage stability information are kept on board is to be made.
4 Fire Control Plan	(1) Confirmation that the fire control plan is exhibited and properly stored is to be made.
5 Operating and Maintenance Manual for the door and inner door and notices indicating procedures for closing and securing	(1) For ships required to have the manual and notices on board in accordance with the requirements in ~~**Chapter 23,**~~ **14.10, Part 1, Part C**, and **Chapter 21, Part CS**; (2) Confirmation that the manual is kept on board is to be made. (3) Confirmation that the board is exhibited is to be made.
6 Instruction Manuals for the Inert Gas System	(1) For ships required to have the manual on board in accordance with the requirements of **4.5.5, Part R**, confirmation that the manual is kept on board is to be made.
7 Towing and Mooring Fitting Arrangement Plan	(1) Confirmation that the Towing and Mooring Fitting Arrangement Plan specified in ~~**27.2,**~~ **14.4, Part 1, Part C** or **23.2, Part CS** is kept on board is to be made.
8 Ship Structure Access Manual	(1) For ships required to have the manual on board in accordance with the requirements of ~~**35.2.6,**~~ **14.16.3.6, Part 1, Part C** or **26.2.6, Part CS**, confirmation that the manual is kept on board and updated as necessary is to be made.
9 Documents related to the surveys for bulk carriers, oil tankers and ships carrying dangerous chemicals in bulk with integral tanks	(1) Confirmation that the documents are kept on board is to be made.
10 Coating Technical File and/or Corrosion Resistant Steel Technical File	(1) For ships required to have a Coating Technical File for dedicated seawater ballast tanks, etc. on board in accordance with the requirements of ~~**25.2.2,**~~ **3.3.5.3, Part 1, Part C**, **22.4.2, Part CS**, **1.2.2 Section 5 Chapter 3, Part CSR-B** or **2.1.1.2 Section 6, Part CSR-T**, confirmation that the file is kept on board and that maintenance and repair work are properly recorded and kept on the file is to be made. (2) For ships required to have a Coating Technical File and/or a Corrosion Resistant Steel Technical File for cargo oil tanks on board in accordance with the requirements of ~~**25.2.3,**~~ **3.3.5.4, Part 1, Part C** or **22.4.3, Part CS**, confirmation that the files are kept on board and that maintenance and repair work are properly recorded and kept on the files is to be made.
(Omitted)	

Paragraph 3.2.2 has been amended as follows.

3.2.2 General Examination*

At Annual Surveys, examinations of hull, equipment, fire-extinction and fittings listed in **Table B3.2** are to be carried out.

Table B3.2 General Examination

Items	Examination
(Omitted)	
17 Towing and mooring fittings	(1) Confirmation that the marks of Safe Towing Load (*TOW*) on towing fittings and Safe Working Load (*SWL*) on mooring fittings as specified in ~~**27.2.3**~~ **14.4.2.4**or ~~**27.2.6,**~~ **14.4.3.5, Part 1, Part C** or **23.2.3 or 23.2.6, Part CS** are clearly visible and these fittings are in good condition.
18 Loading computer	(1) Confirmation that the computer of ships required to have one in accordance with the provisions of ~~**34.1.1**~~ **3.8.1.1, Part 1, 3.2.2.1, Part 2-2,** and ~~**34.3.2, Part C**~~ **3.2.2.1, Part 2-3, Part C** is maintained in good order.
(Omitted)	
Additional Requirement for Container Carriers	
33 Block-to-block butt joints of strength decks and hatch side coamings (including top plates and attached longitudinal stiffeners)	(1) In the case of container carriers using extremely thick steel plates which comply with ~~**32.13, Part C of the Rules**~~ **10.5, Part 2-1, Part C**, it is to be confirmed, as far as practicable, that block-to-block butt joints of strength decks and hatch side coamings (including top plates and attached longitudinal stiffeners) are in good condition.

Note:

Examination of suspect areas identified at previous surveys is to be carried out.

Chapter 5 SPECIAL SURVEYS

5.2 Special Surveys for Hull, Equipment, Fire Extinction and Fittings

5.2.2 General Examination*

Sub-paragraph -5 has been amended as follows.

5 At Special Surveys for container carriers using extremely thick steel plates which comply with ~~**32.13, Part C of the Rules**~~**10.5, Part 2-1, Part C**, in addition to **-1**, the block-to-block butt joints of strength decks, hatch side coamings (including top plates and attached longitudinal stiffeners), sheer strakes, and the topmost strakes of inner hulls and bulkheads (only one strake adjacent to strength decks) are to be examined from both sides as far as practicable. Furthermore, additional non-destructive inspections may be required based upon the results of such examination when deemed necessary by the attending surveyor.

5.2.3 Performance Test*

Sub-paragraph -1 has been amended as follows.

1 At Special Surveys, performance tests specified in **4.2.3** are to be carried out. In addition to such performance tests, it is to be confirmed that the loading instrument required in ~~**34.1.1** and **34.3.2, Part C**~~ **3.8.1.1, Part 1, 3.2.2.1, Part 2-2** and **3.2.2.1, Part 2.3, Part C** works in order. Moreover, the performance tests for mooring and anchoring arrangements specified in item 3 of **Table B4.1** may not be omitted.

Annex 2.1.5 TESTING PROCEDURES OF WATERTIGHT COMPARTMENTS

Table An 1.4-1 has been amended as follows.

Table An 1.4-1 Test Requirements for Tanks and Boundaries

	Tank or boundary to be tested	Test type	Test head or pressure	Remarks
1	Double bottom tanks[*4]	Leak and structural[*1]	The greater of - top of the overflow, - to 2.4 *m* above top of tank[*2], or - to bulkhead deck	
2	Double bottom voids[*5]	Leak	See **An 1.4.4-4** through **-6**, as applicable	including pump room double bottom and bunker tank protection double hull required by **Part 3 of the Rules for Marine Pollution Prevention Systems**
(Omitted)				
12	Watertight doors below freeboard or bulkhead deck	Leak[*6,7]	See **An 1.4.4-3** through **-6**, as applicable	
(Omitted)				

Notes:

(1 to 3 are omitted.)

4 Including tanks arranged in accordance with the provisions of ~~**6.1.1-3, Part C of the Rules**~~ **2.4.1.1-3, Part 1, Part C**.

5 Including duct keels and dry compartments arranged in accordance with the provisions of ~~**6.1.1-3, Part C of the Rules**~~ **2.4.1.1-3, Part 1, Part C**, and/or oil fuel tank protection and pump room bottom protection arranged in accordance with the provisions of **1.2.3** and **3.2.5, Part 3 of the Rules for Marine Pollution Prevention Systems** respectively.

6 Where water tightness of a watertight door has not been confirmed by prototype test, testing by filling watertight spaces with water is to be carried out. See ~~**13.3.3-1, Part C of the Rules.**~~ **2.2.2.3-1, Part 1, Part C**

(7 to 10 are omitted.)

Part U INTACT STABILITY

Chapter 1 GENERAL

1.2 Stability Information

1.2.3 Special Requirements for Bulk Carriers*

Sub-paragraph -1 has been amended as follows.

1 Bulk carriers as defined in ~~**31A.1.2(1)**~~**An1.2.1(1), Annex 1.1, Part 2-2, Part C**, of less than 150*m* in length L_f but not less than 500 *gross tonnage* are to be fitted with a stability computer approved by the Society, as a supplement to the stability information booklet.

Part CSR-B&T COMMON STRUCTURAL RULES FOR BULK CARRIERS AND OIL TANKERS

Part 1 GENERAL HULL REQUIREMENTS

Chapter 1 RULE GENERAL PRINCIPLES

Section 5 LOADING MANUAL AND LOADING INSTRUMENTS

3. Loading Instrument

3.1 General Requirements

Paragraph 3.1.2 has been amended as follows.

3.1.2 Conditions of approval of loading instruments

The loading instrument is subject to approval based on the provisions of ~~3**4.1.3**~~**3.8.3, Part 1, Part C**. The approval is to include:

- Verification of type approval, if any,
- Verification that the final data of the ship has been used,
- Acceptance of number and position of read-out points,
- Acceptance of relevant limits for all read-out points,
- Checking of proper installation and operation of the instrument onboard, in accordance with agreed test conditions, and that a copy of the operation manual is available.

Modifications resulting in changes to the main data of the ship (e.g. lightship weight, buoyancy distribution, tank volumes or usage, etc), require the loading manual to be updated and re-approved, and subsequently the loading instrument to be updated and re-approved. However, new loading guidance and an updated loading instrument need not be resubmitted provided that the resulting draughts, still water bending moments and shear forces do not differ from the originally approved data by more than 2%.

An operational manual is always to be provided for the loading instrument. The operation manual and the instrument output are to be prepared in a language understood by the users. If this language is not English, a translation into English is to be included.

The operation of the loading instrument is to be verified upon installation. It is to be checked that the agreed test conditions and the operation manual for the instrument is available onboard.

Chapter 3 STRUCTURAL DESIGN PRINCIPLES

Section 1 MATERIALS

1. General

1.1 Standard of Material

Paragraph 1.1.1 has been amended as follows.

1.1.1

Materials used during construction are to comply with **3.2, Part 1, Part C** and **Part K**.

Chapter 11 SUPERSTRUCTURES, DECKHOUSES AND HULL OUTFITTING

Section 2 BULWARK AND GUARD RAILS

2. Bulwarks

2.1 General

Paragraph 2.1.6 has been amended as follows.

2.1.6

In the case of ships intended for the carriage of timber deck cargoes, the provisions of ~~1.1.3-2 and 23.1.3-3~~**14.8.3.1-3, Part 1**, **Part C** are to be complied with.

Paragraph 2.1.8 has been amended as follows.

2.1.8

Constructions of bulwarks are to comply with the requirements in ~~23.1.3-4 to -6~~**14.8.3.1-4** to **-6, Part 1**, **Part C** in addition to the requirements in this section.

Part CS HULL CONSTRUCTION AND EQUIPMENT OF SMALL SHIPS

Chapter 1 GENERAL

1.1 Application and Equivalency

Paragraph 1.1.1 has been amended as follows.

1.1.1 Application*

1 This part applies to steel ships of normal form and proportions of less than 90 *m* in length to be classed for unrestricted service.

2 Hull construction, equipment and scantlings of ships to be classed for restricted service may be appropriately modified according to the condition of service in addition to the requirements in **Chapter 27**.

3 In the application of relevant provisions in this Part to ships to which the requirements in **Part V** do not apply, L_f is to be read as L and B_f as B.

4 Cargo vessels engaged in international voyages and that are not less than 500 gross tonnage are to comply with the requirements in ~~**Chapter 33 of**~~ **2.3.4, Part 1, Part C**.

Note: For the construction of ships flying the Japanese flag, alternative arrangements are to be made.

5 Where deemed necessary by the Society, ships coming under the definition of bulk carrier as specified in ~~**31A.1.2(1),**~~ **An1.2.1(1), Annex 1.1, Part 2-2, Part C**, may be applicable to relevant requirements of **Part C**.

1.3 Materials, Scantlings, Welding and End Connections

1.3.1 Materials

Sub-paragraph -7 has been amended as follows.

7 The steels used for hull structures are to be in accordance with the requirements of ~~**1.1.11 and 1.1.12**~~ **3.2.2, Part 1, Part C**. However, the steel grades shown in **Table CS1.1** and **Table CS1.2** may be used in lieu of ~~**Table C1.1 and Table C1.2,**~~ **Table 3.2.2-1** and **Table 3.2.2-2, Part 1, Part C**. Where stainless clad steel specified in **Chapter 3, Part K of the Rules** is used for hull construction, the thickness of the base steel is to be used as the thickness of the plate in ~~**Table C1.1 and Table C1.2**~~ **Table 3.2.2-1** and **3.2.2-2, Part 1, Part C.**

Paragraph 1.3.3 has been amended as follows.

1.3.3 Welding

Welding to be used in hull construction and important equipment is to be in accordance with the requirements in **Chapter 12, Part 1, Part C** and **Part M**.

Paragraph 1.3.9 has been deleted, and Paragraph 1.3.10 has been renumbered to Paragraph 1.3.9.

~~**1.3.9 Approved Corrosion Control**~~

~~**1 Where an approved measure of corrosion control is applied to tanks, the required scantlings of structural members in the tanks may be reduced at the discretion of the Society.**~~

~~**2 Where the scantlings are reduced in accordance with -1, the notation "*CoC*" will be entered in**~~

~~the Classification Register.~~

Paragraph 1.3.10 has been amended as follows.

1.3.~~10~~9 Ship Identification Number

For cargo ships not less than 300 *gross tonnage* engaged on international voyages, the ship's identification number is to be permanently marked in accordance with ~~**1.1.24**~~**14.2, Part 1, Part C** ~~**of the Rules**~~.

Chapter 6 DOUBLE BOTTOMS

6.6 Longitudinals

6.6.3 Vertical Struts

Sub-paragraph -2 has been amended as follows.

2 The sectional area of the above-mentioned vertical struts is not to be less than that obtained from the following formula:

~~$2.2SPh$~~ $2.2Sbh$ (cm^2)

Where:

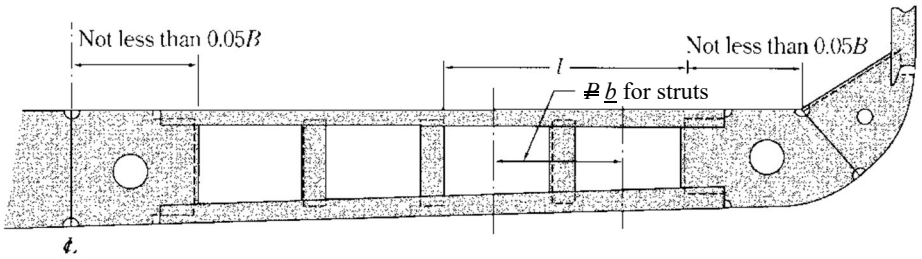
S: Spacing (m) of longitudinals

~~P~~ b: Breadth (m) of the area supported by the strut (*See* **Fig. CS6.1**)

h: As specified in **6.6.2-1**

Fig. CS6.1 has been amended as follows.

Fig. CS6.1 Open Floors



Chapter 13 WATERTIGHT BULKHEADS

13.2 Construction of Watertight Bulkheads

Paragraph 13.2.9 has been amended as follows.

13.2.9 Corrugated Bulkhead

~~Construction of corrugated bulkheads is to be in accordance with the requirements given in **13.2.4, Part C** of the Rules.~~

1 The plate thickness of corrugated bulkheads is not to be less than that obtained from the following formula:

$3.4CS_1\sqrt{h} + 2.5 \ (mm)$

Where:

h: As specified in **13.2.1**

S_1: Breadth (m) of face part or web part indicated as a or b, respectively, in **Fig. CS13.2**

C: Coefficient given below:

Face part: $\dfrac{1.5}{\sqrt{1+\left(\frac{t_w}{t_f}\right)^2}}$

Web part: 1.0

t_f and t_w: Thickness (mm) of plates of face part and web part, respectively

2 The section modulus per half pitch of corrugated bulkheads is not to be less than that obtained from the following formula:

$3.6CShl^2 \ (cm^3)$

Where:

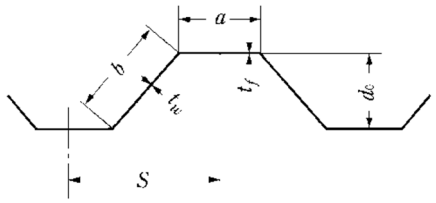
S: Half pitch length (m) of the corrugation (*See* **Fig. CS13.2**)

h: As specified in **13.2.3**

l: Length (m) between the supports, as indicated in **Fig. CS13.3**

C: Coefficient given in **Table CS13.3**, according to the type of end connection

Fig. CS13.2 Measurement of S



$S_1 = a$ or b.
S = Half pitch length.

Fig. CS13.3 Measurement of l

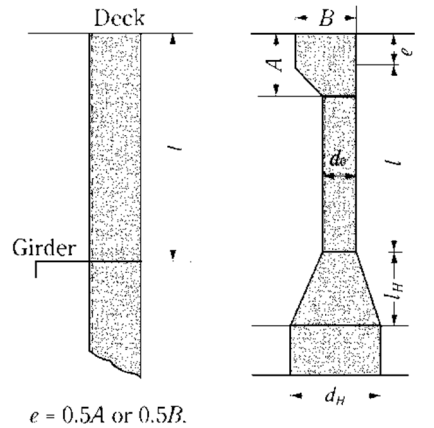


Table CS13.3 Values of C (For Corrugated Bulkheads)

The other end of bulkhead		One end of bulkhead		
		Supported by horizontal or vertical girders	Upper end welded directly to deck	Upper end welded to stool efficiently supported by ship structure
(1)	Supported by horizontal or vertical girders or lower end of bulkhead welded directly to decks or inner bottoms	$\frac{4}{2+\frac{Z_1}{Z_0}+\frac{Z_2}{Z_0}}$	$\frac{4}{2.2+\frac{Z_2}{Z_0}}$	$\frac{4}{2.6+\frac{Z_2}{Z_0}}$
(2)	Lower end of bulkhead welded to stool efficiently supported by ship structure	$\frac{4.8(1+\frac{l_H}{l})^2}{2+\frac{Z_1}{Z_0}+\frac{d_H}{d_0}}$	$\frac{4.8(1+\frac{l_H}{l})^2}{2.2+\frac{d_H}{d_0}}$	$\frac{4.8(1+\frac{l_H}{l})^2}{2.6+\frac{d_H}{d_0}}$
		The value of C is not to be less than that obtained from (1)		

Notes:

Z_0: Minimum section modulus (cm^3) per half pitch of mid part for 0.6l of the corrugated bulkhead

Z_1 and Z_2: Section modulus (cm^3) per half pitch of end part

For vertical corrugation, Z_1 is the section modulus of the upper end part and Z_2 is that of the lower end part. Where the plate thickness is increased in accordance with **13.2.9-5** the section modulus is to be that for the plate thickness reduced by the increment.

l_H: Height (m) of stool measured from inner bottom plating

d_H: Breadth (m) of stool measured on inner bottom plating

d_0: Depth (m) of corrugation

3 Where the end connection of corrugated bulkheads is remarkably effective, the value of C specified in **-2** may be adequately reduced.

4 The thickness of plates at end parts for 0.2l in line with l is not to be less than that obtained from the following formulae respectively:

Web part:

$$0.0417\frac{CShl}{d_0}+2.5 \ (mm)$$

The web thickness is not to be less than that obtained from the following formula:

$1.74 \cdot \sqrt[3]{\frac{CShlb^2}{d_0}} + 2.5$ (mm)

Face part, except the upper end part of vertically corrugated bulkheads:

$12a + 2.5$ (mm)

Where:

S, h, l and d_0: As specified in **-2.**

a and b: Breadth (m) of face part and web part, respectively

C: Coefficient given in **Table CS13.4**

Where the vertically corrugated bulkheads are constructed with a single span, the value of C may be taken as the value for the uppermost span in the Table.

Table CS13.4 Value of C

Position		Upper end	Lower end
Vertically corrugated bulkhead	Uppermost span	0.4	1.6
	Other spans	0.9	1.1
Both ends of horizontally corrugated bulkhead		1.0	

5 The thickness of the plates specified in **-1** and **-4** is to be in accordance with **13.2.2.**

6 The actual section modulus per half pitch of corrugated bulkheads is to be calculated by the following formula:

$\frac{at_f d_0}{0.002} + \frac{bt_w d_0}{0.006}$ (cm^3)

Where:

a and b: Breadth (m) of face part and web part respectively

t_f and t_w: Thickness (mm) of plates of face part and web part respectively

d_0: Depth (m) of corrugation

13.3 Watertight Doors

Paragraph 13.3.6 has been amended as follows.

13.3.6 Alarms*

1 Failure of the normal power supply of alarms required to be installed by **13.3.6-2** and **13.3.6-3** is to be indicated by an audible and visual alarm. This alarm is to be located on the bridge.

2 Watertight doors which are capable of being remotely closed are to be provided with audible alarms which will sound at the door position whenever such doors are remotely closed.

3 All watertight doors (including sliding doors) operated by hydraulic door actuators, irrespective of whether their control positions are a central hydraulic unit or local operating position, are to be provided with either a low fluid level alarm, a low gas pressure alarm or some other means as applicable for monitoring the loss of stored energy in the hydraulic accumulators. Such alarms are to be both audible and visible and located on the bridge

Chapter 14 DEEP TANKS

14.2 Deep Tank Bulkheads

Paragraph 14.2.8 has been amended as follows.

14.2.8 Corrugated Bulkhead

~~Construction of corrugated bulkheads is to be in accordance with the requirements given in **14.2.4, Part C** of the Rules.~~

1 The thickness of plates of corrugated bulkheads is not to be less than that obtained from the following formula:

$3.6CS_1\sqrt{h} + 3.5$ (*mm*)

Where:

S_1: As specified in **13.2.9-1**

h: As specified in **14.2.2**

C: Coefficient given below:

For face part: $\frac{1.4}{\sqrt{1+(\frac{t_w}{t_f})^2}}$

For web part: 1.0

t_f and t_w: As specified in **13.2.9-1**

2 The section modulus per half pitch of corrugated bulkheads is not to be less than that obtained from the following formula:

$7CShl^2$ (cm^3)

Where:

S: As specified in **13.2.9-2**

h: As specified in **14.2.3**

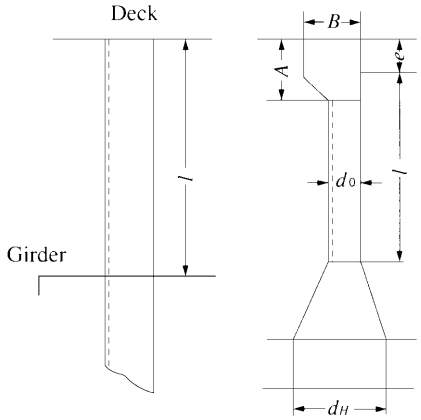
l: Length (*m*) between the supports, as indicated in **Fig. CS14.1**

C: Coefficient given in **Table CS14.3**, according to the type of end connection

For bulkheads with lower stools of which the width in the longitudinal direction at the lower end, d_H, is less than 2.5 times the web depth of the bulkhead, d_0 (*See* **Fig. CS14.1**), the measurement of *l* and the values of *C* are to be at the discretion of the Society.

For vertically corrugated bulkheads, the section modulus per half pitch of the upper part of a corrugated bulkhead which is located above one third of the span measured between the upper deck and the supporting point may not be less than 75% of that obtained by the above formula.

Fig. CS14.1 Measurement of l



$$e = A - \frac{d_0}{2B}A$$

Table CS14.3 Values of C

Column	Lower end	Upper end		
		Supported by Girders	Welded directly to deck	Welded to stool efficiently supported by ship structure
(1)	Supported by girders or welded directly to decks or inner bottoms	1.00	1.50	1.35
(2)	Welded to stool efficiently supported by ship structure	1.50	1.20	1.00

3 The thickness of plates at end parts for 0.2 l in line with l is not to be less than that obtained from the following formulae:

Thickness of web part:

$$0.0417\frac{CShl}{d_0} + 3.5 \ (mm)$$

Not to be less than that obtained from the following formula:

$$1.74 \cdot \sqrt[3]{\frac{CShlb^2}{d_0}} + 3.5 \ (mm)$$

Thickness of the face part except the upper end part of vertically corrugated bulkheads:

$12a + 3.5$ (mm)

Where:

h: As specified in **14.2.3**

C, S, d_0, a and b: As specified in **13.2.9-4**

l: As specified in **-2**

Chapter 19 HATCHWAYS, MACHINERY SPACE OPENINGS AND OTHER DECK OPENINGS

19.2 Hatchways

19.2.3 Net Scantling Approach

Sub-paragraph -4 has been amended as follows.

4 The corrosion addition t_c is to be taken as specified in **Table CS19.1** according to ship type, the type of structure and structural members of steel hatchway covers, steel pontoon covers and steel weathertight covers (hereinafter referred to as "steel hatch covers"). However, the corrosion additions for structural members that make up hatchway coamings are to be as deemed appropriate by the Society when their t_c values are not specified in **Table CS19.1.**

Paragraph 19.2.13 has been amended as follows.

19.2.13 Additional Requirement for Small Hatches Fitted on Exposed Fore Deck

For ships of 80 *m* or more in length ~~L_1~~ L_c, specified in ~~**15.2.1-1,**~~ **1.4.3.1-1, Part 1, Part C**, **s**mall hatches located on exposed decks forward of 0.25 ~~L_1~~L_c are to be of sufficient strength and weathertightness to resist green sea force if the height of the exposed deck in way of those hatches is less than 0.1 ~~L_1~~ L_c or 22 *m* above the designed maximum load line, whichever is smaller.

Chapter 23 EQUIPMENT

23.2 Towing and Mooring Fittings

Paragraph 23.2.2 has been amended as follows.

23.2.2 Tow Lines

Where ships are provided with tow lines, it is advised that such two lines are to be in accordance with the following **(1)** and **(2)**.

(1) Wire ropes and fibre ropes used as tow lines are to be comply with the requirements in **Chapter 4** and **Chapter 5, Part L of the Rules**, respectively. The specifications of tow lines (e.g. breaking load, length) and the number of tow lines are to be in accordance with **Table CS23.1** according to ship equipment numbers. However, when calculating the equipment number, the effect of deck cargoes at the ship nominal capacity condition is to be considered with respect to the side-projected area *A*.

(2) Fibre ropes used as tow lines are to be not less than 20 *mm* in diameter in consideration of rope age degradation and wear. Therefore, the line design break force for such ropes is to be in accordance with the following **(a)** or **(b)**:

(a) Polyamide ropes: $LDBF \geq 120$ % of the minimum breaking load specified in **Table CS23.1** according to equipment number.

(b) Other synthetic ropes: $LDBF \geq 110$ % of the minimum breaking load specified in **Table CS23.1** according to equipment number.

Chapter 27 SHIPS TO BE CLASSED FOR RESTRICTED SERVICE

27.2 Ships to be Classed for *Coasting Service*

Paragraph 27.2.2 has been amended as follows.

27.2.2 Reductions of Scantlings of Members

1 The scantlings of structural members may be reduced by the ratios given in **Table CS27.1** in relation to the requirements in the relevant Chapters, but in no cases are they to be less than each minimum scantling in the same table.

Table CS27.1 Reductions of Scantlings of Members and Minimum Scantlings

Item	*Coasting*	*Smooth Water*	Minimum Scantlings
Longitudinal strength	5%	10%	-
Shell platings (including plate keels)	5%	10%	6 *mm*, except superstructures
Minimum thickness of deck platings	1 *mm*	1 *mm*	5 *mm*
Section modulus of frames (including bottom longitudinals)	10%	20%	30 cm^3
Section modulus of beams	15%	15%	-
Section modulus of deck girders	15%	15%	-
Thickness of plates of double bottom members	1 *mm*	1 *mm*	5.5 *mm*
Thickness of plates of single bottom members	0.5 *mm*	10% or 1 *mm*, whichever is smaller	-
Plate thickness and section modulus of superstructure end bulkhead	10%	10%	-

2 Reductions of scantlings of members other than given in **Table CS27.1** may be made at the discretion of the Society.

3 The scantlings of the structural members of deck beams supporting deck cargoes, inner bottom plates and longitudinals supporting heavy cargoes and deep tanks and those required in accordance with the provisions of ~~**Chapter 31A**~~ **Annex 1.1, Part 2-2, Part C** are not to be reduced from the values specified in the relevant Chapters, notwithstanding the provisions in **-1**. and **-2**.

4 The design pressure P_e given in **21.3.4-1(1)** and **Table CS21.3** may be multiplied by 0.8.

5 The design pressure of rectangular windows P given in **21.5.8-1** may be multiplied by 0.9.

~~**6 Ships not engaged on international voyages need not apply the provisions of Chapter 31A and 34.2, Part C.**~~

Paragraph 27.2.3 has been amended as follows.

27.2.3 Equipment

1 Equipment is to be in accordance with the requirements of **Chapter 23**.

2 Notwithstanding the provision in **-1**, the mass of one of the two anchors may be reduced to 85% of the mass required in the **Table CS23.1**.

3 Notwithstanding the provision in **-1**, for ships not engaged on international voyage Emergency Towing Procedures specified in ~~**27.4, Part C and**~~ **23.3,** ~~**Part CS**~~ are not required.

Paragraph 27.2.6 has been amended as follows.

27.2.6 Means of Embarkation and Disembarkation

For ships not engaged on international voyages, the means of embarkation and disembarkation specified in ~~**23.8, Part C and**~~ **21.8,** ~~**Part CS**~~ are not required.

27.3 Ships to be Classed for *Smooth Water Service*

Paragraph 27.3.2 has been amended as follows.

27.3.2 Reductions of Scantlings of Members

1 The scantlings of structural members may be reduced by the ratios given in **Table CS27.1** in relation to the requirements in the relevant Chapters, but in no cases are they to be less than each minimum scantling in the same table.

2 Reductions of scantlings of members other than given in **Table CS27.1** may be made at the discretion of the Society.

3 The scantlings of the structural members of deck beams supporting deck cargoes, inner bottom plates and longitudinals supporting heavy cargoes and deep tanks and those required in accordance with the provisions of ~~**Chapter 31A**~~ **Annex 1.1, Part 2-2, Part C** are not to be reduced from the values specified in the relevant Chapters, notwithstanding the provisions in **-1** and **-2**.

4 The design pressure P_e given in **21.3.4-1(1)** and **Table CS21.3** may be multiplied by 0.5.

5 The design pressure of rectangular windows P given in **21.5.8-1** may be multiplied by 0.9.

~~**6 Ships not engaged on international voyages need not to apply the provisions of Chapter 31A and 34.2, Part C.**~~

Paragraph 27.3.7 has been amended as follows.

27.3.7 Means of Embarkation and Disembarkation

For ships not engaged on international voyages, the means of embarkation and disembarkation specified in ~~**23.8, Part C and**~~ **21.8~~, Part CS~~** are not required.

27.4 Ships Not Engaged On International Voyages

Paragraph 27.4.1 has been amended as follows.

27.4.1 Relaxation to Ships Not Engaged On International Voyages

~~**1 Ships not engaged on international voyages need not to apply the provisions of 34.2.2, Part C. Where deemed appropriate by the Society taking account of various conditions of such ships related to the navigation, the requirements of 34.2, Part C need not to be applied to.**~~

~~**2 Bulk carriers not engaged on international voyages need not to apply the provisions of 35.2, Part C.**~~

3 For non-conventional ships, the requirements in ~~**27.2, Part C and**~~ **23.2** need not to be applied.

4 Ships not engaged on international voyages need not apply the provisions of ~~**23.8, Part C and**~~ **21.8~~, Part CS~~**.

5 Ships not engaged on international voyages need not to apply the provisions of ~~**27.4, Part C and**~~ **23.3~~, Part CS~~**.

Part D MACHINERY INSTALLATIONS

Chapter 9 BOILERS, ETC. AND INCINERATORS

9.3 Design Requirements

9.3.5 Considerations for Installing

Sub-paragraph -2 has been amended as follows.

2 Boilers are to be installed so that they are clear of any bulkheads as far as practicable. ~~(*See*, **21.3.3, Part C.**)~~

Chapter 12 PIPES, VALVES, PIPE FITTINGS AND AUXILIARIES

12.2 Thickness of Pipes

Table D12.6(1) has been amended as follows.

Table D12.6(1) Minimum Thickness of Steel Pipes

Services of pipes	Location of pipes		Minimum thickness of the encircled alphabets correspond to those in **Table D12.6.(2)**
(Omitted)			
Air pipes, Overflow pipes, Sounding pipes	passing through tanks except for cargo oil tanks		~~Ⓔ~~
	passing through cargo oil tanks		~~Ⓑ~~
	For air pipes and sounding pipes for fuel oil tanks passing through the cargo holds of the bulk carrier defined in **1.3.1(13), Part B**		~~Ⓓ~~
	For tanks forming a part of ship's structure		~~Ⓖ~~
	Exposed portions of air pipes which terminate above freeboard deck and superstructure deck (Note 1)	(Note 3)	~~Ⓔ~~
		(Note 4)	~~Ⓖ~~
(Omitted)			

Notes:

1 (Omitted)

2 (Omitted)

3 For air pipes in the position I or II defined in ~~**20.1.2,**~~ **1.4.3.2, Part 1**, **Part C** leading to spaces below the freeboard deck, enclosed super structure or enclosed deck house.

4 (Omitted)

5 (Omitted)

Chapter 13 PIPING SYSTEMS

13.4 Scuppers, Sanitary Discharges, etc.

13.4.1 General*

Sub-paragraph -2 has been amended as follows.

2 Scupper pipes, draining weather decks and spaces within superstructures and deckhouses, which are not provided with access openings equipped with closing means in accordance with the requirements in ~~**18.3.1,**~~ **11.3.2.6, Part 1, Part C**, are to be led overboard.

Sub-paragraph -4 has been amended as follows.

4 Scupper pipes from spaces below the freeboard deck are to be led directly into inboard bilge wells. Alternatively, they may be led to overboard in cases where they are provided with valves in accordance with the following requirements:

(1) Each separate discharge is to have one automatic non-return valve with a positive means of closing it from a position above the freeboard deck, or one automatic non-return valve having no positive closing means and one stop valve controlled from above the freeboard deck. The means for operating the positive action valve from above the freeboard deck are to be readily accessible and provided with an indicator showing whether the valve is open or closed.

(2) However, in cases where the vertical distance from the load line to the inboard end of the scupper pipe exceeds $0.01L_f$, the scupper pipe may have two automatic non-return valves without any positive means of closing in lieu of valves prescribed in **(1)**. In this case, the inboard valve is to be located above the level of the deepest subdivision draught specified in ~~**4.1.2(3), Part C of the Rules**~~**2.3.1.2(3), Part 1, Part C** and is to always be accessible for inspection under service conditions.

13.4.4 Ash-shoots and Rubbish-shoots

Sub-paragraph -6 has been amended as follows.

6 For those ships in which the damage stability requirements specified in ~~**Chapter 4, Part C of the Rules**~~**2.3, Part 1, Part C** are applied; the following requirements are to be satisfied in cases where the inboard end of the chute is below the freeboard deck.

(1) Inboard-end hinged covers/valves are to be watertight.

(2) Valves are to be a screw-down non-return valve fitted in an easily accessible position above the deepest load line.

(3) Screw-down non-return valves are to be controlled from positions above the bulkhead deck and provided with open/closed indicators. Valve controls are to be clearly marked: “Keep closed when not in use.”

13.5 Bilge and Ballast Piping

13.5.8 Bilge Wells*

Sub-paragraph -1 has been amended as follows.

1 The depth of bilge wells constructed in double bottoms and the vertical distance between the bottom plating and the bottom of bilge wells are to comply with the requirements in ~~**6.1.3-2,**~~ **10.2.1.2, Part 1, Part C**.

Paragraph 13.5.10 has been amended as follows.

13.5.10 Dewatering Arrangements for Bulk Carriers, etc.*

For bulk carriers defined in ~~**31A.1.2(1),**~~ **An1.2.1(1), Annex 1.1, Part 2.2, Part C**, bilge or ballast systems capable of being brought into operation from a readily accessible enclosed space, the location of which is accessible from the navigation bridge or continuously manned propulsion machinery control rooms without traversing exposed decks, are to be provided for draining and pumping those spaces specified in the following **(1)** and **(2)**.

(1) Ballast tanks forward of the collision bulkhead specified in ~~**13.1.1,**~~ **2.2.1.1, Part 1, Part C**

(2) Dry or void spaces other than chain lockers, in which any part extends forward of the foremost cargo hold and a volume that exceeds 0.1 % of the ship's maximum displacement volume

13.6 Air Pipes

Paragraph 13.6.5 has been amended as follows.

13.6.5 Additional Requirements for Air Pipes Fitted on Exposed Fore Decks*

For ships with a ~~*L*~~L_C, specified in ~~**15.2.1-1,**~~**1.4.3.1-1, Part 1, Part C,** of 80 *m* or more and where the height of the exposed deck in way of the item is less than 0.1 ~~*L*~~L_C or 22 *m* above the designed maximum load line, whichever is the lesser, all air pipes located on the exposed deck over the forward 0.25 ~~*L*~~L_C are to be of sufficient strength to resist green sea force.

13.8 Sounding Pipes

13.8.5 Water Level Detection and Alarm Systems for Bulk Carriers, etc.*

Sub-paragraph -1 has been amended as follows.

1 For bulk carriers defined in ~~**31A.1.2(1),**~~ **An1.2.1(1), Annex 1.1, Part 2.2, Part C**, water level detection and alarm systems are to be provided for giving audible and visual alarms in the navigation bridge, in accordance with the following **(1)** to **(4)**:

(1) In each cargo hold, the systems are to give alarms when the water level reaches the following **(a)** and **(b)** at the aft end of the cargo hold.
   (a) A height of 0.5 *m* above the inner bottom
   (b) A height not less than 15 % of the depth of the cargo hold but not more than 2.0 *m*

(2) In any ballast tank forward of the collision bulkhead specified in ~~**13.1.1,**~~ **2.2.1.1, Part 1, Part C**, the system is to give an alarm when the liquid in the tank reaches a level not exceeding 10 % of the tank capacity.

(3) In any dry or void space other than a chain locker, any part of which extends forward of the foremost cargo hold and the volume of which exceeds 0.1 % of the ship's maximum

displacement volume, the system is to give an alarm at a water level of 0.1 *m* above the deck.

(4) The systems are to have constructions and functions deemed appropriate by the Society.

13.8.6 Water Level Detection and Alarm Systems for Single Hold Cargo Ships*

Sub-paragraph -1 has been amended as follows.

1 Cargo ships, other than bulk carriers defined in ~~**13.1.1**~~**An1.2.1(1), Annex 1.1 Part 2-2, Part C**, having a length (L_f) of less than 80 *m* and a single cargo hold below the freeboard deck or cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck, are to be fitted in such space or spaces with water level detection and alarm systems in accordance with the following **(1)** to **(3)**:

(1) These water level detection and alarm systems are to give an audible and visual alarm at the navigation bridge when the water level above the inner bottom in the cargo hold reaches a height of not less than 0.3 *m*, and another when such level reaches not more than 15 % of the mean depth of the cargo hold.

(2) The systems are to be fitted at the aft end of the hold, or above its lowest part where the inner bottom is not parallel to the designed waterline. In cases where webs or partial watertight bulkheads are fitted above the inner bottom, the fitting of additional detectors may be required.

(3) The systems are to have constructions and functions deemed appropriate by the Society.

Chapter 14 PIPING SYSTEMS FOR TANKERS

14.3 Piping Systems for Cargo Oil Pump Rooms, Cofferdams and Tanks adjacent to Cargo Oil Tanks

14.3.2 Ballast Tanks adjacent to Cargo Oil Tanks*

Sub-paragraph -1 has been amended as follows.

1 The requirements given in **14.3.2** are also applied to ballast tanks used as cofferdams at the fore and aft ends of cargo oil tanks in accordance with the requirements given in ~~**29.1.2-2(3),**~~ **2.1.1.1-1(3), Part 2-7, Part C**. However, other requirements will be applied, if the fore ends of these ballast tanks are located forward of the collision bulkhead.

14.5 Piping Systems for Combination Carriers

14.5.2 Terminology

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

The terms used in **14.5** are defined as follows:

(1) Combination carriers are defined as ore/oil carriers ~~specified in **30.7.1, Part C**~~ and as *B/O* carriers~~ specified in **31.8.1, Part C**~~.

((2) to (9) are omitted.)

Chapter 15 STEERING GEARS

15.2 Performance and Arrangement of Steering Gears

Paragraph 15.2.2 has been amended as follows.

15.2.2 Performance of Main Steering Gear

The main steering gear is to be:

(1) Capable of putting the rudder over from 35 *degrees* on one side to 35 *degrees* on the other side with the ship at its load draught and running ahead at the speed specified in **2.1.8, Part A** and, under the same conditions, from 35 *degrees* on either side to 30 *degrees* on the other side in not more than 28 *seconds*;

(2) Operated by power when the main steering gear has to meet the requirements in **(1)** or when the diameter of the upper stock is required in ~~**Chapter 3**~~ **Chapter 13, Part 1, Part C** to be over 120 *mm* (calculated with a material factor K_S =1 where K_S is less than 1, and excluding the increase required for ships which have strengthening for navigation in ice, the same being referred hereinafter); and

(3) So designed that they will not be damaged at maximum astern speed; however, this design requirement need not be proved by trials at maximum astern speed and maximum rudder angle.

Paragraph 15.2.3 has been amended as follows.

15.2.3 Performance of Auxiliary Steering Gear*

The auxiliary steering gear is to be:

(1) Capable of putting the rudder over from 15 *degrees* on one side to 15 *degrees* on the other side in not more than 60 *seconds* with the ship at its load draught and running ahead at one half of the speed specified in **2.1.8, Part A** or 7 *knots*, whichever is greater, and capable of being brought speedily into action in an emergency; and

(2) Operated by power where necessary to meet the requirement in **(1)** and in any case when the diameter of upper stock is required in ~~**Chapter 3,**~~ **Chapter 13, Part 1, Part C** to be over 230 *mm*.

Paragraph 15.2.6 has been amended as follows.

15.2.6 Alternative Source of Power

In cases where the diameter of upper stock is required in ~~**Chapter 3,**~~ **Chapter 13, Part 1, Part C** to be over 230 *mm*, an alternative source of power is to be provided in accordance with the following:

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

15.4 Materials, Constructions and Strength of Steering Gears

Paragraph 15.4.7 has been amended as follows.

15.4.7 Tillers, etc. *

1 The scantlings of tillers, etc., made of forged steels or cast steels, which transfer power from the rudder actuator to the rudder stock, are to be so determined so that the bending stress does not exceeding $118/K(N/mm^2)$ and the shearing stress does not exceeding $68/K(N/mm^2)$ when the rudder torque T_R is applied.

where

T_R : Rudder torque specified in ~~3.3,~~ **13.2.3, Part 1, Part C** (*N-m*).
K : Material coefficient of the tiller, specified in ~~3.1.2,~~**13.2.3, Part 1, Part C**

2 Notwithstanding the requirement specified in **-1**, the scantlings of rapson-slide type or trunk piston type tillers may be determined according to the following **(1)** to **(4)**:

(1) The vertical section of each side of tiller boss at the centre line of rudder stock is to comply with the following formulae:

$(D^2 - d^2)H \geq 170 T_R K$

$H/d \geq 0.75$

where

D : Outer diameter of boss (*mm*).
d : Inner diameter of boss (*mm*).
H : Depth of boss (*mm*).
T_R : Rudder torque specified in ~~3.3,~~**13.2.3, Part 1, Part C** (*N-m*).
K : Material coefficient of the tiller, specified in ~~3.1.2,~~**13.2.1.2, Part 1, Part C**

(2) The section modulus of an arm about its vertical axis is to be not less than that obtained from the following formula:

$$Z_{TA} = 11\left(1 - \frac{r}{R_1}\right) T_R K$$

where

Z_{TA} : Required section modulus of the arm about its vertical axis (mm^3).
r : Distance from the centre of rudder stock to the section (*mm*).
R_1 : Length of the tiller arm measured from the centre of the rudder stock to the point of application of the driving force (*mm*). In cases where this length varies in accordance with rudder angle, R_1 is the maximum length within 35 *degrees* of rudder angle.
T_R : Rudder torque specified in ~~3.3,~~ **13.2.3, Part 1, Part C** (*N-m*).
K : Material coefficient of the tiller, specified in ~~3.1.2,~~ **13.2.1.2, Part 1, Part C**

(3) The sectional area of an arm at its outer end is to be not smaller than that obtained from the following formula:

$$A_R = 18.5 \frac{T_R}{R_2} K$$

where

A_R : Required sectional area of the arm at its outer end (mm^2).
R_2 : Length of the tiller arm measured from the centre of the rudder stock to the point of application of the driving force (*mm*). In cases where this length varies in accordance with rudder angle, R_2 is the length at 0 *degrees* of rudder angle.
T_R : Rudder torque specified in ~~3.3,~~ **13.2.3, Part 1, Part C** (*N-m*).
K : Material coefficient of the tiller, specified in ~~3.1.2,~~ **13.2.1.2, Part 1, Part C**

(4) In cases where a tiller having two arms which have power units that are connected to each arm and these two power units are driven simultaneously, the scantlings of the arms may be reduced from those required in **(2)** and **(3)** to a value recognized by the Society.

3 Notwithstanding the requirement specified in **-1**, the scantlings of rotary vane type rudder actuators of forged steels or cast steels may be determined according to the following requirements, in addition to those requirements specified in **15.4.4**.

(1) Scantlings of the boss are to comply with the requirement specified in **-2(1)**.

(2) The section modulus about the vertical axis and the sectional area of vane is to be not less than that obtained from the following formulae:

$$Z_v = 11\left(\frac{B}{D+B}\right)\frac{T_R}{n}K$$

$$A_R = 37\left(\frac{1}{D+B}\right)\frac{T_R}{n}K$$

where

Z_v : Required section modulus of vane about the vertical axis (mm^3).
A_R : Required sectional area of vane (mm^2).
D : Outer diameter of boss (*mm*).
B : Height of vane measured from outer surface of boss (*mm*).
n : Number of vanes.
T_R : Rudder torque specified in ~~**3.3,**~~ **13.2.3, Part 1, Part C** (*N-m*).
K : Material coefficient of the vane, specified in ~~**3.1.2,**~~ **13.2.1.2, Part 1, Part C**

4 In cases where tillers which are separated into two pieces are bolted, there are to be at least two bolts on each side of the head. The diameter of bolts at bottom of thread is not to be less than that obtained from the following formula. In such case, the thickness of any coupling flange is to not less than three-fourth of the diameter of the bolts.

$$d_b = 1.45\sqrt{\frac{T_R}{nb}K}$$

where

d_b : Required diameter of bolts at bottom of thread (*mm*).
T_R : Rudder torque specified in ~~**3.3,**~~**13.2.3, Part 1, Part C** (*N-m*).
K : Material coefficient of the bolt, specified in ~~**3.1.2**~~ **13.2.1.2, Part 1, Part C**
n : Number of bolts on each side of the head.
b : Distance from the centre of rudder stock to the centre of bolt (*cm*).

5 Tillers are to be coupled, using a key, to rudder stocks by shrinkage fitting, force fitting or the bolted method. However, tillers may be coupled without a key, in cases where the fitting methods are in compliance to the satisfaction of the Society.

6 Scantlings of rotary vane type rudder actuators of nodular graphite cast iron are to be specified to not to be applied with bending stress exceeding 94/*K (N/mm*^{2}), or shearing stresses exceeding 54/*K (N/mm*^{2}) under the rudder torque T_R applied. Alternatively, the scantlings may be determined according to the requirements specified in **-3**, using 1.2 *times* the rudder torque T_R specified in ~~**3.3,**~~ **13.2.3, Part 1, Part C** as rudder torque for calculating.

Chapter 16 WINDLASSES AND MOORING WINCHES

16.2 Windlasses

16.2.4 Design*

Sub-paragraph -2 has been amended as follows.

2 Mechanical designs of windlasses are to be according to the following requirements:
((1) to (6) are omitted.)
(7) Hull supporting structures of windlasses and chain cable stoppers are to be according to the following requirements:
  (a) Hull supporting structures of windlasses and chain cable stoppers are to comply with the requirements specified in ~~**Chapter 27,**~~ **14.3.1.5, Part 1, Part C** or **Chapter 23, Part CS**.
  (b) For those ships of 80 *m* or more in length ~~*L*~~$_1$*L*$_C$ that are specified in ~~**15.2.1-1,**~~ **1.4.3.1-1, Part 1, Part C**, all windlass mounts on an exposed deck over the forward 0.25 ~~*L*~~$_1$*L*$_C$ line are to be of sufficient strength in cases where the height of the exposed deck in way of the item is mounted is less than 0.1 ~~*L*~~$_1$*L*$_C$ or 22 *m* above the designed maximum load line, whichever is lesser.
  (c) The strength of any above deck framing and hull structure supporting a windlass and its securing bolt is to be according to the requirements in ~~**10.7.1,**~~ **10.4.2.3, Part 1, Part C** or **10.6.1, Part CS**.

Chapter 25 SPECIAL REQUIREMENTS FOR MACHINERY INSTALLED IN SHIPS WITH RESTRICTED AREA OF SERVICE AND SMALL SHIPS

25.2 Modified Requirements

25.2.2 Ships with the Class Notation "*Smooth Water Service*" or Equivalent

Sub-paragraph -2 has been amended as follows.

2 For ships with an upper stock diameter of not more than 120 *mm* as calculated by the formula in ~~**Chapter 3,**~~ **Chapter 13, Part 1, Part C** (however, in cases where K_S is less than 1, calculations are to be made with a material factor K_S = 1.), the provisions of the auxiliary steering gear specified in **15.2.1** above may be omitted in cases where spare parts for consumables, such as packing and bearings, are provided for power-driven main steering gear or in cases where spare steering wires are provided for manually-powered main steering gear.

Annex 12.1.6 PLASTIC PIPES

Table 1 has been amended as follows.

Table 1 Fire Endurance Requirements Matrix

N	Piping Systems	Location										
		A	B	C	D	E	F	G	H	I	J	K
(Omitted)												
SANITARY/DRAINS/SCUPPERS												
23	Deck drains (internal)	L1W[4]	L1W[4]	—	L1W[4]	○	—	○	○	○	○	○
24	Sanitary drains (internal)	○	○	—	○	○	—	○	○	○	○	○
25	Scuppers and discharges (overboard)	○[1,8]	○[1,8]	○[1,8]	○[1,8]	○[1,8]	○	○	○	○	○[1,8]	○
(Omitted)												

Notes:

(1) LOCATION

(Omitted)

(2) ABBREVIATIONS

(Omitted)

(3) FOOTNOTES

(1 to 7 are omitted.)

8 : Scuppers serving open decks in positions I and II, as defined in ~~**20.1.2, Part C of the Rules**~~**1.4.3.2, Part 1, Part C,** should be "×" throughout unless fitted at the upper end with the means of closing capable of being operated from a position above the freeboard deck in order to prevent downflooding.

(9 to 15 are omitted.)

Part GF SHIPS USING LOW-FLASHPOINT FUELS

Chapter 2 DEFINITIONS

2.2 Definitions (*IGF Code* 2.2)

2.2.1 Terms*

Sub-paragraph -2 has been amended as follows.

2 *Breadth (B')* means the greatest moulded breadth of the ship at or below the deepest subdivision draught (summer load line draught) (refer to ~~**4.1.2(3),**~~ **2.3.1.2(11), Part 1, Part C**).

Chapter 5 SHIP DESIGN AND ARRANGEMENT

5.3 General Requirements (*IGF Code* 5.3)

Paragraph 5.3.4 has been amended as follows.

5.3.4 Alternative Fuel Tank Locations

As an alternative to **5.3.3(1)** above, the following calculation method may be used to determine the acceptable location of the fuel tanks:

(1) (Omitted)

(2) The f_{CN} is calculated by the following formulation:

$$f_{CN} = f_l \times f_t \times f_v$$

where:

f_l: calculated by use of the formulations for factor p contained in ~~**4.2.2-2, Part C of the Rules**~~ **2.3.2.2-2., Part 1, Part C**. The value of $x1$ is to correspond to the distance from the aft terminal to the aftmost boundary of the fuel tank and the value of $x2$ is to correspond to the distance from the aft terminal to the foremost boundary of the fuel tank.

f_t: calculated by use of the formulations for factor r contained in ~~**4.2.2-3, Part C of the Rules**~~ **2.3.2.2-3., Part 1, Part C**, and reflects the probability that the damage penetrates beyond the outer boundary of the fuel tank. The formulation is follows. When the outermost boundary of the fuel tank is outside the boundary given by the deepest subdivision waterline the value of b is to be taken as 0.

$$f_t = 1 - r(x1, x2, b)$$

f_v: calculated by following formulation:

$f_v = 1.0 - 0.8 \cdot ((H - d)/7.8)$, if ($H$ - d) is less than or equal to 7.8m. f_v is not to be taken greater than 1.

$f_v = 0.2 - \big(0.2 \cdot \big((H - d) - 7.8\big)/4.7\big)$, in all other cases f_v is not to be taken less than 0.

where:

H: the distance from baseline, in metres, to the lowermost boundary of the fuel tank

d: the deepest draught (summer load line draught)

((3) to (8) are omitted.)

5.12 Airlocks (*IGF Code* 5.12)

Paragraph 5.12.1 has been amended as follows.

5.12.1 Structure

An airlock is a space enclosed by gastight bulkheads with two substantially gastight doors spaced at least 1.5 *m* and not more than 2.5 *m* apart. Unless subject to the requirements of the ~~**Chapters 18, 19**~~**11.3.2, 11.3.3, 11.4.6** and ~~**20,**~~ **11.4.7, Part 1, Part C**, the door sill is not to be less than 300 *mm* in height. The doors are to be self-closing without any holding back arrangements.

Chapter 6 FUEL CONTAINMENT SYSTEM

6.4 Liquefied Gas Fuel Containment (*IGF Code* 6.4)

6.4.15 Tank Types*

Sub-paragraph -1 has been amended as follows.

1 Type *A* independent tanks

(1) Design basis

(a) Type *A* independent tanks are tanks primarily designed using classical ship-structural analysis procedures in accordance with ~~the requirements in Chapter 14, Part C of the Rules~~ recognized standards. Where such tanks are primarily constructed of plane surfaces, the design vapour pressure P_0 is to be less than 0.07 *MPa*.

(b) A complete secondary barrier is required as defined in **6.4.3**. The secondary barrier is to be designed in accordance with **6.4.4**.

(2) (Omitted)

(3) Ultimate design condition

(a) For tanks primarily constructed of plane surfaces, the nominal membrane stresses for primary and secondary members (stiffeners, web frames, stringers, girders), when calculated by classical analysis procedures, are to not exceed the lower of $R_m/2.66$ or $R_e/1.33$ for nickel steels, carbon-manganese steels, austenitic steels and aluminium alloys, where R_m and R_e are defined in **6.4.12(1)(a)iii)**. However, if detailed calculations are carried out for the primary members, the equivalent stress σ_C, as defined in **6.4.12(1)(a)iv)**, may be increased over that indicated above to a stress acceptable to the Society. Calculations are to take into account the effects of bending, shear, axial and torsional deformation as well as the hull/liquefied gas fuel tank interaction forces due to the deflection of the hull structure and liquefied gas fuel tank bottoms.

(b) Tank boundary scantlings are to meet at least the requirements in ~~Chapter 14, Part C of the Rules~~**Chapter 6, Part 2-9, Part C** for deep tanks taking into account the internal pressure as indicated in **6.4.9-3(3)(a)** and any corrosion allowance required by **6.4.1-7**.

(c) The liquefied gas fuel tank structure is to be reviewed against potential buckling.

(4) (Omitted)

Sub-paragraph -4(5) has been amended as follows.

4 Membrane tanks

(5) Ultimate design condition

(a) The structural resistance of every critical component, sub-system, or assembly, is to be established, in accordance with **6.4.15-4(1)(b)**, for in-service conditions.

(b) The choice of strength acceptance criteria for the failure modes of the liquefied gas fuel containment system, its attachments to the hull structure and internal tank structures, is to reflect the consequences associated with the considered mode of failure.

(c) The inner hull scantlings are to meet the requirements in ~~Chapter 14~~ **Chapter 6, Part 1, Part C**, taking into account the internal pressure as indicated in **6.4.9-3(3)(a)** and the specified appropriate regulations for sloshing load as defined in **6.4.9-4(1)(c)**.

Part H ELECTRICAL INSTALLATIONS

Chapter 3 DESIGN OF INSTALLATIONS

3.3 Emergency Sources of Electrical Power

Paragraph 3.3.2 has been amended as follows.

3.3.2 Capacities of Emergency Sources of Power*

2 Emergency sources of electrical power are to be capable, having regard for starting currents and the transitory nature of certain loads, of supplying simultaneously at least the following services for those periods specified hereinafter, if they depend upon electrical sources for operation:

((1) to (6) are omitted.)

(7) For a period of 30 *minutes*, indications showing whether closing means are opened or closed and audible alarms showing that such closing means are operating as required by ~~**4.3.1**~~**2.2.3.1, Part 1, Part C**, and indicators showing whether these closing means are opened or closed as required by ~~**4.3.2 and 33.2.1**~~**2.2.3.2** and **2.2.4.2, Part 1, Part C** if they are operated by electrical power.

((8) to (10) are omitted.)

Part K EQUIPMENT

Chapter 3 ROLLED STEELS

3.12 Additional Requirements for Brittle Crack Arrest Properties

3.12.1 Application

Sub-paragraph -1 has been amended as follows.

1 The provisions given in **3.12** are to apply to the steels which are considered so as to have brittle crack arrest properties relating to the brittle crack arrest design for the container carriers specified in ~~**32.13,**~~**10.5, Part 2-1, Part C** ~~**of the Rules**~~.

3.13 Additional Requirements for Corrosion Resistant Steel for Cargo Oil Tanks

3.13.1 Application

Sub-paragraph -1 has been amended as follows.

1 The requirements are to apply to the corrosion resistant steel used in the cargo oil tanks of crude oil tankers required by ~~**25.2.3(2)**~~**3.3.5.4-1(2), Part 1, Part C** or **22.4.3(2), Part CS**.

Part L EQUIPMENT

Chapter 1 GENERAL

1.1 General

Paragraph 1.1.1 has been amended as follows.

1.1.1 Application

1 Anchors, chains, steel wire ropes, fibre ropes, etc. (hereinafter referred to as "equipment" in this Part) specified in **Chapter 14, Part 1, Part C**, etc. are to be in accordance with the requirements in the following Chapters of this Part.

2 The equipment other than those prescribed in this Part may be used where specially approved in connection with the design and usage. In such cases, the detailed data relating to the process of manufacture, construction, performance, etc. of the equipment is to be submitted for approval.

Chapter 2 ANCHORS

2.1 Anchors

Paragraph 2.1.1 has been amended as follows.

2.1.1 Application

Anchors to be equipped on ships in accordance with the provisions in ~~**Chapter 27**~~**14.3, Part 1, Part C** are to be in compliance with the requirements in this Chapter or to be of equivalent quality.

Chapter 4 STEEL WIRE ROPES

4.1 Steel Wire Ropes

4.1.1 Application*

Sub-paragraph -1 has been amended as follows.

1 The steel wire ropes used for mast riggings, mooring lines, etc. to be equipped on ships in accordance with the provisions in ~~**Chapter 27,**~~**14.4, Part 1, Part C** (hereinafter referred to as "steel wire rope") are to comply with the requirements in this chapter or to be of equivalent quality.

2 The provisions in this Chapter are applicable to the wire ropes constructed with fibre rope core and from individual wires having the tensile strength level of 1,500N/mm^2. However, wire ropes constructed from other individual wires than those described above or steel wire ropes constructed with an independent wire rope core may be used where specially approved in connection with their manufacture.

Chapter 5 FIBRE ROPES

5.1 Fibre Ropes

5.1.1 Application

Sub-paragraph -1 has been amended as follows.

1 Hemp ropes and synthetic fibre ropes used for mooring lines to be equipped on ships in accordance with the provisions in ~~**Chapter 27,**~~**14.4, Part 1, Part C** (hereinafter referred to as "fibre rope" in **Chapter 5**) are to comply with the requirements in this Chapter.

Chapter 6 HATCH TARPAULINS

6.1 Hatch Tarpaulins

Paragraph 6.1.1 has been amended as follows.

6.1.1 Application

Hatch tarpaulins to be equipped on ships in accordance with the provisions in ~~**Chapter 20,**~~ **14.6, Part 1, Part C** are to comply with the requirements in this Chapter or to be of equivalent quality. However, the manufacturing approval test by the Society is not required.

Chapter 7 SIDE SCUTTLES

7.1 Side Scuttles

Paragraph 7.1.1 has been amended as follows.

7.1.1 Application

The side scuttles to be fitted up on ships according to the requirements in ~~**Chapter 23,**~~ **14.11, Part 1, Part C** (hereinafter referred to as "side scuttles") are to comply with the requirements in this Chapter or to be of equivalent quality. However, the manufacturing approval test by the Society is not required.

Chapter 8 RECTANGULAR WINDOWS

8.1 Rectangular Windows

Paragraph 8.1.1 has been amended as follows.

8.1.1 Application

The rectangular windows to be fitted up on ships according to the requirements in ~~**Chapter 23,**~~ **14.11, Part 1, Part C** (hereinafter referred to as "rectangular windows") are to comply with the requirements in this Chapter or to be of equivalent quality. However, the manufacturing approval test by the Society is not required.

Part M WELDING

Chapter 1 GENERAL

1.4 Inspection and Quality for Weld

1.4.2 Quality and Repair*

Sub-paragraph -1(2) has been amended as follows.

1 The quality of weld is to be assured in accordance with the requirements provided below.
(1) (Omitted)
(2) Visual inspection of weld
Visual inspection of weld is to be carried out. The weld is to be free from weld cracks, excess weld metal or excessive convexity and surface harmful imperfections, such as undercuts, overlaps, etc., and excessive misalignment and deformation. The size of fillet welds is to comply with the requirements specified in ~~**1.2.3,**~~ **12.2, Part 1, 12.1.1, Part 2-6** and **12.1.2, Part 2-7, Part C**.
(3) (Omitted)

Chapter 8 NON-DESTRUCTIVE INSPECTION FOR THE WELDED JOINTS OF HULL CONSTRUCTIONS

8.4 General Plan of Non-destructive Inspection

8.4.3 Non-destructive Test Application Procedure*

Sub-paragraph -8 has been amended as follows.

8 Ultrasonic testing is to be carried out on all block-to-block butt joints of all upper flange longitudinal structural members in the cargo hold region of container carriers applying extremely thick steel plates which complies with ~~**32.13, Part C of the Rules**~~**10.5, Part 2-1, Part C**. Upper flange longitudinal structural members include the topmost strakes of the inner hull/bulkhead, the sheer strake, strength deck, hatch side coaming plate, coaming top plate, and all attached longitudinal stiffeners. These members are shown in **Fig. M8.1**.

Part N SHIPS CARRYING LIQUEFIED GASES IN BULK

Chapter 1 GENERAL

3.6 Airlocks (IGC Code 3.6)

Paragraph 3.6.7 has been amended as follows.

3.6.7 Door Sill

Subject to the requirements of the ~~**Chapters 18 to 20 of**~~**11.3, 14.6 and 14.7, Part 1, Part C** or **Chapters 18 and 19, Part CS**, the door sill is not to be less than 300 mm in height.

Chapter 4 CARGO CONTAINMENT

4.19 Materials (*IGC Code* 4.19)

4.19.1 Materials Forming Ship Structure*

5 Means of heating structural materials may be used to ensure that the material temperature does not fall below the minimum allowed for the grade of material specified in **Table N6.5**. In the calculations required in **4.19.1-1**, credit for such heating may be taken in accordance with the following:

(1) for any transverse hull structure;

(2) for longitudinal hull structure referred to in **4.19.1-2** and **4.19.1-3** where colder ambient temperatures are specified, provided the material remains suitable for the ambient temperature conditions of +5°C for air and 0°C for seawater with no credit taken in the calculations for heating; and

(3) as an alternative to **-2**, for longitudinal bulkhead between cargo tanks, credit may be taken for heating, provided the material remain suitable for a minimum design temperature of -30°C, or a temperature 30°C lower than that determined by **4.19.1-1** with the heating considered, whichever is less. In this case, the ship's longitudinal strength is to comply with the relevant provisions of **Part C of the Rules** for both when those bulkhead(s) are considered effective and not.

Part S SHIPS CARRYING DANGEROUS CHEMICALS IN BULK

Chapter 1 GENERAL

1.1 General

1.1.1 Application*

Sub-paragraph -3 has been amended as follows.

3 Hull, machinery and equipment of a ship intended to carry dangerous chemicals are to comply with the followings in addition to those of this Part.

(1) For ships having double hull structure and length of 150 m or above intended for the carrying a cargo or part cargo of oil in bulk: **Part CSR-B&T**
In this case, "length of ship" is as defined in **1.1.2-5(1) of Part A**.

(2) For ships intended for the carriage of liquid cargoes in tanks integrated to their hull structures, except ships defined in (1): ~~**Chapter 29,**~~ **Part 2-7, Part C**

(3) For ships intended for the carriage of flammable liquid: ~~**29.1.2 and 29.12.4, Part C**~~ **2.1.1** and **14.2, Part 2-7 and Chapter 14, Part D**

Chapter 4 CARGO CONTAINMENT

4.2 Design and Construction

4.2.2 Gravity Tank

Sub-paragraphs -1 and -2 have been amended as follows.

1 The scantlings of the members of cargo tank are, in general, to be in accordance with the applicable provisions of ~~**Chapter 14 and 29**~~ **Part 2-7** and **Part 2-9, Part C** prescribed for cargo tank construction of oil tanker, considering the loads and stress provided in **4.2.1(1)**.

2 Weldings of gravity tanks are to be in accordance with provisions of ~~**29.13, Part C**~~ **Chapter 12, Part 2-7,** where *F*3 in **Table** ~~**C29.20**~~**12.1.2-1, Part 2-7, Part C** to be altered as *F*2.

Part I SHIPS OPERATING IN POLAR WATERS, POLAR CLASS SHIPS AND ICE CLASS SHIPS

Chapter 3 SHIP STRUCTURE

3.3 Regulations (*Polar Code*, Part I-A, 3.3)

Paragraph 3.3.1 has been amended as follows.

3.3.1 Materials of Structures*

In order to comply with the functional requirements of **3.2.1(1)** above, materials of exposed structures in ships are to be approved by the Society taking into account **Annex 1** "**Special Requirements for the Materials, Hull Structures, Equipment and Machinery of Polar Class Ships**", ~~**1.1.12 of**~~ **3.2.2.2, Part 1, Part C** or other standards offering an equivalent level of safety based on the polar service temperature.

Chapter 4 SUBDIVISION AND STABILITY

4.3 Regulations (*Polar Code*, Part I-A, 4.3)

Paragraph 4.3.2 has been amended as follows.

4.3.2 Stability in Damaged Conditions

In order to comply with the functional requirements of **4.2.1(2)**, ships of categories *A* and *B*, constructed on or after 1 January 2017, are to be able to withstand flooding resulting from hull penetration due to ice impact, of which the damage extent is to be in accordance with the following **(1)** to **(3)**. The residual stability following ice damage is to be such that the factor s_i, as defined in ~~**4.2.3-1,**~~ **2.3.2.3, Part 1, Part C** or **4.2.3-1**, **Part CS**, is equal to one for all loading conditions used to calculate the attained subdivision index *A* in ~~**4.2.1-2,**~~ **2.3.2.1, Part 1, Part C** or **4.2.1-2**, **Part CS**. However, for cargo ships that comply with subdivision and damage stability regulations, the residual stability criteria of that instrument is to be met for each loading condition.

(1) the longitudinal extent is 0.045 times the upper ice waterline length if centred forward of the maximum breadth on the upper ice waterline, and 0.015 times the upper ice waterline length otherwise, and are to be assumed at any longitudinal position along the ship's length;

(2) the transverse penetration extent is 760 *mm*, measured normal to the shell over the full extent of the damage; and

(3) the vertical extent is the lesser of 0.2 times the upper ice waterline draught or the longitudinal extent, and is to be assumed at any vertical position between the keel and 1.2 times the upper ice waterline draught.

Chapter 8 ICE CLASS SHIPS

8.4 Fundamental Requirements of Machinery

8.4.3 Rudders and Steering Arrangements*

Sub-paragraph -1 has been amended as follows.

1 The rudder scantlings of rudder post, rudder stock, pintles, steering gear, etc. are to comply with the requirements in ~~**Chapter 3 of Part C**~~ **Chapter 13, Part 1, Part C** and **Chapter 15, Part D**. However, for I*A Super*, I*A*, I*B* and I*C* ice class ships, the maximum service speed of the ship to be used in these calculations is not to be taken less than that given in the **Table I8.13**.

ANNEX 1 SPECIAL REQUIREMENTS FOR THE MATERIALS, HULL STRUCTURES, EQUIPMENT AND MACHINERY OF POLAR CLASS SHIPS

Chapter 2 MATERIALS AND WELDING

2.1 Material

2.1.2 Material Classes and Grades*

Sub-paragraph -3 has been amended as follows.

3 For polar class ships designed base on a designated design temperature, the steels used for hull structures are to comply with the requirements in ~~**1.1.12, Part C of the Rules**~~**3.2.2.2, Part 1, Part C**. However, regardless of the design temperature, the steel grades are not to be of lower than the steel grade provided in **Part I of the Rules**.

2.2 Welding

2.2.1 General

Sub-paragraph -2 has been amended as follows.

2 All fillet welding within ice-strengthened areas are to be of the double continuous type and their sizes are to be of *F*2 or more as specified in ~~**Table C1.4, Part C of the Rules**~~ **Table 12.2.1-1, Part 1, Part C**.

Chapter 3 HULL STRUCTURE

3.2 Subdivision and Stability

Paragraph 3.2.2 has been amended as follows.

3.2.2 Stability in Damaged Condition

Ships are to be able to withstand flooding resulting from hull penetration due to ice impact, of which the damage extent is to be in accordance with the following **(1)** to **(3)**. The residual stability following ice damage is to be such that the factor s_i, as defined in ~~**4.2.3-1,**~~ **2.3.2.3-1, Part 1, Part C** or **4.2.3-1**, **Part CS**, is equal to one for all loading conditions used to calculate the attained subdivision index A in ~~**4.2.1-2,**~~ **2.3.2.1-2, Part 1, Part C** or **4.2.1-2**, **Part CS**. However, for cargo ships that comply with subdivision and damage stability regulations, the residual stability criteria of that instrument is to be met for each loading condition.

(1) the longitudinal extent is 0.045 times L_{UI} if centred forward of the maximum breadth on the upper ice waterline, and 0.015 times L_{UI} otherwise, and are to be assumed at any longitudinal position along the ship's length;

(2) the transverse penetration extent is 760 *mm*, measured normal to the shell over the full extent of the damage; and

(3) the vertical extent is the lesser of 0.2 times the upper ice waterline draught or the longitudinal extent, and is to be assumed at any vertical position between the keel and 1.2 times the upper ice waterline draught.

3.5 Longitudinal Strength

3.5.3 Design Vertical Shear Force

Sub-paragraph -2 has been amended as follows.

2 The applied vertical shear stress τ_a is to be determined along the hull girder in a similar manner as in ~~**15.4.2-2, Part C of the Rules**~~ **5.2.2.2, Part 1, Part C** by substituting the design vertical ice shear force for the design vertical wave shear force.

3.5.4 Design Vertical Ice Bending Moment

Sub-paragraph -2 has been amended as follows.

2 The applied vertical bending stress σ_a is to be determined along the hull girder in a similar manner as in ~~**15.4.2-1, Part C of the Rules**~~ **5.2.1.2, Part 1, Part C,** by substituting the design vertical ice bending moment for the design vertical wave bending moment. The ship still water bending moment is to be taken as the permissible still water bending moment in the sagging condition.

Table 3.5.5-1 has been amended as follows.

Table 3.5.5-1 Longitudinal Strength Criteria

Failure Mode	Applied Stress	Permissible Stress when $\sigma_y / \sigma_u \leq 0.7$	Permissible Stress when $\sigma_y / \sigma_u > 0.7$
Tension	σ_a	$\eta \sigma_y$	$\eta \times 0.41 (\sigma_u + \sigma_y)$
Shear	τ_a	$\eta \sigma_y / \sqrt{3}$	$\eta \times 0.41 (\sigma_u + \sigma_y) / \sqrt{3}$
Buckling	σ_a	σ_c for plating and for web plating of stiffeners σ_c / 1.1 for stiffeners	
	τ_a	τ_c	

Notes:

σ_a : applied vertical bending stress (N/mm^2)

τ_a : applied vertical shear stress (N/mm^2)

σ_y : minimum upper yield stress of the material (N/mm^2)

σ_u : ultimate tensile strength of material (N/mm^2)

σ_c : critical buckling stress (N/mm^2) in compression, according to ~~**15.4, Part C of the Rules**~~**5.3.3.1(1), Part 1, Part C**

τ_c : critical buckling stress (N/mm^2) in shear, according to ~~**15.4, Part C of the Rules**~~**5.3.3.1(2), Part 1, Part C**

η = 0.8. However, for ships which are assigned the additional notation "*Icebreaker*" (abbreviated to *ICB*), η = 0.6.

Part O WORK-SHIPS

Chapter 1 GENERAL

1.2 General

1.2.3 Workmanship

Sub-paragraph -6 has been amended as follows.

6 The details of welded joints and their workmanship are to be as specified in **Part M** in addition to ~~**1.2,**~~ **Chapter 12, Part 1, Part C**.

1.2.5 Materials, Hull Equipment, Weldings and End Connections

Sub-paragraph -1 has been amended as follows.

1 Materials, hull equipment, weldings and end connections are to be according to the following **(1)** or **(2)** depending upon ship length:

(1) For ships which are 90 *m* or longer, materials, hull equipment and end connections are to be according to ~~**1.1.7, 1.1.11 to 1.1.16 and 1.1.19 to 1.1.24, Part C**~~ relevant requirements in **Part C**. In addition, weldings are to be according to ~~**1.2,**~~ **Chapter 12, Part 1, Part C**.

(2) For ships which are less than 90 *m* long, materials, hull equipment, weldings and end connections are to be according to **1.3**, **Part CS**.

Chapter 2 DREDGERS

2.2 Stability

2.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **2.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**.

Chapter 3 CRANE SHIPS

3.2 Stability

Paragraph 3.2.1 has been amended as follows.

3.2.1 General

Intact and damage stability are to be according to this **3.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**.

Chapter 4 VESSELS ENGAGED IN TOWING OPERATIONS

4.2 Stability

4.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **4.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**.

4.3 Hull Construction

Paragraph 4.3.2 has been amended as follows.

4.3.2 Stern Frames

Scantlings of various parts of propeller posts are to be suitably increased from that given by **11.5.1.2, Part 1, Part C** or the formula and figures in ~~**Fig.C2.1 or**~~ **Fig.CS2.1**.

Paragraph 4.3.3 has been amended as follows.

4.3.3 Rudder Stocks

The diameter of rudder stocks of ships is not to be less than 1.1 times that required in ~~**Chapter 3,**~~ **Chapter 13, Part 1, Part C** or **Chapter 3, Part CS**.

Chapter 5 PUSHER TUGS

5.2 Stability

5.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **5.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**.

Chapter 6 FIRE FIGHTING VESSELS

6.2 Stability

6.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **6.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**.

Chapter 7 OFFSHORE SUPPLY VESSELS

7.2 Stability

7.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **7.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

Chapter 8 ANCHOR HANDLING VESSELS

8.2 Stability

8.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **8.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

Chapter 9 VESSELS ENGAGED IN LAYING OBJECTS ON THE SEABED

9.2 Stability

9.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **9.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

Chapter 10 OIL RECOVERY VESSELS

10.2 Stability

10.2.1 General*

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability are to be according to this **10.2** in addition to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**. However, for ships specifically approved by the Society, these requirements may be waived.

Chapter 11 WIND TURBINE INSTALLATION SHIPS

11.2 Stability

11.2.1 General

Sub-paragraph -1 has been amended as follows.

1 Intact and damage stability of ship-type and barge-type ships are to be in accordance with the requirements given in **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**.

Paragraph 11.4.6 has been amended as follows.

11.4.6 Deckhouses

Deckhouses are to be in accordance with the requirements in **11.3, Part 1, Part C**. ~~For self-elevating ships, where~~ In applying the requirement in **4.9.2.2, Part 1, Part C**, deckhouses which are close to the side shell of ~~the ship~~ self-elevating ships~~, their scantlings are to apply the requirements in Chapter 18, Part C.~~ are to be treated as superstructure end bulkhead and ~~O~~other deckhouses are to be ~~in accordance with the requirements in Chapter 19, Part C~~ treated as boundary walls of deckhouse.

Paragraph 11.4.8 has been amended as follows.

11.4.8 Bottom Mats

In cases where bottom mats are installed to the legs of self-elevating ships, such bottom mats are to be in accordance with the requirements in the following **(1)** to **(6)**:

(1) The construction of bottom mats is to be designed so that loads transmitted from the legs may be evenly distributed to the respective parts of the mats.

(2) The thickness of the shell plating of the bottom mats without opening to the sea and the scantlings of shell stiffeners are not to be less than determined by the requirements in **7.3.2** and **7.3.3, Part P**. In this case, the top of h_s is at the water level at flood tide, and the top of h_c is 0.6 times the design wave height in the severe storm condition above the water level at the design water depth.

(3) The scantlings of the watertight bulkheads and their stiffeners provided in the bottom mats are not to be less than the value determined by the requirements in ~~**Chapter 13, Part C**~~ **Chapter 6, Part 1, Part C** (assessment in flooded conditions) with necessary modifications or the requirements in **Chapter 13, Part CS.** In ~~this~~ the case of applying **Chapter 13, Part CS**, the top of h is to be substituted for the top of h_c specified in **(2)**.

(4) Where the ship is resting on the seabed, the effects of scouring are also to be considered.

(5) The effects of skirt plates, where provided, are to be given special consideration.

(6) Mats are to be designed to withstand the shock of touching the seabed while the ship is afloat and subject to wave motions.

11.5 Hull Equipment

Paragraph 11.5.2 has been amended as follows.

11.5.2 Protective Coatings of Tanks

For dedicated seawater ballast tanks, including pre-load tanks on self-elevating ships, the requirements in ~~**25.2.2,**~~ **3.3.5.3, Part1, Part C** are to be complied with. However, spud cans on such

ships need not comply with such requirements.

Part P OBILE OFFSHORE DRILLING UNITS AND SPECIAL PURPOSE BARGES

Chapter 4 STABILITY

4.1 General

4.1.1 Application

Sub-paragraph -2 has been amended as follows.

2 Regarding damage stability and intact stability of units, notwithstanding the requirements of **-1**, ship-type and barge-type units, except for units fixed on the seabed or positioned for long periods of time, are to be according to **Part U** and ~~**Chapter 4,**~~ **2.3, Part 1, Part C**. In addition, when deemed necessary by the Society, additional requirements may be requested.

Chapter 5 WATERTIGHT BULKHEADS

5.1 Watertight Bulkheads

Paragraph 5.1.1 has been amended as follows.

5.1.1 General

1 Watertight bulkheads of ship-type and barge-type units are to be in accordance with the requirements in ~~**Chapter 13,**~~ **2.2.2, 6.3 and 10.5, Part 1, Part C** or **Chapter 13, Part CS** and **Chapter 10, Part Q**. However, the arrangement of watertight bulkheads of the units to be provided in a specified sea area and in a restricted area for long periods of time or semi-permanent or in case where the arrangements of watertight bulkheads are approved by the Society is to be at the discretion of the Society.

2 The arrangement of watertight bulkheads in self-elevating units and column-stabilized units is to be at the discretion of the Society.

3 The arrangements and scantlings of watertight decks and bulkheads in column-stabilized unit are to be effective to that point necessary to meet the requirements of damage stability.

4 Where openings are provided on watertight bulkheads, the requirements in ~~**13.3,**~~ **2.2.2, Part 1, Part C** and **13.2.5, Part D** are to be applied.

5 Tanks for fresh water or fuel oil, or any other tanks which are not intended to be kept entirely filled in service, are to be in accordance with the requirements in ~~**Chapter 14, Part C**~~**Chapter 6, Part 1, Part C** (assessment in maximum load condition) with necessary modifications or the requirements in **Chapter 14, Part CS**.

5.2 Closing Appliances

5.2.1 General

Sub-paragraph -3 has been amended as follows.

3 With respect to the provisions of **-1** above, ~~**20.2.13, 20.6.8,**~~ **14.7.1, 14.12.4.3, Part 1, Part C** and **21.6.8, Part CS** need not be applied to non self-propelled self-elevating units.

Chapter 6 HULL CONSTRUCTION

6.2 Materials for Structural Members

6.2.2 Application of Steels

Sub-paragraph -1 has been amended as follows.

1 Application of rolled steels for units is to be **Fig. P6.1** to **Fig. P6.4** depending upon the category of structural members defined in **6.2.1**, thickness and service temperature defined in **1.2.11**. Application of rolled steeled for ship-type units and barge-type units, however, is to be accordance with ~~**Table C1.1 and Table C1.2 specified in Part C**~~ **Table 3.2.2-1** and **Table 3.2.2-2, Part 1 Part C** when the service temperature is over -10℃.

6.4 Welding

Paragraph 6.4.1 has been amended as follows.

6.4.1 General

1 Welded joints of crossing parts at the ends of columns and bracings are, as a rule, to be of full-penetration type.

2 Size of fillet welds of Tee-joints applied to respective internal structural members of columns and bracings is to be F_1 specified in ~~**Table C1.5,**~~ **Table 12.2.1-2, Part 1, Part C**.

3 For other welded joints than specified in **-1** and **-2**, welding is to be in accordance with the requirements in ~~**1.2,**~~ **12.1 and 12.2, Part 1, Part C**.

Chapter 7 HULL STRENGTH

7.4 Self-elevating Units

Paragraph 7.4.4 has been amended as follows.

7.4.4 Deckhouses

Deckhouses are to be in accordance with the requirements in **11.3, Part 1, Part C**. ~~Where~~ In applying the requirements in **4.9.2.2, Part 1, Part C**, deckhouses which are close to the side shell of the unit~~, their scantlings~~ are to be ~~applied for the requirements in Chapter 18, Part C.~~ treated as superstructure end bulkhead and ~~O~~other deckhouses are to be ~~in accordance with the requirement in Chapter 19, Part C~~ treated as boundary walls of deckhouse.

7.4.5 Bottom Mats

Sub-paragraph -3 has been amended as follows.

3 The scantlings of the watertight bulkheads and their stiffeners provided in the bottom mats are not to be less than the value determined by the requirements in ~~**Chapter 13, Part C**~~ **Chapter 6, Part 1, Part C** (assessment in flooded conditions) with necessary modifications or the requirements in **Chapter 13, Part CS**. In ~~this~~ the case of applying **Chapter 13, Part CS**, the top of h_s to be substituted to the top of h_c specified in **-2**.

7.5 Column-stabilized Units

7.5.3 Columns, Lower Hulls and Footings

Sub-paragraph -3 has been amended as follows.

3 The scantlings of deep tank bulkheads and their stiffeners provided in columns, lower hulls or footings are not to be less than the value determined by the requirements in ~~**Chapter 14, Part C**~~ **Chapter 6, Part 1, Part C** (assessment in maximum load condition) with necessary modifications or the requirements in **Chapter 14, Part CS**.

Chapter 9 HULL EQUIPMENT

9.2 Mooring Equipment for Temporary Mooring

9.2.1 General

Sub-paragraph -2 has been amended as follows.

2 Anchors, chain cables and ropes necessary for temporary mooring are to be provided on units in accordance with the requirements in ~~**Chapter 27,**~~ **14.3 and 14.4, Part 1, Part C** or **Chapter 23, Part CS** according to their equipment number specified in **9.2.2**. Where, however, deemed appropriate by the Society, the requirements in **Chapter 19, Part Q** may be applied to the mooring equipment of units having no propelling machinery.

9.2.2 Equipment Number

Sub-paragraph -1 has been amended as follows.

1 The equipment number is to be determined according to the requirements in ~~**27.1.2,**~~ **14.5.1, Part 1, Part C** or **23.1.2, Part CS** for ship-type units and those in **19.1.3, Part Q** for barge-type units.

9.3 Guardrails and Bulwarks

9.3.1 General

Sub-paragraph -1 has been amended as follows.

1 In general, guardrails or bulwarks are to be provided on all exposed decks in order to prevent falling. The height and arrangement of the guardrails or bulwarks are to be in accordance with the requirements specified in ~~**Chapter 23,**~~ **14.8, Part 1, Part C**.

Part PS FLOATING OFFSHORE FACILITIES FOR CRUDE OIL/PETROLEUM GAS PRODUCTION, STORAGE AND OFFLOADING

Chapter 3 HULL CONSTRUCTION AND EQUIPMENT

3.1 General

3.1.3 Loading Manual, Stability Information and Instruction for Operation

Sub-paragraph -1 has been amended as follows.

1 In order to avoid the occurrence of unacceptable stress in Floating Offshore Facility structures corresponding to all oil and ballast loading conditions and to enable the master or the person-in-charge of loading operations to adjust the loading of cargo and ballast, Floating Offshore Facilities are to be provided with loading manuals approved by the Society. Such loading manuals are to at least include the following items as well as relevant provisions given in ~~**Chapter 34**~~ **3.8, Part 1, Part C**. ((1) to (4) are omitted.)

3.3 Stability

3.3.1 General

Sub-paragraph -2 has been amended as follows.

2 The arrangements of watertight compartments, watertight bulkheads and closing devices are to be in accordance with the requirements specified in **Chapter 5**, **Part P**, ~~**Chapter 4, Chapter 13 and Chapter 29,**~~ **2.2.2, 2.3, 6.3, 10.5** and **Part 2-7, Part C** and **Part CSR-B&T**.

3.4 Hull Construction

3.4.1 General

Sub-paragraph -2 has been amended as follows.

2 The designs of welded joints are to be in accordance with the requirements specified in ~~**1.2**~~ **Chapter 12, Part 1, Part C**. In cases where consideration is given to the welded joints of parts where the stresses may concentrate and the shapes of welded joints for fatigue strength design, data relative to them is to be submitted for Society approval.

3.5 Structural Strength for Ship-type Floating Offshore Facility

3.5.1 Overall Strength

Sub-paragraph -1 has been amended as follows.

1 In the case of ship-type Floating Offshore Facilities, longitudinal strength is to comply with the

requirements given in **Chapter ~~15~~ 5, Part 1 Part C**.

3.8 Corrosion Control Means and Corrosion Margins

Paragraph 3.8.3 has been amended as follows.

3.8.3 Corrosion Margin

1 Corrosion margins according to the corrosive environment to which structural members are exposed are to be in accordance with the values given in **Table PS3.3**. In cases where a corrosive environment is clearly severer than assumed, values that are bigger than the values given in **Table PS3.3** or additional corrosion control means considered appropriate will be required as deemed necessary by the Society.

~~**2** In cases where the scantlings of structural members are to comply with the requirements given in **Part C**, they are to follow **(1)** or **(2)** below:~~

~~(1) In cases where the scantling is determined by plate thickness~~

~~The value for $+\alpha$ specified in the end of the formula is to be provided by the value given in **Table PS3.3.**~~

~~(2) In cases where the scantling is determined by section modulus~~

~~For stiffeners having section modulus obtained by dividing the formula by 1.2, each scantling of web and face plates may be determined, and the values given in **Table PS3.3** are to be added to the determined thickness of each web and face plate.~~

~~3~~2 In cases where the scantlings of structural members are to comply with the requirements given in **Part C** and **Part CSR-B&T**, they are to follow **(1)** or **(2)** below:

(1) In cases where the scantling is determined by plate thickness

The values given in **Table PS3.3** are to be added to the value calculated by the formula and rounded up to the nearest 0.5 *mm*.

(2) In cases where the scantling is determined by the section modulus

For stiffeners having section modulus given in the formula, each scantling of web and face plates may be determined, and the values given in **Table PS3.3** are to be added to the determined thickness of each web and face plate and rounded up to the nearest 0.5 *mm*.

~~4~~3 In the application of **-2 ~~and 3~~** above, loads calculated in accordance with **Chapter 2** may be able to be used instead of those loads specified in **Part C** and **Part CSR-B&T**.

Table PS3.3 One Side Corrosion Margin for Structural Members

Corrosive environment			One Side Corrosion Margin (*mm*)	
			Period intended to operate: 20 *years*	Period intended to operate: 30 *years*
In oil tank	Under tank top surface		1.5	1.8
	Upper bottom plating surface		2.0	2.3
	Other than those shown above	Face of girder	1.0	1.3
		Other than shown in above	0.8	1.0
In ballast tank	Face of girder		1.0	1.3
	Other than those shown above		0.8	1.0
Exposed to air			1.0	1.1
Exposed to sea water			0.5	0.6
Other than those shown above			0.5	0.6

Note)

In cases where the period intended to operate assumes an intermediate value of **Table PS3.3**, the period intended to operate is to be determined by linear interpolation and rounded up to one decimal place. In cases where the period intended to operate exceeds 30 *years*, the period intended to operate is to be determined by linear extrapolation using the values equal to those in cases where the period intended to operate is 20 *years* and 30 *years* and rounded up to one decimal place.

3.9 Hull Equipment, etc.

3.9.2 Guardrails, Fenders, etc.*

Sub-paragraph -1 has been amended as follows.

1 The guardrails or bulwarks specified in ~~**Chapter 23**~~**14.8, Part C** are to be provided on weather decks. In cases where guardrails will become hindrances to the taking-off and landing of helicopters, means to prevent falling such as wire nets, etc. are to be provided.

Sub-paragraph -3 has been amended as follows.

3 Freeing arrangements, cargo ports and other similar openings, side scuttles, rectangular windows, ventilators and gangways are to be in accordance with the requirements for tankers specified in ~~**Chapter 23**~~**14.9** to **14.13, Part C**.

Part Q STEEL BARGES

Chapter 2 MATERIALS, CONSTRUCTION, ETC.

2.1 General for Materials, Construction, etc.

2.1.1 Materials and Welding

Sub-paragraph -3 has been amended as follows.

3 Application of steels used for hull construction is to be in accordance with the provision in ~~**1.1.11 of**~~ **3.2.2, Part 1, Part C**.

Sub-paragraph -7 has been amended as follows.

7 Welding to be used in hull construction and important equipment is to be in accordance with the requirements in **Chapter 12, Part 1, Part C** and **Part M**.

Paragraph 2.1.5 has been amended as follows.

2.1.5 Ceilings and Sparrings

Ceilings and sparrings in hold are to be as specified in ~~**Chapter 24 of Part C**~~ **Chapter 22, Part CS**.

Paragraph 2.1.6 has been amended as follows.

2.1.6 Cementing and Painting

Cementing and painting are to be as specified in ~~**Chapter 25 of Part C**~~ **Chapter 22, Part CS** ~~**(except 25.2.2-1, Part C)**~~.

Chapter 17 HATCHWAYS AND OTHER DECK OPENINGS

17.1 General

17.1.1 Application

Sub-paragraph -2 has been amended as follows.

2 For the barges of 24 *metres* and above in length and engaged on international voyages, the hatchways and other deck openings on the exposed parts of upper deck are to be in accordance with the requirements in ~~**Chapter 20,**~~ **14.6** and **14.7, Part 1, Part C** or **Chapter 19, Part CS**.

Chapter 18 BULWARKS, GUARDRAILS, FREEING ARRANGEMENTS, VENTILATORS AND GANGWAYS

18.1 General

18.1.1 Application

Sub-paragraph -2 has been amended as follows.

2 The barges specified in **17.1.1-2** are to be in accordance with the requirements in ~~**Chapter 23,**~~ **14.8, 14.9, 14.12** and **14.13, Part 1, Part C**, **Part C** (except **23.8, Part C**).

18.3 Freeing Arrangements

Paragraph 18.3.1 has been amended as follows.

18.3.1 Freeing Arrangements

On the weather parts of upper or superstructure deck, freeing arrangements are to be provided with in accordance with the requirements in ~~**Chapter 23,**~~ **14.9, Part 1, Part C**.

Chapter 19 EQUIPMENT

19.1 Anchors, Chain Cables and Ropes

19.1.5 Mooring Lines

Sub-paragraph -2 has been amended as follows.

2 The number and strength of mooring lines for barges with equipment numbers greater than 2,000 (EN > 2,000) are to be in accordance with ~~**Chapter 27, Part C of the Rules**~~ **14.4, Part 1, Part C**.

Part R FIRE PROTECTION, DETECTION AND EXTINCTION

Chapter 4 PROBABILITY OF IGNITION

4.5 Cargo Areas of Tankers

4.5.2 Restriction on Boundary Openings*

Sub-paragraph -4 has been amended as follows.

4 Where there is pipe tunnel in cargo area, the pipe tunnel is not to be open to engine rooms and is to be provided with at least two exits to open deck arranged at a maximum distance from each other. However, one of these exits may lead to the main pump room. Where there is permanent access from the pipe tunnel to the main pump-room, a watertight door is to be fitted complying with the requirements of ~~**13.3 of**~~ **2.2.2, Part 1, Part C** and, in addition, with the following. For the application of ~~**13.3 of**~~ **2.2.2, Part 1, Part C**, such doors are considered as those which are used at sea.

(1) In addition to the bridge operation, the watertight door is to be capable of being manually closed from outside the main pump-room entrance; and

(2) the watertight door is to be kept closed during normal operations of the ship except when access to the pipe tunnel is required.

“Rules for marine pollution prevention systems” has been partly amended as follows:

Part 3 CONSTRUCTION AND EQUIPMENT FOR THE PREVENTION OF POLLUTION BY OIL

Chapter 3 CONSTRUCTION AND EQUIPMENT FOR THE PREVENTION OF POLLUTION BY OIL CARRIED IN BULK

3.2 Hull Construction

3.2.4 Prevention of Oil Pollution in the Event of Collision or Stranding (*Regulation* 19 of *Annex* I)*

(3) has been amended as follows.

(3) Notwithstanding the requirement of **1.1.3-1**, for an oil tanker of 500 *gross tonnage* and above, which is engaged in international voyages and which were at beginning stage of construction on and after 1 September 1984, oil is not to be carried in any space extending forward of a collision bulkhead located in accordance with ~~**13.1.1-1,**~~ **2.2.1.1-1** and **-2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. An oil tanker other than the above is not to carry oil in any space extending forward of the transverse plane perpendicular to the centreline that is located as if it were a collision bulkhead located in accordance with that requirement.

"Rules for cargo handling appliances" has been partly amended as follows:

Chapter 8 CARGO LIFTS AND CARGO RAMPS

8.3 Strength and Construction

Paragraph 8.3.7 has been amended as follows.

8.3.7 Locking Devices of Cargo Ramps

3 For a cargo ramp utilized commonly as a means for closing openings, the closing devices may be utilized as locking devices, if the area of opening is larger than half of the projected area of the stowed ramp. The design load of the closing devices is to include also the loads specified in **8.2.6-5** in addition to the loads in ~~**Chapter 23,**~~**14.10.1.4, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

"Rules for high speed craft" has been partly amended as follows:

Part 1 GENERAL RULES

Chapter 1 GENERAL

1.1 General

Paragraph 1.1.7 has been amended as follows.

1.1.7 Ship Identification Number

For cargo craft not less than 300 *gross tonnage* and passenger craft not less than 100 *gross tonnage* engaged on international voyages, the ship's identification number is to be permanently marked as follows, in accordance with the material of the hull construction.

(1) Steel craft or aluminum alloy craft: Those specified in ~~**1.1.24,**~~ **14.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**

(2) Fibreglass reinforced plastics craft: Those specified in **1.3.8 of the Rules for the Survey and Construction of Ships of Fibreglass Reinforced Plastics**

Part 3 HULL STRUCTURAL MATERIALS AND THEIR WELDING OR MOULDING

Chapter 4 WELDING OF ALUMINIUM ALLOYS FOR HULL STRUCTURE

4.2 Preparation of Welding

4.2.1 Groove and Groove Processing

Sub-paragraph -3 has been amended as follows.

3 The kind and size of fillet welds for tee joints and their application are to be in accordance with the requirements given in **Table ~~C1.4~~ 12.2.1-1** and **Table ~~C1.5 in Chapter 1,~~12.2.1-2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** respectively. However, the size of fillet "f_{a1}" is not to be less than that obtained from the following formula:

$f_{a1} = (f - 1.5)\frac{\sigma_\gamma}{\sigma_d}$ (*mm*)

Where:

f : Size of fillet of continuous fillet weld or intermittent fillet weld according to the thickness of the plate as specified in **Table ~~C1.4 in Chapter 1,~~ 12.2.1-1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** (*mm*)

σ_γ : Proof stress as specified in **1.2.2 in Part 6** (N/mm^2)

σ_d : The lower limit of the specified proof stress of the base material with suffix "-*O*" in the division or the grade concerned (N/mm^2)

Where **Table ~~C1.4~~12.2.1-1** and **Table~~ C1.5 in Chapter 1,~~ 12.2.1-2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are correspondingly applied, kinds of fillet welds are to be three types of *F*1, *F*2 and *F*3, and taking *F*3 in lieu of *F*4 in **Table ~~C1.5~~12.2.1-2.** And, notwithstanding Note 5 of **~~Table C1.4 of the Rules for the Survey and Construction of Steel Ships~~ Table 12.2.1-1,** the chain intermittent fillet weld may be applied as the intermittent fillet welds. However, the ends 1*w* is to be welded on both sides wherever the chain intermittent fillet weld is applied.

4 Notwithstanding preceding **-3**, kinds and sizes of fillet welds for Tee joints and their application may be in accordance with the other technical standard as deemed appropriate by the Society.

5 For lap joints, the breadth of overlap is not to be less than obtained from the following formula, but need not exceed 50 *mm*.

$2t + 25$ (*mm*)

Where:

t : thickness of the thinner plate (*mm*)

6 For joggled lap joints, the breadth of overlap is not to be less than obtained from the following formula, but need not exceed 40 *mm*.

$t + 25$ (*mm*)

Where:

t : thickness of the thinner plate (*mm*)

7 The groove is to be finished smoothly by a mechanical method.

Part 4 REQUIREMENTS FOR GENERAL ARRANGEMENT

Chapter 2 ARRANGEMENT OF WATERTIGHT BULKHEADS

2.1 Arrangement of Watertight Bulkheads

2.1.4 Hold Bulkheads*

Sub-paragraph -2 has been amended as follows.

2 Notwithstanding preceding **-1**, a cargo craft which is not engaged in international voyage and for restricted service (Refer to the provision of **Chapter 3, Part 8** of this Rule) may have hold bulkheads in accordance with ~~**13.1.4,**~~**2.2.1.4, Part 1, Part C** or **13.1.4, Part CS of Rules for the Survey and Construction of Steel Ships**.

Part 5 DESIGN LOADS

Chapter 2 DESIGN LOADS

2.8 Longitudinal Bending Moments

2.8.1 Maximum Longitudinal Bending Moments at the Midship Part

Sub-paragraph -2 has been amended as follows.

2 In addition to **-1** above, for the craft with Ls more than 60 *m*, maximum longitudinal bending moment at the midship part (*M*) is not to be less than that obtained from following formula in consideration of longitudinal bending moment in still water and wave induced longitudinal bending moment.

$M_S + M_W$ (*kN-m*)

where:

M_S and M_W: As specified in ~~**15.2.1,**~~ **4.3.2, Part 1, Part C** or **15.2.1, Part CS of the Rules for the Survey and Construction of Steel Ships**.

Part 6 SCANTLING DETERMINATION OF HULL CONSTRUCTION

Chapter 1 HULL CONSTRUCTION FOR STEEL OR ALUMINIUM ALLOYS CRAFT

1.3 General Requirements on Hull Construction

Paragraph 1.3.1 has been amended as follows.

1.3.1 Application for Steels

Where the steels are used for hull structures, the grades of the steels are to be in accordance with the requirements specified in ~~**1.1.11 and 1.1.12,**~~ **3.2.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Part 7 EQUIPMENT AND PAINTING

Chapter 2 HATCHWAYS, MACHINARY SPACE OPENINGS AND OTHER DECK OPENINGS

2.2 Hatchways

Paragraph 2.2.1 has been amended as follows.

2.2.1 Application

The construction and the closing means of cargo and other hatchways are to be comply with the requirements in ~~**Chapter 20, Part C**~~**14.6 and 14.7, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** or **Chapter 19, Part CS of the Rules for the Survey and Construction of Steel Ships**, unless otherwise specified in this chapter.

"Rules for the survey and construction of passenger ships" has been partly amended as follows:

Part 1 GENERAL

Chapter 1 GENERAL

1.2 Class Notations

1.2.4 Hull Construction and Equipment, etc.*

Sub-paragraph -5 has been amended as follows.

5 For ships complying with the provisions of ~~**25.2.2-1,**~~ **3.3.5.3-1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** or **22.4.2, Part CS of the Rules for the Survey and Construction of Steel Ships**, by the provision of **1.1.1-4, Part 3**, the notation of "*Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks in All Types of Ships and Double-side Skin Spaces of Bulk Carriers*" (abbreviated to *PSPC-WBT*) is affixed to the Classification Characters.

1.2.5 Polar Class Ships and Ice Class Ships

Sub-paragraph -4 has been amended as follows.

4 For ships made of steel corresponding to a design temperature (T_D) to operate in water areas with low temperatures (*e.g.* Arctic or Antarctic waters) in accordance with the provisions of ~~**1.1.12-1,**~~ **3.2.2.2-1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, by the provisions of **1.1.1-4, Part 3**, the notation of "*Design Temperature Category: TD*" (abbreviated to *TD*) is affixed to the Classification Characters.

Part 2 CLASS SURVEY

Chapter 2 CLASSIFICATION SURVEYS

2.1 Classification Survey during Construction

2.1.2 Submission of Plans and Documents

Sub-paragraph -1 has been amended as follows.

1 With respect to ships intended to undergo the Classification Survey during Construction, the plans and documents indicated in the following **(1)** to **(7)** are to be submitted to the Society for approval, prior to the commencement of the works:
((1) to (4) are omitted.)
(5) A loading manual (for ships to be required in accordance with the requirements of ~~**34.1.1,**~~ **3.8.1.1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.)
((6) and (7) are omitted.)

Paragraph 2.1.9 has been amended as follows.

2.1.9 Verification of Coating Application*

The following will be carried out by the Society prior to reviewing the Coating Technical File for the coatings of internal spaces subject to ~~**25.2.2, Part C**~~ **3.3.5.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** in accordance with **1.1.1-4**, **Chapter 1**, **Part 3**:
((1) to (5) are omitted.)

Part 3 HULL CONSTRUCTION AND EQUIPMENT

Chapter 1 GENERAL

1.1 General

1.1.1 Application*

Sub-paragraph -4 has been amended as follows.

4 The ~~following~~ relevant requirements of **Part C** and **Part CS of the Rules for the Survey and Construction of Steel Ships** are framed for ships not less than 90 *m* in length and ships less than 90 *m* in length respectively, except for the requirements in this part. ~~However, the extent of application may expand at the Society's discretion.~~

~~(1) **Chapter 1** General (**1.1.13** to **1.1.21** and **1.1.23**)~~
~~(2) **Chapter 2** Stems and Stern Frames~~
~~(3) **Chapter 3** Rudders~~
~~(4) **Chapter 9** Arrangements to Resist Panting~~
~~(5) **Chapter 16** Plate Keels and Shell Platings~~
~~(6) **Chapter 18** Superstructures (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 18** including the requirements of deckhouses.)~~
~~(7) **Chapter 19** Deckhouses (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 18**.)~~
~~(8) **Chapter 20** Hatchways, Machinery Space Opening and Other Deck Openings (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 19**.)~~
~~(9) **Chapter 21** Machinery Spaces and Boiler Rooms (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 20** including the requirements of Tunnels and Tunnel Recesses.)~~
~~(10) **Chapter 22** Tunnels and Tunnel Recesses (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 20**.)~~
~~(11) **Chapter 23** Bulwarks, Guardrails, Freeing Arrangements, Cargo Ports and Other Similar Openings, Side Scuttles, Rectangular Windows, Ventilators and Gangways (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 21**. Even if ship is less than 500 *gross tonnage*, the ship is to be considered to be not less than 500 *gross tonnage*.)~~
~~(12) **Chapter 25** Cementing and Painting (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 22**.)~~
~~(13) **Chapter 26** Masts and Derrick Posts (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, this chapter is not provided.)~~
~~(14) **Chapter 27** Equipment (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 23**. Even if ship is less than 500 *gross tonnage*, the ship is to be considered to be not less than 500 *gross tonnage*.)~~
~~(15) **Chapter 34** Loading Manual and Loading Computer (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 25**.)~~
~~(16) **Chapter 35** Means of Access (In **Part CS of the Rules for the Survey and Construction of Steel Ships**, the matter in this chapter is provided in **Chapter 26**.)~~

Sub-paragraph -7 has been amended as follows.

7 In cases where ~~**25.2.2-1**~~**3.3.5.3-1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, referred to in **-4** above, is applied, the following tanks are not considered to be dedicated seawater ballast tanks, provided the coatings applied in the tanks described in **(2)** below are confirmed by the coating manufacturer to be resistant to the media stored in the tanks, and are applied and maintained according to the coating manufacturer's procedures.

(1) Tanks identified as "Spaces included in Net Tonnage" in the 1969 ITC Certificate

(2) Sea water ballast tanks also designated for the carriage of grey water or black water

Paragraph 1.1.5 has been amended as follows.

1.1.5 Ship Identification Number

For ships not less than 100 *gross tonnage* engaged on international voyages, the ship's identification number is to be permanently marked in accordance with ~~**1.1.24**~~**14.2.1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. In this case, in addition to the places specified in ~~**1.1.24-1(1)**~~**14.2.1.1(1), Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, a place on a horizontal surface visible from the air may be acceptable.

Chapter 2 MATERIALS AND WELDING

2.1 Materials

2.1.1 Application*

Sub-paragraph -3 has been amended as follows.

3 The application of steels and special requirements for ships intended to operate for longer period in areas with low temperatures are to be in accordance with the requirements in ~~**1.1.11 and 1.1.12,**~~**3.2.2.1** and **3.2.2.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

2.2 Welding

Paragraph 2.2.3 has been amended as follows.

2.2.3 Details of Joints

Details of joints are to be in accordance with the requirements in ~~**1.2.3,**~~ **12.2.1.2** and **12.2.1.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Chapter 3 has been amended as follows.

Chapter 3 LONGITUDINAL STRENGTH

~~**3.1 General**~~

~~**3.1.1 Application**~~

~~The requirements of longitudinal strength, except for the requirements in this chapter, are to be applied the requirements in **Chapter 15, Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* in length and **Chapter 15, Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* in length respectively.~~

3.~~2~~1 Bending Strength

3.~~2~~1.1 Bending Strength at the Midship Part*

1 Bending strength at the midship part is to be in compliance with **5.2.1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. The section modulus of the transverse sections of hull ~~at the midship part, considering~~ considers all longitudinal members contributed at longitudinal strength below strength deck ~~calculated by the requirement in **15.2.3, Part C of the Rules for the Survey and Construction of Steel Ships** are not to be less than the value of Z_0 obtained from the requirement in **15.2.1, Part C of the Rules for the Survey and Construction of Steel Ships**~~. In case of calculating section modulus of the transverse sections of hull, openings on deck except for strength deck are to be handled as well as openings on strength deck.
(-2 and -3 are omitted.)

3.~~3~~2 Buckling Strength

3.~~3~~2.1 Compressive Buckling Strength*

1 All effective shell plating, deck and longitudinal bulkhead including longitudinal stiffener at the longitudinal strength under strength deck are to be examined compressive buckling strength by longitudinal bending, according to the requirements in ~~**15.4,**~~ **5.3. Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.
(-2 and -3 are omitted.)

Chapter 4 has been amended as follows.

Chapter 4 DOUBLE BOTTOM CONSTRUCTION

~~**4.1 General**~~

~~**4.1.1 Application**~~

~~The requirements of double bottom construction, except for the requirements in this chapter, are to be applied the requirements in **Chapter 6, Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* in length and **Chapter 6, Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* in length respectively.~~

4.~~2~~1 Arrangement

4.~~2~~1.1 Arrangement (*SOLAS* Chap.II-1 Reg.9) *

(Omitted)

4.~~2~~1.2 Transmission of the Pillar Load

(Omitted)

Chapter 5 SIDE SHELL CONSTRUCTION

5.1 General

Paragraph 5.1.1 has been amended as follows.

5.1.1 Application

~~**1** The requirements of side shell construction, except for the requirements of this chapter, are to be applied the requirements in **Chapter 7** and **Chapter 8**, **Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* in length and **Chapter 7**, **Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* in length respectively.~~

~~**2**~~ The upper part of watertight bulkhead and superstructure, which extremely decreased the transverse bulkhead in order to load a ship with wheeled vehicles by means of the roll-on roll-off system, are to be provided with sufficient transverse rigidity by installing web frames or partial bulkheads in the positions such as may be considered necessary, in order to prevent racking deformation.

5.2 Transverse Frames below the Lowest Deck

Paragraph 5.2.1 has been amended as follows.

5.2.1 Scantlings of Transverse Frames below the Lowest Deck

1 The section modulus of transverse frames below the lowest deck is not to be less than that obtained from the following formula according to the location of the transverse frames under consideration.

(1) Transverse frames below the lowest deck between 0.15*L* from the fore end and the after peak bulkhead;

$$KC_0CShl^2 \quad (cm^3)$$

where:

K : The value in proportion to the material strength of steel regulated by **Chapter 3**, **Part K of the Rules for the Survey and Construction of Steel Ships**. The value in using the high tensile steel except for the following, however, are to be at the Society's discretion.

1.0 : where mild steels *KA*, *KB*, *KD* and *KE* regulated by **Chapter 3**, **Part K of the Rules for the Survey and Construction of Steel Ships** are used.

0.78 : where high tensile steels *KA*32, *KD*32, *KE*32 and *KF*32 regulated by **Chapter 3**, **Part K of the Rules for the Survey and Construction of Steel Ships** are used.

0.72 : where high tensile steels *KA*36, *KD*36, *KE*36 and *KF*36 regulated by **Chapter 3**, **Part K of the Rules for the Survey and Construction of Steel Ships** are used.

0.68 : where high tensile steels *KA*40, *KD*40, *KE*40 and *KF*40 regulated by **Chapter 3**, **Part K of the Rules for the Survey and Construction of Steel Ships** are used.

S : Frame spacing (m)

l : The value obtained from the requirements in ~~**7.3.2-1,**~~ **6.4.3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**

C_0 : Coefficient obtained from the following formula, but not to be less than 0.85:

$1.25 - 2\frac{e}{l}$

C : Coefficient obtained from the following formula:

$C_1 + C_2$

$C_1 = 2.34 - 1.29\frac{l}{h}$

$C_2 = 4.52k\alpha\frac{d}{h}$

h : Vertical distance from the lower end of l at the place of measurement to a point of $d + 0.038L'$ above the top of keel (m)

L' : Length of ship (m). Where, however, L exceeds 230m, L' is to be taken as 230m.

~~e, k and α: The value obtained from the requirements in 7.3.2-1, Part C of the Rules for the Survey and Construction of Steel Ships~~

e: Height (m) of the tank side bracket measured from the lower end of l

k: Coefficient given below according to the number of layers of deck:

13 (For single deck systems)
21 (For double deck systems)
50 (For triple deck systems)

Where B/l exceeds the following value according to the deck systems, the value of k is to be suitably increased:

2.8 (For single deck systems)
4.2 (For double deck systems)
5.0 (For triple deck systems)

α: Coefficient given in **Table 3.5.1**

For intermediate values of B/l_H, α is to be obtained by linear interpolation.

Table 3.5.1 Coefficient α

B/l_H	0.5 and under	0.6	0.8	1.0	1.2	1.4 and over
α	0.023	0.018	0.010	0.006	0.0034	0.002

(2) Transverse frames below the lowest deck between 0.15L from the fore end and the fore peak bulkhead;

$1.3KC_0CShl^2$ (cm^3)

where:

K, C, C_0, S, h and l : Values stipulated in **(1)**

2 The section modulus of transverse frames below the lowest deck supporting deck transverse of longitudinal system is also not to be less than the value obtained from the following formula;

$$K\left\{4.62 - 4.42\frac{l}{h} + 0.17n\frac{h_1}{h}\left(\frac{l_1}{l}\right)^2\right\}Shl^2 \quad (cm^3)$$

where:

n : Ratio of the transverse web beam spacing to the frame spacing.

h_1 : Deck load stipulated in ~~**10.2,**~~ **4.4.2.7** and **4.4.2.8, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** for the deck beam at the top of frame (kN/m^2).

l_1 : Horizontal distance from ship's side to deck girder supporting deck transverse, bulkhead or pillar (m).

K, S, l and h : Values stipulated in **-1**.

Chapter 6 WATERTIGHT BULKHEAD AND THE OPENING

6.1 General

Paragraph 6.1.1 has been amended as follows.

6.1.1 Application

~~The requirements of watertight bulkhead, except for the requirements in this chapter, are to be applied the requirements in **Chapter 13** or **14, Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* and **Chapter 13** or **14, Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* respectively. In this context,~~ In applying the requirement in **1.1.1-4,** the list angle of 30 degrees referred to in ~~**13.3.4-1,**~~ **2.2.2.4-1, Part 1, Part C** and **13.3.4-1, Part CS of the Rules for the Survey and Construction of Steel Ships** is to be read as 15 degrees.

Chapter 7 OPENINGS IN THE SHELL PLATING AND THE WATERTIGHT INTEGRITY

7.1 General

Paragraph 7.1.1 has been amended as follows.

7.1.1 Application

~~**1** Port, bow door, side shell door, stern door, freeing arrangements and ventilators are to be applied to the requirements, except for the requirements in this chapter, in **Chapter 23, Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* in length and **Chapter 21, Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* in length respectively.~~

~~**2** The requirements of hatchways, machinery space opening and other deck openings, except for the requirements in this chapter, are to be applied the requirements in **Chapter 20, Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* in length and **Chapter 19, Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* in length respectively.~~

~~**3**~~**1** The requirements of valve, pipe and garbage shoot, except for the requirements in this chapter, are to be applied the requirements in **2.2**, **Part 5** respectively.

~~**4**~~**2** If watertight doors are to be fitted, they are to be in accordance with *IACS* Unified Interpretation SC156 (as amended), unless otherwise specified in this chapter.

Chapter 8 has been amended as follows.

Chapter 8 DECK

~~**8.1 General**~~

~~**8.1.1 Application**~~

~~The requirements of deck except for the requirements of this chapter are to be applied the requirements in **Chapter 10, Chapter 11, Chapter 12 and Chapter 17, Part C of the Rules for the Survey and Construction of Steel Ships** to ships not less than 90*m* in length and **Chapter 10, Chapter 11, Chapter 12 and Chapter 17, Part CS of the Rules for the Survey and Construction of Steel Ships** to ships less than 90*m* in length respectively.~~

8.~~2~~1 Deck Load

8.~~2~~1.1 Deck Load of Closing Accommodation Space

Deck load of all of closing accommodation space may be 4.51kN/m^2, provided that special heavy cargo is not arranged in this space.

8.~~2~~1.2 Deck Girder Construction and Pillar Load

Deck load supported by deck girder is to be specially considered, since it is again transmitted to lower deck girder, pillar and bulkhead through shell plating, bulkhead and pillar, when the deck load practically transmitted from upper layer of each deck girder, bulkhead and pillar is calculated.

Part 4 SUBDIVISION AND STABILITY

Chapter 2 SUBDIVISION

2.3 Damage Stability

2.3.6 Probability of Survival (s_i) (*SOLAS* Chap.II-1 Reg.7-2)*

Sub-paragraph -13 has been amended as follows.

13 Where the ship carries timber deck cargo and its buoyancy is considered, the securing of the cargo is to be in accordance with ~~**4.2.3-10**~~**2.3.2.3-12, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Chapter 3 DAMAGE CONTROL PLANS

3.1 General

Paragraph 3.1.1 has been amended as follows.

3.1.1 Application*

In addition to the requirements in this chapter, the requirements of damage control stipulated in ~~**Chapter 33,**~~ **2.3.4, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are to be correspondingly applied.

Part 5 MACHINERY INSTALLATIONS

Chapter 2 SCUPPERS, SANITARY DISCHRGES, ETC., BILGE AND BALLAST PIPING SYSTEMS

2.2 Scuppers, Sanitary Discharges, etc.

2.2.1 General (*SOLAS* Reg. II-1/15.8 and 35-1.2, and *LOAD LINE* Reg. 22)*

Sub-paragraph -2 has been amended as follows.

2 Scupper pipes draining weather decks and spaces within superstructures and deckhouses of which access openings are not provided with closing means complying with the requirements in ~~**18.3.1,**~~ **11.3.2.6, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are to be led to overboard.

Chapter 3 STEERING GEARS

3.2 Performance and Arrangement of Steering Gears

Paragraph 3.2.2 has been amended as follows.

3.2.2 Performance of Main Steering Gear (*SOLAS* Reg. II-1/29.3)

The main steering gear is to be:

(1) (Omitted)

(2) operated by power when the main steering gear has to meet the requirements in **(1)** or when the diameter of upper stock is required in ~~**Chapter 3,**~~ **Chapter 13, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** to be over 120*mm* (calculated with a material factor K_S = 1 where *Ks* is less than 1, and excluding the increase required for ships which have strengthening for navigation in ice, the same being referred hereinafter); and

(3) (Omitted)

Paragraph 3.2.3 has been amended as follows.

3.2.3 Performance of Auxiliary Steering Gear (*SOLAS* Reg. II-1/29.4)*

The auxiliary steering gear is to be:

(1) (Omitted)

(2) operated by power when the auxiliary steering gear has to meet the requirements in **(1)** or when the diameter of upper stock is required in ~~**Chapter 3,**~~ **Chapter 13, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** to be over 230*mm*.

"Rules for the survey and construction of inland waterway ships" has been partly amended as follows:

Part 3 MATERIALS AND WELDING

Chapter 2 WELDING

2.1 Welding

Paragraph 2.1.1 has been amended as follows.

2.1.1 General

Welding of rolled steels for hull is to comply with the requirements in **Chapter 12, Part 1, Part C** and **Part M of the Rules for the Survey and Construction of Steel Ships**.

Part 5 HULL CONSTRUCTION AND EQUIPMENT OF BARGE

Chapter 14 EQUIPMENT

14.1 Anchors, Chain Cables and Ropes

14.1.5 Tow Lines and Mooring Lines*

Sub-paragraph -2 has been amended as follows.

2 The number and strength of mooring lines whose equipment numbers exceed 2,000 are to be in accordance with ~~**Chapter 27,**~~ **14.4.3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

"Rules for the survey and construction of ships of fibreglass reinforced plastics" has been partly amended as follows:

Chapter 1 GENERAL

1.3 General Rules for Hull Construction and Equipment

Paragraph 1.3.8 has been amended as follows.

1.3.8 Ship Identification Number

For cargo ships not less than 300 *gross tonnage* engaged on international voyages, the ship's identification number is to be permanently marked as follows:

(1) Those specified in ~~**1.1.24, Part C of the Rules for the survey and construction of steel ships**~~**14.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** (except ~~**2(3)**~~ **14.2.1.2(3)**).

(2) The marking is to be made by a method approved by the Society not to be easily expunged.

Chapter 17 HATCHWAY OPENINGS, MACHINERY OPENINGS AND OTHER DECK OPENINGS

17.1 General

17.1.1 Application

Sub-paragraph -2 has been amended as follows.

2 *FRP* ships defined in **20.1.1-1**. are to comply with the requirements in ~~**Chapter 20 of Part C,**~~ **14.6** and **14.7, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Chapter 18 BULWARKS, GUARDRAILS, FREEING ARRANGEMENT, SIDE OPENINGS, SCUTTLES, VENTILATORS AND GANGWAYS

18.1 General

18.1.1 General

Sub-paragraph -1 has been amended as follows.

1 *FRP* ships defined in **20.1.1-1** are to comply with the requirements in ~~**Chapter 23 of Part C,**~~ **14.8** to **14.15, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

"Rules for floating docks" has been partly amended as follows:

Chapter 5 HULL STRUCTURE

5.1 General

5.1.1 Material

Sub-paragraph -2 has been amended as follows.

2 The grades of steels used for the main structures of hulls are to be either of the following **(1)** or **(2)**:

(1) Where mild steel is used, the grade *KA* steels specified in **Part K of the Rules for the Survey and Construction of Steel Ships** may be used for main structures of hulls. Grade *KD* steels, however, is required for primary structural members such as deck plates, shell plates and their associated girders in cases where their respective thickness exceeds 30 *mm* and they are located within 0.4 *L* of amidships.

(2) Grades of high tensile steels used for the main structures of hulls are to be in accordance with ~~**1.1.11,**~~ **3.2.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

5.2 Longitudinal Strength

Paragraph 5.2.7 has been amended as follows.

5.2.7 Buckling

The buckling strength for the longitudinal strength members of docks is to be in accordance with the requirements in ~~**15.4,**~~ **5.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

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

Part B CLASS SURVEYS

B1 GENERAL

B1.1 Surveys

B1.1.3 Intervals of Class Maintenance Surveys

Sub-paragraph -9 has been amended as follows.

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

(4) Additional requirement for fittings on exposed fore deck
For bulk carriers, general dry cargo ships (excluding container vessels, vehicle carriers, Ro-Ro ships and woodchip carriers), and combination carriers (e.g. OBO ships, Ore/Oil Carriers, etc.) of length (~~L_1~~L_C) 100 *m* or more (where, ~~L_1~~L_C is the length of ship specified in ~~**15.2.1-1,**~~ **1.4.3.1-1, Part 1, Part C of the Rules**) which have been contracted for construction prior to 1 January 2004, a survey is to be carried out to verify compliance with the requirements specified in **(a)** and implementation schemes specified in **(b)**.
((a) and (b) are omitted.)

(5) Water level detection and alarm systems on single hold cargo ships
For cargo ships having a single cargo hold below the freeboard deck or cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck, a survey is to be carried out to verify that the water level detection and alarm systems specified in **13.8.6, Part D of the Rules** are provided not later than the date of the first intermediate or special survey of the ship after 1 January 2007. Notwithstanding the above, the following ships are not required to have such a system.
(a) Ships of less than 500 *gross tonnage*
(b) Ships not engaged on international voyages
(c) Bulk carriers as defined in **1.3.1(13), Part B of the Rules** which had been at the beginning stage of construction before 1 July 2006
(d) Bulk carriers as defined in ~~**31A.1.2(1),**~~ **An1.1.2(1), Annex 1.1, Part 2-2, Part C of the Rules** which had been at the beginning stage of construction on or after 1 July 2006
(e) Ships having a length (L_f) of not less than:
i) 80 *m*, for ships that had been at the beginning stage of construction on or after 1 July 1998
ii) 100 *m*, for ships that had been at the beginning stage of construction before 1 July 1998
(f) Ships complying with the requirements of **13.8.6, Part D of the Rules**
(g) Ships having watertight side compartments each side of the cargo hold length extending vertically at least from inner bottom to freeboard deck and breadths of which are not to be less than 760 *mm* measured perpendicular to the side shell

((6) to (8) are omitted.)

(9) Emergency towing procedures
For cargo ships not less than 500 *gross tonnage* engaged on international voyages which had been at the beginning stage of construction prior to 1 January 2010, a survey is to be carried out

by 1 January 2012 to verify that the emergency towing procedures specified in ~~**27.4, Part C**~~ **14.5.3, Part 1, Part C of the Rules** or **23.3, Part CS of the Rules** are provided.

((10) to (24) are omitted.)

B1.1.6 Modification of the Requirements

Sub-paragraph -2 has been amended as follows.

2 Conditions that "the Surveyor considers … necessary" as used in **1.1.6-2, Part B of the Rules** means any of the following ~~**(1) to (3)**~~ **(2)**:

(1) Where the condition of protective coating in the compartment is poor

(2) Where there are tanks or cargo holds similar in structure to tanks, cargo holds or ships that have experienced defects

~~(3) Where the scantlings of structural members are decreased subject to the approved measure of corrosion control in accordance with the requirements in **1.1.21, Part C of the Rules.**~~

B1.3 Definitions

B1.3.1 Terms

Sub-paragraph -3(4) has been amended as follows.

3 "Hatch covers and hatch coamings for cargo holds of ships stipulated otherwise by the Society" in **1.3.1(6)(b), Part B of the Rules** is as specified in the following **(1)** to **(4)**.

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

(4) Hatch covers and hatch coamings of ships complying with the requirements in ~~**20.2**~~**14.6, Part 1, Part C of the Rules** or **19.2, Part CS of the Rules,** and ships which are contracted for construction on or after 1 July 2012

Renewal thickness ($t_{renewal}$) is given by the following formula. If a voluntary addition is included in the as built thickness, the value may be at the discretion of the Society.

$t_{renewal} = t_{as\text{-}built} - t_c + 0.5$ (mm)

$t_{as\text{-}built}$: as built thickness (mm)

t_c: Corrosion addition specified in **Table B1.3.1-1(d)**

Where corrosion addition t_c is 1.0 (mm), renewal thickness may be given by the formula $t_{renewal} = t_{as\text{-}built} - t_c$ (mm)

Sub-paragraph -4 has been amended as follows.

4 For transverse watertight bulkheads in cargo holds complying with the provision of ~~**Chapter 31A,**~~ **Annex 1.1, Part 2-2, Part C of the Rules**, as specified in **1.3.1(6)(c), Part B of the Rules**, the renewal thickness is given by the following **(1)** and **(2)**.

(1) For ships that have the application for Classification Survey during Construction submitted to the Society prior to 1 July 2007, renewal thickness ($t_{renewal}$) is given by the following formula. If a voluntary addition is included in the as built thickness, the value may be at the discretion of the Society.

$t_{renewal} = t_{as\text{-}built} - 3.0$ (mm)

$t_{as\text{-}built}$: as built thickness (mm)

(2) For ships that have the application for Classification Survey during Construction submitted to the Society on or after 1 July 2007, renewal thickness ($t_{renewal}$) is given by the value indicated

in the structural drawings in accordance with the requirements in ~~**31A.3.6,**~~ **An3.6, Annex 1.1, Part 2-2, Part C of the Rules.**

B1.4 Preparation for Survey and Other Items

B1.4.2 Preparation for Surveys

Sub-paragraph -2 has been amended as follows.

2 The applicant is to make the necessary preparations so that tests and examinations to reveal corrosion, deformation, fractures, damage, or other structural deterioration can be conducted smoothly. This includes cleaning compartments; freeing water, scale, dirt, oil residues and gas; and providing means of access, sufficient lighting, non-destructive testing equipment and other necessary items. Furthermore, casings, ceilings or linings, and loose insulation, where fitted, are to be removed as required by the Surveyor. However, the areas of structural members already designated for renewal need only be cleaned and descaled to the extent necessary to determine the limits of renewal. The means of access to the survey area (e.g. temporary staging and rafts) is to comply with the requirements specified in **Means of Access, ~~Chapter 35,~~ 14.16, Part 1, Part C of the Rules** and the soundness of its construction is to be verified.

Sub-paragraph -12 has been amended as follows.

12 For bulk carriers as defined in **1.3.1(13), Part B of the Rules** and bulk carriers as defined in ~~**31A.1.2(1),**~~ **An1.1.2(1), Annex 1.1, Part 2-2, Part C of the Rules** which are at the beginning stage of construction on or after 1 July 2006, the Surveyor is to confirm that the hatch covers on these ships are maintained in accordance with the resolution *MSC*.169(79) "*Standards for owner's inspection and maintenance of bulk carrier hatch covers*" by investigation of inspection records. Notwithstanding the above, this requirement may be waived for bulk carriers of less than 500 *gross tonnage* and those not engaged on international voyages with the Class Notation "*Coasting Service*", "*Smooth Water Service*."

B2 CLASSIFICATION SURVEYS

B2.1 Classification Survey during Construction

B2.1.2 Submission of Plans and Documents for Approval

Sub-paragraph -1 has been amended as follows.

1 The plans required to be submitted for approval in **2.1.2, Part B of the Rules** are to indicate the following items.

(1) Hull structural drawings are to include scantling details, material details, location of butts and seams, cross section details as necessary, details of welding such as sizes and proportions applicable to the ship, and other necessary information unless specified otherwise. For hull structures subject to the requirements of ~~**31A.3.6, Part C**~~ **An3.6, Annex 1.1, Part 2-2, Part C of the Rules,** **Part CSR-B**, **Part CSR-T** or **Part CSR-B&T of the Rules**, renewal thicknesses are to be indicated in the relevant drawings. In addition, for structural members of ships subject to *SOLAS Chapter II-1 Regulation 3-10*, net (renewal) scantlings, as built scantlings and voluntary addition thickness are to be indicated.

(2) Midship Section

~~(a) d_s and L, V, W and C_B corresponding to d_s, where the provisions in **Part C of the Rules** are applied and the scantling draught (d_s) is larger than d specified in **2.1.12, Part A of the Rules**~~

(~~b~~a) The kind of freeboard assigned by the requirements of **Part V of the Rules**

(~~c~~b) Draught in *metres* corresponding to the designed timber freeboard, where the timber load line is intended to be marked

(~~d~~c) The position of the freeboard deck in ships with multiple decks

((3) to (6) are omitted.)

Sub-paragraph -4 has been amended as follows.

4 The wording "in cases where the requirements are separately provided by the Society" in **2.1.2-5, Part B of the Rules** refers to the cases where the accuracy of the calculations have been confirmed according to ~~**C34.1.3-2(2), Part C of the Guidance**~~ **3.8.3.2-2, Part 1, Part C of the Rules**.

Sub-paragraph -10 has been amended as follows.

10 The "drawings indicating critical structural areas" referred to in **2.1.2-14, Part B of the Rules** means drawings indicating 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 or corrosion which would impair the structural integrity of the ship. The following **(1)** and **(2)** are to be considered depending on the subject ships:

(1) For ships subject to the provisions of **14.16.3, Part 1, Part C of the Rules**, drawings are to include the critical structural areas indicated in the ship structural access manuals specified in ~~**35.2.6,**~~ **14.16.3.6, Part 1, Part C of the Rules.**

(2) For ships subject to *SOLAS Chapter II-1 Regulation 3-10*, drawings are to be consistent with information "areas requiring special attention throughout the ship's life, including critical structural areas" included in the Ship Construction File specified in **2.1.6-3(13), Part B of the Rules**.

B2.1.4 Presence of Surveyor

Sub-paragraph -6 has been amended as follows.

6 After installation, loading computers specified in **2.1.4-1(10), Part B of the Rules** are to have an operating test carried out in the presence of the Surveyor, using several of the loading conditions examined in accordance with ~~**C34.1.3-2, Part C of the Guidance**~~ **3.8.3.2-2, Part 1, Part C of the Rules**, in order to confirm that the performance and functions of the loading computer are satisfactory.

B2.5 Alterations

B2.5.1 Examination of Altered Parts

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

1 In applying the requirements specified in **2.5.1, Part B of the Rules**, in the case of the "application of modification, etc. which affects a main particular of a ship" (hereinafter referred to as "application of major conversion"), the following are to apply, except in cases where specified by the Society or Administration:

(1) A "Major Conversion", for example, refers to (but is not limited to) the following cases:
   (a) Alteration of the dimensions of a ship; for example, the lengthening of a ship by adding a new midbody.
   (b) Change of ship type; for example, the conversion from tanker to bulk carrier.
   (c) Modification of construction which affects necessary requirements related to ship subdivisions. For ships not falling under any of the following **i)** to **iii)**, with respect to Required Subdivision Index (R) and Attained Subdivision Index (A) that are specified in ~~**4.2,**~~ **2.3.2, Part 1, Part C of the Rules**, it is demonstrated that the A/R ratio calculated for the ship after such a modification is not less than the A/R ratio calculated for the ship before the modification. However, in cases where the ship's A/R ratio before modification is equal to or greater than 1, it is necessary that the ship's A/R ratio after modification be equal to or greater than 1.
      i) Ships for which the building contract is placed on or after 1 January 2020
      ii) In the absence of a building contract, the keel of ships is laid or which are at a similar stage of construction on or after 1 July 2020
      iii) The delivery of ships is on or after 1 January 2024.

((2) and (3) are omitted.)

Sub-paragraph -2 has been amended as follows.

2 In applying the requirements specified in **2.5.1, Part B of the Rules**, in cases where single hull oil tankers are converted to double hull oil tanker or bulk carriers, except where specified by the Society or Administration, in addition the above requirement **-1**, the following requirements are to be complied with:

(1) With respect to the requirements on subdivision specified in ~~**Chapter 4**~~**2.3, Part 1, Part C of the Rules**, the requirements in accordance with ship's type after conversion are to be complied with.
(2) With respect to the requirements on stability, the following requirements are to be complied with:
   (a) In the case of a conversion to a double hull oil tanker, **3.2.2, Part 3 of Rules for Marine**

Pollution Prevention Systems is to still be applied.

(b) In the case of a conversion to a bulk carrier, **(5)** is to be applied.

(3) The requirements on protective coating in seawater ballast tank, etc. specified in ~~**25.2.2-1**~~**3.3.5.3-1, Part 1, Part C of the Rules** are not required to be complied with, except in cases where the entire internal structure of the seawater ballast tank are newly made. However, the requirements specified in ~~**25.2.2-2**~~**3.3.5.3-2, Part 1, Part C of the Rules** are to be applied.

(4) The requirements on towing and mooring equipment specified in ~~**27.2**~~**14.4, Part 1, Part C of the Rules** are to be applied.

(5) In the case of conversion to a bulk carrier, the requirements specified in ~~**31A and 34.2**~~**3.8.2.3, Part 1** and **Annex 1.1, Part 2-2, Part C of the Rules** are to be applied. However, the requirements on permanent means of access are to comply with **(6)**.

((6) to (10) are omitted.)

(11) The requirements specified in ~~**18.3, 19.2.3, Chapter 20, 23.1, 23.2, 23.4, 23.5, 23.6, 23.7, 27.1.7 and 34.1.1-1, Part C**~~**3.8.1.1-1, 11.3.2.6, 11.3.3.3, 14.3.1.5, 14.6, 14.7, 14.8, 14.9, 14.10, 14.11, 14.12** and **14.13, Part 1, Part C and 13.4 and 13.6, Part D of the Rules** are to be applied when structures or equipment are newly added, replaced or modified.

B3 ANNUAL SURVEYS

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

B3.2.1 Examination of Plans and Documents

Sub-paragraph -1 has been amended as follows.

1 The wording "For ships required to have a damage control plan on board in accordance with the requirements in ~~**Chapter 33**~~**2.3.4, Part 1, Part C**" in **Table B3.1, Part B of the Rules** refer to the ships specified in the following **(1)** and **(2)**.

(1) Dry cargo ships of 500 *gross tonnage* and above engaged on international voyages, which were at the beginning stage of construction on or after 1 February 1992. Dry cargo ship is defined as a cargo ship that does not engage in carrying liquids.

(2) Cargo ships of 500 *gross tonnage* and above engaged on international voyages, which were at the beginning stage of construction on or after 1 January 2009

B3.2.2 General Examination

Sub-paragraph -5 has been amended as follows.

5 The general examination of "bow doors, inner doors, side shell doors and stern doors (hereinafter collectively referred to as "door(s)")" stipulated in item 21 of **Table B3.2, Part B of the Rules** is to confirm that the items specified **(1)** to **(7)** below are in good condition. Non-destructive testing may be required when deemed necessary by the Surveyor as a consequence of the examination specified in **Table 3.2, Part B of the Rules**.

(1) Structural members such as plating and stiffeners and related welded parts of the door(s)

(2) Structural members such as plating and stiffeners of the surrounding hull structure

(3) Items **(a)** to **(h)** below for the door(s)
  (a) Securing, supporting and locking devices
  (b) Hinges, bearings and thrust bearings
  (c) Interlock systems for opening/closing systems and the securing and locking devices
  (d) Sealing arrangements
  (e) Electric devices for operating
  (f) Drainage systems and arrangements
  (g) Hydraulic devices
  (h) Any other devices which are required for the ship in accordance with ~~**Chapter 23,**~~ **14.10, Part 1, Part C of the Rules** and **Chapter 21, Part CS of the Rules**

(4) (Omitted)

(5) Items **(a)** to **(f)** below for indication / monitoring systems, where fitted.
  (a) Visible indication and audible alarms (hereinafter referred to as "indication and alarm system") at the navigation bridge panel and on the operating panel
  (b) Lamp test function at the navigation bridge panel and on the operating panel
  (c) Mode selecting function that allows selection between "harbour" and "sea voyage"
  (d) Power supply for the indication and alarm system
  (e) Sensor for the indication and alarm system
  (f) Any other systems which are required for the ship in accordance with ~~**Chapter 23**~~ **14.10, Part 1, Part C of the Rules** and **Chapter 21, Part CS of the Rules**

((6) and (7) are omitted.)

B3.2.3 Performance Tests

Sub-paragraphs -6 and -7 have been amended as follows.

6 Inspection of Water Level Detection and Alarm Systems (refer to **13.8.5, Part D of the Rules, 13.8.6, Part D of the Rules** and **B1.1.3-9(5)**) specified in item 9 of **Table B3.3, Part B of the Rules,** is to be carried out on the items installed on the following ships.

(1) Cargo ships of 500 *gross tonnage* and above engaged on international voyages, which have a single cargo hold below the freeboard deck or cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck and specified in the following **(a)** or **(b)**:
   (a) Cargo ships having a length (L_f) of less than 100 *m*, which had been at the beginning stage of construction before 1 July 1998
   (b) Cargo ships having a length (L_f) of less than 80 *m*, which had been at the beginning stage of construction on and after 1 July 1998

(2) Cargo ships of 500 *gross tonnage* and above engaged on international voyages and specified in the following **(a)** or **(b)**:
   (a) Bulk carriers defined in **1.3.1(13)**, **Part B of the Rules**, which had been at the beginning stage of construction before 1 July 2006
   (b) Bulk carriers defined in ~~**31A.1.2-1(1),**~~ **An1.1.2(1), Annex 1.1, Part 2-2, Part C of the Rules**, which had been at the beginning stage of construction on or after 1 July 2006

7 Inspection of Dewatering Arrangements (refer to **13.5.10**, **Part D of the Rules**) specified in item 10 of **Table B3.3**, **Part B of the Rules**, is to be carried out on the items installed on the following ships.

(1) Cargo ships of 500 *gross tonnage* and above engaged on international voyages and specified in the following **(a)** or **(b)**:
   (a) Bulk carriers defined in **1.3.1(13)**, **Part B of the Rules**, which had been at the beginning stage of construction before 1 July 2006
   (b) Bulk carriers defined in ~~**31A.1.2-1(1),**~~ **An1.1.2(1), Annex 1.1, Part 2-2, Part C of the Rules**, which had been at the beginning stage of construction on or after 1 July 2006

B5 SPECIAL SURVEYS

B5.2 Special Surveys for Hull, Equipment, Fire Extinction and Fittings

B5.2.3 Performance Test

Sub-paragraph -4(4) has been amended as follows.

4 The performance test specified in **5.2.3-2(10), Part B of the Rules** is to be in accordance with the following:
((1) to (3) are omitted.)
(4) Following satisfactory completion of the applicable test without permanent deformation or damage to the tested item, the load used for that test is to be marked as the maximum operational load on the plate specified in ~~**C23.8.1-2(6), Part C of the Guidance**~~**14.14.1.1-2(6), Part 1, Part C of the Rules**.

Table B5.2.6-1 has been amended as follows.

Table B5.2.6-1

Ship's length for freeboard L_f (*m*)	Hull section modulus			
	Applied rule			
	1964 version to 1972 version (except ships complying with "*fdB*")		1973 version to 1986 version	1987 version and later
	Oil tanker	Other ships		
$L_f \leq 60$	As stipulated in rule requirements	As stipulated in rule requirements	80% of rule requirements (77% for oil tankers and ships carrying dangerous chemicals in bulk)	80% of rule requirements
$60 < L_f < 130$			To be determined by interpolation	To be determined by interpolation
$L_f \geq 130$	As stipulated in rule requirements or $0.9W_{min} \times k$, whichever is greater where: W_{min}: Hull section modulus specified in ~~**15.2.1-2,**~~ **5.2.1.3-1, Part 1, Part C of the Rules** k: Material factor specified in ~~**1.1.7-2,**~~ **3.2.1.2-2, Part 1, Part C of the Rules**		90% of rule requirements (87% for oil tankers and ships carrying dangerous chemicals in bulk)	90% of rule requirements

Part U INTACT STABILITY

U1 GENERAL

U1.1 General

U1.1.4 Definitions

Sub-paragraph -1 has been amended as follows.

1 In applying the requirements of **1.1.4(1), Part U of the Rules**, "openings in the hull, superstructures or deckhouses which cannot be closed weathertight" include ventilators provided with weathertight closing appliances in accordance with the requirements of ~~**23.6.5-2**~~**14.12.3.1-3, Part 1, Part C of the Rules** or **21.6.5-2, Part CS of the Rules** that for operational reasons have to remain open to supply air to the engine room, emergency generator room or closed ro-ro and vehicle spaces (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship. Where it is not technically feasible to treat some closed ro-ro and vehicle space ventilators as unprotected openings, an alternative arrangement that provides an equivalent level of safety may be used provided that it is deemed appropriate by the Administration.

U1.2 Stability Information

U1.2.2 Stability Computer

Sub-paragraph -1 has been amended as follows.

1 The computer for stability calculation and the operation manual specified in **1.2.2, Part U of the Rules** is to be prepared in accordance with **Annex U1.2.1 "GUIDANCE FOR STABILITY INFORMATION FOR MASTER"**. Software for the stability calculation is to be determined corresponding to the stability requirements applied to the ship and, in general, according with the followings.

(1) For ships other than those specified in **(2)** or **(3)** (*e.g.*, dry cargo ships of less than 80*m* in subdivision length (L_S) defined in ~~**4.1.2(6)**~~**2.3.1.2(6), Part 1, Part C of the Rules**, ships assigned to *B*-60 or *B*-100 freeboard in accordance with the provisions of **Part V of the Rules**), software is to be able to calculate intact stability for each loading condition (Type 1).

(2) For ships subject to the subdivision requirements specified in ~~**Chapter 4**~~**2.3, Part 1, Part C** or **Chapter 4, Part CS**, as applicable, but excluding bulk carriers as specified in **(3)**, software is to be able to calculate intact stability as specified in **(1)** and checking damage stability by showing a limit G_0M curve or previously approved loading conditions (Type 2).

(3) For tankers, ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk, and ships bulk carriers subject to the requirements of ~~**31A.2**~~**An2., Annex 1.1, Part 2-2, Part C of the Rules** and the compliance with the requirements of ~~**31A.2.1-2**~~**An2.1.1-2, Annex 1.1, Part 2-2, Part C of the Rules** has been done for all conditions loaded to the summer load line, software is to be able to calculate intact stability and damage stability by direct application of pre-programmed damage cases for each loading condition (Type 3).

Annex U1.2.1 GUIDANCE FOR STABILITY INFORMATION FOR MASTER

1.3 The Details of Each Content

1.3.5 Data for Cargoes, Stowage, etc.

Sub-paragraph -2 has been amended as follows.

2 General arrangement

Drawings in a suitable scale, which show the arrangement of cargo spaces, tanks, lockers and stores, machinery spaces, accommodation spaces, compartments, closing apparatuses and vents together with their name, downflooding angles, permanent ballast, allowable deck loadings and freeboard, are to be attached.

In case of ships to which the requirements in ~~**Chapter 4**~~**2.3, Part 1, Part C of the Rules** apply, the plans showing clearly the boundaries of each compartment (shells, decks and bulkheads), the openings therein with the control positions of closing apparatuses, and the arrangements of means, if fitted, to ensure the stability of the ship after flooding are to be attached in addition to above. However, if these plans are permanently posted on the bridge, these requirements may be waived.

1.3.9 Stability in Standard Loading Condition

Sub-paragraph -1 has been amended as follows.

1 Standard loading condition

The undermentioned conditions are to be at least included in standard loading conditions unless they are clearly inappropriate. A departure condition means a condition in which provisions and fuel are fully loaded and an arrival condition means a condition in which 90% thereof are consumed. In full load departure conditions, it is to be assumed that water ballast tanks are empty and that the ship is loaded to its subdivision load line used for damage stability calculations according to ~~**Chapter 4**~~**2.3, Part 1, Part C of the Rules** or summer load line, if intended to carry a timber deck cargo, to the summer timber load line or for tankers, ships carrying liquefied gases in bulk and ships carrying dangerous chemicals in bulk assigned with a tropical load line, the ship should be assumed to be loaded to the tropical load line (if the tropical load line is not assigned to the ships, the ships should be assumed to be loaded to the summer load line). In all cases, the cargo in holds is assumed to be fully homogeneous unless this condition is inconsistent with the practical service of the ship.

((1) to (6) are omitted.)

1.3.10 General Data

Sub-paragraph -4 has been amended as follows.

4 Hydrostatic values

Hydrostatic values in the range of light draught to 115% of the maximum draught in intervals not more than 5*cm* are to be presented on the basis of mean draught above underside of keel in the designed trim condition. Stability information is to show the influence of various trims on hydrostatic values for a suitable range of trim in cases where the operational trim range exceeds +/- 0.5% of L_s specified in ~~**4.1.2(6)**~~**2.3.1.2(6), Part 1, Part C of the Rules**. The following items are to be included:

(1) Mould displacement and displacement including shell platings, etc. (Specific gravity of sea water is to be 1.025(t/m^3). Lower specific gravity may be adopted subject to the approval by the Administration.)

(2) *TPC*, *MTC*
(3) *TKM* (*LKM* to be included, if necessary)
(4) ℓ_{cb}, l_{cf} (*KB* to be included, if necessary)
(5) C_b
(6) Thickness of keel plates

Sub-paragraph -10 has been amended as follows.

10 If the damage stability is calculated in accordance with the requirements specified in ~~**Chapter 4, Part C of the Rules or C6.1.1-3(1)**~~**2.3** or **2.4.1.1-4(1), Part 1, Part C of the Rules**, a stability limit curve is to be determined using linear interpolation between the minimum required G_0M assumed for each of the three draughts d_s, d_p and d_l. When additional subdivision indices are calculated for different trims, a single envelope curve based on the minimum values from these calculations is to be presented. When it is intended to develop curves of maximum permissible KG_0 it is to be ensured that the resulting maximum KG_0 curves correspond with a linear variation of G_0M. When light service draught is not with the same trim as other draughts, *TKM* for draughts between partial and light service draught are to be calculated for trims interpolated between trim at partial draught and trim at light service draught.

Sub-paragraph -11 has been amended as follows.

11 As an alternative to the single envelope curve specified in **-10** above, the calculations for additional trims may be carried out with one common G_0M for all of the trims assumed at each subdivision draught. The lowest values of each partial index A_s, A_p and A_l across these trims are then to be used in the summation of the attained subdivision index *A* according to the requirements specified in ~~**Chapter 4**~~**2.3, Part 1, Part C of the Rules**. This will result in one G_0M limit curve based on the G_0M used at each draught. A trim limit diagram showing the assumed trim range is to be developed. (See **Fig. 1**)

Part V LOAD LINES

V2 ASSIGNMENT OF FREEBOARD AND MARKING OF LOAD LINES

V2.2 Assignment of Freeboard and Marking of Load Lines

V2.2.1 Assignment of Freeboard

Sub-paragraph -7 has been amended as follows.

7 For bulk carriers assigned *B*-60 or *B*-100 freeboards according to regulation 27 of *ILLC* and intended to carry deck cargoes, the *KG* used for demonstrating compliance with the deterministic damage stability requirements of that regulation is to be the same as that used for the probabilistic damage stability calculations specified in ~~**Chapter 4,**~~ **2.3, Part 1, Part C of the Rules**, at the deepest subdivision load line. For ships assigned timber freeboards according to the provisions of **Part V of the Rules**, the above mentioned deepest subdivision load line is to be read as the deepest timber subdivision load lines.

Sub-paragraph -13 has been amended as follows.

13 In the application of the regulation 27(13)(e) of the *ILLC*, "unprotected openings" include ventilators provided with weathertight closing appliances in accordance with the requirements of ~~**23.6.5-2,**~~ **14.12.3.1, Part 1, Part C of the Rules** or **21.6.5-2, Part CS of the Rules** that for operational reasons have to remain open to supply air to the engine room, emergency generator room or closed ro-ro and vehicle spaces (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship. Where it is not technically feasible to treat some closed ro-ro and vehicle space ventilators as unprotected openings, an alternative arrangement that provides an equivalent level of safety may be used provided that it is deemed appropriate by the Administration.

Part CS HULL CONSTRUCTION AND EQUIPMENT OF SMALL SHIPS

CS1 GENERAL

CS1.1 Application and Equivalency

Paragraph CS1.1.1 has been amended as follows.

CS1.1.1 Application

1 Even where a ship is intended to be classified for restricted services, the provisions in **27.2.4**, **27.3.3** and **27.3.4, Part CS** of the Rules cannot be applied as far as the ”International Convention on Load Lines, 1966” (as may be amended) is to apply to the ship.

2 In cases where a ship is engaged in international voyages and is not subject to the “International Convention on Load Lines, 1966” (as may be amended), the Society may require the ship comply with provisions equivalent to those of the “International Convention on Load Lines, 1966” (as may be amended).

3 With respect to the provisions of **1.1.1-5, Part CS** of the Rules, bulk carriers as defined in ~~**31A.1.2-1(2)**~~ **An1.2.1(2), Annex 1.1, Part 2-2, Part C** of the Rules, of 500 *gross tonnage* and above, are to apply the provisions of ~~**31A.6.1-3 and 34.2.1-3**~~**3.3.5.2-2, Part 1, 3.2.1.1, Part 2-2** and **An6.1.1-3, Annex 1.1, Part 2-2, Part C** of the Rules ~~**and C25.2.1-2**~~. In this case, for the application to ships of less than 65 *m* in length L_f, loading manuals as specified in ~~**C31A.1.2**~~ **An1.2.1(1), Annex 1.1, Part 2-2, Part C** of the Rules are to read as stability information booklets as required in **1.2.1-1, Part U** of the Rules. The provisions of ~~**34.2.1-3**~~**3.2.1.1, Part 2-2, Part C** of the Rules need not apply to such ships. Notwithstanding the above, such ships not engaged on international voyages need not to apply the provisions of ~~**C25.2.1-2**~~ **3.3.5.2-2, Part 1, Part C** of the Rules.

Paragraph CS1.1.3 has been added as follows.

CS1.1.3 Ships of Unusual Form or Proportion, or Intended for Carriage of Special Cargoes

1 Ships Having Unusually Large Freeboards

(1) “Ships having unusually large freeboards” are the ships having freeboards that comply with following formula.

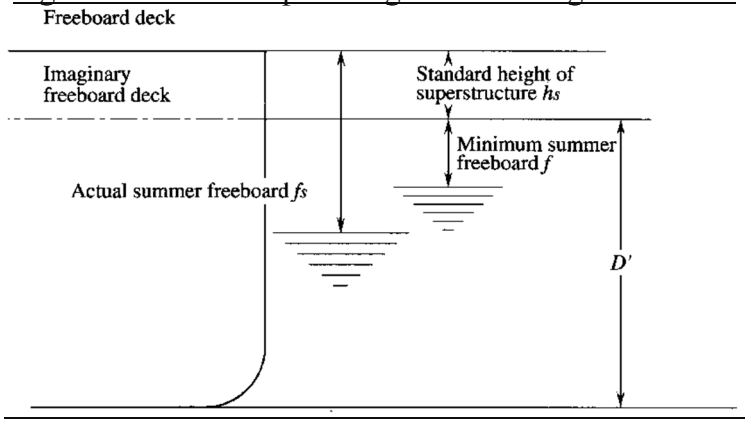
$f_s \geq h_s + f$

f_s : Actual summer freeboard (*mm*) assigned by the requirements in **V2.2.1**

h_s: Standard height (*mm*) of superstructure determined by the requirements in **V2.2.1**

f : Minimum summer freeboard (*mm*) determined by the requirements in **Part V of the Rules** on the basis of an assumed freeboard deck which is measured down from the actual freeboard deck by h_s

Fig. CS1.1.3-1 Ship Having Unusual Large Freeboard



(2) Ships having unusually large freeboards may be treated as follows where the requirements in **Part CS of the Rules** apply. However, the undermentioned treatment is not to apply to ships whose assigned freeboards are "*B*-60" or "*B*-100" type specified in **Part V of the Rules**.

(a) In the provision of "*h*" specified in **5.4.3, Part CS of the Rules**, "*D*" may be replaced with "*D* '" which is the vertical distance from the top of the keel to an assumed freeboard deck.

(b) The requirements in **7.5.2-1, Part CS of the Rules** may be applied to tween deck frames above an assumed freeboard deck even if they are located below the actual freeboard deck.

(c) In the provision of "*h*" specified in **17.1.1-2, Part CS of the Rules**, a weather deck may be regarded as follows in relation to H_D which is the vertical distance from an assumed freeboard deck to the weather deck at side. The same may be applied to other chapters in **Part CS of the Rules** where "*h*" is used.

$h_s \leq H_D < 2h_s$: Superstructure deck of first tier above the freeboard deck

$2h_s \leq H_D < 3h_s$: Superstructure deck of second tier above the freeboard deck

$3h_s \leq H_D$: Superstructure deck of third tier above the freeboard deck

(d) The thickness of side shell plating located above the imaginary freeboard deck is to be obtained according to the following.

i) The thickness of side shell plating from the imaginary freeboard deck to a height of $2h_s$ above the imaginary freeboard deck is to be obtained from the formulae in **16.3.2, Part CS** of the Rules, where $(d + 0.04L)$ in the first term may be replaced by $(d + 0.04L)D/(D + 2h_s)$

Where

h_s: Standard height of superstructures specified in **V2.2.1**

ii) The thickness of superstructure side plating from a height equal to twice h_s (as per **i)**) above the freeboard deck to the strength deck is not to be less than that obtained from the following formula:

$0.7\sqrt{(L + 50)}$ (mm)

iii) The thickness of superstructure side plating from the freeboard deck to a height h_s (as per **i)**) above the freeboard deck forward of $0.25L_f$ aft of F.P. is not to be less than that obtained from **i)** above or **16.5.2, Part CS** of the Rules, whichever is greater.

(e) The interpretation of **(c)** above may be applied to the provision of "*h*" specified in **18.2.1-1, Part CS of the Rules**.

(f)

i) The interpretation of **(c)** above may be applied to the provision of "Position of Exposed Deck Openings" in **19.1.2, Part CS of the Rules**. The same may be applied to other chapters in **Part CS** and **Part D of the Rules** where this provision is used.

ii) In Note(*3) of **Table CS19.2, Part CS of the Rules**, "freeboard deck" may read as "assumed freeboard deck".

(g) In the application of the requirements in **21.1, 21.2** and **21.5, Part CS of the Rules**, "freeboard deck" may be read as "assumed freeboard deck" and the interpretation of **(c)** above may be applied when determining the position of the deck. However, side scuttles for spaces below the actual freeboard deck or spaces considered as buoyancy in stability calculations are to be class *A* side scuttles, class *B* side scuttles, or equivalent thereto. In such cases, the deadlight is not to be omitted.

(h) In **13.5.3, Part D**, D' may be used in place of *D* in determining the diameters of bilge suction pipes.

2 Ships Having Unusually Reduced Freeboards

"Ships having unusually reduced freeboards" are ships whose freeboards are of the "*A*", "*B*-60" or "*B*-100" type, assigned in accordance with the requirements in **Part V of the Rules**.

Paragraph CS1.3.1 has been added as follows.

CS1.3.1 Materials

1 Where high tensile steel are used, the construction and scantlings are to be determined in accordance with **Annex CS1.3.1-1 "GUIDANCE FOR HULL CONSTRUCTION CONTAINING HIGH TENSILE STEEL MEMBERS"**.

2 Where the requirements in **1.3.1-2(3), Part CS of the Rules** are applied, data corresponding to the standard of steels used (extent of their use, location of structural members, section rigidity, fatigue strength, minimum thickness, etc.) is to be submitted to the Society and approved.

3 When the requirements in **1.3.1-4(1), Part CS of the Rules** are applied, data corresponding to the standard of steels used (e.g., extent of use, location of structural members, section rigidity, buckling strength, minimum thickness, etc.) is to be submitted to the Society for approval when deemed necessary.

4 The requirements of **1.3.1-4 (2), Part CS of the Rules** apply to members which do not come in contact with sea water, and the values in **(1)** and **(2)** may be deducted from the scantlings required by relevant requirements.

(1) For stainless steel

(a) Where the scantling is determined by the thickness of the plate: 1.0 *mm*

(b) Where the scantling is determined by the section modulus: 5%

(2) For stainless clad steel

Where the scantling is determined by the thickness of plate: 0.5*mm*

5 "Areas of anticipated stress concentration" specified in **1.3.1-4 (3) Part CS of the Rules** refers to, for example, the connections of the lower corner parts of corrugated bulkheads and inner bottom plates or the top plate of the lower stools, the connections of inner bottom plates and bilge hopper plates or lower stools, etc.

6 "Where deemed appropriate by the Society" specified in **1.3.1-4(3) Part CS of the Rules** refers to cases such as where fatigue strength assessments based upon hot spot stresses obtained using the finite element method are carried out and the results are submitted to the Society for approval.

7 In cases where it has been deemed appropriate by the Society, fiber reinforced plastic (FRP) may be used for equipment specified in this Part. In this case, such usage is subject to the requirements given in **Annex 3.2, Part 1, Part C of the Rules**.

Chapter CS2 has been added as follows.

CS2 STEMS AND STERN FRAMES

CS2.1 Stems

CS2.1.1 Plate Stems

1 The thickness of plate stems may be the same as that of side shell plating at the level of the freeboard deck and the same as that of the forecastle-side shell in the range of the forecastle.

2 Where the plate stem with a large radius of curvature at its fore end is not fitted with a centreline stiffener or is not reinforced by using thicker plate in accordance with **2.1.1-1, Part CS** of the Rules, horizontal breasthooks are to be provided at a space not exceeding 600 *mm* apart for reinforcement.

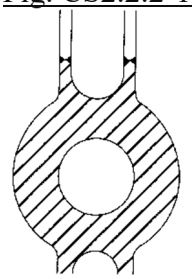
CS2.2 Stern Frames

CS2.2.2 Propeller Posts

1 Connection of cast steel boss and plate parts of built-up stern frame

The connection of a cast steel boss and built-up stern frame is to be well grooved and welded with full penetrations at the root as shown in **Fig. CS2.2.2-1**. A cast steel boss having a shape different from that shown in **Fig. CS2.2.2-1** may be used if enough consideration is paid to workmanship, at the discretion of the Society.

Fig. CS2.2.2-1



2 Length of shaft hole of propeller boss

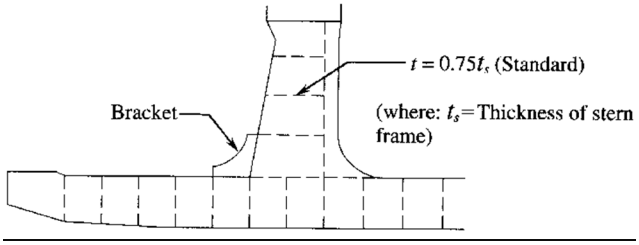
The length of the shaft hole of the propeller boss is to be greater than 1.25 *times* the inside diameter of the boss hole. Where the length of the shaft hole is less than the length of the bearing prescribed in **6.2.10, Part D** of the Rules, it is recommended that the length of the shaft hole be adjusted to match that of the bearing.

3 Round bars used for built-up stern frame

Where a round bar is used as the aft edge of a built-up stern frame, the standard radius of the round bar is at least 70% of $R(0.40L + 16)$ prescribed in **2.2.2, Part CS** of the Rules. At the connection of the round bar to the cast steel part or at the connection of round bars, the depth of the bevel for welding is to be at least 1/3 the diameter of the round bar.

4 The standard thickness of ribs fitted to the stern frame is 75% of the stern frame plate. (*See* **Fig. CS2.2.3-1**)

Fig. CS2.2.3-1



CS2.2.3 Shoe Pieces

1 Connection of shoe pieces and propeller posts

The top plate of the shoe piece is to be extended forward beyond the aft end of the propeller post. A bracket of the same thickness as the stern frame is to be fitted at the connection of the shoe piece and the aft end of the propeller post to keep a sufficient continuity of strength. (*See* **Fig. CS2.2.3-1**)

2 Steel bolts for fixing zinc slabs to the shoe piece must not be directly screwed into the shoe piece. They are to be directly welded to the shoe piece or screwed into steel plates welded to the shoe piece.

3 Shoe pieces of built-up construction are to be made watertight and the inside coated with effective coating material. Where no coating is applied to the inside of the built-up shoe piece, the thickness of the shoe piece is to be increased by 1.5 *mm*.

4 Refer to **CS2.2.2-4** above.

CS2.2.4 Heel Pieces

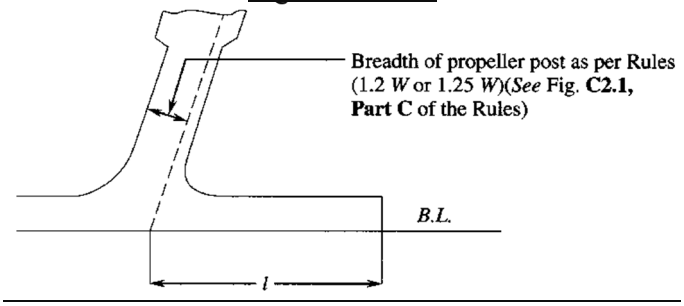
Determination of length of heel pieces

(1) In built-up stern frames, the length of heel pieces may be equal to twice the frame spacing at the position of the heel pieces providing that the thickness of flat keels connected to the heel pieces is increased by 5 *mm*.

(2) The length of heel pieces is to be measured as shown in **Fig. CS2.2.4-1**.

(3) Refer to **CS2.2.2-4** also.

Fig. CS2.2.4-1



CS3 RUDDERS

CS3.1 General

Paragraph CS3.1.1 has been amended as follows.

CS3.1.1 Application

1 For Mariner-type rudders (*See* **Fig. ~~C3.1~~ 13.2.1-1** (*D*) and (*E*), **Chapter 13, Part 1, Part C** of the Rules), the scantling of rudders is to be determined in accordance with the requirements in **Chapter 13, Part 1, Part C** of the Rules.

2 The scantling of each member of rudders having three or more pintles is to be determined in accordance with the requirements in **Chapter 3, Part CS** of the Rules. However, the moment and force acting on each member are to be determined by the direct calculation method, in accordance with the requirements in **CS3.4**.

3 Rudders having a special shape or sectional form are to be in accordance with following **(1)** and **(2)**.

(1) The scantling of each member of nozzle rudders is to be determined in accordance with the requirements in **Chapter 3, Part CS** of the Rules, unless the rudder force and rudder torque are required to be determined by tests or detailed theoretical calculation. In applying the Rules, the total rudder area and the rudder area ahead of the centreline of the rudder stock are to be calculated as follows:

Total rudder area A:

$2h(b_1 + b_2) + h'(a_1 + a_2)$ (m^2)

Rudder area ahead of the centreline of the rudder stock A_f:

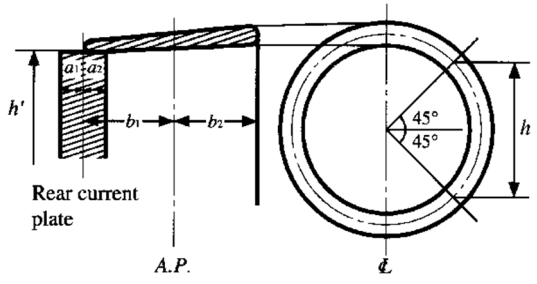
$2hb_2$ (m^2)

Where:

a_1, a_2, b_1, b_2, h and h': Refer to **Fig. CS3.1.1-1**

(2) In other rudders, the scantling of each member is to be determined by obtaining the rudder force and rudder torque through tests or detailed theoretical calculations, and correspondingly applying the requirements in **Chapter 3, Part CS** of the Rules. Results of tests or theoretical calculations are to be submitted to the Society.

Fig. CS3.1.1-1 Area of Nozzle Rudder



4 The scantling of each member of rudders designed for helm angles exceeding 35° is to be determined in accordance with the requirements in **Chapter 3, Part CS** of the Rules, on the basis of the rudder force and rudder torque obtained through tests or detailed theoretical calculations. The results of tests and theoretical calculations are to be submitted to the Society.

Paragraph CS3.1.2 has been added as follows.

CS3.1.2 Materials

1 If the diameter of the rudder stock is small, cast carbon steel is not to be used.

2 Rolled bar steel (*KSFR*45) may be treated in the same way as *KSF*45.

Paragraph CS3.1.4 has been added as follows.

CS3.1.4 Equivalence

Where steel castings with a yield stress of less than 205 N/mm^2 are used for rudder main pieces according to the provisions of **3.1.4, Part CS of the Rules**, the Society may require that consideration be given to the yield stress of such castings with respect to the application of the allowable stress of rudder main pieces in way of the recesses specified in **3.6.3-3(2), Part CS of the Rules**.

Section CS3.4 has been added as follows.

CS3.4 Rudder Strength Calculation

CS3.4.1 Rudder Strength Calculation

1 General

The bending moment, shear force, and supporting force acting on the rudder and rudder stock may be evaluated using the basic rudder models shown in **Fig. CS3.4.1-1** to **Fig. CS3.4.1-4**.

2 Moments and forces to be evaluated

The bending moment M_R and the shear force Q_1 acting on the rudder body, the bending moment M_b acting on the bearing, and the bending moment M_s acting on the coupling between the rudder stock and the rudder main piece and the supporting forces B_1, B_2, B_3 are to be obtained. These moments and forces are to be used for analyzing the stresses in accordance with the requirements in **Chapter 3, Part CS** of the Rules.

3 Method of evaluating moments and forces

The method of evaluating moments and forces is to be as in the following **(1)** to **(3)** below.

(1) General data

Data on the basic rudder models shown in **Fig. CS3.4.1-1** to **Fig. CS3.4.1-4** is as follows:

l_{10}~l_{50} : Lengths (*m*) of individual girders of the system

I_{10}~I_{50} : Moments (cm^4) of inertia of these girders

For rudders supported by a shoe piece, the length l_{20} is the distance between the lower edge of the rudder body and the centre of the shoe piece and I_{20} is the moment of inertia of the pintle in the shoe piece.

h_c is the vertical distance (*m*) from the mid-point of the length of that pintle to the centroid of the rudder area.

(2) Direct calculation

The standard data to be used for direct calculation are as follows:

Load acting on rudder body (Type *B* rudder)

$$P_R = \frac{F_R}{1000 l_{10}} \ (kN/m)$$

Load acting on rudder body (Type *C* rudder)

$$P_R = \frac{F_R}{1000 l_{10}} \ (kN/m)$$

Notwithstanding the above, the value is as follows for rudders with rudder trunks supporting rudder stocks.

$$P_R = \frac{F_R}{1000(l_{10}+l_{20})} \ (kN/m)$$

Load acting on rudder body (Type *A* rudder)

$$P_{R10} = \frac{F_{R2}}{1000 l_{10}} \ (kN/m)$$

$$P_{R20} = \frac{F_{R1}}{1000 l_{30}} \ (kN/m)$$

Where:

F_R, F_{R1}, F_{R2}: As specified in **3.2** and **3.3, Part CS** of the Rules

k: Spring constant of the supporting point of the shoe piece or rudder horn respectively, as shown below

For the supporting point of the shoe piece:

$$k = \frac{6.18 I_{50}}{{l_{50}}^3} \ (kN/m)$$

(*See* **Fig. CS3.4.1-1** and **Fig. CS3.4.1-2**)

Where:

I_{50}: The moment (cm^4) of inertia of shoe piece around the Z-axis

l_{50}: Effective length (m) of shoe piece

For the supporting point of rudder horn:

$$k = \frac{1}{f_b + f_t} \ (kN/m)$$

(*See* **Fig. CS3.4.1-1**)

Where:

f_b: Unit displacement of rudder horn due to a unit force of 1 kN acting in the centre of support as shown below.

$$f_b = 1.3 \frac{d^3}{6.18 I_n} \ (m/kN)$$

Where:

I_n: The moment (cm^4) of inertia of rudder horn around the X-axis

f_t: Unit displacement due to torsion, as shown below.

$$f_t = \frac{dc^2 \Sigma u_i / t_i}{3.14 {F_T}^2} \times 10^{-8} \ (m/kN)$$

F_T: Mean sectional area (m^2) of the rudder horn

u_i: Breadth (mm) of the individual plates forming the mean sectional area of the rudder horn

t_i: Plate thickness (mm) within the individual breadth u_i

(3) Simplified method

The moments and forces for rudders of each type may be obtained from the following formulae.

(a) Type *A* rudders

$$M_R = \frac{{B_1}^2 (l_{10}+l_{30})}{2F_R} \ (N\text{-}m)$$

$$M_b = \frac{B_3 (l_{30}+l_{40}) (l_{10}+l_{30})^2}{l_{10}^2} \ (N\text{-}m)$$

$$M_s = B_3 l_{40} \ (N\text{-}m)$$

$B_1 = \frac{F_R h_c}{l_{10}}$ (*N*)

$B_2 = F_R - 0.8B_1 + B_3$ (*N*)

$B_3 = \frac{F_R {l_{10}}^2}{8 l_{40}(l_{10}+l_{30}+l_{40})}$ (*N*)

(b) Type *B* rudders

$M_R = \frac{{B_1}^2 l_{10}}{2F_R}$ (*N-m*)

$M_b = B_3 l_{40}$ (*N-m*)

$M_s = \frac{3M_R l_{30}}{l_{10}+l_{30}}$ (*N-m*)

$B_1 = \frac{F_R h_c}{l_{10}+l_{30}}$ (*N*)

$B_2 = F_R - 0.8B_1 + B_3$

$B_3 = \frac{F_R (l_{10}+l_{30})^2}{8 l_{40}(l_{10}+l_{30}+l_{40})}$ (*N*)

(c) Type *C* rudders

$M_b = F_R h_c$ (*N-m*)

$B_2 = F_R + B_3$ (*N*)

$B_3 = \frac{M_b}{l_{40}}$ (*N*)

Notwithstanding the above, the value is as follow, for rudders with rudder trunks supporting rudder stocks.

M_R is the greatest of the following values:

$M_{FR1} = F_{R1}(CG_{1Z} - l_{10})$

$M_{FR2} = F_{R2}(l_{10} - CG_{2Z})$

where A_1 and A_2 are the rudder blade area which are above the lower bearing and below respectively and symbols are as follows (*See* **Fig. CS3.4.1-4**)

F_{R1} : Rudder force over the rudder blade area A_1

F_{R2} : Rudder force over the rudder blade area A_2

CG_{1Z}: Vertical position of the centre of gravity of the rudder blade area A_1 from base

CG_{2Z}: Vertical position of the centre of gravity of the rudder blade area A_2 from base

$F_R = F_{R1} + F_{R2}$

$B_2 = F_R + B_3$

$B_3 = \frac{M_{FR2} - M_{FR1}}{\ell_{20} + \ell_{40}}$

Fig. CS3.4.1-1 Type *A* Rudder

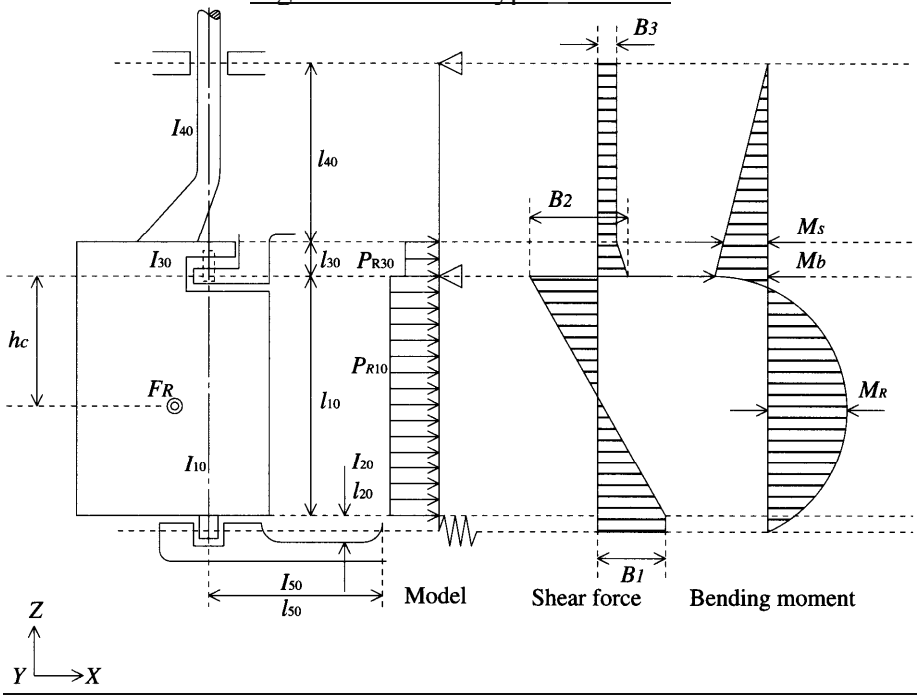


Fig. CS3.4.1-2 Type *B* Rudder

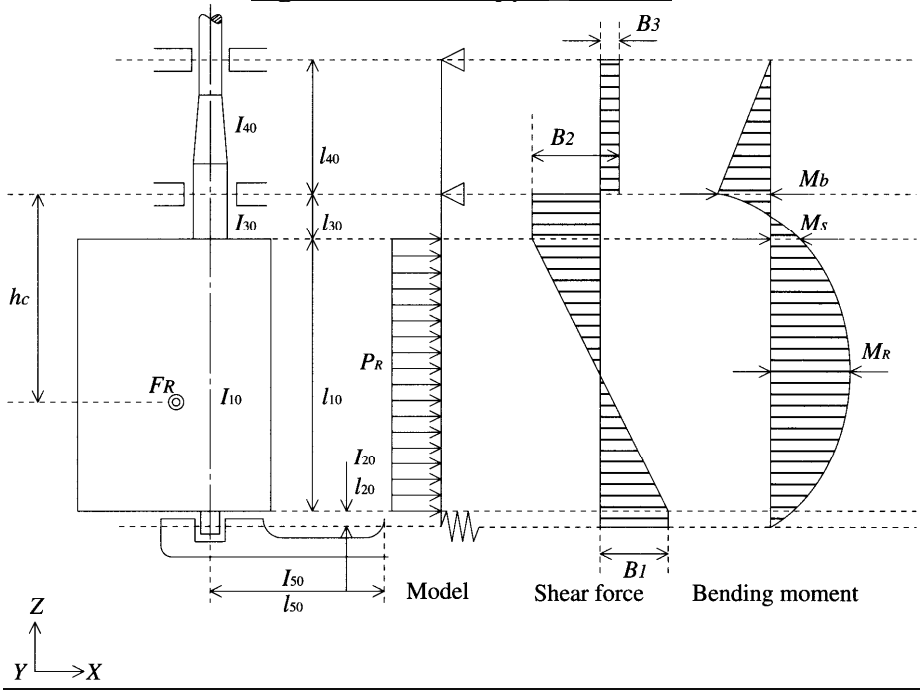


Fig. CS3.4.1-3 Type *C* Rudder

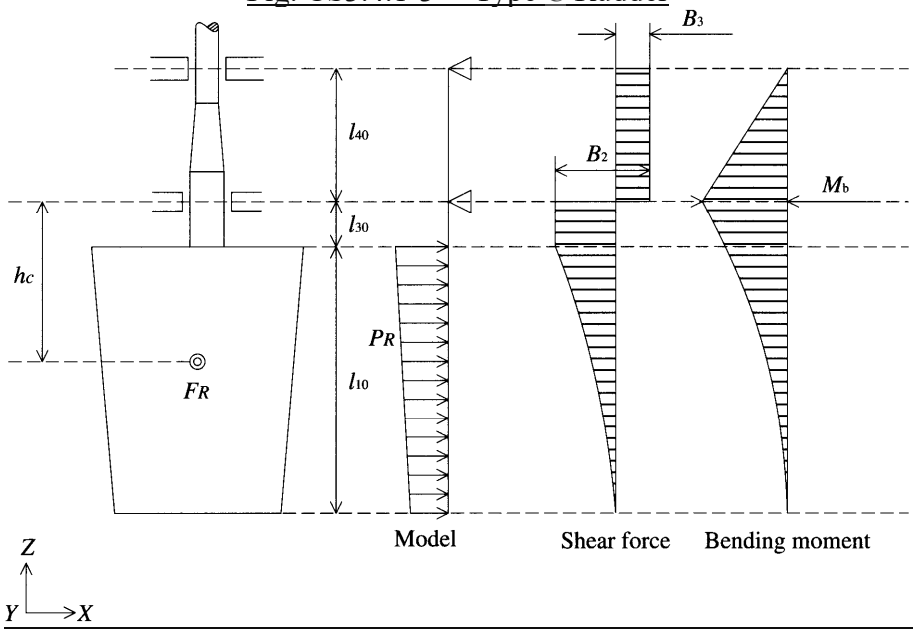
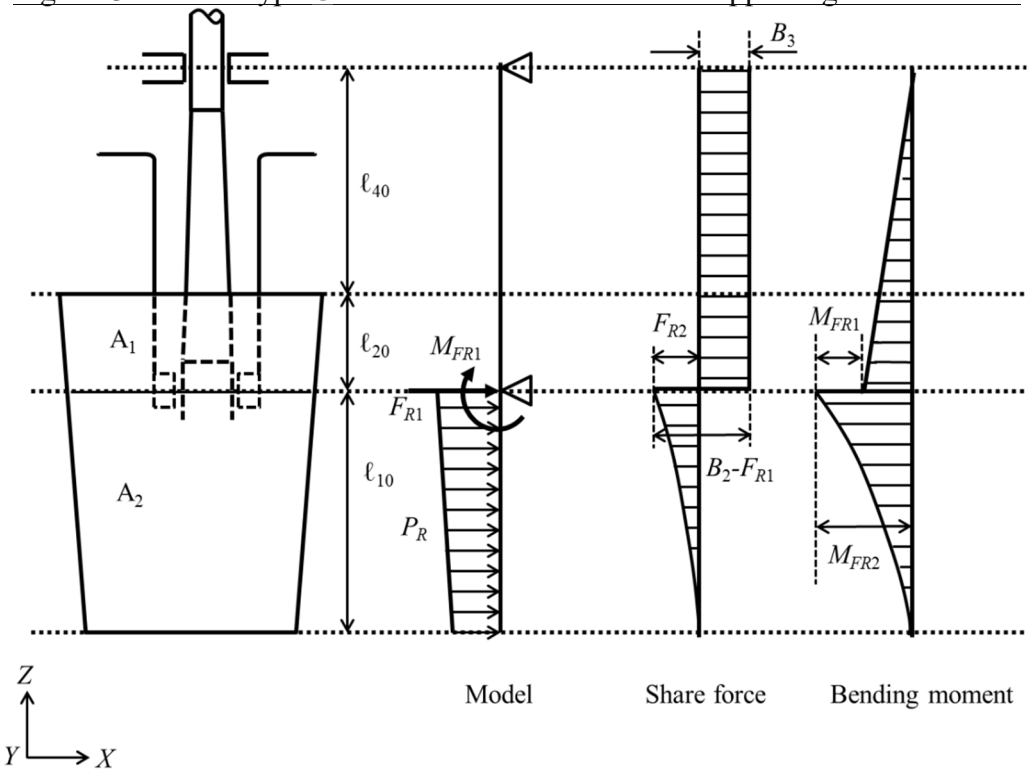


Fig. CS3.4.1-4 Type *C* Rudder with Rudder Trunk Supporting Rudder Stock



Section CS3.5 has been added as follows.

CS3.5 Rudder Stocks

CS3.5.1 Upper Stocks

1 Taper of upper stock at joint with tiller

Where the upper stocks are tapered for fitting the tiller, the taper is not to exceed 1/25 of the radius or 1/12.5 of the diameter.

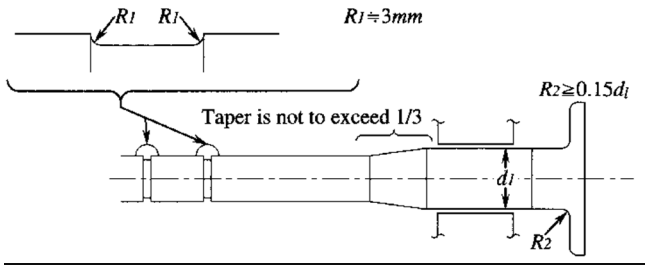
2 Keyways

(1) The depth of the keyway may be neglected in determining the diameter of the rudder stock.

(2) All corners of keyways are to be properly rounded.

3 Each part of the rudder stocks of Type *B* and *C* rudders specified in **3.5, Part CS** of the Rules is to be so constructed as shown below.

Fig. CS3.5.1-1 Rudder Stock of Type *B* and *C* Rudder



Section CS3.6 has been added as follows.

CS3.6 Rudder Plates, Rudder Frames and Rudder Main Pieces of Double Plate Rudders

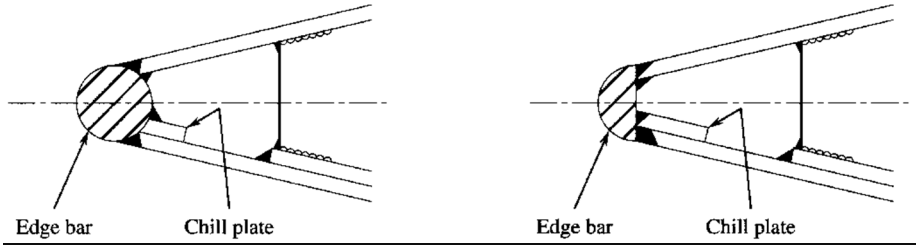
CS3.6.3 Rudder Main Pieces

Material factor K_m is to be for the lowest strength material among the materials used in the section considered.

CS3.6.4 Connections

In principle, edge bars are to be fitted to the aft end of the rudder. However, considering the size and form of the rudder, weldability, etc., edge bars and/or chill plates may be omitted. (*See* **Fig. CS3.6.4-1**)

Fig. CS3.6.4-1 Aft end Construction of Rudder



Section CS3.9 has been added as follows.

CS3.9 Couplings between Rudder Stocks and Main Pieces

CS3.9.1 Horizontal Flange Couplings

1 Diameters of coupling bolts in Type *A* rudder

In the application of **3.9.1-1, Part CS** of the Rules, the diameter of the coupling bolt d_l in Type *A* rudder is to be determined in accordance with the requirements in **3.5.2, Part CS** of the Rules, assuming that the lower stock is cylindrical.

2 Locking device for nuts of coupling bolts

The nuts of coupling bolts are to have locking devices. They may be split pins.

CS3.9.2 Vertical Flange Couplings

1 Diameter of coupling bolts in Type *A* rudder

In the application of **3.9.2-1, Part C** of the Rules, the diameter of the coupling bolt d_l in Type *A* rudder is to be determined in accordance with **3.5.2, Part CS** of the Rules, assuming that the lower stock is cylindrical.

2 Locking devices for nuts of coupling bolts

The nuts of coupling bolts are to have locking devices. They may be split pins.

CS3.9.3 Cone Couplings with Key

1 General

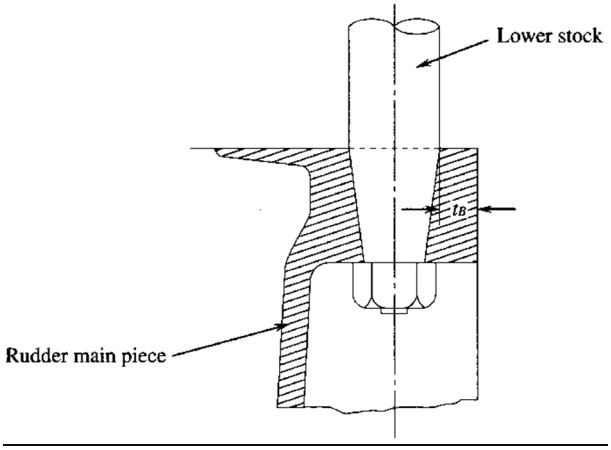
(1) The lower stock is to be securely connected to the rudder body with slugging nuts or hydraulic arrangements. Shipbuilders are to submit data on this connection to the Society.

(2) Special attention is to be paid to corrosion of the lower stock.

(3) The thickness t_B of the cast steel part of the rudder body (*See* **Fig. CS3.9.3-1**) is not to be less than 0.25 *times* the required diameter of the lower stock.

(4) In the application of **3.9.3-1** to **-3, Part CS** of the Rules, actual values are to be used for d_0, d_g and d_e.

Fig. CS3.9.3-1 Coupling Between Lower Stock and Rudder Main Piece



2 In the application of **3.9.3-5**, the scantlings of the key are as follows in cases where all rudder torque is considered to be transmitted by the key at the couplings.

(1) The shear area A_k of keys is not to be less than:

$$A_k = \frac{30 T_R K_k}{d_k} \ (mm^2)$$

Where:

d_k: Rudder stock diameter (mm) at the mid-point of length of the key

K_k: Material factor for the key as given in **3.1.2, Part CS** of the Rules

T_R: Rudder torque obtained from **3.3, Part CS** of the Rules

(2) The abutting surface area A_c between the key and rudder stock or between the key and rudder body, respectively, is not to be less than:

$$A_c = \frac{10 T_R K_{\max}}{d_k} \ (mm^2)$$

Where:

$K_{\max}$: The greater of the material factors (given in **3.1.2, Part CS** of the Rules) between the rudder stock and the key it is in contact with or the greater of the material factors between the rudder body and the key it is in contact with

d_k and T_R: As specified in **(1)**

CS3.9.4 Cone Couplings with Special Arrangements for Mounting and Dismounting the Couplings

The outer diameter of gudgeon (d_a) is recommended to be taken at the same plane in which the mean cone diameter (d_m).

Section CS3.10 has been added as follows.

CS3.10 Pintles

CS3.10.2 Construction of Pintles

1 Locking device for pintle nut

Split pins are not recommendable as the locking device for pintle nuts. Locking rings or other equivalent devices are to be used, as shown in **Fig. CS3.10.2-1**.

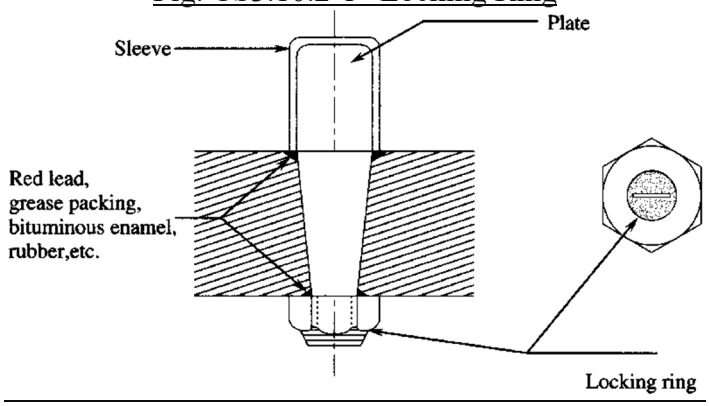
2 Preventing corrosion of pintles

To prevent corrosion of pintles, the end of the sleeve is to be filled with red lead, grease packing, bituminous enamel, rubber, etc. as shown in **Fig. CS3.10.2-1**.

3 Combination of pintle and rudder frame in monoblock

In ships exceeding 80 *m* in length, combining the pintle and rudder frame into a monoblock is not recommended.

Fig. CS3.10.2-1 Locking Ring



Section CS3.11 has been added as follows.

CS3.11 Bearings of Rudder Stocks and Pintles

CS3.11.1 Minimum Bearing Surface

1 Where a metal bush is used, the sleeve is to be of a different material from the bush (for example, sleeve of *BC*3 and bush of *BC*2).

2 "The type as deemed appropriate by the Society" stipulated in **Table CS3.3, Part CS** of the Rules means that approval is to be made in accordance with the requirements of **Chapter 5, Part 4 of Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

CS3.11.3 Bearing Clearances

Where a bush is non-metal, the standard bearing clearance is to be 1.5~2.0 *mm* in diameter.

Section CS3.12 has been added as follows.

CS3.12 Rudder Accessories

CS3.12.1 Rudder Carriers

1 Materials of rudder carriers and intermediate bearings

Rudder carriers and intermediate bearings are to be of steel. They are not to be of cast iron.

2 Thrust bearing of rudder carrier

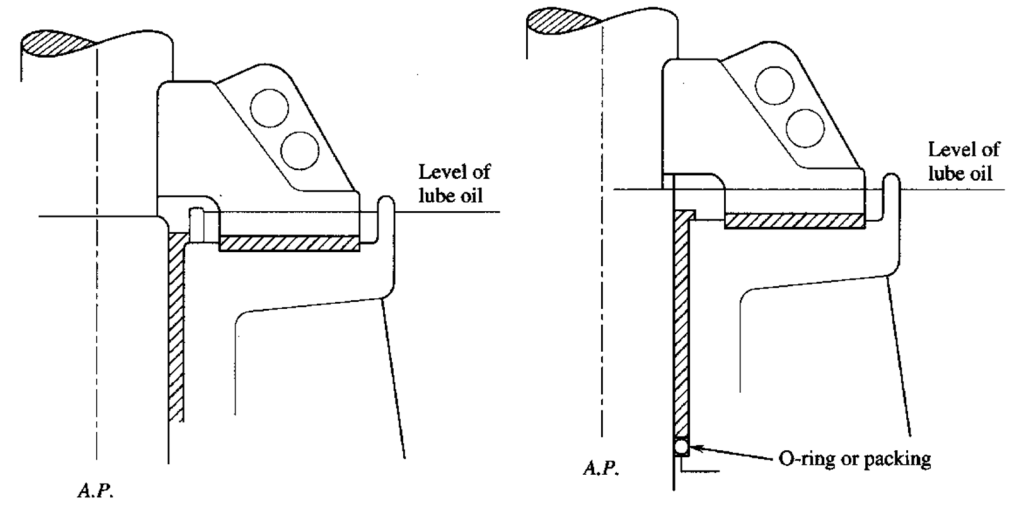
(1) The bearing is to be provided with a bearing disc made of bronze or other equivalent materials.

(2) The calculated bearing pressure is not to exceed 0.98 *MPa* as a standard. In calculating the weight of the rudder, its buoyancy is to be neglected.

(3) The bearing part is to be well lubricated by dripping oil, automatic grease feeding, or a similar method.

(4) The bearing is to be designed to be structurally below the level of lubricating oil at all times. (*See* **Fig.CS3.12.1-1**)

Fig. CS3.12.1-1 Rudder Carrier



3 Watertightness of rudder carrier part

(1) In rudder trunks which are open to the sea, a seal or stuffing box is to be fitted above the deepest

load waterline to prevent water from entering the steering gear compartment and the lubricant from being washed away from the rudder carrier. If the top of the rudder trunk is below the deepest waterline two separate stuffing boxes are to be provided.

(2) It is recommended that the packing gland in the stuffing box have an appropriate clearance from the rudder stock corresponding to the position of the stuffing box. The standard clearance is to be 4 *mm* for the stuffing box provided at the neck or intermediate bearing, and 2 *mm* for the stuffing box at the upper stock bearing.

4 Assembly of rudder carriers

In split type rudder carriers, at least two bolts are to be used on each side of the rudder for assembly.

5 Installation of rudder carriers

(1) In ships exceeding 80 *m* in length, it is recommended that the rudder carrier is directly installed on the seat on the deck.

(2) A spigot type seat is not recommended to be installed on the deck.

(3) The hull construction in way of the rudder carrier is to be suitably reinforced.

6 Bolts securing rudder carriers and intermediate bearing

(1) At least one half of the bolts securing the rudder carrier and the intermediate bearing are to be reamer bolts. If stoppers for preventing the rudder carrier from moving are to be fitted on the deck, all bolts may be ordinary bolts. In using chocks as stoppers, they are to be carefully arranged so that they are not driven in, in the same direction. (*See* **Fig CS3.12.1-2**)

(2)

(a) In ships provided with electrohydraulic steering gears, the total sectional area of the bolts securing the rudder carriers or the bearing just under the tiller to the deck is not to be less than that obtained from the following formula:

$0.1d_u^2$ (mm^2)

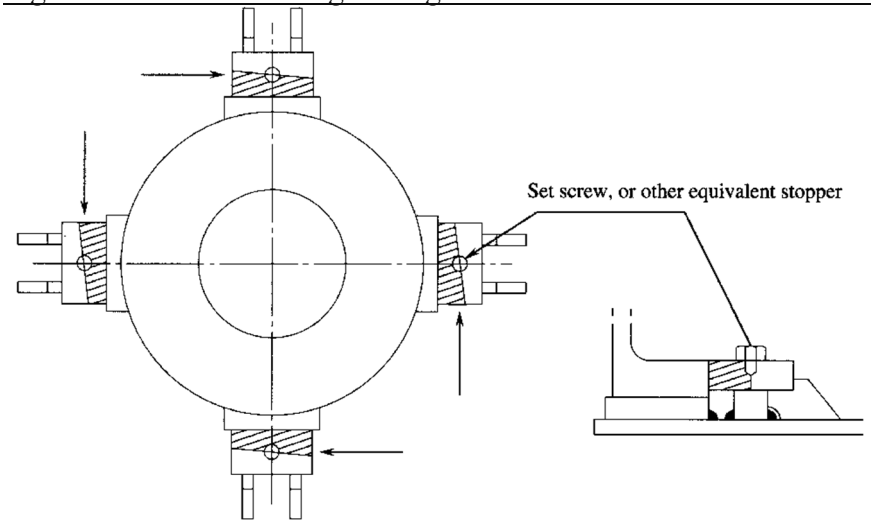
Where:

d_u: Required diameter of upper stock (*mm*)

(b) Where the arrangement of the steering gear is such that each of the two tiller arms is connected with an actuator and two actuators function simultaneously, or is of any other type where the rudder stock is free from horizontal force, the total sectional area of bolts securing the rudder carrier to the deck may be reduced to 60% of the area required in **(a)**.

(c) Where all the bolts securing the rudder carrier to the deck are reamer bolts, the total sectional area of bolts may be reduced to 80% of the area required by **(a)** and **(b)**.

Fig. CS3.12.1-2 Securing Arrangement of Rudder Carrier on Deck



C3.12.2 Prevention of Jumping

A 2 *mm* clearance between the jumping stopper and its contact surface is deemed as standard.

Chapter CS4 has been added as follows.

CS4 SUBDIVISIONS

CS4.1 General

CS4.1.1 Application

"Those ships specifically approved by the Society" refers to the following.

(1) Bulk carriers having freeboards of type *B*-60 or *B*-100 as specified in the requirements of **Part V** of the Rules; however, when carrying deck cargoes, the requirements of **Chapter 4, Part CS** of the Rules apply

(2) Special purpose ships complying with the requirements of *IMO Resolution MSC*.266(84)

CS4.1.2 Definitions

1 "Light service draught" stated in **4.1.2(4), Part CS** of the Rules corresponds, in general, to the ballast arrival condition with 10 % consumables.

2 "Deck or decks limiting the vertical extent of flooding" stated in **4.1.2(6), Part CS** of the Rules refers to the weather deck. However, when the ship has multiple decks above d_s + 12.5 (*m*) at the deepest subdivision draught, the deck just above d_s + 12.5 (*m*) is implied.

3 The wording "specifically accepted by the Society" stated in **4.1.2(13), Part CS** of the Rules means the carriage of timber and wood chip in cargo holds. Figures specified in **Table CS4.1.2** may be used as the permeability of compartment.

4 With respect to the provisions of **4.1.2(13), Part CS** of the Rules, the volume of spaces under consideration is to be taken as the moulded volume.

Table CS4.1.2 Permeability of Compartment Regarding Timber Cargo

Space for	Permeability at draught d_s	Permeability at draught d_p	Permeability at draught d_l
Timber cargo in holds	0.35	0.70	0.95
Wood chip cargo	0.60	0.70	0.95

CS4.2 Subdivision Index

CS4.2.1 Subdivision Index

1 If pipes, ducts or tunnels are provided within an assumed damaged compartment or group of compartments, they are to be arranged in such a way as to prevent flooding progressing to other compartments, or they are to be fitted with devices which can easily control the progress of flooding to other compartments. However, where the attained subdivision index takes into account flooding to other compartment through the pipes, ducts or tunnels, and satisfies the requirements in **4.2, Part CS** of the Rules, these requirements need not apply.

2 Notwithstanding the provisions of **-1** above, minor progressive flooding may be permitted if it is demonstrated that the effects of progressive flooding of other compartments through these pipes, ducts or tunnels can be easily controlled and the safety of the ship is not impaired. However, for ships up to L_f = 150 *m* the provision for allowing "minor progressive flooding" is to be limited to pipes penetrating a watertight subdivision with a total cross-sectional area of not more than 710 mm^2 between any two watertight compartments. For ships of L_f = 150 *m* and upwards the total cross-sectional area of pipes is not to exceed the cross-sectional area of one pipe with a diameter of L_f/5000 *m*.

3 Where penetrations for piping, ventilation, electrical cables, etc. are provided in bulkheads, decks and shells forming a compartment, the watertight integrity of the penetrations are to be at least equivalent to the parts they penetrate.

4 With the same intent as wing tanks, the summation of the attained index A is to reflect effects caused by all watertight bulkheads and flooding boundaries within the damaged zone. It is not correct to assume damage only to one half of the ship's breadth (B') and ignore changes in subdivision that would reflect lesser contributions.

5 In the forward and aft ends of the ship where the sectional breadth is less than the ship's breadth (B') specified in **4.1.2(11), Part CS** of the Rules, transverse damage penetration may extend beyond the centreline bulkhead.

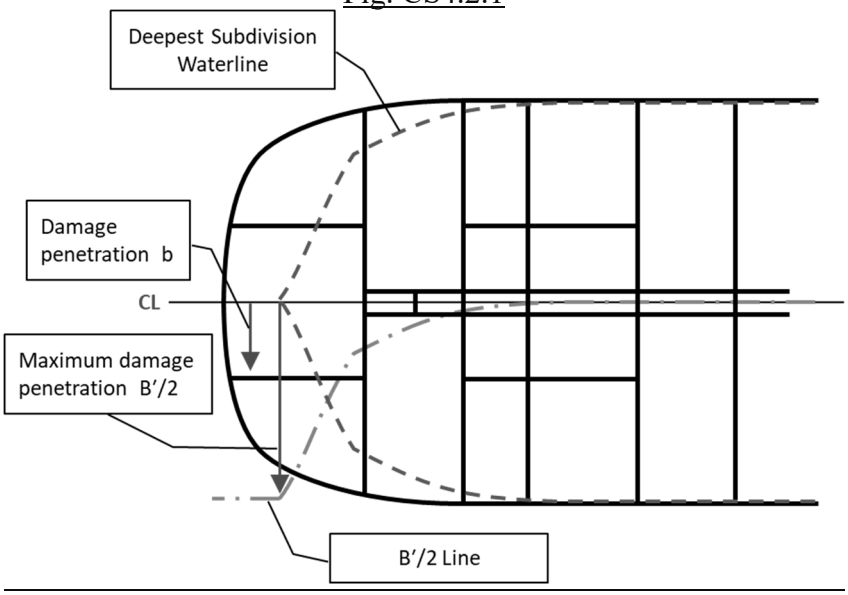
6 Where, at the extreme ends of the ship, the subdivision exceeds the waterline at the deepest subdivision draught, the damage penetration b or $B'/2$ is to be taken from centreline. **Fig. CS4.2.1** illustrates the shape of the $B'/2$ line.

7 Where longitudinal corrugated bulkheads are fitted in wing compartments or on the centreline, they may be treated as equivalent plane bulkheads provided the corrugation depth is of the same order as the stiffening structure. The same principle may also be applied to transverse corrugated bulkheads.

8 Pipes and valves directly adjacent or situated as close as practicable to a bulkhead or to a deck can be considered to be part of the bulkhead or deck, provided the separation distance on either side of the bulkhead or deck is of the same order as the bulkhead or deck stiffening structure. The same applies for small recesses, drain wells, etc.

9 In setting the trim and G_0M used to calculate the subdivision index, reference is also to be made to **1.3.10-11 and -12, Annex U1.2.1 "GUIDANCE FOR STABILITY INFORMATION FOR MASTER", Part U of the Guidance.**

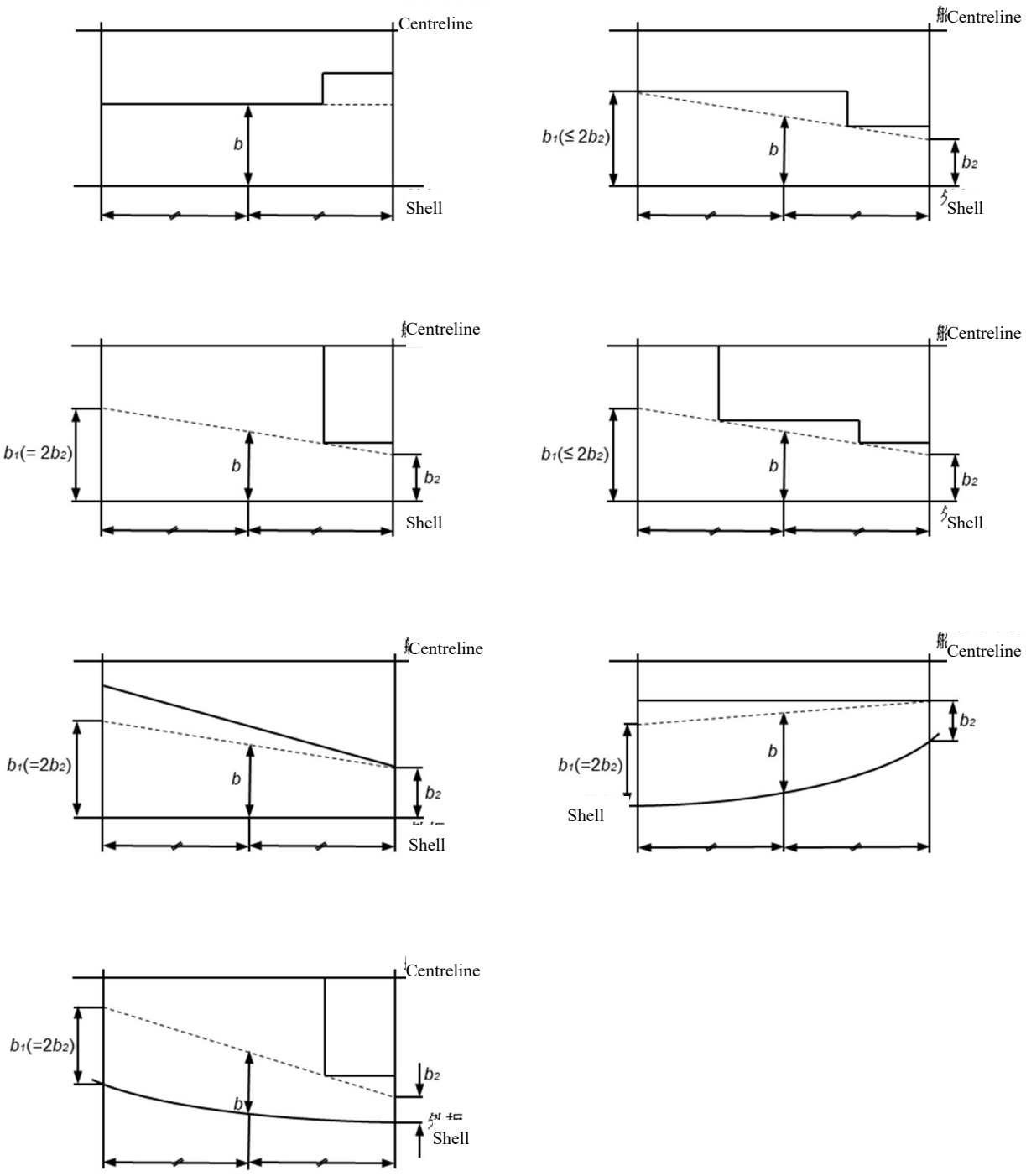
Fig. CS4.2.1



CS4.2.2 Compartment Flooding Probability (p_i)

In application of the requirement of **4.2.2-1, Part CS** of the Rules, in case where the longitudinal bulkhead is not paralleled to the side shell plating, the assumed vertical plane which is considered in the determination of transverse distance (b) between longitudinal bulkhead and side shell plating is to be refer to a example specified in **Fig.CS4.2.2.**

Fig.CS4.2.2 Examples of Assumed Vertical Plane (In case of Single Damage Zone)



CS4.2.3 Probability of Survival (s_i)

1 Openings (e.g., access openings provided in the end bulkhead of the superstructure and cargo hatchways), air pipes, and ventilators which are provided only with the weathertight closing apparatus specified in **Part CS** of the Rules are to be treated as allowing progress of flooding when the water line at the final equilibrium state immerses their lower edge.

2 In applying θ_v specified in **4.2.3-1, Part CS of the Rules**, an "opening incapable of being closed weathertight" includes ventilators provided with weathertight closing appliances in accordance with the requirements of **21.6.5-2, Part CS of the Rules** that for operational reasons have to remain open to supply air to the engine room, emergency generator room or closed ro-ro and vehicle spaces (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship. Where it is not technically feasible to treat some closed ro-ro and vehicle space ventilators as unprotected openings, an alternative arrangement that provides an equivalent level of safety may be used provided that it is deemed appropriate by the Administration.

3 The calculation of the probability of survival (s_i) in **4.2.3-10, Part CS of the Rules** is to be treated as follows.

(1) Where the buoyancy of the timber deck cargo is taken into account, the cargo is to be in compliance with the following **(a)** to **(d)**:

(a) The timber deck cargo is to be stowed in accordance with the requirements of **Section 2.9, Part A** of the *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011* (*IMO* resolution *A*.1048(27)).

(b) The timber deck cargo is to be secured by lashings, uprights or both.

(c) Lashings and uprights are to comply with the requirements of **Section 2.10**, **Part A** of the *Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 2011* (*IMO* resolution *A*.1048(27)).

(d) The height and extent of the timber deck cargo is to be in accordance with **Section 3.3.2** of **Chapter 3**, **Part A** of the *International Code on Intact Stability, 2008 (2008 IS Code)* and is to be at least stowed to the standard height of one superstructure.

(2) The permeability of the timber deck cargo is not to be less than 25 % of the volume occupied by the cargo up to one standard superstructure height.

(3) When the buoyancy of any timber deck cargo is taken into account, the timber deck cargo in way of a damaged zone is deemed ineffective to all areas in an athwartships direction. However, when the vertical extent of the damage stops at the upper deck and the coefficient (v_m) from **4.2.3-4, Part CS** of the Rules is used in the calculations, the buoyancy of the timber deck cargo may be taken into account in accordance with **(2)** above even if it is directly above the damaged area.

4 Tanks and compartments taking part in such equalization is to be fitted with air pipes or equivalent means of sufficient cross-section to ensure that the flow of water into the equalization compartments is not delayed.

5 In applying the requirements specified in **4.2.3-9(2), Part CS of the Rules**, with respect to equalization devices, reference is to be made to the *IMO Res. MSC*.362(92) *"Revised Recommendation on a standard method for evaluating cross-flooding arrangements"*, as amended.

6 If the final waterline immerses the lower edge of any opening through which progressive flooding takes place, the factor "*s*" may be recalculated taking such flooding into account. However, in this case the *s* value is also to be calculated without taking into account progressive flooding and corresponding opening. The smallest *s* value is to be retained for the contribution to the attained index.

CS4.3 Openings

CS4.3.1 Internal Openings

1 "Watertight" stated in **4.3.1-1, Part CS** of the Rules means watertight integrity that is sufficient against a water head corresponding to the opening in question at the final equilibrium state and intermediate waterline.

2 With respect to the provisions of **4.3.1-2, Part CS** of the Rules, watertight closing appliances are categorized as in the following **(1)** to **(3)** corresponding to their purpose and frequency of use.

(1) Watertight closing appliances which are to be *permanently closed* at sea:
Such appliances are open in port and closed before the ship leaves port. The time of opening/closing such doors is to be recorded in the log-book.

(2) Watertight closing appliances which are to be *normally closed* at sea:
Such appliances are kept closed at sea but may be used if authorized by the officer of the watch and to be closed again after use.

(3) Watertight closing appliances which are *used* at sea:
Such appliances are used regularly and may be left open provided they are ready to be immediately closed.

3 General requirements of **4.3.1-2, Part CS** of the Rules are shown in **Table CS4.3.1-1**.

4 Details of functions, specifications, etc. for the power, controls, indicators, alarms, notices for watertight closing appliances specified in **4.3.1-2, Part CS** of the Rules are to be in accordance with **13.3, Part CS** of the Rules.

5 With respect to the provisions of **4.3.1-2, Part CS** of the Rules, watertight closing appliances above the bulkhead deck are also to comply with the requirements for doors provided for means of escape specified in **Chapter 13, Part R** of the Rules.

CS4.3.2 External Openings

1 General requirements of closing appliances specified in **4.3.2, Part CS** of the Rules are show in **Table CS4.3.1-2**.

2 Details of indicators for the watertight closing appliances specified in **4.3.2, Part CS** of the Rules are to be in accordance with **13.3.5, Part CS** of the Rules.

3 "Bridge" stated in **4.3.2-2, Part CS** of the Rules means the place where the watch officer is always present and normally implies the navigation bridge deckhouse.

Table CS4.3.1-1 Requirements for Closing Devices for Internal Openings

Position relative to bulkhead or freeboard deck	Referenced requirement in Part CS of the Rules	Frequency of use	Type of closing appliance	Remote closure	Open/close indicators	Audible or visual alarms	Notices	Notes
Below	4.3.1-2(2), 13.3.4-2 13.3.5, 13.3.6	Used	POS	Yes	Yes	Yes (Local)	No	---
	4.3.1-2(3), 13.3.5-1 13.3.8-1	Norm. Closed	S or H	No	Yes	No	Yes	*1, 6
	4.3.1-2(4), 13.3.4-3 13.3.8-2	Perm. Closed (cargo spaces)	S or H	Prohibited	No	No	Yes	*3, 4, 7
	4.3.1-2(5), 13.3.8-2	Perm. Closed (others)						
At or above	4.3.1-2(2), 13.3.4-2 13.3.5, 13.3.6	Used	POS	Yes	Yes	Yes (Local)	No	*2, 5
	4.3.1-2(3), 13.3.5-1 13.3.8-1	Norm. Closed	S or H	No	Yes	No	Yes	*1, 6
	4.3.1-2(4), 13.3.8-2	Perm. Closed	S or H	Prohibited	No	No	Yes	*3, 4, 7

Notes:

*1 : If hinged, this door is to be of single-action type.

*2 : Under the "International Convention on Load Lines, 1966", doors separating a main machinery space from a steering gear compartment may be hinged single-action types provided the lower sill of such doors is above the Summer Load Line and the doors remain closed at sea whilst not in use.

*3 : The time of opening such doors in port and closing them before the ship leaves port is to be entered into the logbook in the case of doors in watertight bulkheads subdividing cargo spaces.

*4 : Doors are to be fitted with devices which prevent unauthorized opening.

*5 : Under *MARPOL*, hinged watertight doors may be acceptable in watertight bulkheads of the superstructure.

*6 : Notices are to state "Kept closed at sea".

*7 : Notices are to state "Not to be opened at sea".

Table CS4.3.1-2 Requirements for Closing Devices for External Openings

Position relative to bulkhead or freeboard deck	Referenced requirement in **Part CS** of the Rules	Frequency of use	Type of closing appliance	Remote closure	Open/close indicators	Audible or visual alarms	Notices	Notes
Below	**4.3.2-2, 4.3.2-3 13.3.8-2**	Perm. Closed	S or H	No	Yes	No	Yes	*2, 3, 5
At or above	**13.3.5-1, 13.3.8-1**	Norm. Closed	S or H	No	Yes	No	Yes	*1, 4
	4.3.2-2, 13.3.8-2	Perm. Closed	S or H	No	Yes	No	Yes	*2, 3, 5

Notes:

*1 : If hinged, this door is to be of single-action type.

*2 : The time of opening such doors in port and closing them before the ship leaves port is to be entered into the logbook in the case of doors in watertight bulkheads subdividing cargo spaces.

*3 : Doors are to be fitted with devices which prevent unauthorized opening.

*4 : Notices are to state “Kept closed at sea”.

*5 : Notices are to state “Not to be opened at sea”.

Chapter CS5 has been added as follows.

CS5 SINGLE BOTTOMS

CS5.4 Floor Plates

CS5.4.3 Scantlings

In ships which have L and C_b not more than 150 m and 0.7 respectively, and $V/\sqrt{L}$ not less than 1.4, it is recommended that the face plates of floors in way of strengthened bottom forward required in **CS6.9.1-2(1)** are to be plated. The thickness of floors is to comply with the requirements in **CS6.9.1-2(3)**.

CS6 DOUBLE BOTTOMS

CS6.1 General

CS6.1.1 Application

Table CS6.1.1-1 has been amended as follows.

Table CS6.1.1-1 Assumed Extent of Damage

	For 0.3L from the forward perpendicular of the ship	Any other part of the ship
Longitudinal extent	$1/3\,L_f^{2/3}$ or 14.5m, whichever is less	$1/3\,L_f^{2/3}$ or 14.5m, whichever is less
Transverse extent	B'/6 or 10m, whichever is less	B'/6 or 5m, whichever is less
Vertical extent, measured from the keel line	B'/20, to be taken not less than 0.76 m and not more than 2 m	B'/20, to be taken not less than 0.76 m and not more than 2 m

Notes:
1. Keel line is to be in accordance with **2.1.48, Part A** of the Rules.
2. Ship breadth (B') is to be in accordance with **4.1.2(11), Part CS** of the Rules.

Section CS6.6 has been added as follows.

CS6.6 Longitudinals

CS6.6.2 Scantlings

1 For longitudinal stiffeners in double bottoms, where both ends of those stiffeners are fixed to vertical stiffeners on solid floors, horizontal stiffeners on vertical webs or struts, the section modulus required for those stiffeners may be multiplied by the value obtained from the following formula:

$$\left(1-\frac{a}{l}\right)^2\left(1-\frac{b}{l}\right)$$

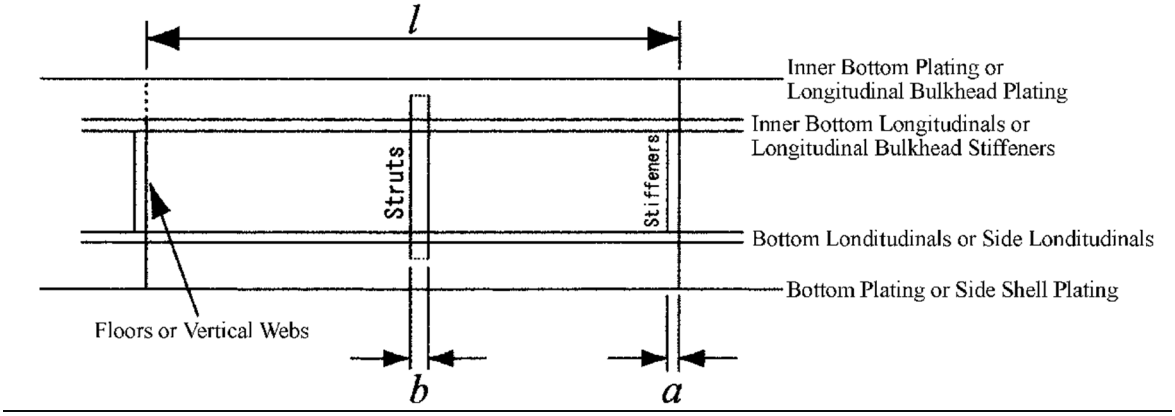
l : Distance (m) between floors or vertical webs

a : Width (m) of stiffeners of floors or vertical webs (a is zero if the stiffeners are not secured to longitudinals or other stiffeners by means of a lug connection)

b : Width of struts (m)

(*See* **Fig. CS6.6.2-1**)

Fig. CS6.6.2-1



Section CS6.7 has been added as follows.

CS6.7 Inner Bottom Plating and Margin Plates

CS6.7.1 Thickness of Inner Bottom Plating

1 Where the height of the centre girder is less than $B/16$, the thicknesses of the inner bottom plating and bottom shell plating are to be increased so that the moment of inertia of the double bottom obtained from the following formula may be equivalent to that corresponding to when the centre girder has the required height.

$$I = 1.23\frac{t_1 t_2}{t_1 + t_2} d_0^2$$

Where:

d_0: Height (m) of centre girder

t_1 : Thickness (mm) of bottom shell plating

t_2 : Thickness (mm) of inner bottom plating

2 Where fork-lift trucks are used for handling cargoes, **CS17.3.5** is to be applied for determining the thickness of the inner bottom plating.

Section CS6.9 has been added as follows.

CS6.9 Construction and Strengthening of the Bottom Forward

CS6.9.1 Application

1 Here, "ballast condition" means the ordinary ballast condition where only ballast tanks such as clean ballast tanks, segregated ballast tanks and ballast holds are ballasted. This ballast condition excludes exceptional cases where cargo tanks are ballasted in heavy weather conditions to ensure the safety of the ship.

2 In ships of which C_b is not more than 0.7 and $V/\sqrt{L}$ is not less than 1.4, the construction of the bottom forward is to be as required in the following **(1)**, **(2)** and **(3)**.

(1) Construction

The construction of the strengthened bottom forward is to be in accordance with **6.9.3, Part CS** of the Rules. However, the vertical stiffeners for the solid floors specified in **6.9.3-3, Part CS** of the Rules are to be provided on all shell stiffeners. Where the bottom longitudinals or

longitudinal shell stiffeners are extended through the solid floors, slots are to be reinforced with collar plates.

(2) Scantlings of longitudinal shell stiffeners or bottom longitudinals

(a) In ships having a bow draught of not more than $0.025L$ in ballast condition, the section modulus of longitudinal shell stiffeners or bottom longitudinals in way of the strengthened bottom forward is not to be less than that obtained from the following formula:

$0.53P\lambda l^2$ (cm^3)

Where:

l : Spacing (m) of solid floors

λ : $0.774l$.

However, where the spacing of longitudinal shell stiffeners or bottom longitudinals is not more than $0.774l$, λ is to be taken as the spacing (m).

P : Slamming impact pressure (kPa) obtained from the following formula:

$$2.48\frac{LC_1C_2C_3}{\beta} \text{ } (kPa)$$

C_1: Coefficient given in **Table CS6.9.1-1**. For intermediate values of $V/\sqrt{L}, C_1$ is to be obtained by linear interpolation.

C_2: Coefficient obtained from following formula:

Where $\frac{V}{\sqrt{L}}$ is 1.0 and under: 0.4

Where $\frac{V}{\sqrt{L}}$ is over 1.0, but less than 1.3: $0.667\frac{V}{\sqrt{L}} - 0.267$

Where $\frac{V}{\sqrt{L}}$ is 1.3 and over: $1.5\frac{V}{\sqrt{L}} - 1.35$

β: Slope of the ship's bottom obtained from the following formula, but C_2/β need not be taken as greater than 11.43:

$$\frac{0.0025L}{b}$$

b : Horizontal distance (m) measured at the station $0.2L$ from the stem, from the centre line of the ship to the intersection of the horizontal line $0.0025L$ above the top of the keel with the shell plating (*See* **Fig. CS6.9.1-1**)

C_3: Coefficient obtained from the following formula:

$$C_3 = 1.9 - 0.9\left(\frac{d_f}{0.025L}\right)$$

Where:

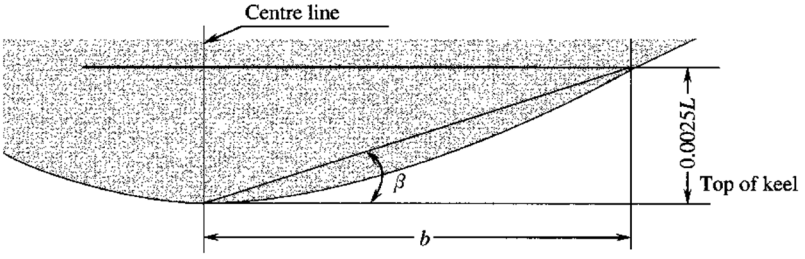
d_f: Minimum bow draught in ballast condition

(b) In ships having a bow draught of more than $0.025L$ but less than $0.037L$ in ballast condition, the section modulus of longitudinal shell stiffeners or bottom longitudinals in way of the strengthened bottom forward is to be obtained by linear interpolation from the values given by the requirements in **(a)** and **6.6, Part CS** of the Rules.

Table CS6.9.1-1 Value of C_1

$V/\sqrt{L}$	1.4	1.5	1.6	1.7	1.8
C_1	0.31	0.33	0.36	0.38	0.40

Fig. CS6.9.1-1 Measurement of b



(Hull section at the station 0.2L from the stem)

(3) Thickness of solid floors

The thickness of solid floors in way of the strengthened bottom forward is obtained from the following requirements **(a)** and **(b)**, whichever is greater:

(a) The thickness obtained from the following formula.

$$\frac{PSb_1}{196(b_1-d_1)} + 2.5 \ (mm)$$

P : Slamming impact pressure given by **(2)(a)**. In ships having a bow draught of more than 0.025L but less than 0.037L in ballast condition, this requirement is to be applied using the actual bow draught in ballast condition.

S : Spacing (m) of solid floors

b_1: Breadth (m) of solid floor panel between the midpoints of the spaces on either side of a bottom longitudinal (excluding longitudinal shell stiffeners provided in between bottom longitudinals)
(*See* **Fig. CS6.9.1-2**)

d_1: Total breadth (m) of openings (lightening holes, slots, etc.) at the level of the floor in question ($d_1 = d_2 + d_3$)
Where, the openings are reinforced with doubling plates, the sectional area may be considered.

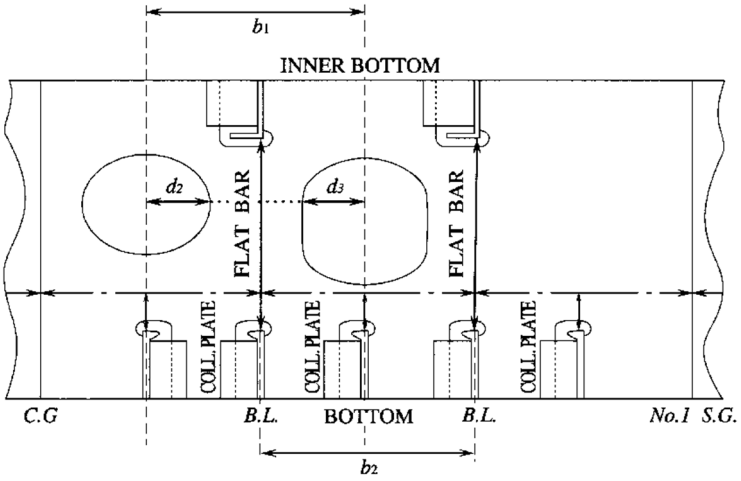
(b) The thickness obtained from the following formula.

$$1.1 \cdot \sqrt[3]{PSb_2{}^2} + 2.5 \ (mm)$$

P and S: As specified in **(a)**.

b_2: Spacing (m) of bottom longitudinals (*See* **Fig. CS6.9.1-2**)

Fig. CS6.9.1-2 Solid Floor



3 In way of the strengthened bottom forward, structural arrangements other than those specified in **6.9.3**, **Part CS** of the Rules may be adopted subject to the following **(1)** to **(3)**.

(1) Solid floors of a longitudinal stiffened system and girders in a transverse stiffened system are to comply with the provisions of **CS6.9.1-2(3)**. The slamming impact pressure P acting on the solid floors of a longitudinal stiffened system may be corrected by multiplying the coefficient C_9 specified in **(3)** below.

(2) The thickness of solid floors and girders is to be in accordance with the value obtained by the following.

$$t_1 = K \cdot \frac{C_8 \cdot P \cdot S \cdot l}{226 \cdot (d_0 - d_1)} + 2.5 \ (mm)$$

K: As specified in **1.2.1-2(2)** of **Annex CS1.3.1-1 "GUIDANCE FOR HULL CONSTRUCTION CONTAINING HIGH TENSILE STEEL MEMBERS"**

P: The applicable slamming impact pressure as specified in **6.9.4-1, Part CS** of the Rules, or **CS6.9.1-2.**

In ships having a bow draught of more than $0.025L'$ but less than $0.037L'$ in ballast condition, the slamming impact pressure of when the bow draught is $0.037L'$ is to be obtained by linear interpolation from the following formula. The slamming impact pressure is not to be less than the value obtained by the following formula.

$P = 1.015L$ (kPa)

C_8: As given by the following formula

This value is not to be less than 0.1 and not to be greater than 1.

$$C_8 = \frac{3}{A}$$

A: Area (m^2) considered in the strength examination, as given by the following formula $A = S \times l$

S: Spacing (m) of solid floors (or girders) when solid floors (or girders) are under consideration

l: Spacing (m) of girders (or solid floors) when solid floors (or girders) are under consideration

d_0: Depth (m) of floors or girders at the considered position

d_1: Depth (m) of openings in the floors or girders at the considered position

(3) In the calculation of the section modulus of longitudinal shell stiffeners and bottom

longitudinals, the slamming impact pressure P may be corrected by multiplying by the coefficient C_9 as given by the following formula. The coefficient C_9 is not to be less than 0.1 and not to be greater than 1.

$$C_9 = \frac{3}{l}$$

l: As given in **6.9.4-1, Part CS** of the Rules

CS6.9.2 Strengthened Bottom Forward

In ships of which C_b is less than 0.7 and the bow draught is less than $0.025L$ in ballast condition, the area of the strengthened bottom forward of the ship is to be expanded as follows. However, ships that carry a certain amount of cargo regularly such as Container Ships need not comply.

(1) The after end of the strengthened area is to be extended the distance a afterwards from the position required in **6.9.2-1 of Part CS**.

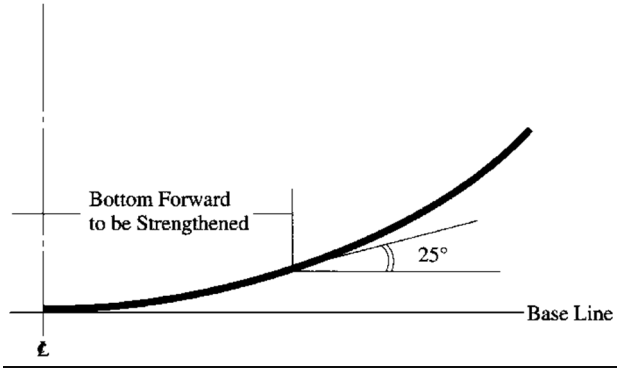
$a = 0 \quad (C_b = 0.7)$

$a = 0.05L \quad (C_b \leq 0.6)$

For intermediate values of C_b, a is to be obtained by linear interpolation.

(2) In addition to **(1)** above, bottom areas whose tangential slope to the base line is less than 25 *degrees* are required to be strengthened. (*See* **Fig. CS6.9.2-1**)

Fig. C6.9.2-1 Transverse Area of Bottom Forward to be Strengthened



Chapter CS7 has been added as follows.

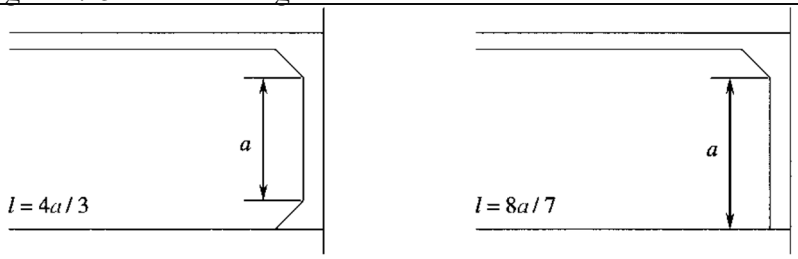
CS7 FRAMES

CS7.5 Tween Deck Frames

CS7.5.2 Scantlings of Tween Deck Frames

Where ends of tween deck frames are connected with brackets that have an arm length longer than *l*/8, the requirements of **7.5.2, Part CS** of the Rules may be applied in the manner shown in **Fig. CS7.5.2-1**.

Fig. CS7.5.2-1 Strong End Connections of Tween Deck Frames



CS7.5.3 Special Precautions Regarding Tween Deck Frames

In ships with multiple decks such as pure car carriers that have freeboards shorter than the length given in **Table CS7.5.3-1**, the tween deck frames above the freeboard deck are to be generally reinforced according to the ship's length as follows.

(1) Range of reinforcement is at least up to the tween deck frames of the first tier above the freeboard deck.

(2) The section modulus of tween deck frames is to be determined applying the requirements of **7.5.2-1, Part CS** of the Rules. However, the coefficient C is to be obtained from **Table CS7.5.3-2**, according to the description of the tween deck frames. The section modulus of parts forward of the collision bulkhead and abaft the after peak bulkhead is not to be less than the values determined applying the requirements in **7.6.1** and **7.6.3, Part CS** of the Rules.

Table CS7.5.3-1 Standard Value of Freeboard

Length of Ship: L (m)	$75>L$	$75 \leq L < 90$
Freeboard (m)	0.36	0.40

Table CS7.5.3-2 Coefficient C

Description of tween deck frames	C
Superstructure frames for 0.125L from fore end and cant frames at stern	0.89
Superstructure frames for 0.125L from aft end	0.74
Superstructure frames excluding above	0.54

Chapter CS8 has been added as follows.

CS8 CANTILEVER BEAM CONSTRUCTION

CS8.3 Connection of Cantilever Beams to Web Frames

1 To prevent the buckling of end brackets of cantilever beams connected to web frames, stiffeners are to be fitted to the brackets, with suitable spacing, in order to keep their panels small as shown in **Fig. CS8.3-1**.

2 Within the range of 1/2 of the throat depth of the end bracket from the side of the face plate, stiffeners such as inverted angles are to be arranged in the direction of compression at the spacing obtained from the following formula. This spacing is deemed as the standard.

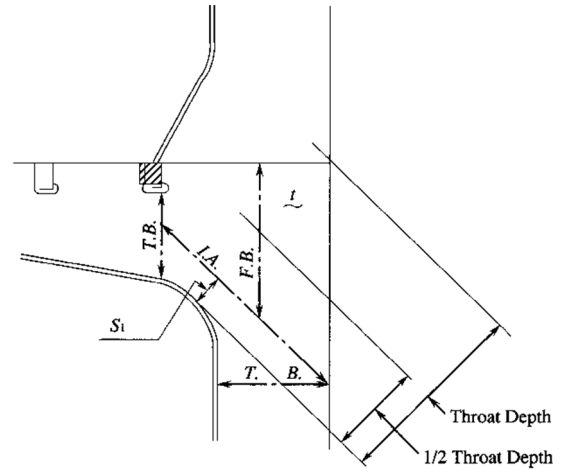
$S_1 = 35(t - 2.5)$

Where:

S_1: Spacing (*mm*) of stiffeners (*See* **Fig. CS8.3-1**)

t : Thickness (*mm*) of bracket

Fig. CS8.3-1 Reinforcement of Brackets



CS9 ARRANGEMENTS TO RESIST PANTING

Section CS9.1 has been added as follows.

CS9.1 General

CS9.1.2 Swash Plates

The scantlings of swash plates in fore and aft peak tanks used as deep tanks are to comply with **9.2.2-5, Part CS** of the Rules.

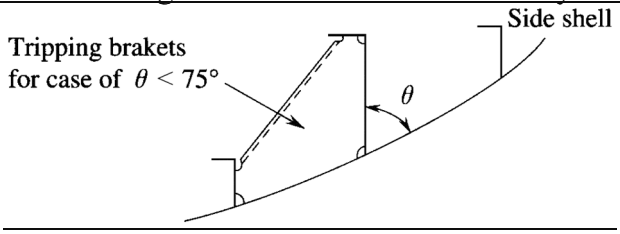
CS9.1.3 Stringers Fitted to Shell at Extremely Small Angles

Where the angle between the web of stringers and the shell plating is smaller than 75°, the stringer is to be treated as follows unless approved otherwise by the Society (*See* **Fig. CS9.1.3-1**). In general, even where stringers and girders attach to the shell at an angle, the actual section modulus is to be calculated against a neutral axis parallel to the shell plating.

(1) Face plates are to be fitted on the side of open bevels.

(2) Tripping brackets are to be fitted spaced suitably.

Fig. CS9.1.3-1 Stringers Fitted to Shell at Extremely Small Angles



Chapter CS10 has been added as follows.

CS10 BEAMS

CS10.1 General

CS10.1.2 Connections of Ends of Beams

1 The connection method of the ends of longitudinal beams shown in **Fig. CS10.1.2-1** is standard.

2 The connection method of transverse beams by means of brackets shown in **Fig. CS10.1.2-2** is standard.

Fig. CS10.1.2-1

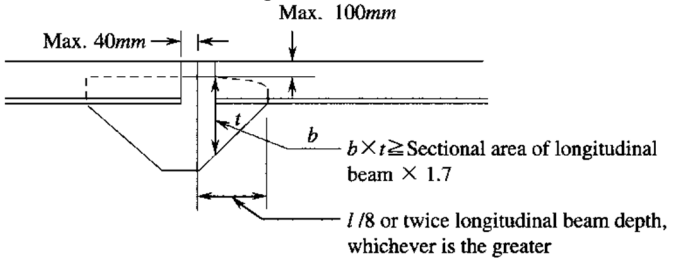
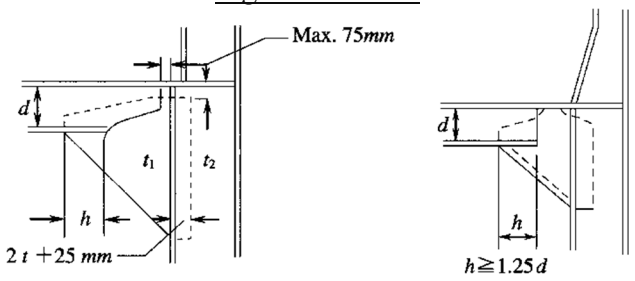


Fig. CS10.1.2-2



$h \geqq 1.5 \times$ width of free flange for inverted angles
$h \geqq 75$ *mm* for bulb plates
$t = t_1$ or t_2, whichever is the smaller

CS10.2 Longitudinal Beams

CS10.2.3 Section Modulus of Longitudinal Beams

The section modulus of longitudinal beams outside the line of hatchway openings of the strength deck fore and aft of the midship part may be determined by interpolation between the requirements of **10.2.3-1** and **10.2.3-2, Part CS** of the Rules. Interpolation may be performed at the middle of each building block in the direction of the ship's length. However, where the length of the block is over 15 *metres*, the block is to be subdivided into appropriate lengths.

CS10.3 Transverse Beams

CS10.3.2 Proportion

Where the span/depth ratio of transverse beams exceeds 30 in strength decks or 40 in effective decks and superstructure decks, the section moduli of these beams are to be increased by the

corresponding ratios.

CS10.7 Deck Beams Supporting Vehicles

CS10.7.1 Section Modulus of Beams

1 The section modulus of beams of decks loaded with wheeled vehicles (hereinafter referred to as "car decks") is not to be less than that obtained from the following formula. Where the span length or moment of inertia changes along the continuous beam, the scantlings of the beam are to be determined by direct strength calculation as specified in **-2**.

$C_1 C_2 M$ (cm^3)

Where:

C_1 : Coefficient determined as follows:

C_1 : 1.0 for $b/S \leq 0.8$

C_1 : 1.25-0.31 b/S for b/S >0.8

Where:

S : Beam spacing (m)

b : Length (m) of wheel print measured at right angle to beams (*See* **Fig. CS10.7.1-1**)

For vehicles with ordinary pneumatic tires, values in **Table CS10.7.1-1** may be used.

C_2 : Coefficient determined from **Table CS10.7.1-2**

M : M_1, M_2 and M_{3j} obtained from the following formulae, whichever is the greatest $(kN \cdot m)$:

$$M_1 = \frac{1}{15}\left[\sum_{i=1}^{N_I} 4P_{Ii}\alpha_{Ii}\left\{1-\left(\frac{\alpha_{Ii}}{l}\right)^2\right\} + \sum_{j=1}^{N_{II}} P_{IIj}\alpha_{IIj}\left(1-\frac{\alpha_{IIj}}{l}\right)\left(7-5\frac{\alpha_{IIj}}{l}\right) - \sum_{k=1}^{N_{III}} P_{IIIk}(l-\alpha_{IIIk})\left\{1-\left(\frac{l-\alpha_{IIIk}}{l}\right)^2\right\}\right]$$

$$M_2 = \frac{1}{15}\left[-\sum_{i=1}^{N_I} P_{Ii}\alpha_{Ii}\left\{1-\left(\frac{\alpha_{Ii}}{l}\right)^2\right\} + \sum_{j=1}^{N_{II}} P_{IIj}\alpha_{IIj}\left(1-\frac{\alpha_{IIj}}{l}\right)\left(2+5\frac{\alpha_{IIj}}{l}\right) + \sum_{k=1}^{N_{III}} 4P_{IIIk}(l-\alpha_{IIIk})\left\{1-\left(\frac{l-\alpha_{IIIk}}{l}\right)^2\right\}\right]$$

$$M_{3j} = \left| R_{II}\alpha_{IIj} - \sum_{r=0}^{j-1} P_{IIr}(\alpha_{IIj}-\alpha_{IIr}) - \left(\frac{M_2-M_1}{l}\right)\alpha_{IIj} - M_1 \right|$$

Where:

$P_{II0} = 0,\ \alpha_{II0} = 0$

l: Span (m) of beam between support points

P_{Ii}, P_{IIj} and P_{IIIk}: Maximum design wheel load (kN) between support points

Where the maximum design wheel loads between support points are given in tons, the values of P_{Ii}, P_{IIj} and P_{IIIk} should be multiplied by 9.81 to convert them into kN. Subscript "I_i" means the ith load point from left end of the Ith beam. Subscript "II_j (or II_r)" means the jth (or rth) load point from left end of the IIth beam. Subscript "III_k" means the kth load point from left end of the IIIth beam. (*See* **Fig. CS10.7.1-2**)

$\alpha_{Ii}, \alpha_{IIj}$ and α_{IIIk}: Distance (m) from each support point to the point of action of wheel load (*See* **Fig. CS10.7.1-2**), when wheels are so arranged that M may be at its maximum value

N_I, N_{II} and N_{III} : Number of wheel loads between each span

R_{II}: The value obtained from following the formula

$$R_{II} = \frac{1}{l}\sum_{j=1}^{N_{II}} P_{IIj}(l - \alpha_{IIj})$$

Fig. CS10.7.1-1 Measurement of Wheel Print Length

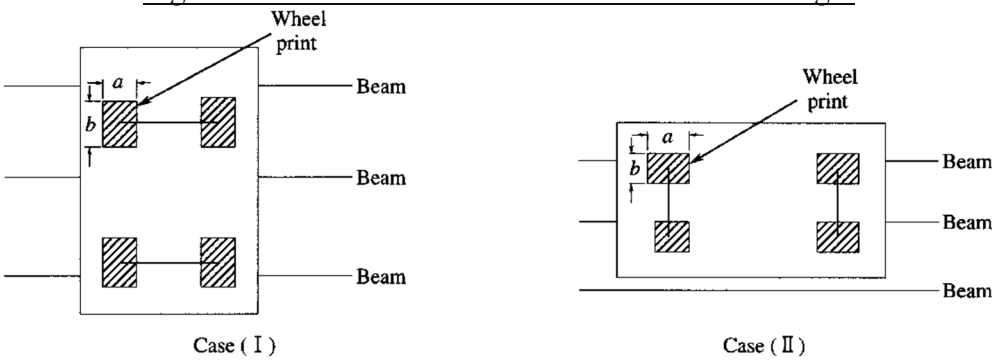


Fig. CS10.7.1-2 Measurement of P_{Ii}, α_{Ii}, l etc.

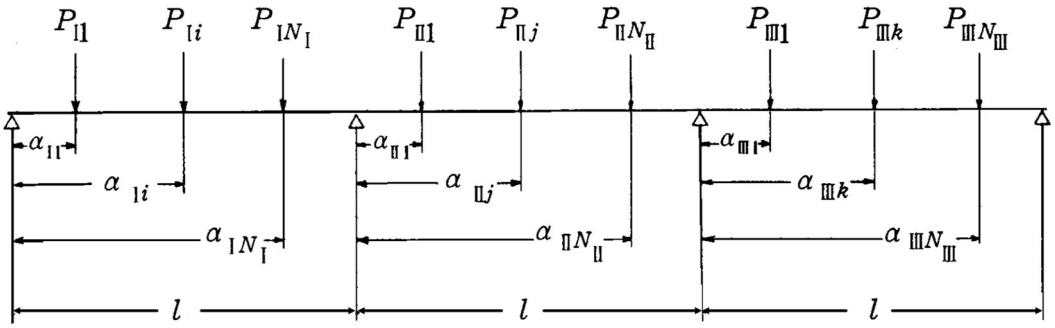


Table CS10.7.1-1 Wheel Print Length (Pneumatic Tires)

	Wheel print length parallel to axle in **Fig.CS10.7.1-1**, *a* in Case (I), *b* in Case(II)	Wheel print length right angles to axle in **Fig.CS10.7.1-1**, *b* in Case (I), *a* in Case (II)
Single tire	Tire width	$\sqrt{P}/20$
Double tire	2×Tire width. Gap between tires, if any, may be added	$9\sqrt{P}/250$

Note:

P: Maximum design wheel load (*kN*). Where the maximum design wheel load is given in tons, the value of *P* should be multiplied by 9.81 to convert it into *kN*.

TableCS10.7.1-2. Value of C_2

		Vehicles exclusively used for cargo handing	Other vehicles
Longitudinal beams of strength decks in mid ship region	Decks where vehicles are exclusively loaded (except weather deck)	$\frac{5.6K}{1-0.34f_{DH}K}$	$\frac{7.0K}{1-0.64f_{DH}K}$
	Elsewhere	$\frac{6.1K}{1-0.34f_{DH}K}$	$\frac{7.7K}{1-0.64f_{DH}K}$
Elsewhere	Decks where vehicles are exclusively loaded (except weather deck)	$5.6K$	$7.0K$
	Elsewhere	$6.1K$	$7.7K$

Notes

f_{DH}: Ratio of the section modulus of transverse section of hull at deck according to the requirements in **Chapter 15, Part CS** of the Rules when mild steel is used to the actual section modulus of hull at strength deck. Where the ratio is less than $0.79/K$, f_{DH} is to be assumed as $0.79/K$

K: Coefficient corresponding to the material, as specified in **1.3.1-2, Part CS** of the Rules

2 Scantlings of beams of car decks may be determined by the direct calculation methods shown below.

(1) The model of structures and the method of calculation are to be those approved by the Society.

(2) Loads are to be assumed as follows:

(a) 1.5×maximum design wheel load for loaded condition with vehicles on car decks

(b) 1.2×maximum design wheel load for vehicles used for cargo handling only (fork-lifts or similar vehicles used for handling cargo in ports only)

(3) The allowable stresses for calculation of the section modulus are to be as shown in **Table CS10.7.1-3.**

(4) To take into account the effects of corrosion and similar wear, the section moduli obtained in **(1)**, **(2)** and **(3)** above are to be multiplied by 1.1 for decks exclusively loaded with vehicles (except the weather deck) and 1.2 for other decks.

Table CS10.7.1-3 Permissible Stress (N/mm^2)

Members	Vehicles used for cargo handling only	Other vehicles
Longitudinal beams of strength decks in midship region	$\frac{235}{K}-80f_{DH}$	$\frac{235}{K}-150f_{DH}$
Elsewhere	$\frac{235}{K}$	$\frac{235}{K}$

Chapter CS11 has been added as follows.

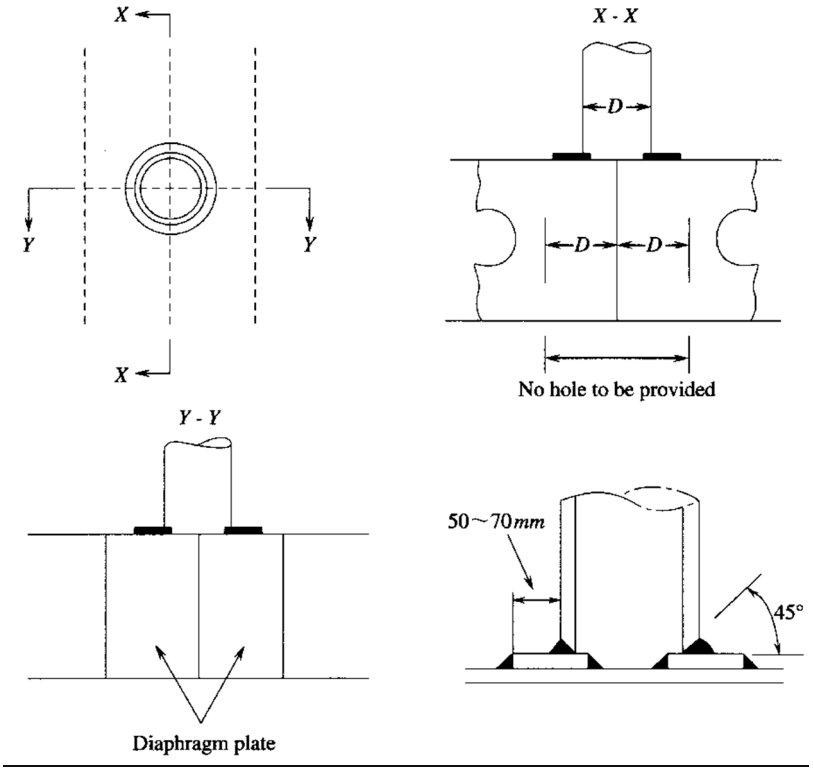
CS11 ILLARS

CS11.1 General

CS11.1.2 Pillars in Holds

The reinforcement under pillars is to be as shown below.

Fig. CS11.1.2-1



CS11.2 Scantlings

CS11.2.1 Sectional Area of Pillars

The sectional area of pillars which can be regarded as fixed at both ends may be obtained from the following formula:

$$\frac{0.223w}{2.72-\frac{0.5l}{k_0}} \ (cm^2)$$

Chapter CS12 has been added as follows.

CS12 DECK GIRDERS

CS12.1 General

CS12.1.3 Construction

1 At the upper and lower ends of pillars and other places where concentrated loads are expected, girders are to be fitted with tripping brackets and slots in the girders are to be fitted with collars. Under the end bulkheads of superstructures, only collars are required. Collars are also to be fitted at the slots near the toes of end brackets.

2 Butt joints of girder webs are to be away from slots. Butt joints of face plates are to be away from knuckled parts. The depth of slots is not to exceed $0.4d_G$. If this limit is exceeded, collars are to be fitted. This depth is not to exceed $0.5d_G$. These requirements may be suitably modified for superstructures.

3 Sizes of lightening holes are to be as follows:

Girder with slot: $d \leq \frac{d_G}{4}$

Girder without slot: $d \leq \frac{d_G}{3}$

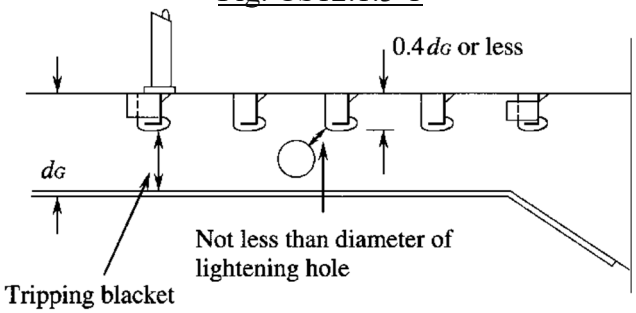
Where:

d_G: Depth of girder

d : Diameter of lightening hole

No lightening hole is to be provided near the toes of brackets or under pillars where shearing force is augmented. The distance between the lightening hole and slot is not to be less than the diameter of the lightening hole. (*See* **Fig. CS12.1.3-1**)

Fig. CS12.1.3-1



4 In ships such as RO-RO ships, the scantlings of girders may be determined by direct calculation of strength.

5 Where the value obtained from the following formula is not less than 1.6, special consideration is to be given to the beams on the shell side or bulkhead side around the mid-span of girders because of added stress due to forced deflection.

$$\frac{I_b l^4}{I_g S b^3}$$

Where:

I_b and I_g : Actual moment of inertia (cm^4) of beam and girder, respectively

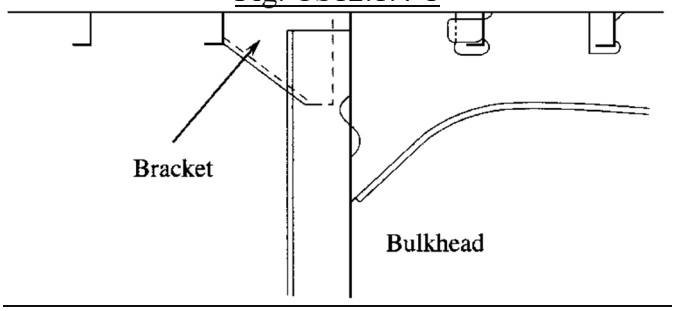
b and l : Span (m) of beam and girder, respectively

S : Beam spacing (m).

CS12.1.4 End Connection

1 Where a girder stops at a bulkhead, a bracket is to be fitted on the reverse side. (*See* **Fig. CS12.1.4-1**)

Fig. CS12.1.4-1



2 Continuity of Deck Girders

(1) The standard depth of a bracket is twice the depth of a web. If the depth of the bracket is smaller than this standard, suitable equivalent means, such as attaching a gusset plate, is to be provided. (*See* **Fig. CS12.1.4-2**)

(2) The girder included in the calculation of the section modulus is to completely penetrate the bulkhead (including the web and face plate) or is to be connected in a way that ensures an equivalently secure bond. (*See* **Fig. CS12.1.4-3**)

(3) Where deck girders are discontinuous, they are to be sufficiently overlapped. (*See* **Fig. CS12.1.4-4**)

Fig. CS12.1.4-2

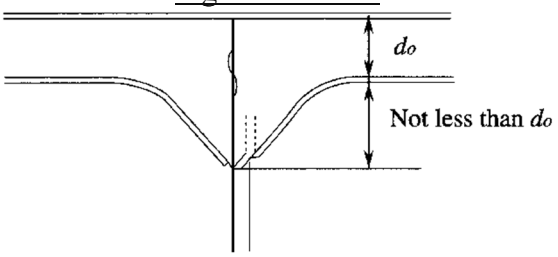


Fig. CS12.1.4-3

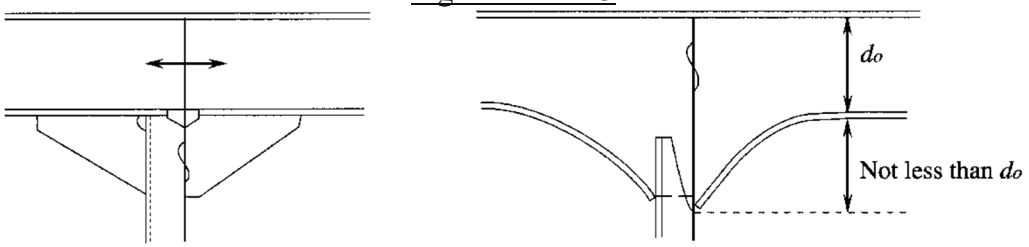
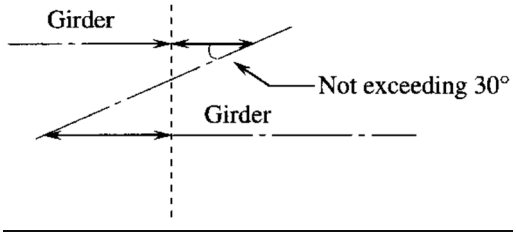


Fig. CS12.1.4-4



CS12.2 Longitudinal Deck Girders

CS12.2.1 Section Modulus of Girders

The section modulus of longitudinal deck girders outside the line of hatchway openings of the strength deck fore and aft of the midship part is generally determined by interpolation as stipulated in **12.2.1-1** and **12.2.1-2, Part CS** of the Rules. Interpolation is to be performed at the centre of the girder's span. However, this may be modified when taking into consideration factors such as the length of building blocks.

CS13 WATERTIGHT BULKHEADS

CS13.1 Arrangement of Watertight Bulkheads

Paragraph CS13.1.1 has been amended as follows.

CS13.1.1 Collision Bulkheads

1 ~~When the position of the collision bulkhead is determined, refer to the provisions of **C13.1.1-1, Part C** of the Guidance.~~ The position of the collision bulkhead is to be determined as shown below.

(1) In case of a Bulbous Bow (*See* **Fig. CS13.1.1-1**)
(When the stem has a hollowed part over the waterline at 85% of the least moulded depth measured from the top of the keel)

(2) In case of a Collision Bulkhead with a Step or Recess (*See* **Fig. CS13.1.1-2**)

Fig. CS13.1.1-1

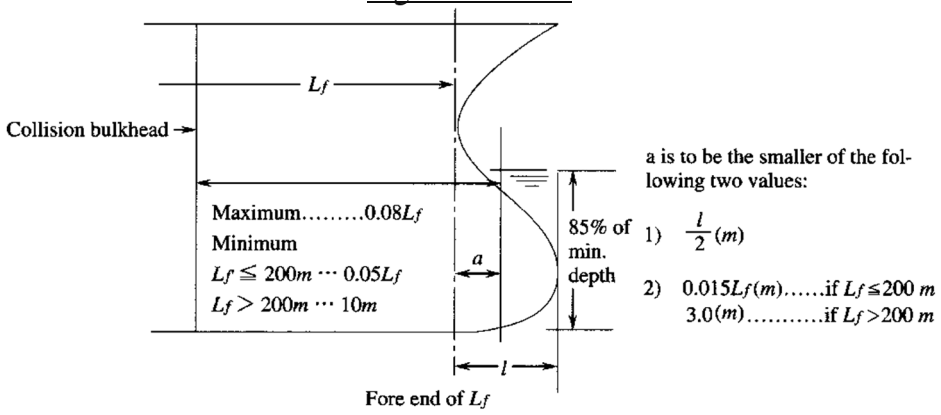
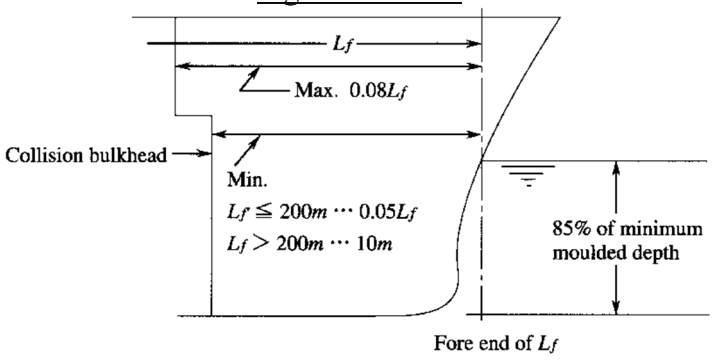


Fig. CS13.1.1-2



2 In ships with bow doors, the collision bulkhead under the deck just above the freeboard deck is to comply with the requirements mentioned in **13.1.1-1** and **-2** and **13.1.5(2), Part CS** of the Rules.

3 "Special structural reasons which are approved by the Society" in **13.1.1-1, Part CS** of the Rules are reasons approved on the basis that an application is submitted together with calculations verifying that no part of the bulkhead deck will be immersed even when the compartment forward of the collision bulkhead is flooded under loaded conditions (without trim) corresponding to the load line.

Paragraph CS13.1.2 has been added as follows.

CS13.1.2 After Peak Bulkheads

Measures to minimize the danger of water penetrating into the ship in case of damage to stern tube arrangements are to be taken.

Paragraph CS13.1.4 has been added as follows.

CS13.1.4 Hold Bulkheads

1 Where the distance between two neighbouring bulkheads is less than $0.7\sqrt{L}$ *m*, these two bulkheads are not counted as two bulkheads.

2 Where the number of watertight bulkheads is smaller than that specified in **13.1.4-1, Part CS** of the Rules, due attention is to be paid to the transverse strength of the hull in accordance with the requirements of **13.1.4-2, Part CS** of the Rules, and the number of watertight bulkheads may be in accordance to one of the following **(1)** to **(3).** Where the number of watertight bulkheads is decreased from that required according to the following **(2)**, an application for the omission of bulkheads stating the reasons for such omission is to be submitted by the shipowner to the Society.

(1) The number of bulkheads arranged in accordance with the following **(a)** and **(b)**.

(a) The ships has sufficient transverse strength of hull

(b) The final waterline does not exceed the upper surface of the bulkhead deck at the side of the ship even after any compartment, except the machinery space, has been flooded under the loading condition corresponding to the summer load water line. The permeability used in flooding calculations is to be in accordance with **Table CS13.1.4-1** and **Table CS13.1.4-2.** However, the following ships are exempted from this calculation.

(i) Tankers in compliance with the requirements of **3.2.2, Part 3 of the Rules for Marine Pollution Prevention Systems**

(ii) Ships carrying liquefied gases in bulk or ships carrying dangerous chemicals in bulk

(iii) Ships in compliance with the requirements of **Chapter 4, Part CS** of the Rules (including ships specified in **CS4.1.1**)

Table CS13.1.4-1. Permeability of Cargo Spaces

Cargo spaces	Permeability
empty	0.95
loaded with general cargo	0.60
loaded with timber	0.55
loaded with ore	0.50
loaded with cars or containers	$0.95 - 0.35 \times \frac{V_C}{V_0}$

Notes:

V_C: Volume (m^3) occupied by cars and/or containers

V_0: Moulded volume (m^3) of the compartment

Table CS13.1.4.-2. Permeability of Deep Tanks

Cargo condition	Permeability
empty	0.95
filled	0

Note:

For spaces loaded with special kinds of cargo, a suitable permeability is used depending on the kind of cargo.

(2) For ships of special types, the number is in accordance with **(a)**, **(b)** or **(c)**

(a) Ships carrying long cargoes (rails, sheet piles or similar long cargoes), train ferries, and car carriers, may omit one bulkhead where the required number is 5 or less, and 2 bulkheads where the required number is 6 or more

(b) Ships having conveyor systems for handling cargoes may omit all the hold bulkheads, if necessary

(c) Ships other than those specified above are, as a rule, not regarded as special type ships

(3) Where special consideration is given for improving safety of ships by means such as that of a double hull, the arrangement of watertight bulkheads may be different from that required in the Rules.

Section CS13.2 has been added as follows.

CS13.2 Construction of Watertight Bulkheads

CS13.2.3 Stiffeners

1 Scantlings of bulkhead stiffeners just under deck girders

The scantlings of bulkhead stiffeners supporting under-deck girders are to comply with the following formula:

$$C\frac{Z_0}{Z}+\frac{W}{A}\leq C$$

Z_0: Required section modulus (cm^3) of stiffener

Z : Actual section modulus (cm^3)

C : 17.7

A : Sectional area (cm^2) of stiffener (may include attached plate)

W: Axial load (kN) of stiffener obtained from the following formula:

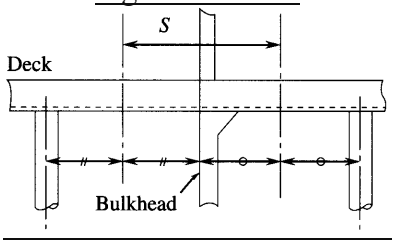
Sbh

S : Distance (m) between mid-spaces of adjacent girders supported by stiffeners (*See* **Fig. CS13.2.3-1**)

b and h : As specified in **12.2.1, Part CS** of the Rules.

In ships having two or more decks, W for the upper tier deck need not be taken into consideration.

Fig. CS13.2.3-1



2 Scantlings of bulkhead stiffeners just under cargo gears and deck girders

The scantlings of bulkhead stiffeners just under cargo gears and deck girders are to comply with **-1** above using the value obtained from following formula as the axial load on the stiffener. Where the stiffeners support only tare weight of cargo gears, the first term in the formula may be zero.

$Sbh+P$ (kN)

S, b and h : As specified in above **-1**

P : Tare weight of cargo gears (kN)

For derrick systems, it may be acceptable to use the value shown in **Table CS13.2.3-1** according to the type of derrick system and the arrangement of derrick booms.

Table CS13.2.3-1 Tare Weight of Derrick Systems (*kN*)

Arrangement of Derrick Booms	Type of Derrick Post	
	Independent type	Gate type
Booms arranged only on fore or aft side	2.0*w*	2.3*w*
Booms arranged on both sides	2.7*w*	3.0*w*

Note:

Where, w : Safe working load (*kN*) of each boom

For booms arranged on both sides, the average value is to be taken.

3 Dimensions of brackets of bulkhead stiffeners

The dimensions of brackets of bulkhead stiffeners are to be as indicated in **Fig. CS13.2.3-2**.

4 Support of stiffeners at decks

Where a deck terminates at the bulkhead, the stiffeners are to have ribs at the level of the deck. (*See* **Fig.CS13.2.3-3**)

Fig. CS13.2.3-2

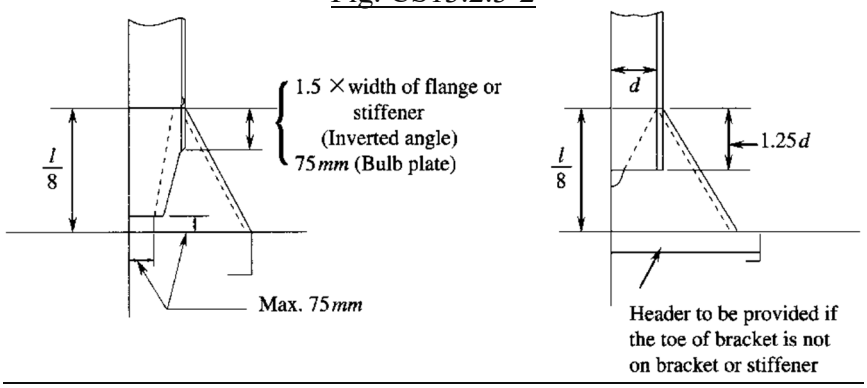
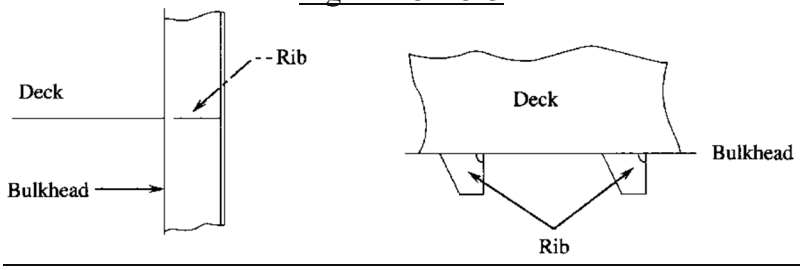


Fig. CS13.2.3-3



CS13.2.9 Corrugated Bulkheads

1 Section modulus of corrugated bulkheads

Where the end connection of corrugated bulkheads is remarkably effective, the coefficient *C* in **13.2.9-2, Part CS** of the Rules may be the value taken from **Table CS13.2.9-1** in calculating the section modulus per half pitch. "Remarkably effective" means the following:

(1) The value of m_1 specified in **Table CS13.2.9-1.** is greater than 0.2 for the connection of the upper end of the corrugated bulkhead to the deck

(2) The value of m_2 specified in **Table CS13.2.9-1.** is greater than 0.6 for the connection of the upper end of the corrugated bulkhead to the stools

(3) The plate thickness of lower stools is not less than half the thickness of the face plates of the

corrugated bulkhead for the connection of the lower end of the corrugated bulkhead to the stools

2 Construction of corrugated bulkheads

(1) Stiffeners are to be provided at the ends of under-deck girders.

(2) Where brackets are fixed to bulkhead plates, pads or headers are to be fitted at the bracket toe.

(3) The angle of corrugation is to be not less than 45°.

(4) Girders fitted to corrugated bulkheads are to be balanced girders, except where the strength of such girders is at least equivalent to that of girders fitted to flat bulkheads. In calculating the actual section modulus of the girder, the depth of the girder is to be taken as shown in **Fig. CS13.2.9-3**. The bulkhead plate of corrugated bulkheads is not to be included into the section modulus of the girder as an effective attached plate.

(5) The lower end of the corrugated bulkhead is to be constructed as shown in **Fig. CS13.2.9-4** (A) or (B). The construction of the upper end is recommended to follow the construction of the lower end.

Table CS13.2.9-1 oefficient *C*

		C		
Col.	Other ends	One end of bulkhead		
		Supported by horizontal or vertical girders	Upper end welded directly to deck	Upper end welded to stool efficiently supported by ship structure
1	Supported by horizontal or vertical girders or lower end of bulkhead welded directly to decks or inner bottoms	As per the Rules	$\frac{4}{2+m_1+\frac{Z_2}{Z_0}}$	$\frac{4}{2+m_2+\frac{Z_2}{Z_0}}$
2	Lower end of bulkhead welded to stool efficiently supported by ship structure	$\frac{4.8\left(1+\frac{l_H}{l}\right)^2}{2+\frac{Z_1}{Z_0}+\frac{Z_H}{Z_0}}$	$\frac{4.8\left(1+\frac{l_H}{l}\right)^2}{2+m_1+\frac{Z_H}{Z_0}}$	$\frac{4.8\left(1+\frac{l_H}{l}\right)^2}{2+m_2+\frac{Z_H}{Z_0}}$
		Not to be less than value of Column 1		

Notes:

In the above table, Z_0, Z_1, Z_2, l_H and l are to be as per the Rules.

m_1 is to be obtained from the following formula for the upper end but it need not exceed Z_1/Z_0.

$$\frac{1}{Z_0}\left[Z_S+\left(\frac{l_L+d_0}{l_L-d_0}+1.0\right)Z_L\right]$$

Z_S is the section modulus (cm^3) of the continuous stiffener at the upper end (*See* **Fig. CS13.2.9-1**).

l_L and Z_L are the span (m) and section modulus (cm^3) of the longitudinal member connected to the upper end. (*See* **Fig. CS13.2.9-1**)

d_0 is as per the Rules.

m_2 is to be obtained from the following formulae, whichever is smaller.

$$\frac{1}{Z_0}\times\frac{1050At}{n}$$

$$3.6\left(\frac{l}{l_0}\right)^2-3$$

A : Area (m^2) enclosed by periphery upper stool (*See* **Fig. CS13.2.9-2**)

t : Average plate thickness (mm) of upper stool (*See* **Fig. CS13.2.9-2**)

n : Number of pitches of corrugation supported by upper stool (*See* **Fig. CS13.2.9-2**)

l_0 : Distance (m) between insides of upper and lower stools (*See* **Fig. CS13.2.9-2**)

Z_H: Section modulus (cm^3) per half pitch of lower end of lower stool (*See* **Fig. CS13.2.9-2**)

Fig. CS13.2.9-1

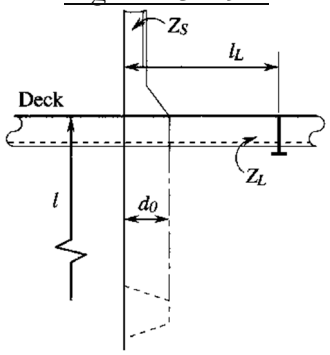


Fig. CS13.2.9-2

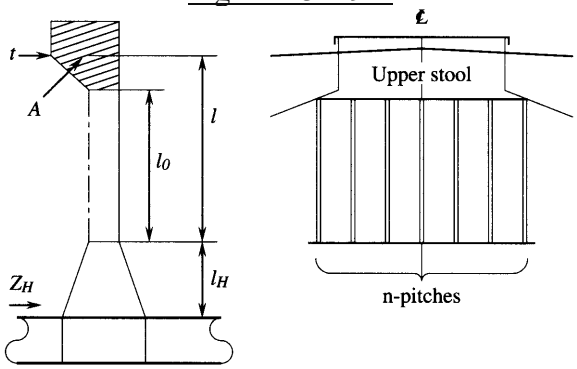


Fig. CS13.2.9-3. Depth of Girder

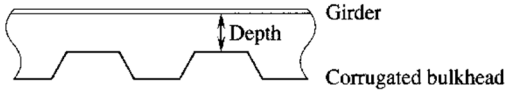
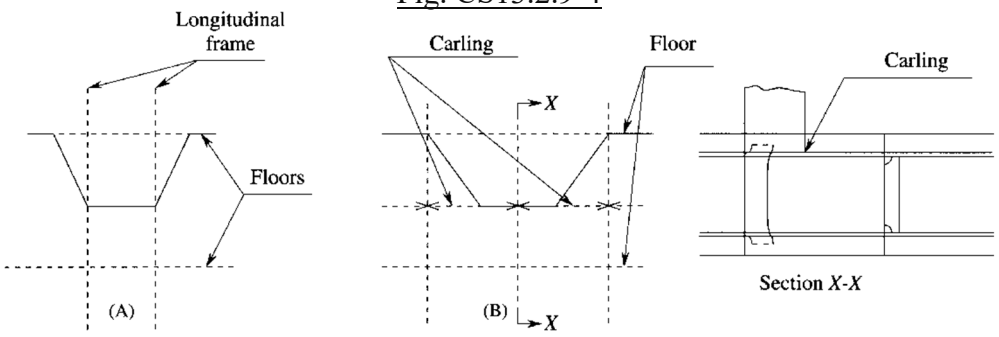


Fig. CS13.2.9-4



Section CS13.3 has been amended as follows.

CS13.3 Watertight Doors

CS13.3.1 General

1 With respect to the provisions of **13.3, Part CS** of the Rules, watertight doors are categorized as the following **(1)** to **(3)** corresponding to their purpose and frequency of use.

(1) Watertight doors which are to be permanently closed at sea

Such doors are open in port and closed before the ship leaves port (*e.g.* bulkhead doors for loading/unloading). The time of opening/closing such doors is to be entered in the log-book.

(2) Watertight doors which are to be normally closed at sea

Such doors are kept closed at sea but may be used if authorized by the officer of the watch and to be closed again after use.

(3) Watertight doors which are used at sea

Kept closed, but may be opened during navigation when authorized by the Administration to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened. The door, however, is to be immediately closed after use.

2 The requirements of **13.3, Part CS** of the Rules apply to watertight doors required by other regulations regarding damage stability requirements. Watertight doors located above the bulkhead deck are to also comply with the requirements for doors provided for means of escape specified in **Chapter 13, Part R** of the Rules.

3 With respect to the provisions of **13.3, Part CS** of the Rules, **Table CS4.3.1-1** and **Table CS4.3.1-2** are also referenced as general requirements for watertight doors.

CS13.3.2 Types of Watertight Doors

Watertight doors provided in watertight bulkheads are to be of a sliding type as far as is practicable. If hinged doors are used, they are to be accessible at any time.

CS13.3.3 Strength and Watertightness

1 "Where deemed necessary by the Society" in **13.3.3-1, Part CS** of the Rules refer to cases other than those specified in the following **(1)** to **(3)**.

(1) The prototype of such doors has been tested by design water pressure

(2) The design of such doors has been verified to have enough strength and watertightness by direct structural analysis

Where watertight doors utilize gasket seals, a prototype pressure test to confirm that the compression of the gasket material is capable of accommodating any deflection is to be carried out.

(3) Such doors are complying with a standard deemed appropriate by the Society

2 Hydrostatic tests specified in **13.3.3-1, Part CS** of the Rules are to be carried out as follows:

(1) The head of water used for the hydrostatic test is to correspond at least to the head measured from the lower edge of the door opening (at the location in which the door is to be fitted in the ship) to 1 *m* above the freeboard deck. However, for watertight doors subject to **4.3.1, Part CS** of the Rules, the head is not to be less than the height of the final damage waterline or the intermediate waterline, whichever is greater.

(2) The acceptable leakage rate at the test is not to be greater than the following values.

(a) Doors with gaskets: No leakage

(b) Doors with metallic sealing: 1 *l/min*

(3) Notwithstanding **(2)** above, the following leakage rate may be accepted for hydrostatic tests on large doors located in cargo spaces employing gasket seals or guillotine doors located in conveyor tunnels.

(a) For doors of design head exceeding 6.10 *m*:

$$\frac{(P+4.572)\cdot h^3}{6568}\ (l/min)$$

P: Perimeter of door opening (*m*)
h: Test head of water (*m*)

(b) For doors with a design head not exceeding 6.10 *m*, the acceptable leakage rate is the value calculated by the formula specified in **(a)** above or 0.375 *l/min*, whichever is greater.

CS13.3.4 Control

1 Where it is necessary to start the power unit for remote operation of the watertight door required by **13.3.4, Part CS** of the Rules, means to start the power unit is also to be provided at remote control stations.

2 Remote controls required by **13.3.4, Part CS** of the Rules, are to be in accordance with the following.

(1) The operating console at the navigation bridge is to have a "master mode" switch with the following two modes of control. This switch is normally to be in the "local control" mode. The "doors closed" mode is only used in an emergency or for testing purposes. Special consideration is to be given to the reliability of the "master mode" switch.

(a) "Local control" mode
This mode is to allow any door to be locally opened and locally closed after use without automatic closure.

(b) "Doors closed" mode
This mode is to permit doors to be opened locally and automatically reclose the doors upon release of the local control mechanism.

(2) The operating console at the navigation bridge is to be provided with a diagram showing the location of each door, with visual indicators to show whether each door is open or closed. A red light is to indicate that a door is fully open and a green light is to indicate that a door is fully closed. When the door is closed remotely, the red light is to indicate the intermediate position by flashing. The indicating circuit is to be independent of the control circuit for each door.

3 Where remote control is required by **13.3.4, Part CS** of the Rules, signboard/instructions are to be placed in way of the door advising how to act when the door is in the "doors closed" mode.

4 With respect to the provisions of **13.3.4, Part CS** of the Rules, where a watertight door is located adjacent to a fire door, both doors are to be capable of independent operation, remotely if required and from both sides of each door.

5 "Navigation bridge" stated in **13.3.4, Part CS** of the Rules means the place where the watch officer is always present and normally implies the navigation bridge deckhouse.

6 With respect to the provisions of **13.3.4-1, Part CS** of the Rules, operation capability with the ship listed at 30 *degrees* to either side is to be verified by tests such as the prototype test.

7 With respect to the provisions of **13.3.4-1, Part CS** of the Rules, power operated doors are also to be capable of being opened and closed by power, in addition to by hand.

CS13.3.5 Indication

1 For watertight doors with dogs/cleats for securing watertightness, position indicators required by **13.3.5, Part CS** of the Rules are to be provided to show whether all dogs/cleats are fully and properly engaged or not.

2 With respect to the provisions of **13.3.5, Part CS** of the Rules, a position indicator may not be required for doors which are designed to confirm easily whether the doors are open or closed from either side and, if applicable, all dogs/cleats are fully and properly engaged or not.

3 The door position indicating system required by **13.3.5, Part CS** of the Rules is to be of a self-

monitoring type and the means for testing it are to be provided at the position where the indicators are fitted.

4 "Position indicators on the bridge showing whether the doors are open or closed" required by **13.3.5, Part CS** of the Rules is to be in accordance with **CS13.3.4-2(2).**

5 "Those permanently closed at sea" stated in **13.3.5, Part CS** of the Rules means "other closing appliances which are kept permanently closed at sea" stated in **4.3.1-2(4), Part CS** of the Rules.

CS13.3.6 Alarms

~~All watertight doors (including sliding doors) operated by hydraulic door actuators, irrespective of whether their control positions are a central hydraulic unit or local operating position, are to be provided with either a low fluid level alarm, a low gas pressure alarm or some other means as applicable for monitoring the loss of stored energy in the hydraulic accumulators. Such alarms are to be both audible and visible and located on the bridge.~~

An audible alarm required by **13.3.6-2, Part CS** of the Rules is to have a sound distinctive from any other alarms in the area, which will sound whenever the door is remotely closed.

CS13.3.7 Source of Power

~~Failure of the normal power supply of alarms required to be installed by **13.3.6, Part CS of the Rules** and by **CS13.3.6** is to be indicated by an audible and visual alarm. This alarm is to be located on the bridge.~~

"Electrical installations for devices specifies in **-1**" stated in **13.3.7-2, Part CS** of the Rules refers to electrical motors for opening and closing the doors and their control components; indicators that show whether the doors are opened or closed; audible alarms; and limit switches for ensuring the door position and their associated cables.

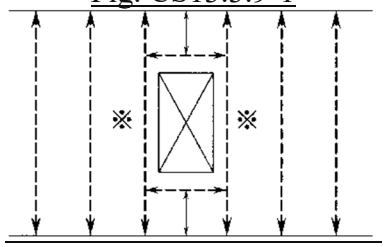
CS13.3.8 Notices

"A device which prevents unauthorized opening" stipulated in **13.3.8-2, Part CS** of the Rules can be a lock that prevents access to closing and/or operating apparatus.

CS13.3.9 Sliding Doors

The section moduli of stiffeners adjacent to both sides of sliding doors (indicated with an asterisk in **Fig. CS13.3.9-1**) are to be determined by the formula for stiffeners of deep tank bulkheads. The upper end of h in the formula is to be the bulkhead deck at the centreline of hull.

Fig. CS13.3.9-1



Chapter CS14 has been added as follows.

CS14 DEEP TANKS

CS14.1 General

CS14.1.3 Divisions in Tanks

1 Length of deep tanks

The length of deep tanks is not to exceed the following limits.

(1) Where no longitudinal bulkhead is provided or a longitudinal bulkhead is provided on the centreline only:

$0.15L_f$ (m) or 10 m, whichever is greater

(2) Where two or more longitudinal bulkheads are provided:

$0.2L_f$ (m) except that the limit is to be $0.15L_f$ (m) in the bow and stern parts of bulk carrier type ships

Further, where the breadth of the wing tank is less than $4L + 500$ (mm), the inner wall cannot be regarded as a longitudinal bulkhead.

2 Divisions

(1) Except in the bow and stern parts, deep tanks extending from side to side of the ship are to have longitudinal divisions in the ship's centreline. However, when it can be confirmed by the stability data that such bulkheads will be unnecessary, they might be omitted.

(2) In fresh water tanks extending from side to side of the ship, fuel oil tanks or other tanks which may not be kept completely full during navigation, wash plates or deep girders are to be provided on the centreline as well as in positions approximately $B/4$ distant from the ship's sides, except when it can be confirmed by the data on the rolling period of the ship and the inherent period of oscillation of water or oil in the tanks, that they will be unnecessary.

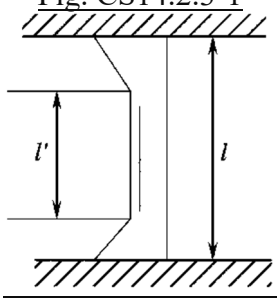
CS14.2 Deep Tank Bulkheads

CS14.2.3 Bulkhead Stiffeners

1 Span of stiffeners

For stiffeners having "Connection Type A," the span may be taken as $4l'/3$ if the arm length of brackets exceed $l/8$. For "Connection Type A," *see* **Fig. CS14.2.3-1**.

Fig. CS14.2.3-1



2 End connection of stiffeners at the top of deep tanks

Stiffeners of deep tank bulkheads, which are not in line with stiffeners of tween deck bulkheads at the top of the tank, are to have bracket ends.

3 Scantlings of bulkhead stiffeners supporting under-deck girders

The scantlings are to be calculated according to **CS13.2.3-1**, taking C as 9.81.

CS14.2.8 Corrugated Bulkheads

1 Upper and lower structures supporting corrugated bulkheads

(1) In cases where stools are not fitted with corrugated bulkheads, the standard upper and lower structures supporting the corrugated bulkheads are to be in accordance with **Table CS14.2.8-1**.

Table CS14.2.8-1 Upper and Lower Structures Supporting Corrugated Bulkheads

Type of corrugated bulkhead		Location	Supporting structure
Vertically corrugated bulkhead	Transverse	Lower	Floors with a thickness that is the same as that of the lower part of a corrugated bulkhead are to be arranged beneath both flanges of the corrugated bulkhead or a floor with a thickness that is the same as that of the lower part of a corrugated bulkhead is to be arranged beneath one flange of the corrugated bulkhead and a bracket with a web depth that is not less than 0.5 times the depth of the corrugation is to be arranged beneath the other side flange of the corrugated bulkhead. (See **Fig.CS14.2.8-1.**)
	Longitudinal	Upper	An on-deck longitudinal girder or an on-deck longitudinal with a web thickness of not less than 80% of the thickness of the upper part of a corrugated bulkhead is to be arranged above both flanges of the corrugated bulkhead.
		Lower	Girders (center girders or side girders) with a thickness that is the same as that of the lower part of a corrugated bulkhead are to be arranged beneath both flanges of the corrugated bulkhead or a girder with a thickness that is the same as that of the lower part of a corrugated bulkhead is to be arranged beneath one flange of the corrugated bulkhead and an inner bottom longitudinal with a web depth that is not less than 0.5 times the depth of the corrugation or an equivalent stiffener is to be arranged beneath the other side flange of the corrugated bulkhead.
Horizontally corrugated bulkhead	Transverse	Lower	A floor with a thickness that is the same as that of the lower part of a corrugated bulkhead is to be arranged beneath the web of the corrugated bulkhead.
	Longitudinal	Upper	An on-deck longitudinal girder with a web thickness that is not less than 80% of the thickness of the upper part of a corrugated bulkhead is to be arranged above the web of the corrugated bulkhead.
		Lower	A girder (center girder or side girder) with a thickness that is the same as that of the lower part of a corrugated bulkhead is to be arranged beneath the web of the corrugated bulkhead.

(2) In cases where a stool is fitted with a corrugated bulkhead, the standard lower stool and structures supporting such a lower stool are to be in accordance with the following **(a)** and **(b)**:

(a) The thickness of the top plate and the uppermost part of the side plating of the lower stool is to be the same as that of the lower part of the corrugated bulkhead.

(b) At the bottom of a lower stool, floors in a double bottom are to be arranged beneath the side plating of the lower stools for transverse corrugated bulkheads and girders (center girders or side girders) are to be arranged beneath the side plating of the lower stools for longitudinal corrugated bulkheads. In addition, the thickness of the upper part of floors and girders are to be the same as that of the side plating of the lower stool.

(3) In cases **(1)** and **(2)** above, any openings such as slots or scallops providing penetration for stiffeners to a floor, web of transverses or girders are to be eliminated or covered by collar plates.

2 Section modulus of corrugated bulkheads

Where the width d_H in the direction of the ship's length of the lower stool of the corrugated bulkhead at the inner bottom is less than 2.5 *times* the web depth d_0 of the corrugated bulkhead, the span l between supports is to be measured as shown in **Fig. CS14.2.8-2**. Further, the section modulus per half pitch of the corrugated bulkhead and the section modulus of the lower stool at the inner bottom are to be obtained from the formulae in **14.2.8-2, Part CS of the Rules**, using the value of C in **Table CS14.2.8-2**.

3 Construction of corrugated bulkheads

The corrugation angle, ϕ, of a corrugated bulkhead is not to be less than 55 degrees. (See **Fig. CS14.2.8-3.**)

4 In evaluating the corrugated bulkheads of compartments intended to carry liquid cargoes with specific gravity, ρ, more than 1.0, the scantlings of the corrugated bulkheads are to be calculated by multiplying h by ρ before using the formulae specified in **14.2.8-1** to **-3, Part CS of the Rules**.

Fig. CS14.2.8-1 Example of Structures Supporting Vertically Corrugated Bulkheads (Transverse Bulkheads)

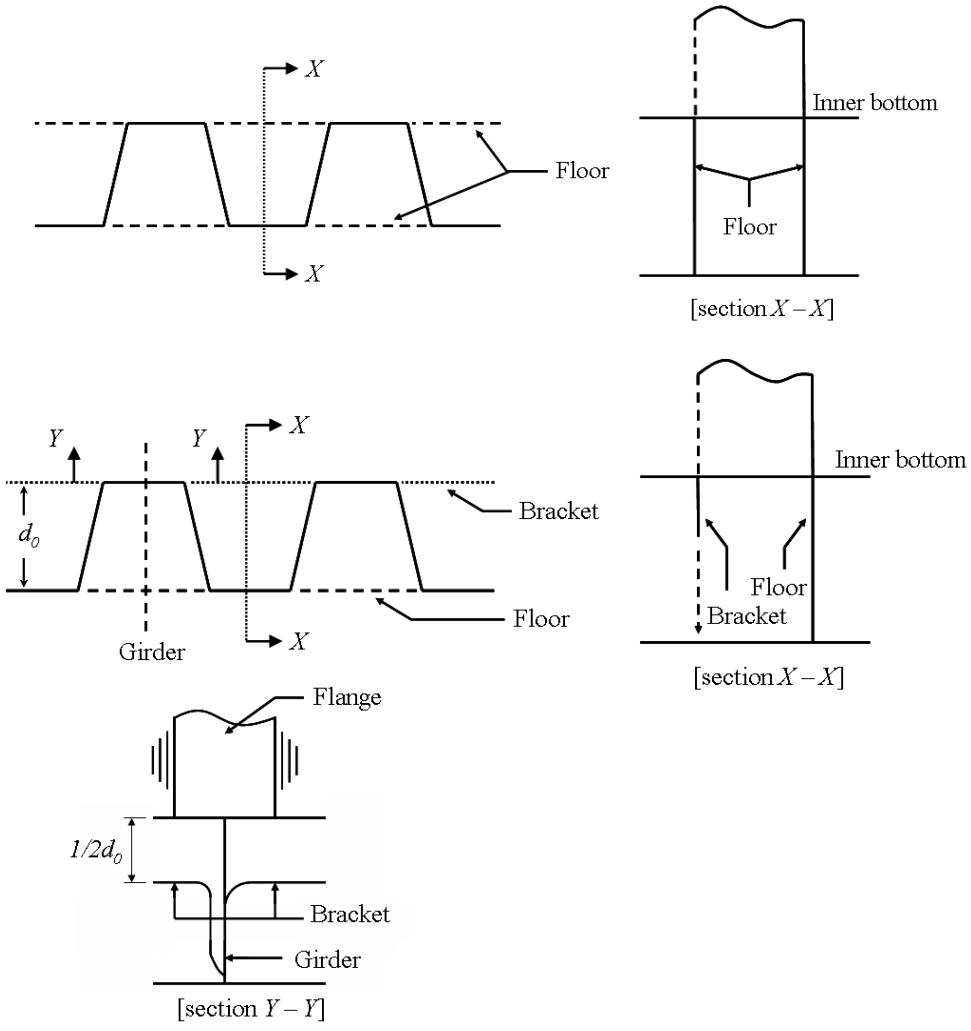


Fig. CS14.2.8-2. Measurement of l where d_H/d_0<2.5

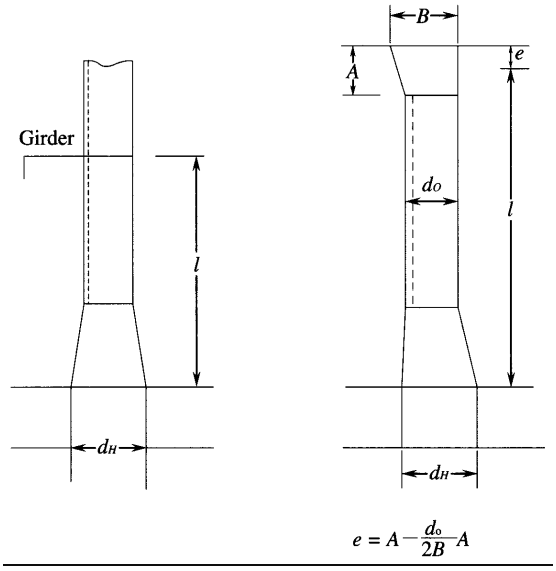


Fig. CS14.2.8-3. Definition of the Corrugation Angle of a Corrugated Bulkhead

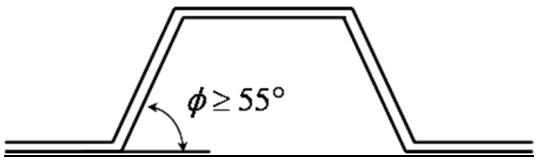


Table CS14.2.8-2 Coefficient C

Upper end support	Supported by girder	Connected to deck	Connected to stool
Section modulus of corrugated bulkhead	1.00	0.85	0.78
Section modulus of stool at bottom	1.00	1.50	1.35

Chapter CS15 has been added as follows.

CS15 LONGITUDINAL STRENGTH

C15.1 General

C15.1.1 Special Cases in Application

The ships stated in **15.1.1, Part CS** of the Rules are to be treated as follows.

(1) Ships of unusual proportion

For ships that have L/B<5 or B/D_s>2.5, adequate consideration is to be given regarding overall strength of the ships in addition to the requirements in **Chapter 15, Part CS** of the Rules.

(2) Ships with especially large hatches

Ships that have hatches with a breadth exceeding 0.7B in the midship part are to have their torsional strength examined.

(3) Ships with especially small C_b

Where C_b' specified in **15.2.1-1, Part CS** of the Rules is less than 0.65, Z_σ specified in **15.2.1-1, Part CS** of the Rules is to be obtained by multiplying by the following coefficient according to the value of C_b'.

$C_b' \leq 0.60$: 1.05

$0.60 < C_b' < 0.65$: 1.65-C_b'

(4) Ships with large flares and high ship speed

According to the values of K_v and K_f obtained from the following formulae, M_w specified in **15.2.1-1, Part CS** of the Rules is to be increased in accordance with the requirements in **(a)** and **(b)**.

$$K_v = 0.2V/\sqrt{L_1}$$

$$K_f = (A_d - A_W)/L_1 h_B$$

Where:

A_d: Area (m^2) projected onto a horizontal plane of exposed deck forward of 0.2L_1 aft of the fore end (including the part forward of the fore end)

Where a forecastle is provided, the horizontal project area of the forecastle overlaps the aforementioned area.

A_w: Water plane area (m^2) corresponding to the designed maximum load line within the forward 0.2L_1

h_B : Vertical distance (m) from designed maximum load line to exposed deck at the side of fore end

(a) Where K_v exceeds 0.28

C_2 specified in **15.2.1-1, Part CS** of the Rules is to be replaced with the value given in **Table CS15.1.1-1** according to the values of K_v and x which is the distance (m) from aft end of L to the position of the considered hull transverse section. For intermediate values of K_v and/or x, the value is to be determined by interpolation.

(b) Where ($K_v + K_f$) exceeds 0.40

C_2 specified in **15.2.1-1, Part CS** of the Rules is to be replaced with the value given in **Table CS15.1.1-2** according to the values of (K_v+K_f) and x only under sagging conditions. For intermediate values of (K_v+K_f) and/or x, the value is to be determined by interpolation.

Table CS15.1.1-1 Modified Value of C_2

K_v	X		
	$0.65L_1$	$0.75L_1$	$1.0L_1$
0.28	1.0	5/7	0
0.32 and over	1.0	0.8	0

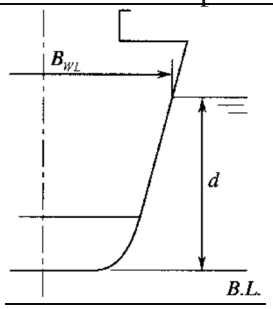
Table CS15.1.1-2 Modified Value of C_2

$K_v + K_f$	X		
	$0.65L_1$	$0.75L_1$	$1.0L_1$
0.40	1.0	5/7	0
0.50 and over	1.0	0.8	0

(5) Other ships

Where the requirements in **15.2.1, Part CS** of the Rules apply, B may be replaced with B_{WL} which is the moulded breadth corresponding to the designed maximum load line at the widest section of the ship. (*See* **Fig. CS15.1.1**)

Fig. CS15.1.1 Breadth of Ships with Inclined Sides



CS15.2 Bending Strength

CS15.2.1 Bending Strength at the Midship Part

1 With respect to the provisions of **15.2.1, Part CS of the Rules**, calculation of the longitudinal bending moment in still water is to be as follows.

(1) To perform the calculation of longitudinal bending moment in still water, the method of calculation used is to be submitted for prior approval by the Society.

(2) For ships intended to be built under Classification survey, calculation sheets for longitudinal strength in still water corresponding to the actual loading plans and the data necessary for the calculations are to be submitted to the Society.

(3) In the Classification Survey, longitudinal strength calculations in still water are to be performed at the time of completion of the ship on each type of operating condition, and the necessary data and results of these calculations are to be included in the loading manual specified in **25.1.1, Part CS of the Rules**.

(4) Where ballast conditions in the actual loading plans (including intermediate conditions specified in **An1.3.1-2. in Annex 3.8, Part 1, Part C of the Rules**) involve partially filled ballast tanks, such conditions where such ballast tanks are assumed to be empty or full are to be included with the calculation sheets for longitudinal strength specified in **(2)** above. Where two or more ballast tanks are partially filled simultaneously at departure, arrival or during the intermediate conditions specified in **An1.3.1-2. in Annex 3.8, Part 1, Part C of the Rules**, all possible combinations with these ballast tanks empty or full are to be considered.

(5) In cargo loaded conditions, the requirements of **(4)** above are to apply to the peak tanks only.

(6) For large wing ballast tanks of ore carriers as defined in **1.3.1(13)(b), Part B of the Rules**, an examination for partially filled ballast tanks specified in **(4)** above, may be according to the following.

(a) Where the ship's trim exceeds one of the following conditions when one or two pairs of these tanks are empty or have full ballast water filling levels, it is sufficient to demonstrate compliance with maximum, minimum, and intended partial filling levels of these tanks such that the ship's condition does not exceed any of these trim limits.

i) Trim by stern of 3% of the ship's length (L_1)

ii) Trim by bow of 1.5% of ship's length (L_1)

iii) Any trim that cannot maintain propeller immersion (I/D) of not less than 25%, where:
I = the distance from propeller centreline to the waterline
D = propeller diameter

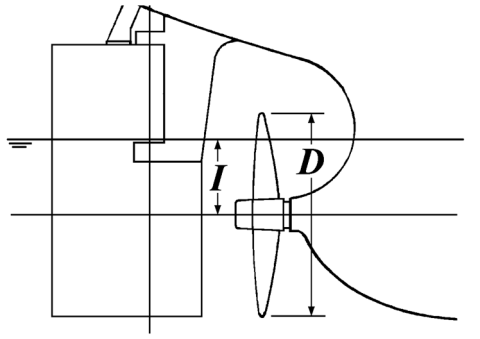
(b) In the application of the provisions of **(a)** above, where two or more pairs of these tanks are intended to be partially filled, filling levels of all other wing ballast tanks are to be considered between empty and full.

(c) In the application of the provisions of **(a)** above, the maximum and minimum filling levels of the above mentioned pairs of side ballast tanks are to be indicated in the loading manual specified in **25.2.1, Part CS of the Rules**.

(7) The provisions of **(4)** to **(6)** above need not apply to ballast water exchange using the sequential method. However, bending moment and shear force calculations for each de-ballasting or ballasting stage in the ballast water exchange sequence are to be included in the loading manual or ballast water management plan of any vessel that intends to employ the sequential ballast water exchange method.

(8) For the application of the provisions of **(4)** to **(6)** above, reference is to be made to **Annex 4.3, Part 1, Part C of the Rules**.

Fig. CS15.2.1-1 Propeller Immersion



CS15.2.3 Calculation of Section Modulus of Transverse Section of Hull

1 Unit of section modulus of transverse section of hull

The section modulus Z (cm^3) is to have five significant figures.

2 Members included in longitudinal strength

The ratio of inclusion of members effective for longitudinal strength is to be as follows.

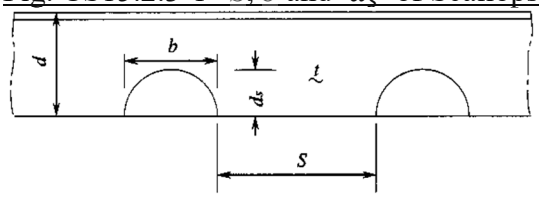
(1) All intercostal plates may be included if the fillet welding complies with **12.2.1.3-2, Part 1, Part C of the Rules**.

(2) All doubling plates may be included if fitted during ship construction or 90% if fitted during conversion or addition.

(3) For side stringers, slots for frames are to be deducted.

(4) Scallops complying with the following conditions need not be deducted from the sectional area. (*See* **Fig. CS15.2.3-1**)
(a) d_s not exceeding $d/4$ nor exceeding $7t$, maximum 75 *mm*
(b) S more than $5b$ and more than $10d_s$

Fig. CS15.2.3-1 S, b and d_s of Scallops



(5) As for the longitudinal continuous decks between hatchways of ships having 2 or 3 rows of cargo hatches, the ratio of sectional area to be included in the calculation of the section modulus is to be obtained from **Table CS15.2.3-1**. For intermediate values of ξ and l/L, linear interpolation is to be applied.

Table CS15.2.3-1 Ratio of Inclusion of Sectional Area

	Hatches in 2 rows			Hatches in 3 or more rows		
ξ	l/L					
	0.10	0.20	0.30	0.10	0.15	0.20
0	0.96	0.85	0.70	0.96	0.91	0.85
0.5	0.65	0.57	0.48	0.89	0.80	0.69
1.0	0.48	0.43	0.36	0.83	0.73	0.62
2.0	0.32	0.29	0.25	0.73	0.63	0.53
3.0	0.24	0.22	0.18	0.65	0.57	0.47

Notes:

ξ = Values obtained from the following formula:

$$\frac{ab^3}{lI_c}\left\{\frac{1+2\mu}{6(2+\mu)}\times 10^4 + 2.6\frac{I_c}{a_c b^2}\right\}$$

Where:

I_c : Moment of inertia (cm^4) of deck between hatches, including hatch coamings

a_c: Effective shear area (cm^2) of deck between hatches

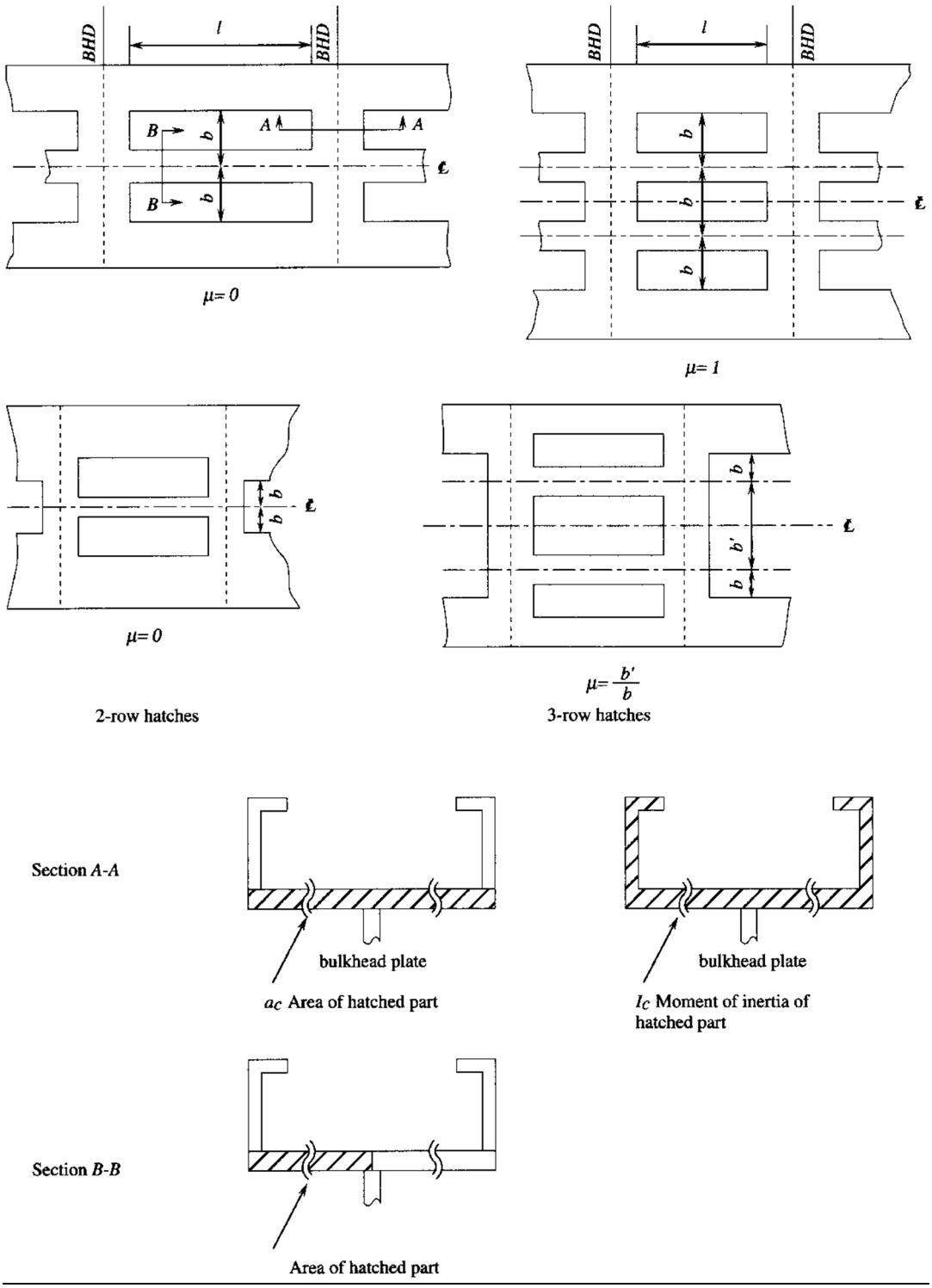
a : Sectional area (cm^2) of continuous deck between hatches (port or starboard side half)

l : Length (m) of hatch

μ , b : As per **Fig. CS15.2.3-2** (m)

(6) Where the sectional area of longitudinals, which are unable to be continued due to factors such as the arrangement of small hatch openings are compensated by adjacent ones, they may be included in the calculation of the section modulus of the transverse section.
(7) Where the car deck plating of exclusive car carriers are intermittently welded in lap joints, they are not to be included in the calculation of the section modulus of the transverse section.

Fig. CS15.2.3-2. l, b and μ



3 Openings in strength decks

Openings in strength decks outside the line of hatch openings are to be treated as mentioned below.

(1) Where the shape and dimensions do not meet the conditions in **Table CS15.2.3-3**, reinforcement by means of rings, thicker plates, etc. is required (*See* **Fig. CS15.2.3-3** and **Fig. CS15.2.3-4**)

(2) Where the intervals between centres of holes e do not meet the conditions in **Fig. CS15.2.3-5**, reinforcement as per **(1)** above is needed.

Table CS15.2.3-3

	Elliptic holes	Circular holes
Oil tankers	$\frac{a}{b} \le \frac{1}{2}, a \le 0.06B$ $(a_{max} = 900\ mm)$	$a \le 0.03B$ $(a_{max} = 450\ mm)$
Cargo ships	$\frac{a}{b} \le \frac{1}{2}, a \le 0.03(B - b_H)$ $(a_{max} = 450\ mm)$	$a \le 0.015(B - b_H)$ $(a_{max} = 200\ mm)$

Fig. CS15.2.3-3 Where Elliptic Hole and Circular Hole are in Same Cross-section

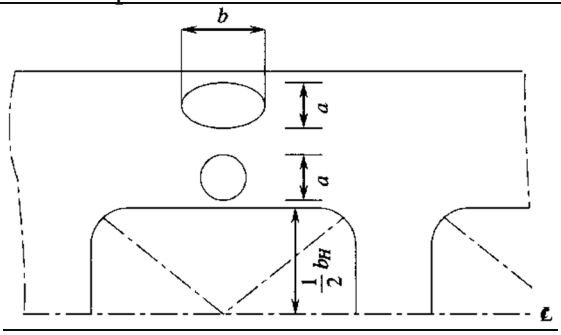


Fig. CS15.2.3-4 Reinforcement by Means of Ring

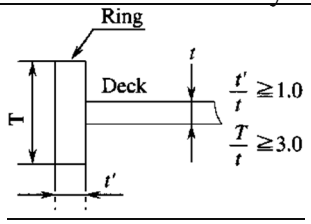
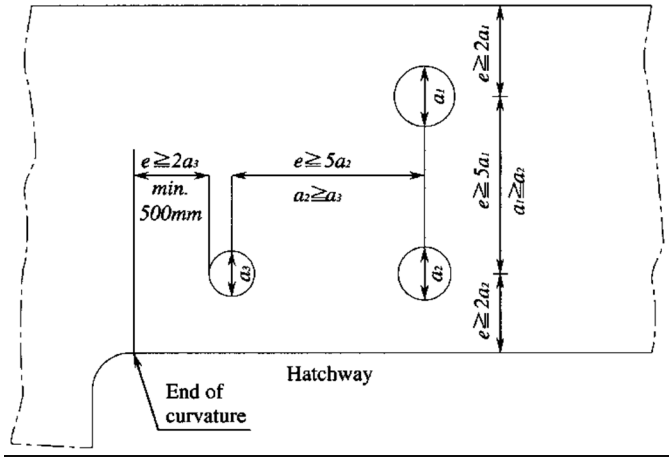


Fig. CS15.2.3-5 Intervals between Centres of Holes



CS16 PLATE KEELS AND SHELL PLATING

Section CS16.3 has been added as follows.

CS16.3 Shell Plating for Midship Part of Ship

CS16.3.3 Sheer Strakes

Precautions regarding sheer strakes

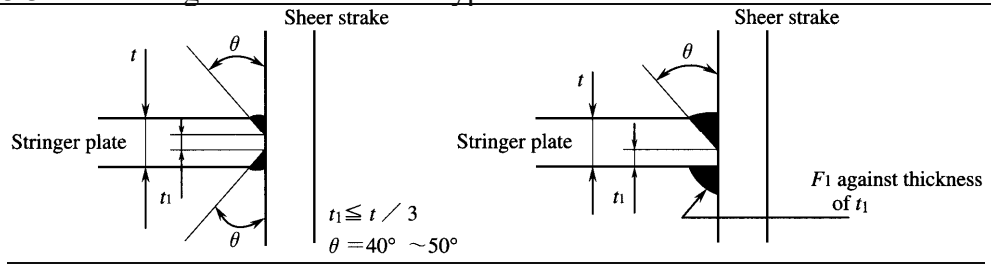
(1) The upper edges of sheer strakes are to be properly smoothed.

(2) Bulwarks are not to be directly welded to sheer strakes in the range of 0.6L amidships. Furthermore, fixtures such as eye plates are not to be directly welded on to the upper edge of sheer strakes, except in the fore and aft end parts.

(3) Special care should be taken where fixtures, gutter bar ends, etc. are directly welded on to the curved parts of round gunwales.

(4) At least for 0.6L amidships, the standard manner of welding construction of T-type joints between sheer strakes and stringer plates of the strength deck is to be as shown in **Fig. CS16.3.3-1**. However, where the thickness of stringer plates is less than 13 *mm*, fillet welds of F_1 grade may be acceptable without edge preparation.

Fig. CS16.3.3-1 Welding Construction of T-type Joints between Sheer Strakes and Stringer Plates



CS16.4 Special Requirements for Shell Plating

Paragraph CS16.4.4 has been added as follows.

CS16.4.4 Shell Plating of Bottom Forward

1 In ships of which C_b is not more than 0.7 and $V/\sqrt{L}$ is not less than 1.4, the thickness of shell plating at the strengthened bottom forward specified in **CS6.9.2** is to be determined in accordance with **16.4.4, Part CS** of the Rules using P in **CS6.9.1-2(2)(a)**.

Section CS16.5 has been added as follows.

CS16.5 Side Plating in way of Superstructure

CS16.5.3 Compensation at Ends of Superstructure

The manner of construction at the ends of superstructures is to be as shown in **Fig. CS16.5.3-1** or **Fig. CS16.5.3-2**.

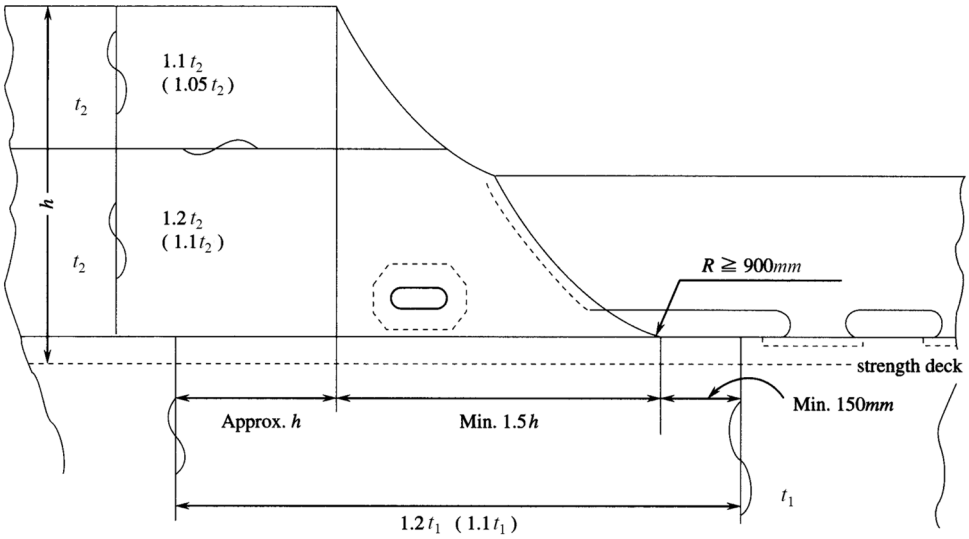
(1) The side shell plating of the superstructure is to be well extended beyond the end of the superstructure to terminate with an ample radius ($R \geq 900$ *mm*).

(2) Butt welding joints of sheer strakes at the strength deck is to be off by at least 150 *mm* from the R-end.

(3) The rate of thickening of shell plating in the region of 0.4L amidships is to be as shown in **Fig. CS16.5.3-1** and **Fig. CS16.5.3-2** (even when an expansion joint is not provided, the rate of thickening is to be the same). The rate of thickening is to be zero in the region 0.2L from the fore and aft ends of the ship. At intermediate points, the rate is to be determined by linear interpolation.

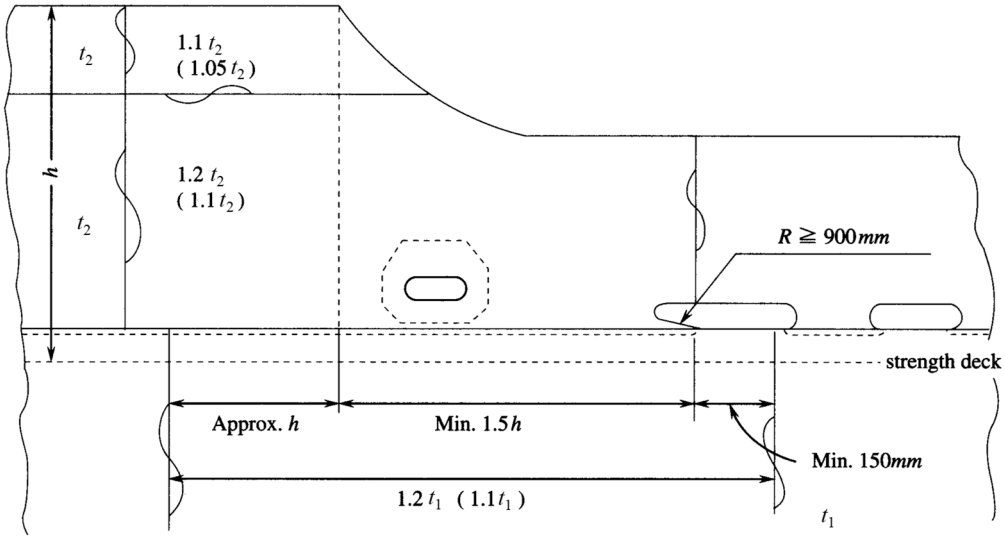
(4) Where the superstructure is set in, no thickening of shell plating is needed.

Fig. CS16.5.3-1 Construction at the End of Superstructure (With Expansion Joint)



Notes: 1. t_1 = Thickness of sheer strake
2. t_2 = Thickness of superstructure side plating
3. Figures without brackets ( ) show the case where the superstructure deck is regarded as the strength deck.
4. Figures in brackets ( ) show the case where the superstructure deck is not the strength deck.

Fig. CS16.5.3-2 Construction at the End of Superstructure (Without Expansion Joint)



Notes: For symbols, the **Notes** to **Fig. C16.6.1-1** are to be referred to.

Section CS16.6 has been added as follows.

CS16.6 Local Compensation of Shell Plating

CS16.6.1 Openings in Shell

Compensation for openings

(1) Openings in shell plating of 300 *mm* or more in size are to be compensated by doubling plate or by thickening of the plate.

(2) In the end parts of the hull, proper modifications may be accepted in regards to the compensation for openings.

(3) The radius at the corners of openings is to be at least 100 *mm*.

CS16.6.2 Recesses

Refer to **CS16.6.1** for compensation of openings.

Chapter CS17 has been added as follows.

CS17 DECKS

CS17.1 Value of Deck Load *h*

CS17.1.1 Value of *h*

Suitable documents which specify values of the deck load h (kN/m^2) prescribed in **17.1.1-1, Part CS** of the Rules (e.g. Loading Manual) are to be provided on board to aid the ship's master.

CS17.2 General

CS17.2.1 Steel Deck Plating

1 Decks which are not fully plated

(1) Stringer plates

Decks not fully plated are to have stringer plates of an appropriate breadth and of a thickness not less than that determined for deck plating in accordance with the requirements in **17.4, Part CS** of the Rules for the positions concerned. The stringer plates of effective decks are to be effectively connected to the shell plating.

(2) Tie plates

Tie plates are to be provided along hatch sides, in way of pillars, on the under-deck girders and under deckhouse coamings. These tie plates are to have an appropriate breadth and a thickness not less than that determined for deck plating in accordance with the requirements in **17.4, Part CS** of the Rules for the positions concerned.

(3) In way of transverse bulkheads and at the ends of deck openings

In way of transverse bulkheads and at the ends of deck openings, the deck is to be suitably plated with steel plates.

2 Wooden decks

(1) Materials

(a) The materials of wooden deck planking are to be of a good quality well seasoned and without rots, saps, cracks and defective knots.

(b) The term "hard wood" means materials such as teak, and the term "soft wood" those such as cedar.

(2) Scantlings of wooden deck planking

Deck planks are to be effectively arranged and fixed, and their thickness is not to be less than 63 *mm* for soft wood and 50 *mm* for hard wood. The thickness may be suitably reduced in spaces appropriated for living accommodation and navigation works only.

CS17.2.2 Watertightness of Decks

1 Where the rudder stock penetrates the deck lower than 1.5 *m* above the load line, special attention is to be given to the watertightness at the penetration.

2 With respect to the provisions of **17.2.2-2, Part CS** of the Rules, decks required to be watertight are to be in accordance with following **(1)** and **(2)**.

(1) Deck structures are to comply with related provisions of **Chapter 13, Part CS** of the Rules for the pressure due to head of water in the most severe conditions at the intermediate or final stages of flooding specified in **Chapter 4, Part CS** of the Rules. In this case, such decks are to be regarded as the part of the deck which forms bulkhead recesses.

(2) Where the trunks and other constructions penetrating watertight deck are provided, such trunks are to be capable of withstanding the pressure due to a head of water up to the bulkhead deck

and head of water in the most severe conditions at the intermediate or final stages of flooding specified in **Chapter 4, Part CS** of the Rules.

CS17.2.4 Compensation for Openings

1 All corners of openings in decks, such as hatchways, are to be well rounded, properly smoothed and reinforced, as necessary, by thickening the deck plating or by means of doubling plates.

(1) Regions where thicker plating or doubling plates are required

Strength deck: Within 0.75*L* from ℄

Effective 2nd deck: Within 0.6*L* from ℄

3rd deck and lower decks: No doubling needed, as a rule

Superstructures and long deckhouse:

Doubling within 0.6*L* from ℄ for decks immediately above the strength deck

(2) Plate thickening and doubling plates may be properly reduced depending upon their locations. (*See* **Fig. CS17.2.4-1**)

(3) The dimensions and thickness of doubling plates or ranges of thickening are to be determined considering the degree of stress concentration around the openings.

(4) The minimum radii at the corners are to be as follows:

Within 0.5*L* from ℄ of strength deck: 250 *mm*

Elsewhere: 200 *mm*

The radius may be suitably reduced for small openings. For companionways and similar small openings, the radius at the corners may be 150 *mm* in the strength deck outside the line of openings and 75 *mm* or so elsewhere.

(5) For corners of openings having a radius not less than 600 *mm* or having a parabolic or similar shape, neither doubling plates nor thickening of the plating is required. The recommended corner shape is as shown in **Fig. CS17.2.4-2.**

(6) No welded joints are permitted at the corners of openings in the strength deck. The welded joints are to be properly off the end of the curvature. (*See* **Fig. CS17.2.4-3**)

Fig. CS17.2.4-1

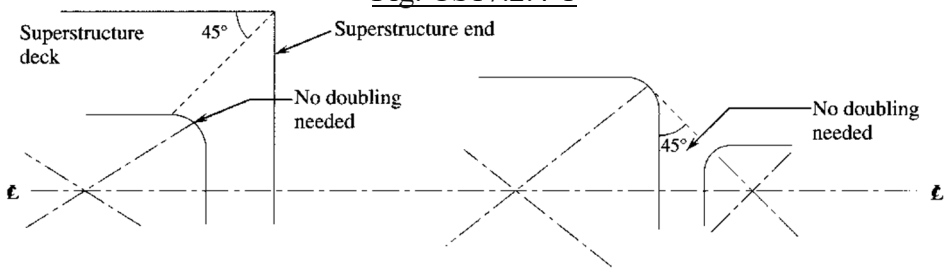


Fig. CS17.2.4-2

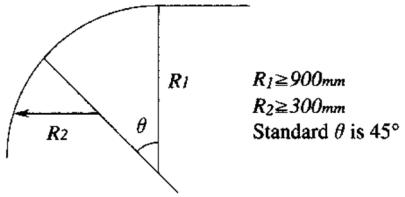
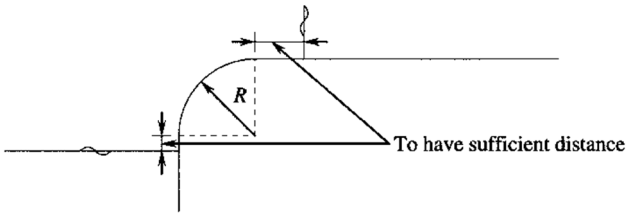
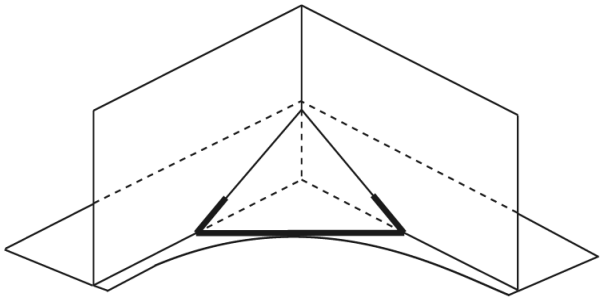


Fig. CS17.2.4-3



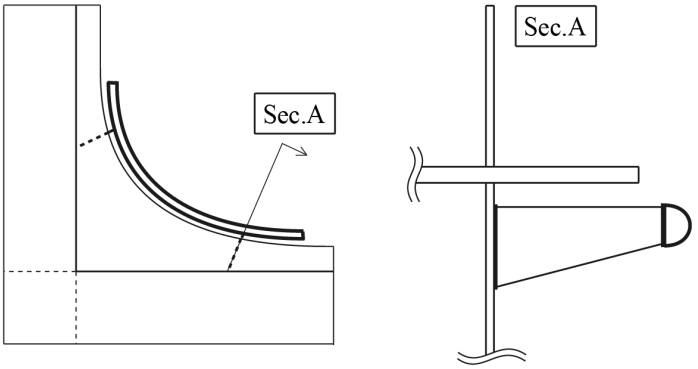
2 Where attachments such as slant plates or protective means are provided as stated in **17.2.4-2, Part CS of the Rules**, such attachments are to be provided as referred to the method shown in **Fig. CS17.2.4-4** or **Fig. CS17.2.4-5**.

Fig. CS17.2.4-4 Example of the Method for Providing Slant Plates



Note:
The connections between slant plates and strength deck (indicated in the bold line) are not to be welded.

Fig. CS17.2.4-5 Example of the Method for Providing Protective Means



Note:
Protective means (i.e. half round bars) are to be provided on hatch side girders and hatch end beams.

CS17.2.5 Rounded Gunwales

Where rounded gunwales are made of steel plate of Grade *D* or Grade *E*, the inner radius of the curvature is not to be less than 20 *times* the thickness of the gunwale plate. However, where the width of the sheer strake that is bent to form the rounded gunwale is not less than 500 *mm* plus the plate width of the strake prescribed in **3.2.2.1-4, Part 1, Part C of the Rules** or the method of bending work is especially approved by the Society, the radius may be reduced down to 15 *times* the plate thickness.

CS17.3 Effective Sectional Area of Strength Deck

CS17.3.2 Effective Sectional Area of Strength Deck

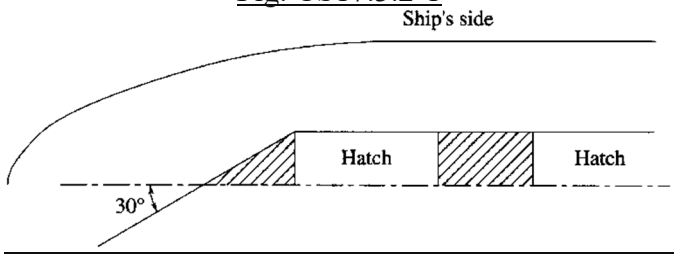
1 Members to be included in the calculation of the actual sectional area of strength deck

In addition to the deck plating, members attached to the deck plating, such as stringer angles and longitudinal beams, which are included as longitudinal strength members are to be included in the calculation of the actual sectional area. The shaded areas in the figure below are not to be included in the calculation. (*See* **Fig. CS17.3.2-1**)

2 Where round gunwales are provided, the sectional area is to be calculated assuming that the plate of the round gunwale is horizontally extended to the ship's side.

3 In the requirements of **17.3.2-3, Part CS** of the Rules, "the value approved by the Society" means the value obtained by applying the provisions of **15.2.1-1, Part C of the Rules** by using the coefficient C_2 obtained from the dotted line in **Fig. CS15.1, Part C of the Rules**.

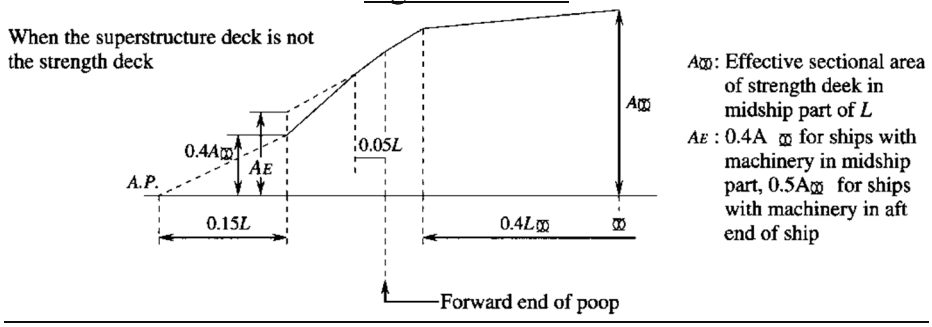
Fig. CS17.3.2-1



CS17.3.4 Effective Sectional Area of Strength Deck within Long Poop

When the superstructure deck is not the strength deck (*See* **Fig. CS17.3.4-1**)

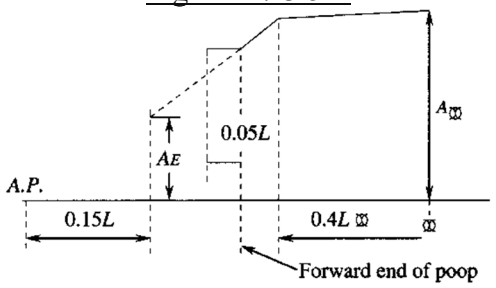
Fig. CS17.3.4-1



CS17.3.5 Deck within Superstructure where Superstructure Deck is Designed as Strength Deck

In case of poop deck (*See* **Fig. C17.3.5-1**)

Fig. CS17.3.5-1



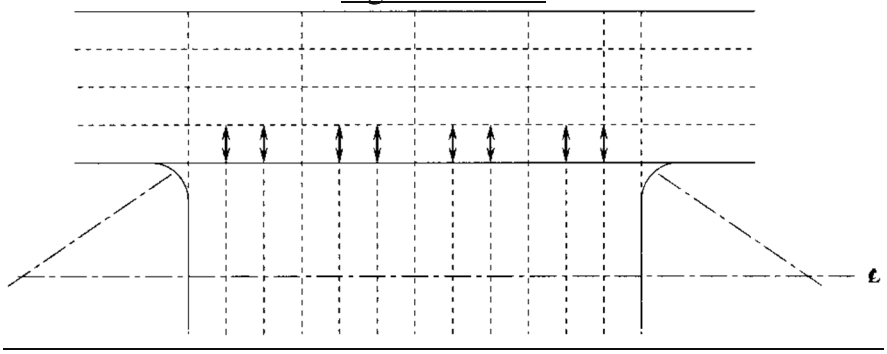
$A_{\text{Ⓕ}}$ and A_E are as specified in **Fig. C17.2.4-1**

CS17.4 Deck Plating

CS17.4.1 Thickness of Deck Plating

For prevention of deck buckling, the deck within the line of openings is recommended to be constructed using the transverse framing system. (*See* **Fig. C17.4.1-1**)

Fig. CS17.4.1-1



CS17.4.5 Thickness of Deck Plating Loaded with Wheeled Vehicles

The thickness of deck plating loaded with wheeled vehicles is to be determined according to **(1)** or **(2)** below. The thickness of plating of the weather deck is to be 1 *mm* thicker than that obtained from these formulae.

(1) Where the distance between the centres of wheel prints in a panel is not less than ($2S + a$):

$$C\sqrt{\frac{2S-b'}{2S+a}\cdot\frac{P}{9.81}}+1.5 \quad (mm)$$

Where:

C: Coefficient obtained from **Table CS17.4.5-1**

S: Beam spacing (m)

P: Maximum designed wheel load (kN), or, if $b > S$, a value equal to the maximum designed wheel load multiplied by the value of S/b

Where the maximum designed wheel load is given in tons, the value of P should be multiplied by 9.81 to convert it into kN.

b' : b or S, whichever is the smaller

a and b : Dimensions of wheel print as shown in **Fig. CS10.7.1-1**
However, for vehicles with ordinary pneumatic tires, values of a and b in **Table CS10.7.1-1** may be used.

(2) Where the distance between centres of wheel prints in a panel is less than ($2S + a$) (*See* **Fig. CS17.4.5-1**):

$$C\sqrt{\frac{2S-b'}{2S+a+e}\cdot\frac{nP}{9.81}}+1.5 \quad (mm)$$

Where:

C, S, a, b' and P: As specified in **(1)** above

e: Sum of distances (m) between centres of wheel prints where wheels are placed side by side at a spacing of less than ($2S + a$) in one panel (*See* **Fig. CS17.4.5-1**)

n: Number of wheel loads in the range of e

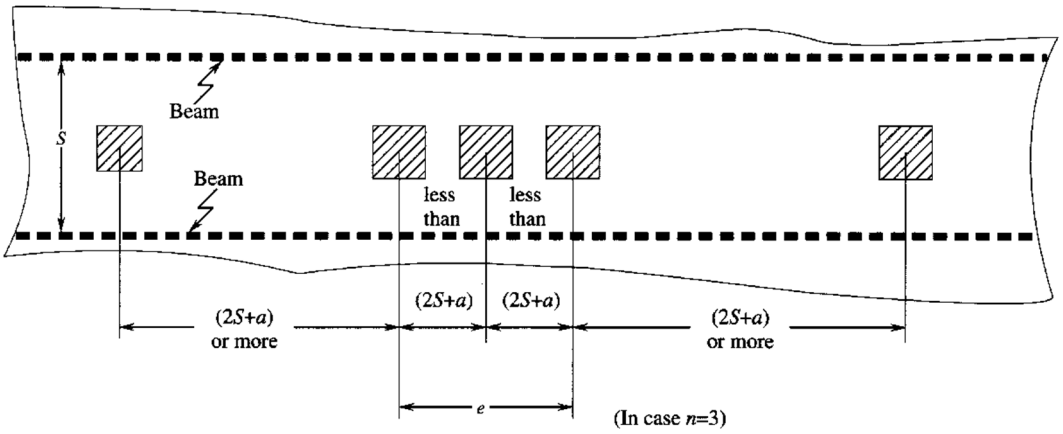
Table CS17.4.5-1 Values of C

		Vehicles exclusively used for cargo handling	Other vehicles
Midship part of strength deck	Longitudinal framing	$4.6\sqrt{K}$	$\frac{3.64\sqrt{K}}{\sqrt{1-0.64f_{DH}K}}$
	Transverse framing	$4.9\sqrt{K}$	$\frac{5.15\sqrt{K}}{\sqrt{1-0.41{f_{DH}}^2K^2}}$
Elsewhere		$4.6\sqrt{K}$	$5.2\sqrt{K}$

Note:

f_{DH}: Value as specified in **CS10.7.1-1**
In longitudinal framing system, f_{DH} is not to be less than 0.79/K.

Fig. CS17.4.5-1 Measurement of e



Chapter CS18 has been added as follows.

CS18 SUPERSTRUCTURES AND DECKHOUSES

CS18.1 General

CS18.1.1 Application

With respect to the provisions of **Chapter 18, Part CS of the Rules**, the determination of the position of tiers above the freeboard deck may be treated in the same manner as the provisions of **CS1.1.3-2(2)(c)**.

CS18.3 Closing Means for Access Openings in Superstructure End Bulkheads

CS18.3.1 Closing Means for Access Openings

Where the sill of an access opening is liable to hinder the passage of heavy spare parts or similar, a portable sill may be used subject to approval by the Society under the following conditions.

(1) Portable sills are to be installed before the ship leaves port.

(2) Portable sills are to be gasketed and fastened by closely spaced through-bolts.

(3) Whenever sills are replaced after removal, the weathertightness of the sills and relevant doors is to be verified by hose testing. The dates of removal, replacement and hose testing are to be recorded in the ship's log-book.

CS18.4 Additional Requirements for Bulk Carriers, Ore Carriers and Combination Carriers, etc.

If this requirement hinders hatch cover operation, the aft bulkhead of the forecastle may be fitted forward of the forward bulkhead of the foremost cargo hold provided the forecastle length is not less than 7% of the length for freeboard defined in **Part A 2.1.3.**

CS19 HATCHWAYS, MACHINERY SPACE OPENINGS AND OTHER DECK OPENINGS

Section CS19.1 has been added as follows.

CS19.1 General

CS19.1.2 Position of Exposed Deck Openings

1 In the application of the requirements of **19.1.2, Part CS** of the Rules, "superstructure decks" include top decks of superstructures, deckhouses, companionways and other similar deck structures.

2 "Exposed raised quarter decks" in the definition of Position I specified in **19.1.2, Part CS** of the Rules refers to exposed superstructure decks lower than h_S specified in **V2.2.1** above the freeboard deck.

3 "Exposed superstructure decks" in the definition of Position I specified in **19.1.2, Part CS** of the Rules refers to exposed superstructure decks lower than $2h_S$ specified in **V2.2.1** above the freeboard deck.

4 "Exposed superstructure decks located at least one standard height of superstructure above the freeboard deck" in the definition of Position II specified in **19.1.2, Part CS** of the Rules refers to exposed superstructure decks located at least h_S specified in **V2.2.1** above the freeboard deck and lower than $2h_S$ specified in **V2.2.1** above the freeboard deck.

5 "Exposed superstructure decks located at least two standard heights of superstructure above the freeboard deck" in the definition of Position II specified in **19.1.2, Part CS** of the Rules refers to exposed superstructure decks located at least $2h_S$ specified in **V2.2.1** above the freeboard deck and lower than $3h_S$ specified in **V2.2.1** above the freeboard deck.

CS19.2 Hatchways

Paragraph CS19.2.4 has been added as follows.

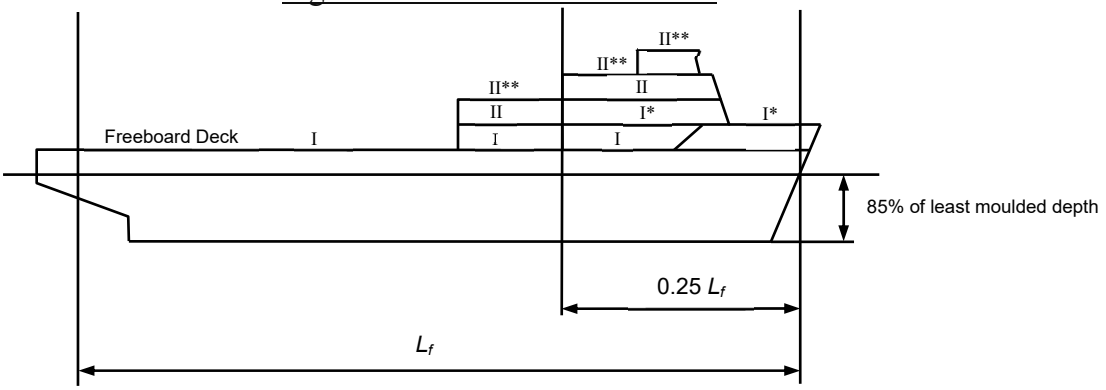
CS19.2.4 Design Loads for Steel Hatch Covers, Portable Beams and Hatchway Coamings

1 Design vertical wave load P_V as specified in **19.2.4(1), Part CS** of the Rules is to comply with the following requirements.

(1) Positions I and II may be determined in accordance with **Fig. CS19.2.4-1** and **-2**.

(2) Where an increased freeboard is assigned, the design load for hatch covers according to **19.2.4(1), Part CS** of the Rules on the actual freeboard deck may be as required for a superstructure deck, provided the summer freeboard is such that the resulting draught will not be greater than that corresponding to the minimum freeboard calculated from an assumed freeboard deck situated at a distance at least equal to one superstructure standard height (as per Regulation 33 of the "*International Convention on Load Lines,* 1966 *and Protocol of* 1988 *relating to the International Convention on Load Lines,* 1966") below the actual freeboard deck (see **Fig. CS19.2.4-2**).

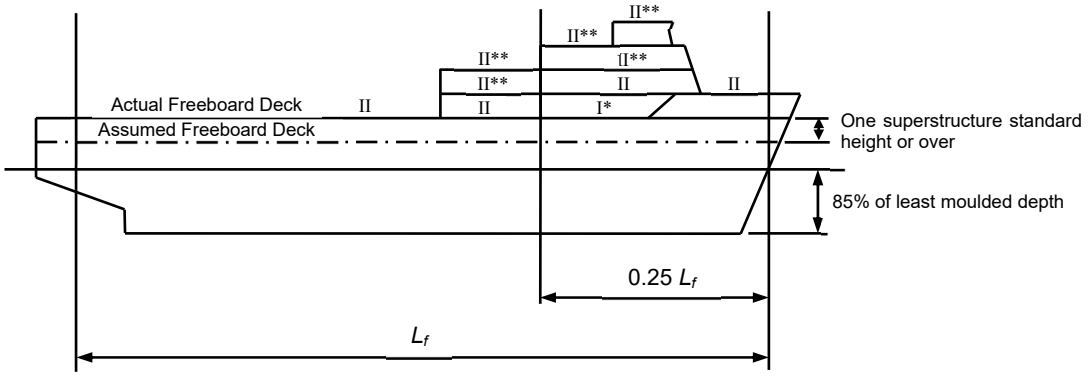
Fig. CS19.2.4-1 Position I and II



* Exposed superstructure decks located at least one superstructure standard height above the freeboard deck

** Exposed superstructure decks of vessels having length L_f of greater than 100m located at least one superstructure standard height above the lowest Position II deck

Fig. CS19.2.4-2 Position I and II for an Increased Freeboard

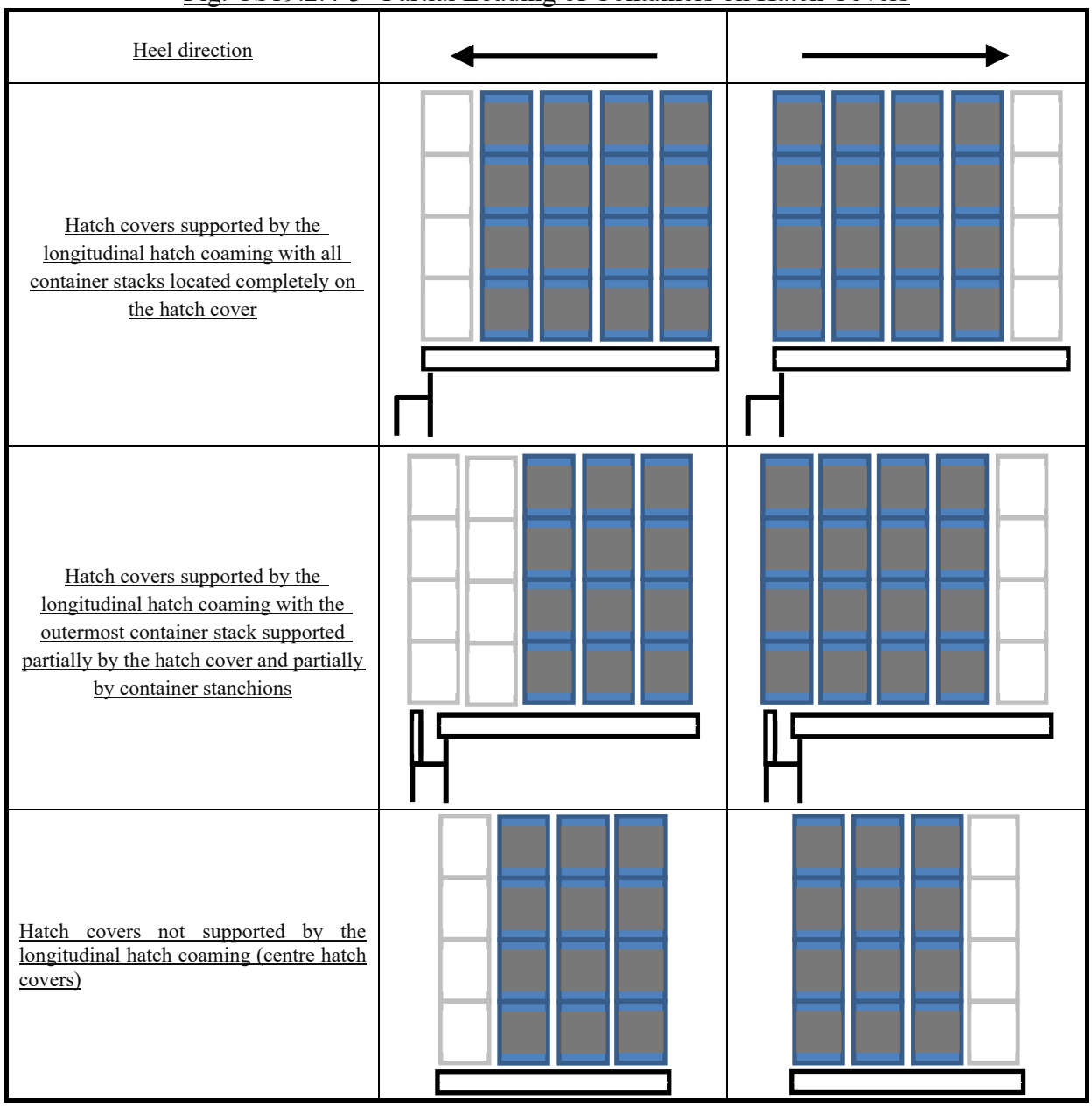


* Exposed superstructure decks located at least one superstructure standard height above the freeboard deck

** Exposed superstructure decks of ships having length L_f of greater than 100m located at least one superstructure standard height above the lowest Position II deck

2 In the application of the requirements of **19.2.4(4)(a)** and **(c)**, **Part CS** of the Rules, load cases with the partial loading of containers on hatch covers are to be considered (see **Fig. CS19.2.4-3**). However, where deemed necessary by the Society, load cases other than those specified in **Fig. CS19.2.4-3** are to be separately considered.

Fig. CS19.2.4-3 Partial Loading of Containers on Hatch Covers



3 The partial load cases specified in **Fig. CS19.2.4-3** may not cover all partial load cases critical for the hatch cover lifting specified in **19.2.10-2, Part CS of the Rules.**

4 In the case of mixed stowage (e.g., 20-*foot* + 40-*foot* container combined stacks), the foot point forces at the fore and aft ends of the hatch cover are not to be higher than those resulting from the design stack weight for the 40-*foot* containers, and the foot point forces at the middle of the cover are not to be higher than those resulting from the design stack weight for the 20-*foot* containers.

Paragraph CS19.2.5 has been added as follows.

CS19.2.5 Strength Criteria of Steel Hatch Covers and Hatch Beams

1 Where scantlings of structural members of steel hatch covers are determined based upon direct calculations, the following requirements are to be applied. Those not specified in this paragraph are to comply with the requirements in **Chapter 8, Part 1, Part C of the Rules.**

(1) Loads

The design wave loads imposed on steel hatch covers are to be P_V specified in **19.2.4(1), Part CS** of the Rules.

(2) Modelling of structures

(a) The structural model is to be able to reproduce the behaviour of the structure with the highest possible fidelity. Stiffeners and primary supporting members subject to pressure loads are to be included in the modelling. However, buckling stiffeners may be disregarded for stress calculation.

(b) Net scantlings which do not include corrosion additions are to be used for modelling.

(c) In no case is element width to be larger than stiffener spacing. The ratio of element length to width is not to exceed 4. The element height of the webs of primary supporting members is not to exceed one-third of the web height.

(d) The structural model is to be supported by pads. If the arrangement of pads differs from the arrangement of stiffeners, the edge elements of steel hatch covers are also to be modelled.

(3) Permissible value

When the loads specified in **(1)** act on the structural model specified in **(2)**, the net scantlings are to be determined so that the stress and deflection generated in each structural member satisfy the allowable values specified in **19.2.5-1**, **Part CS** of the Rules.

(4) Miscellaneous

(a) The thickness of the top plating of steel hatch covers is to comply with the requirements in **19.2.5-2, Part CS** of the Rules.

(b) The scantlings of the secondary stiffeners of steel hatch covers are to comply with the requirements in **19.2.5-3, Part CS** of the Rules.

(c) The buckling strength for the structural members forming steel hatch covers is to comply with the requirements in **19.2.5-6, Part CS** of the Rules.

Paragraph CS19.2.6 has been added as follows.

CS19.2.6 Additional Requirements for Steel Hatch Covers Carrying Cargoes

1 "Direct calculations deemed appropriate by the Society" in **19.2.6-1, Part CS** of the Rules refers to calculations that comply with the following requirements. Those not specified in this paragraph are to comply with the requirements in **Chapter 8, Part 1, Part C of the Rules.**.

(1) Loads

(a) The loads acting on steel hatch covers are to be according to **19.2.4, Part CS** of the Rules based on the type of load and loading condition. Except as deemed necessary by the Society, no loads are to be assumed to act jointly.

(b) No dynamic loads due to ship motion are to be assumed as the wheel loads from wheeled vehicles only used for loading/unloading while in port.

(2) Modelling of Structures

(a) The structural model is to be able to reproduce the behaviour of the structure with the highest possible fidelity. Stiffeners and primary supporting members subject to pressure loads are to be included in the modelling. However, buckling stiffeners may be disregarded for stress calculation.

(b) Net scantlings which do not include corrosion additions are to be used for modelling.

(c) In no case is element width to be larger than stiffener spacing. The ratio of element length to width is not to exceed 4. The element height of the webs of primary supporting members is not to exceed one-third of the web height.

(d) The structural model is to be supported by pads. If the arrangement of pads differs from the arrangement of stiffeners, the edge elements of steel hatch covers are also to be modelled.

(3) Permissible values

When the loads specified in **(1)** act on the structural model specified in **(2)**, the net scantlings are to be determined so that the stress and deflection generated in each structural member satisfy the allowable values specified in **19.2.5-1**, **Part CS** of the Rules.

2 The details for steel hatch covers carrying cargoes are to comply with the following **(1)** to **(4)**:

(1) To prevent damage to hatch covers and the ship structure, the location of stoppers is to be compatible with the relative movements between hatch covers and the ship structure.

(2) Hatchway covers and supporting structures are to be adequately stiffened to accommodate the load from hatch covers.

(3) At the cross-joints of multi-panel covers, vertical guides (male/female) are to be fitted to prevent excessive relative vertical deflections between loaded/unloaded panels.

(4) The construction and scantlings of hatchways on exposed parts or on the lower deck are to comply with the following requirements in addition to those of **19.2, Part CS** of the Rules.

(a) The loading arrangement is to be clearly shown in drawings submitted for approval. In the case of freight containers, the type and location are to be additionally described.

(b) Girders or stiffeners are to be provided for reinforcement beneath the corner fittings of freight containers.

(c) The top plates of hatch covers, upon which wheeled vehicles are loaded, are to comply with the following:

i) The thickness of hatch cover top plating may be determined by direct calculation or in accordance with **CS17.4.5**.

ii) The scantlings of the stiffeners of hatch covers may be determined by direct calculation or in accordance with **CS10.7.1**.

Paragraph CS19.2.10 has been added as follows.

S19.2.10 Closing Arrangements

"At the discretion of the Society" prescribed in **19.2.10-2, Part CS** of the Rules refers to the following case:

(1) The case in which the height h_E (*mm*) of the transverse cover guides above the hatch cover supports is not less than that obtained from the following formula (see **Fig. CS19.2.10-1**):

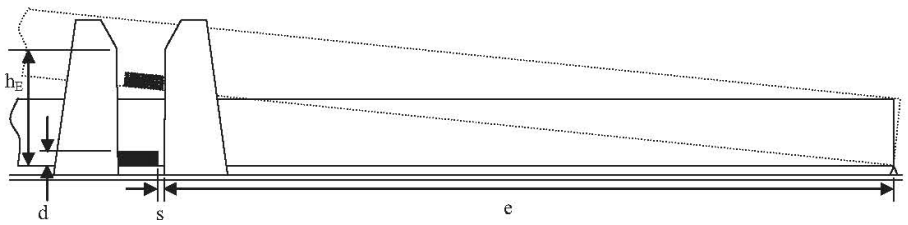
$h_E = 1.75\sqrt{2se + d^2} - 0.75d$, however, in no case is h_E to be less than the height of the cover edge plate plus 150 *mm*.

e: Largest distance (*mm*) from the inner edges of the transverse cover guides to the ends of the cover edge plate

s: Total clearance (*mm*) within the transverse cover guide, with $10 \leq s \leq 40$

d: Distance between the upper edge of transverse stopper and the hatch cover supports

Fig. CS19.2.10-1 Height of Transverse Cover Guides



Paragraph CS19.2.12 has been added as follows.

CS19.2.12 Steel Hatchway Covers for Container Carriers

1 In the application of the requirements of **19.2.12, Part CS** of the Rules, the height of coamings above the upper surface of the deck where the hatchway covers are fitted is to be at least 600 *mm* in Position II.

2 In the application of the requirements of **19.2.12-1, Part CS** of the Rules, the following requirements **(1)** through **(4)** are to be complied with:

(1) The hatchway covers concerned may be fitted to hatchways located on weatherdecks which are at least two standard superstructure heights (as per Regulation 33 of the "*International Convention on Load Lines*, 1966") above an actual freeboard deck or an assumed freeboard deck from which the freeboard can be calculated which will result in a draught not less than that corresponding to the freeboard actually assigned. Where any part of a hatchway is forward of a point located one quarter of the ship's length (0.25*Lf*) from the forward perpendicular, that hatchway is to be located on a weatherdeck at least three standard superstructure heights above the actual or assumed freeboard deck.

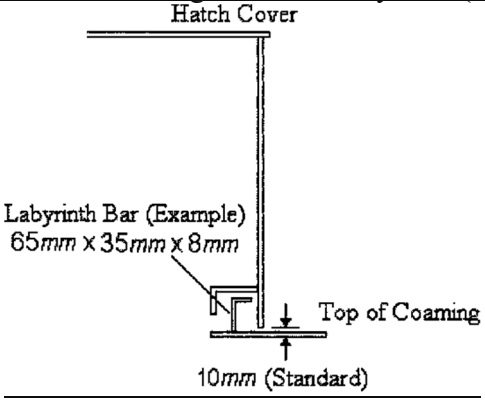
(2) The non-weathertight gaps between hatch cover panels are to be considered as unprotected openings in the application of **Part U** and **Chapter 4, Part CS** of the Rules. They are to be as small as possible commensurate with the capacity of the bilge system and expected water ingress, and the capacity and operational effectiveness of the fixed gas fire-extinguishing system required in **Part R** of the Rules, and are not to be more than 50 *mm*.

(3) Labyrinths, gutter bars, or other equivalent means are to be fitted close to the edges of each panel in way of the gaps to minimize the amount of water that can enter the container hold from the top surface of each panel. In general, the height of such means is not to be less than 65 *mm* from the top of the coaming and gutter bars or from the top of the panel, and the gaps between hatch covers and the top of the coaming are not to exceed 10 *mm*. (See **Fig. CS19.2.12-1**)

(4) Bilge alarms are to be provided in each hold fitted with non-weathertight covers.

3 In the application of **19.2.12-2, Part CS** of the Rules, relevant requirements specified in MSC/Circ.1087 may be applied.

Fig. CS19.2.12-1 Arrangement of Labyrinth (Example)



Paragraph CS19.2.13 has been added as follows.

CS19.2.13 Additional Requirement for Small Hatches Fitted on Exposed Fore Deck

1 General

(1) The strength of, and securing devices for, small hatchways fitted on the exposed fore deck in **19.2.13, Part CS** of the Rules are to comply with the requirements of this paragraph.

(2) Small hatchways in the context of this requirement are hatchways designed for access to spaces

below the deck and are capable of being closed weathertight or watertight, as applicable. Their opening is normally 2.5 m^2 or less.

(3) Notwithstanding the provisions of **(1)** above, hatchways designed for emergency escape need not comply with the requirements of **-3(1)(a)**, **-3(1)(b)**, **-4(3)** and **-5**.

(4) The securing devices of the hatchways 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.

2 Strength

(1) For small rectangular steel hatch covers, plate thickness, stiffener arrangement and scantlings are to be in accordance with **Table CS19.2.13-1** and **Fig. CS19.2.13-1**. Stiffeners, where fitted, are to be aligned with the metal-to-metal contact points, required in **-4(1)**. Primary stiffeners are to be continuous. All stiffeners are to be welded to the inner edge stiffener. (See **Fig. CS19.2.13-2**)

(2) For rectangular hatchways, the upper edge of 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.

(3) For small hatch covers of a circular or similar shape, the cover plate thickness and reinforcement is to be according to the requirements of the Society.

(4) For small hatch covers constructed of materials other than steel, the required scantlings are to provide equivalent strength.

3 Primary Securing Devices

(1) Small hatchways located on an exposed fore deck subject to the application of this requirement are to be fitted with primary securing devices such that their hatch covers can be secured in place and weathertight by means of a mechanism employing any one of the following methods:
- (a) Butterfly nuts tightening onto forks (clamps)
- (b) Quick acting cleats
- (c) Central locking device

(2) Dogs (twist tightening handles) with wedges are not acceptable.

4 Requirements for Primary Securing Devices

(1) Hatch covers are to be fitted with a gasket of elastic material. This is to be designed to allow 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. (See item 9 of **Fig.CS19.2.13-2**) The metal-to-metal contacts are to be arranged close to each securing device in accordance with **Fig.CS19.2.13-1**, and of sufficient capacity to withstand the bearing force.

(2) The primary securing device 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 device that uses butterfly nuts, the forks (clamps) are to be of a robust design. They are to be designed to minimize the risk of the 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*. An example arrangement is shown in **Fig.CS19.2.13-2**.

(4) For small hatch covers located on an exposed deck forward of the foremost cargo hatch, the hinges are to be fitted such that the predominant direction of green sea force will cause the cover to close, which means that the hinges are normally to be located on the fore edge.

(5) On small hatchways located between the main hatchways, for example between Nos. 1 and 2, the hinges are to be placed on the fore edge or outboard edge, whichever is practicable for protection from green sea force in beam seas and bow quartering conditions.

5 Secondary Securing Device

Small hatchways 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 becomes loosened or dislodged. It is to be fitted on the side opposite to the hatch cover hinges.

Table CS19.2.13-1 Scantlings for Small Steel Hatch Covers on the Fore Deck

Nominal size (*mm* × *mm*)	Cover plate thickness (*mm*)	Primary stiffeners	Secondary stiffeners
		Flat Bar (*mm* × *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

Fig. CS19.2.13-1 Arrangement of Stiffeners

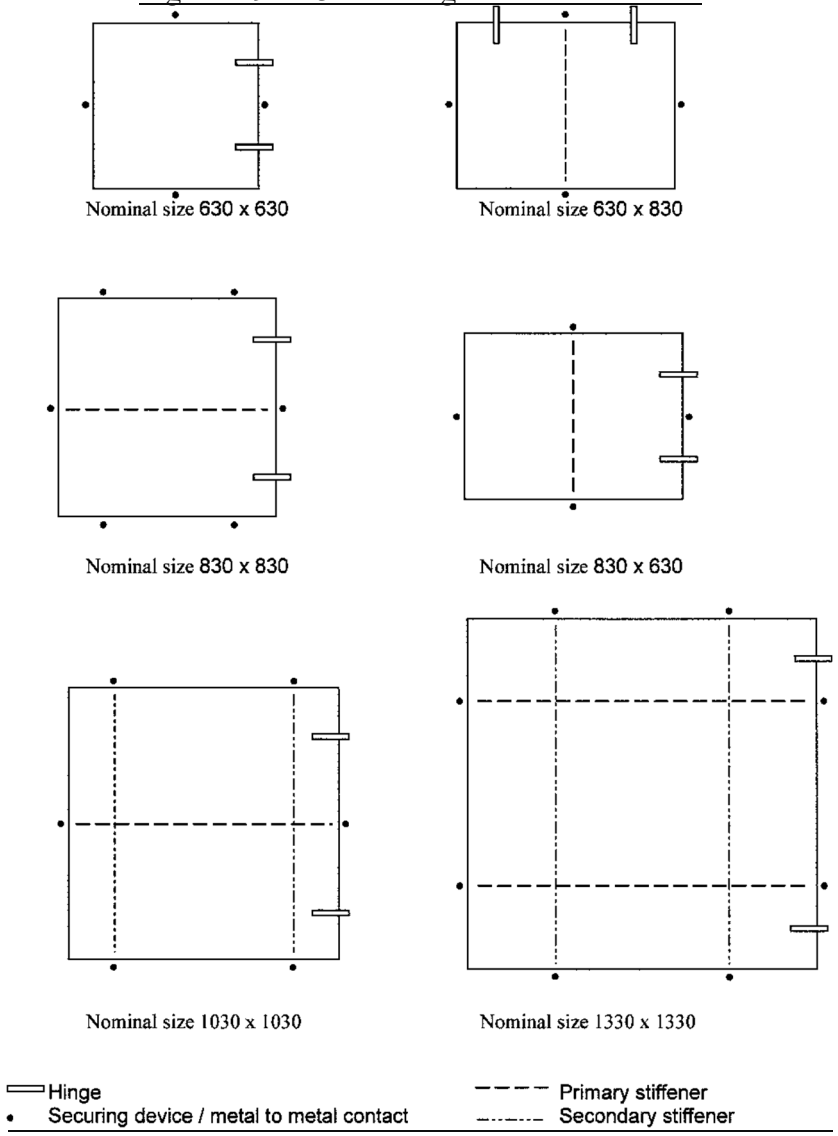
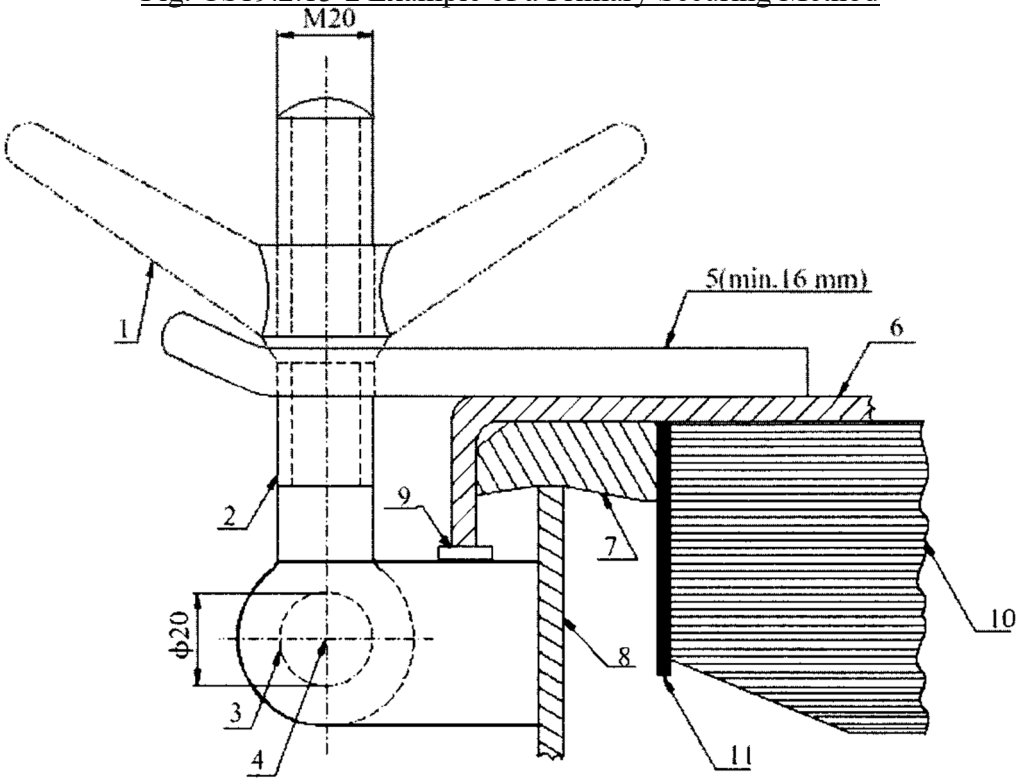


Fig. CS19.2.13-2 Example of a Primary Securing Method



(Note : Dimensions in millimeters)

1. Butterfly nut
2. Toggle Bolt
3. Toggle bolt pin
4. Center of toggle bolt pin
5. Fork(clamp) plate
6. Hatch cover
7. Gasket
8. Hatch coaming
9. Bearing pad welded on the bracket of a toggle bolt for metal to metal contact
10. Stiffener
11. Inner edge stiffener

Section CS19.3 has been added as follows.

CS19.3 Machinery Space Openings

CS19.3.5 Miscellaneous Openings in Machinery Casings

In applying the requirements of **19.3.5-1, Part CS** of the Rules, the ventilator coamings above the upper surface of the deck is to extend more than 4.5*m* above the surface of the deck in Position I, and more than 2.3*m* above the surface of the deck in Position II specified in **19.1.2, Part CS** of the Rules. Ventilator openings are not to be fitted with weathertight closing appliances. However, ventilator openings are to be fitted with closing means specified in **19.3.5-3, Part CS** of the Rules.

Section CS19.4 has been added as follows.

CS19.4 Companionways and Other Deck Openings

CS19.4.2 Companionways

Grouping into deckhouse and companion

(1) A structure is regarded as a deckhouse where its inside is always accessible through access openings provided on the top of the structure or through under-deck passageways, even when all access openings in the boundary walls are closed.

(2) A structure is regarded as a companion where its inside is not accessible through any other way, when all access openings in the boundary walls are closed.

CS20 MACHINERY SPACES, BOILER ROOMS AND TUNNEL RECESSES

CS20.2 Main Engine Foundations

Paragraph CS20.2.2 has been added as follows.

CS20.2.2 Ships with Double Bottoms

1 The following method for determining scantlings of double bottom construction in engine rooms is standard. Other methods approved by the Society may be acceptable.

(1) Thickness of centre girders is not to be less than the value obtained from the following formula.

$5.7 + 0.056L$ (*mm*)

(2) Thickness of side girders and solid floors is not to be less than the value obtained from the following formula.

When the ship is over 100 *m* in length:

$6.5 + 0.035L$ (*mm*)

When the ship is not over 100 *m* in length:

$0.6\sqrt{L} + 4.0$ (*mm*)

2 Girder plates beneath seat plates of the main engine are generally to penetrate inner bottom plates. Where they are unable to penetrate, the inner bottom plates are to be suitably thicker than required and rider plates are to be welded with edge preparation.

If man holes are provided in girder plates, their number is to be minimized as far as possible.

3 Where main engines are directly installed on to inner bottom plates, the compartments beneath main engines are recommended to be cofferdams. Where they are used as deep tanks, cap nuts, packing, etc. are to be fitted to the foundation bolts in order to keep water/oil-tightness.

Chapter CS21 has been added as follows.

CS21 BULWARKS, GUARDRAILS, FREEING ARRANGEMENTS, CARGO PORTS AND OTHER SIMILAR OPENINGS, SIDE SCUTTLES, RECTANGULAR WINDOWS, VENTILATORS AND GANGWAYS

CS21.1 Bulwarks and Guardrails

CS21.1.1 General

In **21.1.1-2(2), Part CS of the Rules**, "measures deemed appropriate by the Society" implies that **(1)** and **(2)** below need to be satisfied.

(1) Stanchions are to be of increased breadth as in **(a)** to **(c)** below, depending on their arrangement. The figure of these stanchions is given in **Fig.CS21.1.1-1.**

(a) At least every third stanchion is to be of increased breadth: $kb_s \geq 2.9b_s$

(b) At least every second stanchion is to be of increased breadth: $kb_s \geq 2.4b_s$

(c) Every stanchion is to be of increased breadth: $kb_s \geq 1.9b_s$

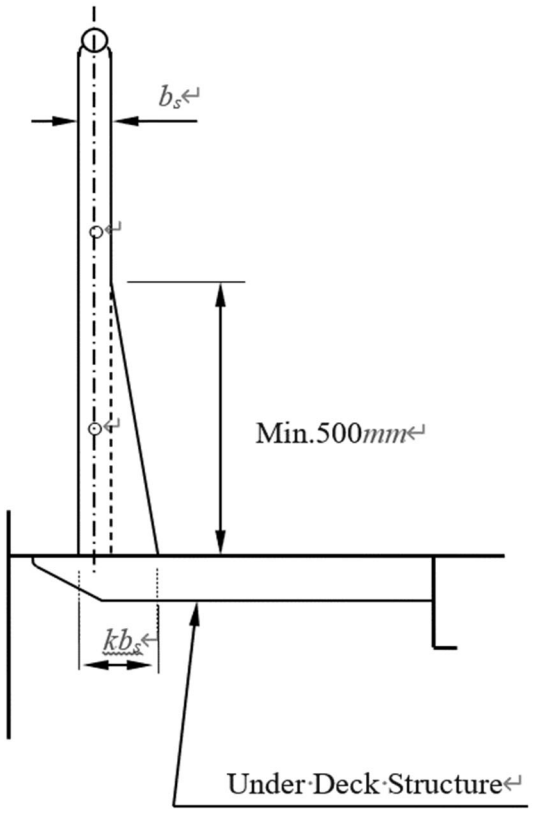
kb_s: increased breadth (*mm*) of stanchion

b_s: breadth (*mm*) of stanchion according to standards approved by the Society

Stanchions of increased breadth are to be welded to the deck with double continuous fillet welds and a minimum leg size of 7 *mm* or as specified by standards approved by the Society.

(2) Stanchions with increased breadth, as described in **(1)** above, are to be aligned with the members below the deck. These members are to be a minimum of 100×12 *mm* flat bar welded to the deck by double continuous fillet welds. The stanchions with increased breadth need not be aligned with under deck structures for deck plating exceeding 20 *mm*.

Fig.CS21.1.1-1 Guardrail Stanchion (Example)



CS21.1.2 Dimensions

Where bulwarks and/or guardrails specified in **21.1.2, Part CS** of the Rules interfere with the ship's normal operation due to their height, the height may be reduced on the condition that suitable alternative protection devices such as portable guardrails are provided.

CS21.1.3 Construction

In cases where the base of a bulwark stay adopts a gusset type, "special consideration" in **21.1.3-4, Part CS of the Rules** means the following **(1)** to **(3)**:

(1) The gusset plate is to be made of steel with the same yield stress as the steel of the upper deck to which the gusset plate is attached.

(2) The toes of gusset plates are to have a soft nose design.

(3) Pad plates are to be provided beneath the gusset plates. In addition, the breadth of such pad plates is to be as narrow as practicable. The pad plates are to be made of steel with the same yield stress as the steel of the upper deck to which the pad plate is attached.

C21.2 Freeing Arrangements

C21.2.1 General

1 The "adequate provisions for freeing the space within superstructures" referred to in **21.2.1-3, Part CS** of the Rules is subject to the following.

(1) The minimum freeing port area on each side of the ship for the open superstructure (A_s) is not to be less than that obtained from the following formula.

$$A_s = \frac{A_1 b_0 h_s}{2 l_t h_w}\left\{1 - \left(\frac{l_w}{l_t}\right)^2\right\} \ (m^2)$$

A_1: As given by the following formulae

Where l_t is not more than 20 *m*: $0.7 + 0.035 l_t$ (m^2)

Where l_t is more than 20 *m*: $0.07 l_t$ (m^2)

l_t : As given by the following formula:

$l_w + l_s$ (*m*)

l_w : Length (*m*) of the open deck enclosed by bulwarks

l_s : Length (*m*) of the common space within the open superstructure

b_0 : Breadth (*m*) of the openings in the end bulkhead of the enclosed superstructure

h_s : One standard superstructure height (*m*) according to the requirement in **Part V**

h_w: The distance (*m*) of the well deck above the freeboard deck

(2) The minimum freeing port area on each side of the ship for the open well (A_w) is not to be less than that obtained from the following formula.

$$A_w = \frac{A_2 h_s}{2 h_w} \ (m^2)$$

A_2: As given by the following formulae

Where l_w is not more than 20 *m*: $0.7 + 0.035 l_w + a$ (m^2)

Where l_w is more than 20 *m*: $0.07 l_w + a$ (m^2)

a : As obtained from the following formulae

Where h is more than 1.2 *m*: $0.04 l_w (h - 1.2)$ (m^2)

Where h is not more than 1.2 *m*, but not less than 0.9 *m*: 0 (m^2)

Where h is less than 0.9 *m*: $-0.04 l_w (0.9 - h)$ (m^2)

h : Average height (*m*) of bulwarks above the deck

l_w, h_s and h_w: As specified in **(1)**

(3) In ships either without sheer or with less sheer than the standard, the minimum freeing port area

obtained from **(1)** and **(2)** above is to be multiplied by the factor obtained from the following formula.

$$1.5 - \frac{S}{2S_0}$$

S : Average of actual sheer (*mm*)

S_0: Average of the standard sheer (*mm*) according to the requirements in **Part V**

2 The requirements in **21.2.1-4, Part CS** of the Rules apply to type "*A*" or "*B*-100" ships with especially reduced freeboards.

3 The requirements in **21.2.2-4, Part CS** of the Rules apply to type "*A*" or "*B*-100" ships with especially reduced freeboards having trunks.

CS21.2.2 Freeing Port Area

1 A flush-decker having an effective deckhouse is to be considered to have two wells afore and abaft the deckhouse, and each of these wells is required to have a freeing port area as prescribed in **21.2.2, Part CS** of the Rules. The term "effective deckhouse" means a structure having a breadth not less than 80% of the breadth of ship and the width of passageways at its sides does not exceed 1.5 *m*.

2 Where a divisional bulkhead extending from side to side is provided at the forward end of deckhouse, the ship is to be considered to have two wells afore and abaft the bulkhead, irrespective of the breadth of deckhouse, and each of these wells is required to have the freeing port area prescribed in **21.2.2, Part CS** of the Rules.

3 In ships complying with the provisions of **CS21.2.1-2**, the guardrails installed on more than half the length of the exposed parts of the freeboard deck may be replaced by freeing ports in the lower parts of the bulwarks, for at least 33% of the total area of bulwarks. In ships complying with the provisions of **CS21.2.1-3**, the guardrails installed on half the length of trunks may be replaced by freeing ports in the lower parts of the bulwarks, for at least 33% of the total area of bulwarks.

4 In type "*B*-60" ships, freeing ports in the lower parts of bulwarks are to have an area not less than 25% of the total area of bulwarks.

5 Where freeing ports have rails or other fixtures that reduce the area of the opening, the projected area caused by these fixtures is to be deducted from the actual freeing port area during calculations.

6 Where a recess in the side shell or superstructure of a pure car carrier or similar ship forms a well, adequate freeing ports are to be provided in accordance with the requirements of **21.2.2-3, Part CS** of the Rules.

7

(1) "Where a ship is provided with a trunk or a hatch side coaming which is continuous or substantially continuous between detached superstructures" stipulated in **21.2.2-3, Part CS** of the Rules refers to the case where F_0 is not greater than F_1, and F_0 and F_1 are shown below.

F_0: Free flow area (m^2) through which water runs across the deck given by the following formula

$\sum(l_i h_i - a_i)$

l_i : Distance (*m*) between hatchways, and between hatchways and superstructures and deckhouses

h_i: Height (*m*) of bulwarks

a_i: Projected area (m^2) of structures which prevent free flow in $l_i h_i$

F_1: As specified in **21.2.2-1** and **-2, Part CS** of the Rules (m^2)

(2) Where F_0 is greater than F_1, but not greater than F_2, the freeing port area (F) is to be increased by the following formula. F_0 and F_1 are shown in **(1)** above, and F_2 is shown below.

$F = F_1 + F_2 - F_0$ (m^2)

F_2: As specified in **21.2.2-3, Part CS** of the Rules (m^2)

(3) Where F_0 is greater than F_2, F is to be equal to F_1. F_0, F_1 and F_2 are shown in **(1)** and **(2)** above.

CS21.2.3 Arrangement of Freeing Ports

In ships without sheer or having very small sheer, the area of freeing ports is to be distributed throughout the whole length of the well.

CS21.3 Bow Doors and Inner Doors

CS21.3.1 Application

1 "Bow doors" referred to in **21.3.1, Part CS** of the Rules mean the doors provided forward of the collision bulkhead.

2 The "securing device", "supporting device" and "locking device" referred to in **21.3, Part CS** of the Rules mean the following devices.

(1) Securing device: a device used to keep the door closed by preventing it from rotating about its hinges.

(2) Supporting device: a device used to transmit external or internal loads from the door to a securing device and from the securing device to the ship's structure, or a device other than a securing device, such as a hinge, stopper or other fixed device that transmits loads from the door to the ship's structure.

(3) Locking device: a device that locks the securing device in the closed position.

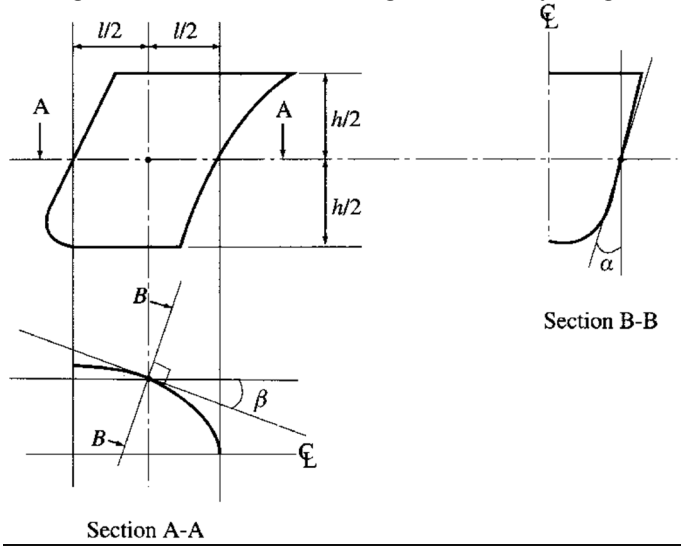
CS21.3.4 Design Loads

The "flare angle" and "entry angle" referred to in **21.3.4, Part CS** of the Rules mean the following angles. (*See*, **Fig. CS21.3.4-1**)

(1) Flare angle at the point to be considered is defined as the angle between a vertical line and the tangent to the side shell plating, measured in a vertical plane normal to the horizontal tangent to the shell plating.

(2) Entry angle at the point to be considered is defined as the angle between a longitudinal line parallel to the centreline and the tangent to the shell plating in a horizontal plane.

Fig. CS21.3.4-1 Flare Angle and Entry Angle



CS21.3.7 Securing and Supporting of Doors

"All load transmitting elements" referred to in **21.3.7-2(9), Part CS** of the Rules include pins, supporting brackets and back-up brackets.

CS21.3.8 Securing and Locking Arrangement

1 Making opening and closing systems as well as securing and locking devices "interlocked in such a way that they can only operate in the proper sequence" as stipulated in **21.3.8-1(3), Part CS** of the Rules means providing safeguards such as an interlocking system, where the doors can be closed only if securing and locking devices are released.

2 Making operating panels "inaccessible to unauthorized persons" as stipulated in **21.3.8-1(5), Part CS** of the Rules means providing safeguards such as installing a locking device on the operating panel.

3 In the application of **21.3.8-1(6), Part CS** of the Rules, if gravity or friction cannot maintain the door mechanically closed, securing devices such as mechanical pins are to be provided.

4 Indicator lights in the navigation bridge and on local operating panels specified in **21.3.8-2(1), Part CS** of the Rules are to indicate closing and securing conditions for each door. In addition, the required visual alarms are to indicate opening and lock-releasing conditions for each door. A common indicator can be used for both the securing and locking devices.

5 Visual and audible alarms specified in **21.3.8-2(1), Part CS** of the Rules are to be linked with the mode selection switch specified in **21.3.8-2(3), Part CS** of the Rules. The audible alarms may be equipped with a silence function switch.

6 Systems "designed on the fail safe principle" stipulated in **21.3.8-2(2)(a), Part CS** of the Rules means as follows.

(1) The indication panel is provided with:
  (a) A power failure alarm
  (b) A lamp test
  (c) A separate indication for door closed, door locked, door not closed, and door not locked

(2) Limit switches electrically close when the door is closed (when more limit switches are provided they may be connected in series)

(3) Limit switches electrically close when securing arrangements are in place (when more limit switches are provided they may be connected in series)

(4) Two electrical circuits (separate cables even if using multicore cable) with one for the indication of door closed/unclosed and the other for door locked/unlocked

(5) When the limit switches malfunction, an indication to show: unclosed, unlocked, and securing arrangement not in place - as appropriate

7 "A backup power source" referred to in **21.3.8-2(2)(c), Part CS** of the Rules may be regarded as a source of power (e.g., emergency generator with automatic start or electrical batteries) which is capable of supplying power within 45 *seconds* of a failure of the main source of power, or another secure supply of power (e.g., UPS) which is capable of supplying power for 18 *hours*.

8 In order to ensure that the sensors are "protected from water" as specified in **21.3.8-2(2)(d), Part CS** of the Rules, the sensors are required to have at least IP55 enclosures.

9 The "water leakage detection system" referred to in **21.3.8-2(4), Part CS** of the Rules is to be designed on the fail safe principle.

10 The "television surveillance system" referred to in **21.3.8-2(5), Part CS** of the Rules is to be designed on the fail safe principle.

11 The "audible alarm function" referred to in **21.3.8-2(6), Part CS** of the Rules is to be designed on the fail safe principle.

CS21.3.10 Operating and Maintenance Manual

The "Operating and Maintenance Manual" specified in **21.3.10-1 in Part CS** of the Rules is to include the following sentences.

The following recorded inspections of the door supporting and securing devices are to be carried out by the ship's staff;

(1) Inspections at monthly intervals

(2) Inspections following incidents that could result in damage, including heavy weather or contact in the region of doors

CS21.4 Side Shell Doors and Stern Doors

CS21.4.1 Application

1 "Side shell doors" and "stern doors" stipulated in **21.4.1, Part CS** of the Rules refer to the doors provided between the collision bulkhead and the after peak bulkhead and those provided after the after peak bulkhead.

2 The definitions of "securing device", "supporting device" and "locking device" referred to in **21.4, Part CS** of the Rules are to be as specified in **CS21.3.1.**

CS21.4.2 Arrangement of Doors

Shipside doors used for pilot transfer are to be in accordance with Regulation 23.5, Chapter V, SOLAS Convention.

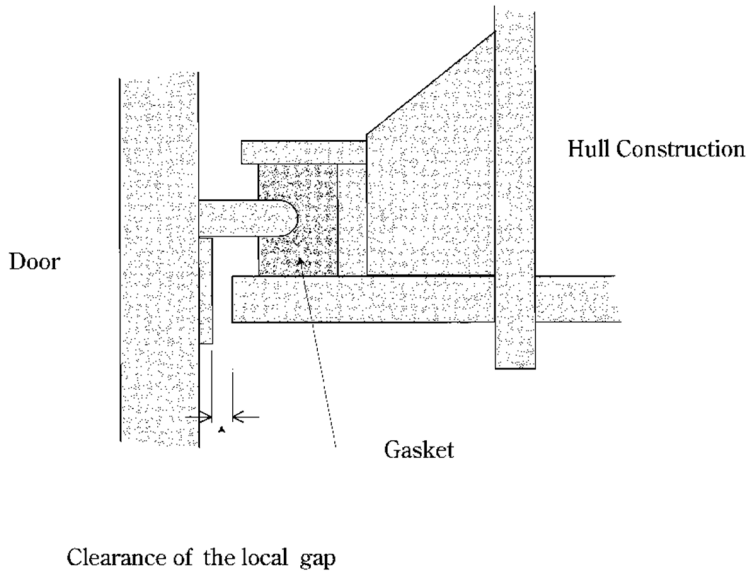
CS21.4.4 Design Loads

Where more than one securing and supporting devices are provided, vertical and horizontal forces may be considered as uniformly distributed between the devices.

CS21.4.6 Securing and Supporting of Doors

The "maximum design clearance between securing and supporting devices" stipulated in **21.4.6-1(4), Part CS** of the Rules refers to the permissible clearance of the local gap of the door in the secured condition. An example is shown in **Fig.CS21.4.6-1**. "All load transmitting elements" referred to in **21.4.6-2(4), Part CS** of the Rules includes pins, supporting brackets and back-up brackets.

Fig CS21.4.6-1 Maximum Design Clearance between Securing and Supporting Devices



CS21.4.7 Securing and Locking Arrangement

1 Making opening and closing systems as well as securing and locking devices "interlocked in such a way that they can only operate in the proper sequence" as stipulated in **21.4.7-1(3), Part CS** of the Rules means providing safeguards such as an interlocking system, where the doors can be closed only if securing and locking devices are released.

2 Making operating panels "inaccessible to unauthorized persons" as stipulated in **21.4.7-1(5), Part CS** of the Rules means providing safeguards such as installing a locking device on the operating panel.

3 In the application of **21.4.7-1(6), Part CS** of the Rules, if gravity or friction cannot maintain the door mechanically closed, securing devices such as mechanical pin are to be provided.

4 The "Ro-Ro spaces" referred in to **21.4.7-2, Part CS** of the Rules means spaces not normally subdivided in any way and extending to either a substantial length or the entire length of ship in which goods can be loaded and unloaded normally in a horizontal direction. (Refer to **3.2.41, Part R** of the Rules)

5 Indicator lights in the navigation bridge and on local operating panels specified in **21.4.7-2(2), Part CS** of the Rules are to indicate closing and securing conditions for each door. In addition, the required visual alarms are to indicate opening and lock-releasing conditions for each door. A common indicator can be used for both the securing and locking devices.

6 Visual and audible alarms specified in **21.4.7-2(2)(b), Part CS** of the Rules are to be linked with the mode selection switch specified in **21.4.7-2(4), Part CS** of the Rules. The audible alarms may be equipped with a silence function switch.

7 Systems "designed on the fail safe principle" stipulated in **21.4.7-2(3)(a), Part CS** of the Rules means as follows.

(1) The indication panel is provided with:
  (a) A power failure alarm
  (b) A lamp test
  (c) A separate indication for door closed, door locked, door not closed, and door not locked

(2) Limit switches electrically close when the door is closed (when more limit switches are provided they may be connected in series)

(3) Limit switches electrically close when securing arrangements are in place (when more limit switches are provided they may be connected in series)

(4) Two electrical circuits (separate cables even if using multicore cable) with one for the indication of door closed/unclosed and the other for door locked/unlocked

(5) Where the limit switches malfunction, an indication to show: unclosed, unlocked, and securing arrangement not in place - as appropriate

8 "A backup power source" referred to in **21.4.7-2(3)(c), Part CS** of the Rules may be regarded as a source of power, (e.g., emergency generator with automatic start or electrical batteries) which is capable of supplying power within 45 *seconds* of a failure of the main source of power, or another secure supply of power (e.g., UPS) which is capable of supplying power for 18 *hours*.

9 In order to ensure that the sensors are "protected from water" as specified in **21.4.7-2(3)(d), Part CS** of the Rules, the sensors are required to have at least IP55 enclosures.

CS21.4.9 Operating and Maintenance Manual

The "Operating and Maintenance Manual" specified in **21.4.9-1, Part CS** of the Rules is to include the following sentences.

The following recorded inspections of the door supporting and securing devices are to be carried out by the ship's staff;

(1) Inspections at monthly intervals

(2) Inspections following incidents that could result in damage, including heavy weather or contact in the region of doors

CS21.5 Side Scuttles and Rectangular Windows

CS21.5.1 General Application

1 With respect to the provisions of **21.5, Part CS of the Rules**, side scuttles with round or oval openings having areas exceeding 0.16 m^2 are to be treated as windows.

2 With respect to the provisions of **21.5.1-1, Part CS** of the Rules, the design pressures of windows in the fore end bulkheads of superstructures and deckhouses above the third tier located above the freeboard deck and forward of 0.5L are not to be less than the minimum design pressures given in **Table CS21.5, Part CS** of the Rules. However, this requirement may be dispensed with if the height of the highest deck at the fore end is not less than 22 m above the designed maximum load line, or if cargo, etc. is regularly loaded onto exposed decks in front of the windows (e.g., container carriers).

3 With respect to the provisions of **21.5.1-2, Part CS** of the Rules, windows on the navigation bridge up to the third tier above the freeboard deck permitted to be rectangular according to the provisions of **21.5.6, Part CS** of the Rules may be other than those of Class E or Class F subject to the following **(1)** and **(2)**.

(1) The navigation bridge is to be separated from spaces below the freeboard deck and spaces within enclosed superstructures by the followings
   (a) Weathertight closing devices
   (b) Two or more cabin bulkheads or doors
   The height of the doorway sill to the navigation bridge is not to be less than that required for closing devices at the position of such a doorway.

(2) The design pressure of such windows is not to be less than the value specified in **21.5.8, Part CS** of the Rules. The frame of the window is to conform to Class E or Class F according to the location it is installed, and the window is to have appropriate weathertightness.

CS21.5.3 Application of Side Scuttles

The side scuttles "deemed appropriate by the Society" referred to in **21.5.3-5, Part CS** of the Rules are class B side scuttles or class A side scuttles without deadlights in cases where the height of superstructures and deckhouses specified in **21.5.3-5, Part CS of the Rules** is greater than standard quarterdeck height specified in **V2.2.1-1**.

CS21.5.5 Design Pressure and Maximum Allowable Pressure of Side Scuttles

With respect to the provisions of **21.5.5-1, Part CS** of the Rules, the value of coefficient "a" for side scuttles for spaces below the freeboard deck or spaces within superstructures may be determined using the formula for the first tier deckhouse in the provisions of **18.2.1-1, Part CS** of the Rules.

CS21.5.7 Application of Rectangular Windows

The rectangular windows "deemed appropriate by the Society" referred to in **21.5.7-3, Part CS** of the Rules are rectangular windows without shutters or deadlights. In such cases, deckhouses situated on the following spaces may be regarded as being in the second tier of the freeboard deck.

(1) A raised quarterdeck of a height equal to or greater than the standard quarterdeck height specified in **V2.2.1-1**.

(2) The deck of a superstructure of a height equal to or greater than the standard quarterdeck height specified in **V2.2.1-1**.

(3) The deck of a deckhouse of a height equal to or greater than the standard quarterdeck height specified in **V2.2.1-1**.

CS21.6 Ventilators

CS21.6.5 Closing Appliances

1 Closing appliances required in **21.6.5, Part CS of the Rules** are to be of steel or other equivalent materials. Furthermore, the closing appliances of the ventilators for machinery and cargo spaces required in **21.6.5-1, Part CS of the Rules** are to have inherent corrosion resistance properties or be provided with an adequate anticorrosion treatment.

2 With respect to the provisions of **21.6.5, Part CS of the Rules**, mechanical ventilation systems are to be provided with warning plates stating that the closing appliances of mechanical ventilation systems are generally to be closed after the ventilation system has been shut off, unless reinforced.

3 With respect to the provisions of **21.6.5-1, Part CS of the Rules**, in cases where internal checks of ventilators are impossible even if equipment installed on board is used, e.g. large ventilators that have cowls which cannot be easily removed or ventilators that have fans installed above, an inspection port at least 150 *mm* in diameter is to be installed in the coaming of the ventilator. In addition, such inspection ports are to be provided with suitable covers so as not to spoil the water tightness/weather tightness and fire resistance required for the coaming of ventilators.

CS21.6.7 Ventilators for Emergency Generator Room

1 Where it is not practicable for the height of ventilator coamings to comply with **21.6.7, Part CS** of the Rules, they are to comply with the following requirements **(1)** or **(2) instead**.

(1) Where the emergency generator room is located in an enclosed superstructure, the ventilators are to have coamings in compliance with **21.6.1, Part CS** of the Rules, and are to be fitted with weathertight closing appliances in combination with other suitable arrangements to ensure adequate ventilation.

(2) In cases other than **(1)** above, where the emergency generator room has no opening leading to a space below the freeboard deck, the height of coamings of ventilators to supply air to the emergency generator room, above the upper surface of the deck, is to be at least 900 *mm* above the surface of the deck in Position I or 760 *mm* above the surface of the deck in Position II specified in **19.1.2, Part CS** of the Rules. In addition, these ventilator openings are to be fitted with suitable protection devices such as louvers to prevent the intrusion of sea-water. Openings on the boundaries of the emergency generator room are to be treated in a similar manner.

2 The weathertight closing appliances and louvers specified in **-1** above are also to comply with requirements specified in **1.3.5-2, Part D of the Rules**.

CS21.6.8 Additional Requirement for Ventilators Fitted on Exposed Fore Deck

The strength of ventilators and their closing devices in **21.6.8, Part CS** of the Rules are to comply with the following requirements.

(1) Applied Loads

Forces acting in the horizontal direction on the pipe and its closing device are to be calculated by using the pressure (p) obtained from the following formula and the largest projected area of each component.

$$p = 0.5\rho V_w^2 C_a C_s C_p \quad (kN/m^2)$$

ρ : Density of sea water (1.025 t/m^3)

V_w: Velocity of water over the fore deck given by the following:

$13.5(m/sec)$: for $h_{ed} \leq 0.5h_t$

$$13.5\sqrt{2\left(1-\frac{h_{ed}}{h_t}\right)}\,(m/sec) : \text{for } 0.5h_t < h_{ed} < h_t$$

h_{ed}: Distance from the designed maximum load line to exposed deck (m)

h_t : $0.1L_1$ or 22 *m* whichever is the lesser

C_d: Shape coefficient (0.5 for pipes and 1.3 for ventilator head in general, 0.8 for ventilator head of cylindrical form with its axis in the vertical direction)

C_s : Slamming coefficient (3.2)

C_p : Protection coefficient given by the following

(0.7): for pipes and ventilator heads located immediately behind a breakwater or forecastle

(1.0): elsewhere and immediately behind a bulwark

(2) Strength Requirements

(a) Bending moments and stresses in air and ventilator pipes are to be calculated at critical positions, such as at penetration pieces, at weld or flange connections, and at toes of supporting brackets. Bending stresses in the net section are not to exceed 0.8 times σ_y, where σ_y is the specified minimum yield stress or 0.2% proof stress of steel at room temperature. Irrespective of corrosion protection, a corrosion addition to the net section of 2.0 *mm* is then to be applied.

(b) For standard ventilators of 900 *mm* height closed by heads of not more than the tabulated projected area, pipe thickness standards are to be according to **Table CS21.6.8-1.** Where brackets are required, three or more radial brackets of a gross thickness of 8 *mm* or more, of a minimum length of 100 *mm*, and a height according to **Table CS21.6.8-1** are to be fitted; but they need not extend over the joint flange for the head. Bracket toes at the deck are to be suitably supported.

(c) For other configurations, loads according to **(1)** are to be applied, and means of support are to be determined in order to comply with the requirements of **(a)**. Brackets, where fitted, are to be of suitable thickness and length according to their height. Pipe thickness is not to be less than as indicated in column 1of **Table CS21.7, Part CS** of the Rules.

(d) All component parts and connections of the air pipe or ventilator are to be capable of withstanding the loads defined in **(1)**.

(e) Rotating type mushroom ventilator heads are deemed unsuitable.

Table CS21.6.8-1900 *mm* Ventilator Pipe Thickness and Bracket Standards

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

CS21.7 Gangways

CS21.7.1 General

1 In order to satisfy the provisions of **21.7.1, Part CS** of the Rules that require a means of protecting crew passageways on the exposed freeboard or raised quarterdeck, a means from **Table CS21.7.1-1** is to be provided according to the assigned freeboard or location onboard

2 In **Table CS21.7.1-1**, "**a**" to "**f**" refer to installations and **1)** to **5)** refer to locations onboard, as specified in the following **(1)** and **(2)**.

(1) Acceptable arrangements

a: A well lighted and ventilated under-deck passageway (clear opening 0.8 *m* wide, 2.0 *m* high) as close as practicable to the freeboard deck, connecting and providing access to the locations in question

b: A permanent and efficiently constructed gangway fitted at or above the level of the superstructure deck on or as near as practicable to the centre line of the ship, providing a continuous platform at least 0.6*m* in width and a non-slip surface, with guard rails extending on each side throughout its length

Guard rails shall be at least 1 *m* high with courses as required in **21.1.2-2** and **21.1.2-4, Part CS** of the Rules, and supported by stanchions spaced not more than 1.5 *m*, and with a foot-stop.

c: A permanent walkway at least 0.6 *m* in width fitted at freeboard deck level consisting of two rows of guard rails with stanchions spaced not more than 3 *m* apart

The number of courses of rails and their spacing are to be as required by **21.1.2-2** and **21.1.2-4, Part CS** of the Rules. On Type B ships, hatch coamings not less than 0.6 *m* in height may be regarded as forming one side of the walkway, provided that between the hatches two rows of guard rails are fitted.

d: A 10 *mm* minimum diameter wire rope lifeline supported by stanchions not more than 10 *m* apart, or a single hand rail or wire rope attached to hatch coamings, continued and adequately supported between hatches

e: A permanent and efficiently constructed gangway for tankers fitted at or above the level of the superstructure deck on or as near as practicable to the centre line of the ship:

- located so as not to hinder easy access across the working areas of the deck
- providing a continuous platform at least 1.0 *m* in width
- constructed of fire resistant and non-slip material
- fitted with guard rails extending on each side throughout its length; guard rails should be at least 1.0 *m* high with courses as required by **21.1.2-2** and **21.1.2-4, Part CS** of the Rules, and supported by stanchions spaced not more than 1.5 *m*
- provided with a foot stop on each side
- having openings (not more than 40 *m* apart) with ladders where appropriate, to and from the deck
- having shelters of substantial construction set in way of the gangway at intervals not exceeding 45 *m* if the length of the exposed deck to be traversed exceeds 70 *m*

Every such shelter should be capable of accommodating at least one person (1×1×2 *m* in size as standard, and at least 0.6 *m* in width of entrance), be so constructed as to afford weather protection on the forward, port and starboard sides and the strength is to be in accordance with the requirements of **Chapter 18, Part CS** of the Rules.

f: A permanent and efficiently constructed walkway fitted at or above the level of the freeboard deck on or as near as practicable to the centre line of the ship having the same specifications as those for a permanent gangway listed in the arrangements "**e**" except for footstops

On type B ships (certified for the carriage of liquids in bulk), with a combined height of hatch coamings and fitted hatch covers of together not less than 1 *m* in height, the hatch coamings may be regarded as forming one side of the walkway, provided that between the hatches two rows of guard rails are fitted.

(2) Alternative transverse locations for arrangements

1): At or near the centre line of the ship; or fitted on hatch covers at or near the centre line of

the ship

2): Fitted on each side of the ship

3): Fitted on one side of the ship, provision being made for fitting on either side

4): Fitted on one side only

5): Fitted on each side of the hatches as near to the centre line as practicable

3 Precautions regarding arrangements specified in **-1** above

(1) Where wire ropes are fitted, turnbuckles are to be provided to ensure their tautness.

(2) Wire ropes may only be acceptable in lieu of guard rails in special circumstances and then only in limited lengths.

(3) Lengths of chain may only be acceptable in lieu of guard rails where fitted in between two fixed stanchions.

(4) Where stanchions are fitted, every third stanchion is to be supported by a bracket or stay.

(5) Removable or hinged stanchions shall be capable of being locked in the upright position.

(6) A means of passage over obstructions, if any, such as pipes or other fittings of a permanent nature, should be provided.

(7) Generally, the width of the gangway and deck-level walkway should not exceed 1.5 *m*.

4 Where a suitable passage facility is unable to be secured on or under the deck due to cargoes loaded on the exposed deck, life lines or guardrails are to be provided on the cargo on or near the centre line of the ship. Where a lumber freeboard is assigned, in addition to the above, life lines or guardrails, the height of which is at least 1.0 *m* and the clearance between courses is less than 350 *mm*, are to be fitted on both sides of the deck lumber.

Table CS21.7.1-1 Protection of Crew on Exposed Deck or Raised Quarter Deck

Locations of access in Ship	Assigned Summer Freeboard	Acceptable arrangements according to type of freeboard assigned:			
		Type A	Type B-100	Type B-60	Type B&B+
1.1 Access to Midship Quarters 1.1.1 Between poop and bridge,	≤ 3000 *mm*	A b e	a b e	a b c 1) e f 1)	a b c 1) c 2) c 4) d 1) d 2) d 3) e f 1) f 2) f 4)
1.1.2 Between poop and deckhouse containing living quarters or navigating equipment, or both.	> 3000 *mm*	A b e	a b e	a b c 1) c 2) e f 1) f 2)	
1.2 Access to Ends 1.2.1 Between poop and bow (if there is no bridge) 1.2.2 Between bridge and bow. 1.2.3 Between a deckhouse containing living quarters	≤ 3000 *mm*	A b c 1) e f 1)	a b c 1) c 2) e f 1) f 2)	a b c 1) c 2) e f 1) f 2)	
or navigating equipment, or both, and bow 1.2.4 In the case of a flush deck vessel, between crew accommodation and the forward and after ends of ship	> 3000 *mm*	a b c 1) d 1) e f 1)	a b c 1) c 2) d 1) d 2) e f 1) f 2)	a b c 1) c 2) c 4) d 1) d 2) d 3) e f 1) f 2) f 4)	

CS21.7.2 Tankers

1 Notwithstanding **CS21.7.1**, safe access to the bow is to be provided by at least one permanent arrangement noted in **Table CS21.7.2-1**.

2 Notations in **Table CS21.7.2-1** are as specified in **CS21.7.1-2**.

3 For tankers less than 100 *m* in length, the minimum width of the gangway platform or deck level walkway fitted in accordance with the arrangements "**e**" or "**f**", respectively, may be reduced to 0.6 *m*.

4 For gas carriers, where gangways are provided sufficiently high above the freeboard deck or where permanently constructed arrangements achieve an equivalent level of safety, the Society may approve modifications to the provisions of **-1** above. "Sufficiently high above the freeboard deck" means a vertical height of more than 3 times the standard superstructure height specified in **Table V2.2.1-1**.

Table CS21.7.2-1 Protection of Crew on Exposed Freeboard Deck or Raised Quarter Deck for Tankers

Location of access in Ship	Assigned Summer Freeboard	Acceptable arrangements according to type of freeboard assigned:
2.1 Access to Bow 2.1.1 Between poop and bow 2.1.2 Between a deckhouse containing living accommodation or navigating equipment or both, and bow 2.1.3 In the case of a flush deck vessel, between crew accommodation and the forward ends of ship	$\leq (Af + Hs)$*	a e f 1) f 5)
	$\geq (Af + Hs)$*	a e f 1) f 2)
2.2 Access to After End 2.2.1 In the case of a flush deck vessel, between crew accommodation and the after end of ship	As required in **1.2.4** of **Table CS21.7.1-1** for other types of ships	

Notes:
Af: Minimum summer freeboard calculated as type A ship regardless of the type of freeboard actually assigned
Hs: Standard height of superstructure as defined in **Table V2.2.1-1.**

CS21.8 Means of Embarkation and Disembarkation

CS21.8.1 General

1 The wording "specially approved by the Society" specified in **21.8.1, Part CS of the Rules** means those cases where a ship is engaged in voyages between designated ports where appropriate shore accommodation/embarkation ladders (platforms) are provided.

2 With respect to the requirements specified in **21.8.1, Part CS of the Rules**, the means of embarkation and disembarkation are to be in accordance with the following. However, ships that have small freeboards and are provided with boarding ramps needs not to be in accordance with the following:

(1) Accommodation ladders and gangways are to be constructed based on ISO 5488:1979 "*Shipbuilding - accommodation ladders*", ISO 7061:1993 "*Shipbuilding - aluminium shore gangways for seagoing vessels*" or standards where deemed appropriate by the Society. Accommodation ladder winches are to be constructed based on ISO 7364:1983 "*Shipbuilding and marine structures – deck machinery – accommodation ladder winches*" or standards where deemed appropriate by the Society or are to be the one pursuant to aforementioned standards.

(2) The structure of the accommodation ladders and gangways and their fittings and attachments are to be such as to allow regular inspection, maintenance of all parts and, if necessary, lubrication of their pivot pin. Special care is to be paid to welding connection.

(3) As far as practicable, the means of embarkation and disembarkation are to be sited clear of the working area and are not to be placed where cargo or other suspended loads may pass overhead. However, in cases where the Society recognizes unavoidable circumstances, the means of embarkation and disembarkation may be installed within the above mentioned areas or places, provided that safe passage is ensured through description in operation manuals, the installation of warning plates, and so on.

(4) Each accommodation ladder is to be of such a length to ensure that, at a maximum design operating angle of inclination, the lowest platform will be not more than 600 *mm* above the waterline in the lightest seagoing condition (in this regard, trim is to be the condition resulting from the loading condition of the lightest seagoing condition), as defined in SOLAS Regulation

III/3.13. However, in cases where the height of the embarkation/disembarkation deck exceeds 20 *m* above the waterline or is deemed appropriate by the Society, an alternative means of providing safe access to the ship or supplementary means of access to the bottom platform of the accommodation ladder may be accepted.

(5) The arrangement at the head of the accommodation ladder is to provide direct access between the ladder and the ship's deck by a platform securely guarded by handrails and handholds. The ladder is to be securely attached to the ship to prevent overturning.

(6) Each accommodation ladder or gangway is to be clearly marked at each end with a plate showing the restrictions on the safe operation and loading, including the maximum and minimum permitted design angles of inclination, design load, maximum load on bottom end plate, etc. Where the maximum operational load is less than the design load, it is also to be shown on the marking plate.

(7) Gangways are not to be used at an angle of inclination greater than 30 *degrees* from the horizontal and accommodation ladders are not to be used at an angle greater than 55 *degrees* from the horizontal, unless designed and constructed for use at angles greater than these and marked as such.

(8) Gangways are not to be secured to a ship's guardrails unless they have been designed for that purpose. If positioned through an open section of bulwark or railings, any remaining gaps are to be adequately fenced.

(9) Adequate lighting is to be provided to illuminate the means of embarkation and disembarkation, the position on deck where persons embark or disembark and the controls of the arrangement.

(10) A lifebuoy equipped with a self-igniting light and a buoyant lifeline is to be available for immediate use in the vicinity of the embarkation and disembarkation arrangement when in use. This lifebuoy is not to be taken into account when determining the minimum number and distribution of lifebuoys as required by *SOLAS* Reg. III/32.1.1.

(11) A safety net is to be mounted and arrangements that enable the installation of such net are to be provided to prevent falling accident in cases where it is possible that a person may fall from the means of embarkation and disembarkation or between the ship and quayside.

Chapter CS22 has been added as follows.

CS22 CEILINGS, SPARRINGS, CEMENTING AND PAINTING

CS22.2 Sparrings

CS22.2.1 Sparrings

1 The "equivalent arrangements … for the protection of framing" prescribed in **22.2.1-1, Part CS** of the Rules are to be in accordance with the following **(1)** and **(2)**.

(1) Hold frames are to be stiffened by one of the following:

(a) Longitudinal stiffeners or tripping brackets are to be fitted at intervals of about 2 *m*.

(b) Angle bars are to be fitted longitudinally at intervals of about 1.5 *m* on the flange surface of hold frames.

(c) Flat bars of about 150 *mm* wide 10 *mm* thick are to be fitted longitudinally at intervals of about 0.5 *m* on the flange surface of hold frames.

(2) Angle bars or flat bars (in case of flat bars, at least 2 tiers) are to be fitted longitudinally on the flange surface of tank side brackets or on the lower bracket of hold frames of bulk carrier type ships. However, the above requirements may be dispensed with where the thickness and breadth of the flange of hold frames of bulk carrier type ships are not less than that determined by the following.

(a) Thickness of bracket t = As determined by **Table CS1.4 of Part CS of the Rules** taking the arm length in **Fig. CS22.2.1-2** as the longer arm of the bracket

(b) Breadth of flange b = Value obtained from the following formula

$128\sqrt{d_0 l}$ (*mm*)

d_0: Depth of throat of bracket (*m*)

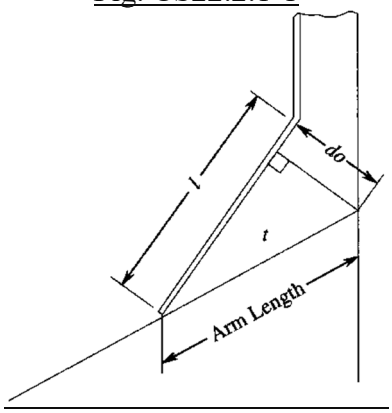
l: Length of flange of bracket (*m*)

2 For ships intended to carry timbers, the special protection of framing is to be in accordance with the following **(1)** and **(2)** in addition to the requirements of **-1** above,

(1) Where hold frames come right under hatchway at forward or after part of ship, the hold frames are to be stiffened further.

(2) Consideration is to be given on arrangement and size of tripping brackets for deep hold frames or other similar deep hull structural members.

Fig. CS22.2.1-1



CS22.4 Painting

CS22.4.1 General

1 Limitation of Using Aluminium Paint

Paints containing aluminium greater than 10 percent aluminium by weight in the dry film are not to be used in hazardous areas defined in **4.2.3-1** or **4.2.3-2, Part H** of the Rules in tankers and ships carrying dangerous chemicals in bulk intended to carry crude oil and petroleum products having a flashpoint not exceeding 60℃ and a Reid vapour pressure below atmospheric pressure or other liquid cargoes having similar fire hazards.

2 Cathodic Protection System

With respect to the provisions of **22.4, Part CS** of the Rules, where a cathodic protection system is adopted as a backup for coating or the omission of painting, the cargo tanks and their adjacent tanks in tankers and ships carrying dangerous chemicals in bulk, intended to carry crude oil and petroleum products having a flash point not exceeding 60˚C and Reid vapour pressure below atmospheric pressure or other liquid cargoes having similar fire hazards are to be in accordance with the following requirements.

(1) The anodes are to have steel cores and these are to be sufficiently rigid to avoid resonance in the anode support and be designed so that the anode does not come free when the surroundings become wasted.

(2) The anode is to be provided in accordance with **(a)** or **(b)**. When anode inserts and/or supports are welded to the structure, they are to be arranged so that the welds are clear of stress raisers. The supports at each end of an anode are not to be attached to separate structures which are likely to move independently.

(a) The steel inserts are to be attached to the structure by means of a continuous weld of adequate section.

(b) The steel inserts are to be attached to separate supports which are attached to the structure by means of a continuous weld of adequate section, by bolting, provided a minimum two bolts with locknuts are used or by appropriate mechanical means of clamping deemed as equivalent by the Society.

(3) Where anodes of aluminium or aluminium alloy are used, they are to meet the following requirements.

(a) Anodes are to be located such that their potential energy does not exceed 274.68N-m. The height of the anode is to be measured from the bottom of the tank to the centre of the anode, and its weight is to be taken as the weight of the anode as fitted, including the fitting devices and inserts. However, where anodes are located on horizontal surfaces not less than 1m wide and fitted with an upstanding flange or face flat projecting not less than 75mm above the horizontal surface, the height of the anode may be measured from this surface.

(b) Anodes are not to be located under tank hatches or butterworth openings, unless protected from any objects falling on the fitted anodes by an adjacent structure.

(4) Anodes of magnesium or magnesium alloy are not permitted.

CS22.4.2 Protective Coatings in Dedicated Seawater Ballast Tanks and Double-side Skin Spaces

1 The application of **22.4.2, Part CS** of the Rules with respect to coating system applications is to be in accordance with IACS Unified Interpretations SC223, as may be amended.

2 With respect to the provision of **22.4.2, Part CS of the Rules,** the following tanks are not considered to be dedicated seawater ballast tanks, provided the coatings applied in the tanks described in **(2)** below are confirmed by the coating manufacturer to be resistant to the media stored in the tanks, and are applied and maintained according to the coating manufacturer's procedures.

(1) Tanks identified as "Spaces included in Net Tonnage" in the International Convention on

Tonnage Measurement of Ships, 1969

(2) Sea water ballast tanks in livestock carriers also designated for the carriage of the livestock dung

CS25.4.3 Corrosion Protection for Cargo Oil Tanks

1 "Crude oil tankers" in **22.4.3, Part CS of the Rules** refers to ships defined in **2.1.1(19), Part 1 of the Rules for Marine Pollution Prevention Systems**, and falling under items 1.11.1 or 1.11.4 of the Supplement to the International Oil Pollution Prevention Certificate (Form B).

2 The requirements of **22.4.3, Part CS of the Rules** need not be applied to "combination carrier" defined in **2.1.1(8), Part 1 of the Rules for Marine Pollution Prevention Systems** and "ships carrying dangerous chemicals in bulk" including ships certified to carry oil stipulated in **2.1.1(1), Part 1 of the Rules for Marine Pollution Prevention Systems**.

3 With respect to **22.4.3(1), Part CS of the Rules**, IACS Unified Interpretation SC259 as may be amended is to be applied.

4 With respect to **22.2.3(2), Part CS of the Rules**, IACS Unified Interpretation SC258 as may be amended is to be applied.

CS23 EQUIPMENT

CS23.1 Anchors, Chain and Ropes

Paragraphs CS23.1.1 and CS23.1.2 have been added as follows.

CS23.1.1 General

1 The "special consideration" referred to in **23.1.1-3, Part CS of the Rules** means the evaluation of the design effectiveness of anchors, chain cables and windlasses.

CS23.1.2 Equipment Numbers

1 Significant figures are to be taken as follows:

(1) Dimensions, such as length, height, and breadth are to be in metres rounded to two decimal places.

(2) The displacement W is to be measured in tons in whole numbers.

(3) Terms in the formula ($W^{2/3}$, $2.0(hB+S_{fun}$, $0.1A$) are to be rounded to the nearest whole number.

Example

L_2 = 313.00 *m* (Designed)

= 313.06 *m* (Scantling)

B = 48.20 *m*

D = 25.50 *m*

d = 19.00 *m* (Designed)

d_s = 19.8 *m* (Scantling)

W = 253,800 *t* (Scantling)

f = 25.50 − 19.80 = 5.70

h' = 2.70 × 4 + 2.80 × 1 = 13.60

h = 5.70 + 13.60 = 19.30

$f \times$ = 5.70 × 313.06 = 1,784.4

(figures below 1st place of decimals omitted)

$(h'' \times l)$

Upper deck house = 2.70 × 40.85 = 110.2

(figures below 1st place of decimal omitted)

A deckhouse = 2.70 × 40.85 = 110.2 (〃)

B deckhouse = 2.70 × 34.85 = 94.0 (〃)

+) *C* deckhouse = 2.70 × 34.85 = 94.0 (〃)

$\sum(h'' \times l)$ = 408.4

A = 1,784.4 + 408.4 = 2,192 (fraction omitted)

$W^{2/3}$ = 253,800$^{2/3}$ = 4,009

(whole number rounded to nearest)

$2.0\,hB$ = 2.0 × 19.30 × 48.20 = 1,861 (〃)

+) $0.1A$ = 0.1 × 2,192 = 219 (〃)

Equipment number = 6,089

2 Measurement of breadth of structures for second term of the formula in **23.1.2, Part CS of the Rules**

(1) Structures are to be treated as separated above and below by a deck level. A continuous superstructure or deckhouse situated on one tier is to be treated as a single structure irrespective

of the mode of variation of their breadth and height, continuous or discontinuous, and the breadth is to be the largest one as shown in **Fig. CS23.1.2-1**.

(2) As for detached independent deckhouses on one tier, breadths of respective deckhouses are to be measured separately to determine whether they are to be included or not. (*See* **Fig. CS23.1.2-2**)

(3) Where a deckhouse having a breadth greater than $B/4$ is above a deckhouse with a breadth of $B/4$ or less, the narrow deckhouse may be ignored. (*See* **Fig. CS23.1.2-3**)

(4) When calculating h, sheer and trim are to be ignored. (*See* **Fig. CS23.1.2-4**)

3 Side projected area A may be in accordance with following **(1)** and **(2)**.

(1) The area of deck camber may disregarded when determining side projected area A.

(2) Side projected area A may be calculated using following formula.

(a) A is the value obtained from the following formula:

$aL_2 + \sum h''l$

$\Sigma h''l$: Sum of the products of the height h'' (m) and length l (m) of superstructures, deckhouses, trunks or funnels which are located above the uppermost continuous deck within L_2 and also have a breadth greater than $B/4$ and a height greater than 1.5 m

(b) Structures are to be treated as separated above and below by a deck level. A continuous superstructure or deckhouse situated on one tier is to be treated as a single structure irrespective of the mode of variation of their breadth and height, continuous or discontinuous. The length of the single structure is to be the value at the largest point. However, if the height is not more than 1.5 m, the part of the single structure is to be ignored. (See **Fig. CS23.1.2-5**)

(c) h'' is the height (m) at the centreline of each tier of deckhouses having a breadth greater than $B/4$.

4 Structures to be included in the third term of the formula in **23.1.2, Part CS of the Rules**

(1) The following items may be excluded from ship side projected area A:

(a) portions outside the fore and aft ends of L

(b) derrick posts, ventilators, etc. in continuation with superstructures or deckhouses

(c) cargoes loaded on decks

Fig. CS23.1.2-1

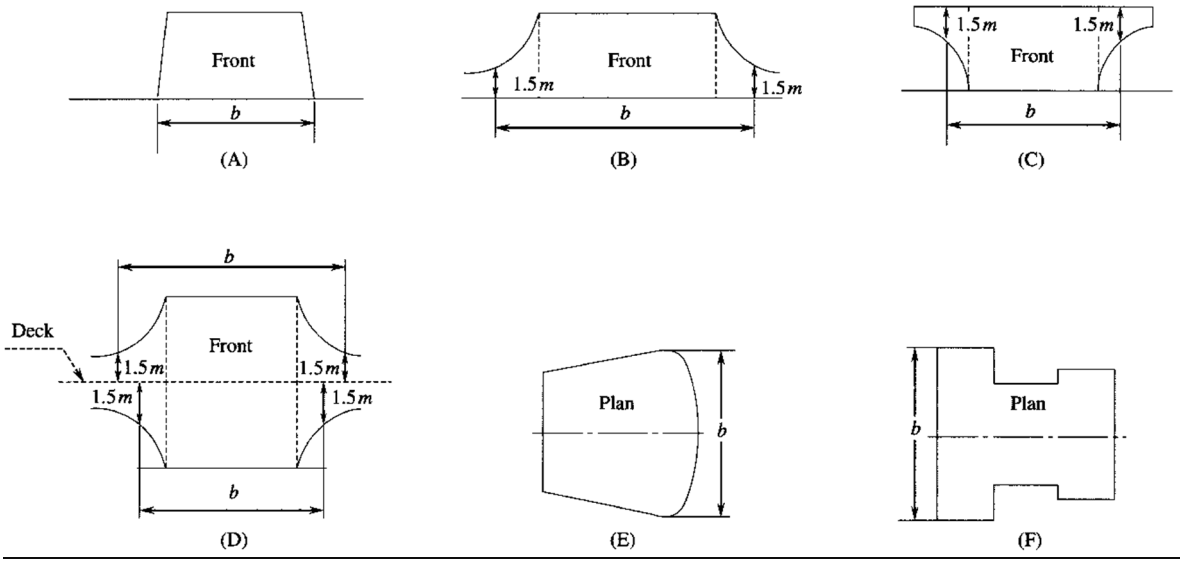
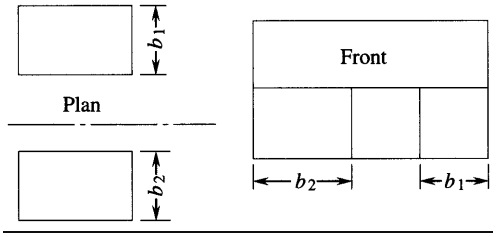


Fig. CS23.1.2-2



Note:

If both b_1 and b_2 are less than $B/4$, they are not to be included (irrespective of the sum b_1+b_2)

Fig. CS23.1.2-3

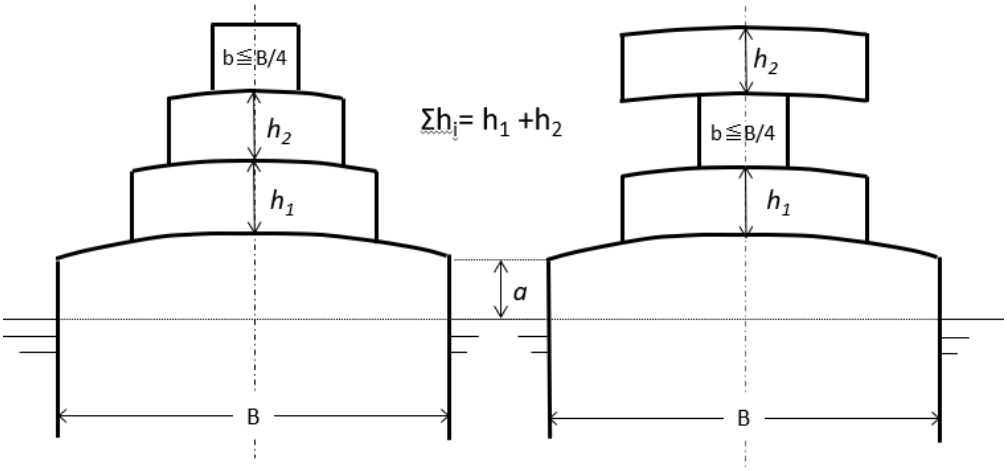


Fig. CS23.1.2-4

$$\sum h' = h_1 + h_2 + h_3$$

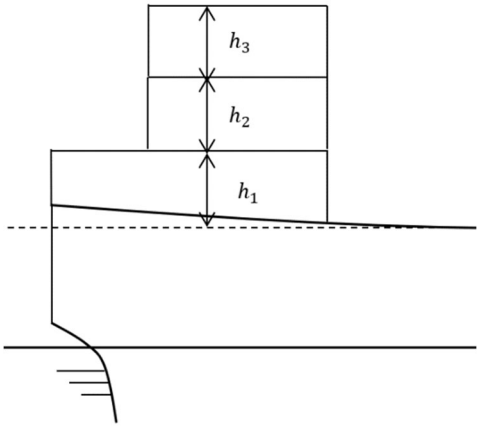
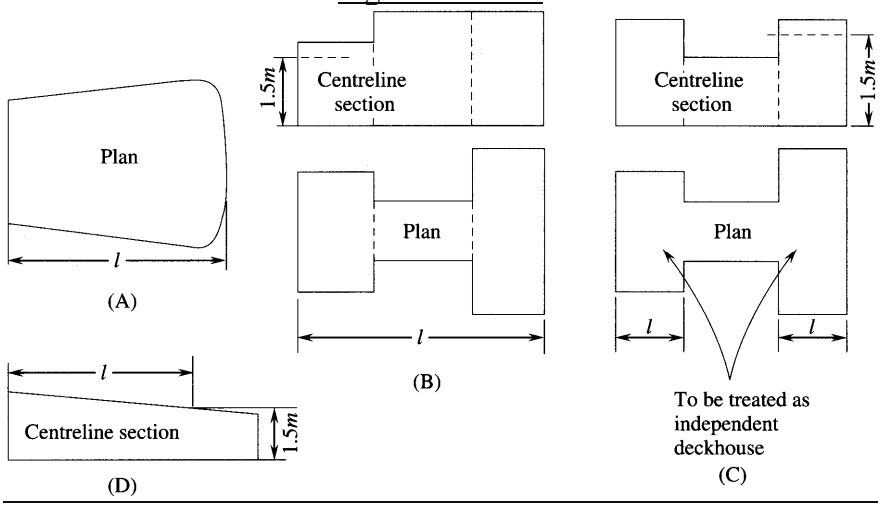


Fig. CS23.1.2-5



Paragraph CS23.1.5 has been added as follows.

CS23.1.5 Chain Lockers

The wording "the access cover and its securing arrangements to the satisfaction of the Society" in **23.1.5-5, Part CS of the Rules** means those which are in accordance with *JIS* F 2304, *JIS* F 2329, or *ISO* 5894:1999 or their equivalent.

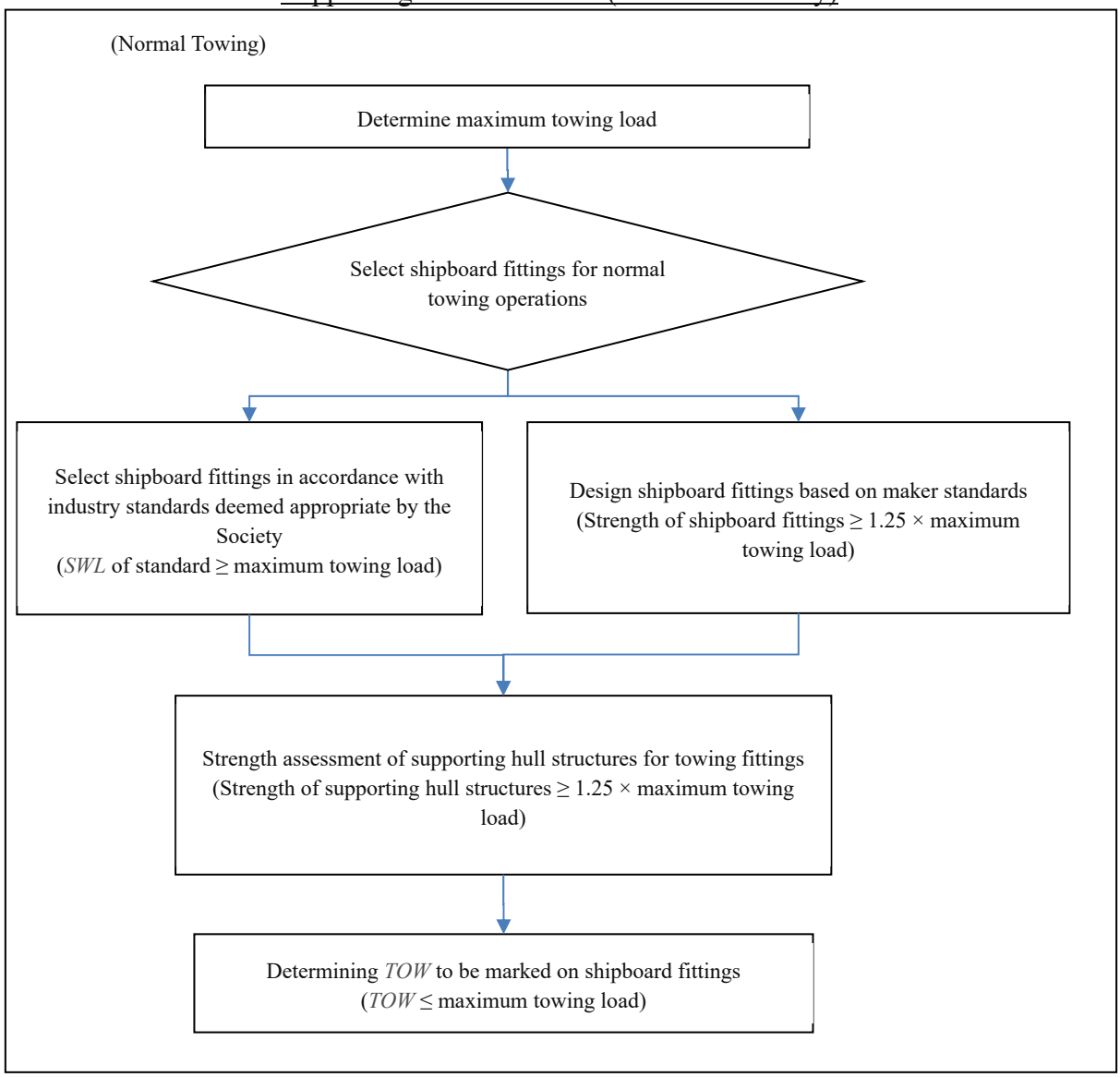
Section CS23.2 has been added as follows.

CS23.2 Towing and Mooring Fittings

CS23.2.1 General

With respect to the provisions of **23.2, Part CS of the Rules**, the flow charts shown in **Fig. CS23.2.1-1** and **Fig. CS23.2.1-2** are standard methods for the design processes of tow lines, mooring lines, shipboard fittings and their supporting hull structures.

Fig. CS23.2.1-1 Standard Design and Selection Process for Tow Lines, Towing Arrangements and Supporting Hull Structures (for reference only)



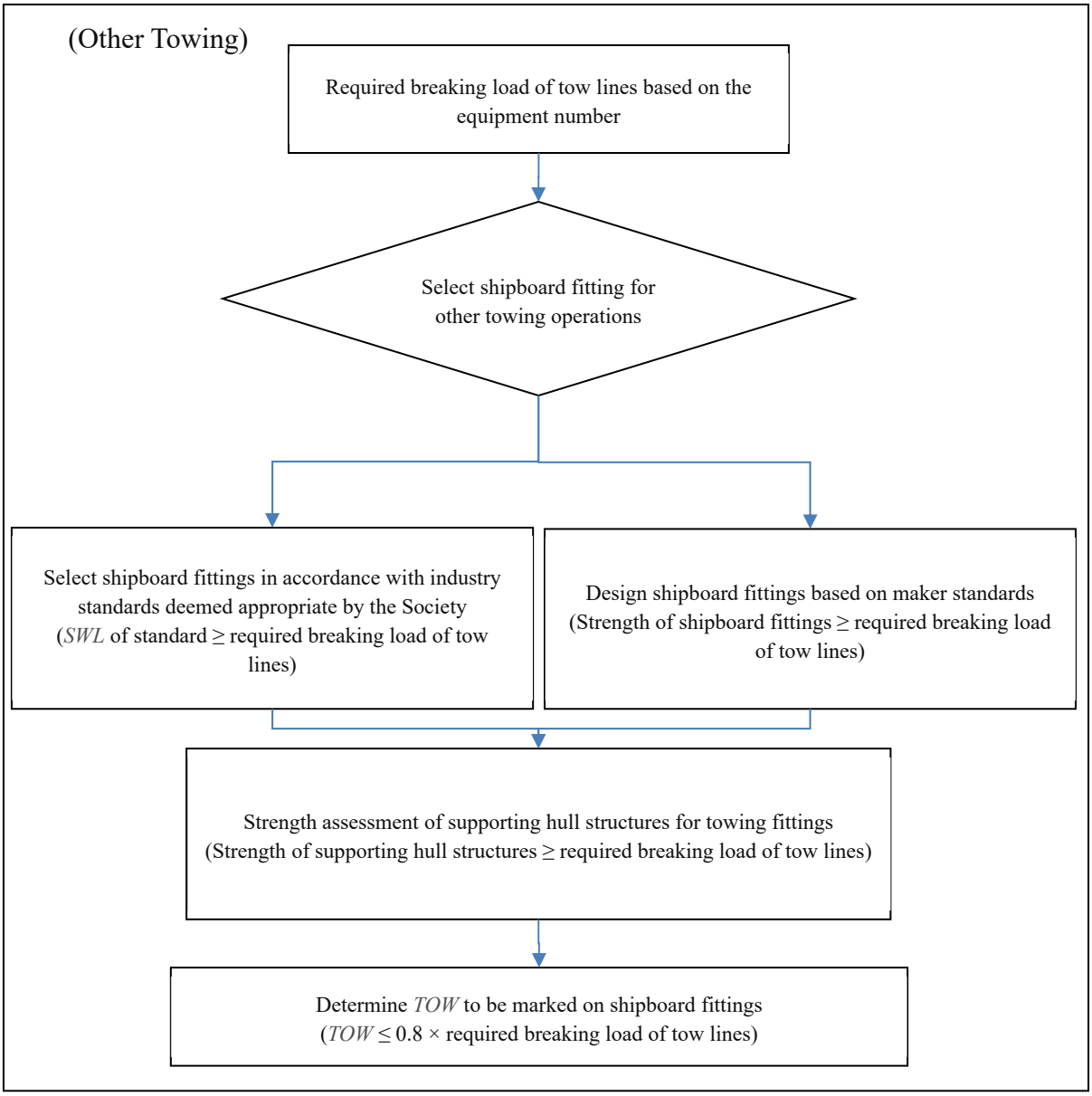
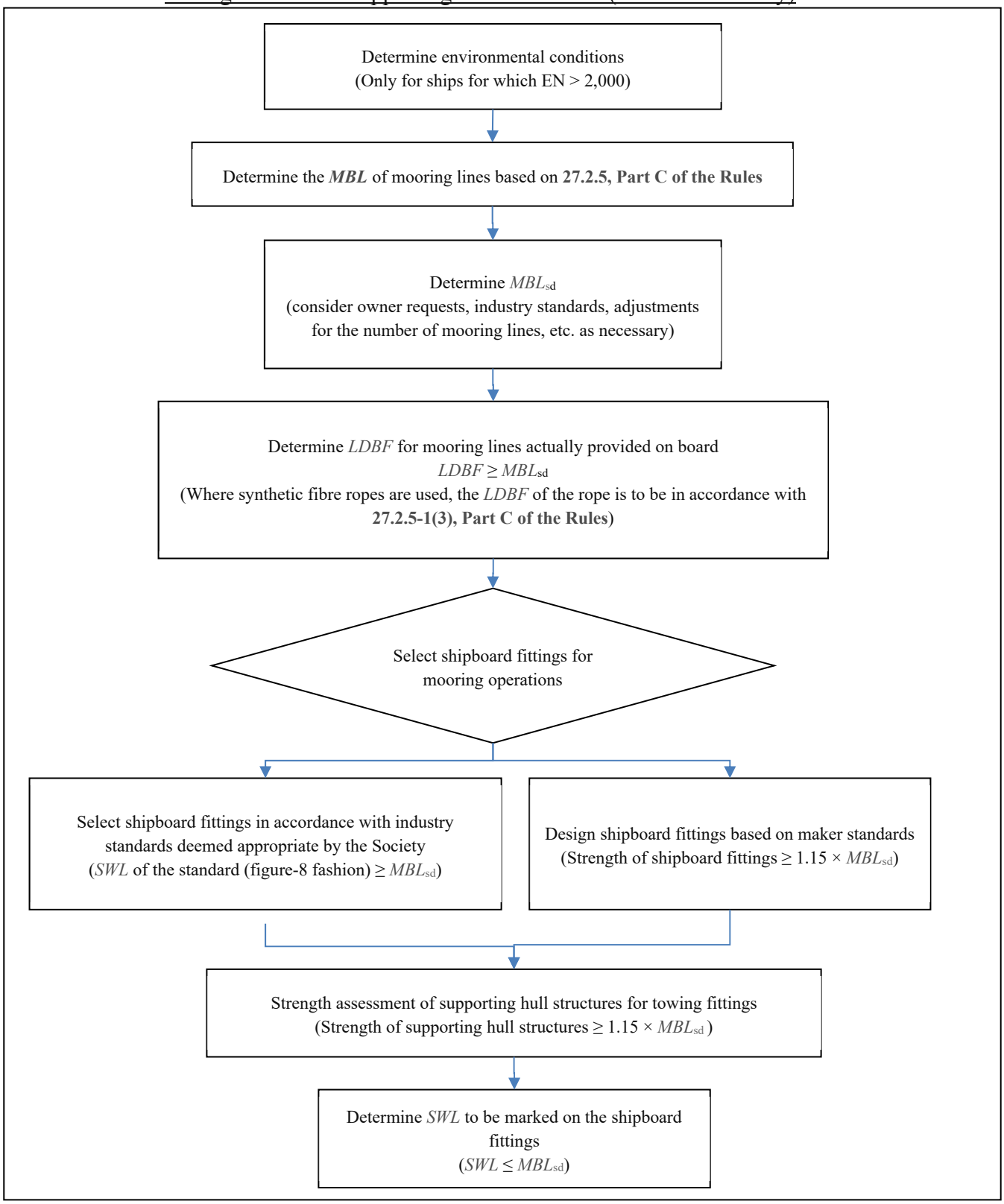

(Other Towing)
Required breaking load of tow lines based on the equipment number
Select shipboard fitting for other towing operations
Select shipboard fittings in accordance with industry standards deemed appropriate by the Society (*SWL* of standard ≥ required breaking load of tow lines)
Design shipboard fittings based on maker standards (Strength of shipboard fittings ≥ required breaking load of tow lines)
Strength assessment of supporting hull structures for towing fittings (Strength of supporting hull structures ≥ required breaking load of tow lines)
Determine *TOW* to be marked on shipboard fittings (*TOW* ≤ 0.8 × required breaking load of tow lines)

Fig. CS23.2.1-2 Standard Design and Selection Process for Mooring Lines, Mooring Arrangements and Supporting Hull Structures (for reference only)



CS23.2.3 Towing Fittings

1 "Industry standards deemed appropriate by the Society" as prescribed in **23.2.3-3(1), Part CS of the Rules**, means international standards or national standards such as *ISO*, *JIS F*, etc.

2 The provisions for the *TOW* specified in **23.2.3-6, Part CS of the Rules** are applied for the use of no more than one line. If not otherwise specified the *TOW* for towing bitts (double bollards) is the load limit for tow lines attached with eye splices.

3 Towing arrangements are recommended as follows.

(1) Tow lines are to be led through a closed chock. The use of open fairleads with rollers or closed roller fairleads is to be avoided.

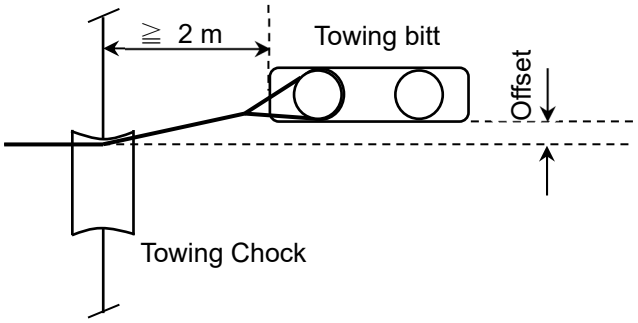
(2) It is recommended to provide at least one chock close to centreline of the ship forward and aft. It is beneficial to provide additional chocks on the port and starboard sides at the transom and at the bow.

(3) Tow lines are to have a straight lead from the towing bitt or bollard to the chock. Bitts or bollards serving chocks are to be located slightly offset and at a distance of at least 2 *m* away from the chock. (See **Fig. CS23.2.3-1**)

(4) Warping drums are to be positioned not more than 20 *m* away from chocks measured along the path of the line as far as practicable.

(5) Attention is to be given to the arrangement of the equipment for towing and mooring operations in order to prevent interference of mooring and tow lines as far as practicable.

Fig. CS23.2.3-1 Sample Arrangement of Towing Fittings



CS23.2.6 Mooring Fittings

1 The requirements in **23.2, Part CS of the Rules** also apply to additional mooring fittings as well as their supporting hull structures. However, MBL_{sd} specified in **23.2.6-3(1), Part CS of the Rules** and MBL_{sd} specified in **23.2.6-4, Part CS of the Rules** may be read as assumed values in consideration of the intended use. This information is to be incorporated into the towing and mooring arrangement plan specified in **23.2.9, Part CS of the Rules.**

2 The "industry standards deemed appropriate by the Society" referred to in **23.2.6-3(1), Part CS of the Rules** means international standards or national standards such as *ISO*, *JIS F*, etc.

3 The provisions for *SWL* specified in **23.2.6-6, Part CS of the Rules** apply only in cases where no more than one line is used.

4 Mooring arrangements are recommended to be as follows.

(1) As far as possible, a sufficient number of mooring winches is to be fitted to allow for all mooring lines to be belayed on winches. If the mooring arrangement is designed such that mooring lines are partly belayed on bitts or bollards, it is to be considered that these lines may not be as effective as the mooring lines belayed on winches. Mooring lines are to have as straight a lead

as is practicable from the mooring drum to the fairlead.

(2) At points of changes in direction, sufficiently large radii of the contact surface of a rope on a fitting is to be provided to minimize the wear experienced by mooring lines and as recommended by the rope manufacturer for the rope type intended to be used.

(3) Attention is to be given to the arrangement of the equipment for mooring operations in order to prevent interference of the mooring lines as far as practicable.

CS23.2.9 Towing and Mooring Arrangements Plan

1 It is recommended that the information related to safe towing and mooring operation in the towing and mooring arrangement plan specified in **23.2.9, Part CS of the Rules** is incorporated into the pilot card in order to provide pilots with relevant information on harbour or escort operations.

2 With respect to the provisions specified in **23.2.9-2(6), Part CS of the Rules**, the design condition related to **23.2.5-3(2), Part CS of the Rules** is to be described in this plan as a note.

Chapter CS24 has been added as follows

CS24 TANKERS

CS24.1 General

CS24.1.1 Application

1 With respect to the provisions of **24.1.1-2, Part CS** of the Rules, ships intended for the carriage of liquid cargoes having a vapour pressure less than 0.28 *MPa* at 37.8°C other than crude oil and oil petroleum products, are to be in accordance with the following.

(1) For tankers carrying liquid cargoes with a specific gravity ρ exceeding 1, the scantlings of structural members composing the cargo oil tank are to be the greater of the values obtained by the following two procedures.

(a) All scantlings calculated in accordance with the relevant requirements of the Rules

(b) Scantlings calculated by structural member type as follows

i) The scantlings of bulkhead plates, stiffeners attached to bulkhead plating, and girders attached to bulkhead plating are to be calculated by multiplying h by ρ before using the formulae specified in **24.3**, **24.4** and **24.7, Part CS** of the Rules.

ii) The scantlings of girders and floors in the double bottom and girders and transverses in the double side hull are to be calculated by multiplying h' by ρ before using the formulae specified in **24.6.3** and **24.6.4, Part CS** of the Rules. Where the load from the cargo oil tank is considered in determining h_i specified in **C24.5.1(1)**, the load is to be multiplied by ρ.

iii) The values of ρ are to be determined for respective cases unless shown in **Table CS24.1.1-1**.

(2) For tankers carrying dangerous chemicals in bulk, the requirements in **Part S** of the Rules are also to be applied.

Table CS24.1.1-1 Values of ρ

Cargo	ρ
Molasses	1.4
Asphalt	1.1
Concentrated sulphuric acid	1.85

2 Proposal of novel construction type

In the event that a novel construction type is proposed, scantlings are to be determined by carrying out comparative calculations with the standard structural model conforming to the requirements of the Rules. Submission of data covering the results of model experiments or real ship experiments may be requested by the Society as necessary.

CS24.1.2 Location and Separation of Spaces

1 Size and arrangement of cargo oil tanks and segregated ballast tanks.

The size and arrangement of cargo oil tanks and segregated ballast tanks are to comply with the requirements of **3.2.1, Part 3 of the Rules for Marine Pollution Prevention Systems**.

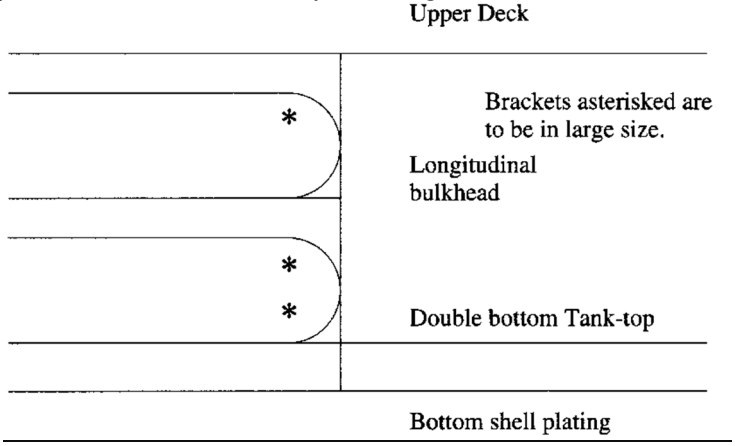
2 Restriction on arrangements of double hull structures and double bottom structures

Arrangements of double side hulls and double bottoms are to comply with the requirements of **3.2.4, Part 3 of the Rules for Marine Pollution Prevention Systems**.

3 Continuity of longitudinal bulkhead

At the forward and afterward ends of cargo oil tanks, precautions are to be taken to keep continuity between the ends of longitudinal bulkheads and the longitudinal members of the deck. (*See* **Fig. CS24.1.2-1**)

Fig. CS24.1.2-1 Continuity of Longitudinal Bulkhead at Ends



4 Cofferdams and bulkheads bounding cargo oil tanks

(1) "Cofferdam" referred to in **24.1.2-2, Part CS** of the Rules means an isolating void space between two adjacent steel bulkheads or decks. In case of the cofferdam between bulkheads, it is to be arranged to keep the minimum distance of 600 *mm* between bulkheads.

(2) Where a cargo oil tank is adjacent to the fore peak (fore peak tank), the collision bulkhead is to be free from openings. (*See* **14.3.2** and **14.3.3, Part D** of the Rules)

(3) Divisions between compartments defined as cofferdams and other compartments (except cargo oil tanks and fuel oil tanks) are not to have any openings with the exception of bolted watertight manholes provided in chain locker bulkheads, etc. (no watertight door is permitted).

(4) Electrical equipment is to be dealt with referring to the relevant requirements in **Chapter 4, Part H** of the Rules.

5 Airtight bulkheads

(1) Cofferdams which are not utilized as main or auxiliary pump rooms and compartments utilized as cofferdams under the freeboard deck are to meet the requirements for the strength of deep tanks. The bulkhead between the main pump room and engine room is to have structural scantlings of a watertight bulkhead in ships of not less than 100 *m* in length and of an airtight bulkhead in ships of less than 100 *m* in length.

(2) The following values are standard for scantlings of airtight bulkheads for which no hydrostatic tests are required. Airtightness tests may be replaced by hose tests. The plate thickness is not to be less than 6 *mm*, which may, however, be reduced to 4.5 *mm* in ships of less than 100 *m* in length. The section modulus of stiffeners and girders is to be 50% of the Rule requirements for watertight bulkheads. Where connected to the shell and decks, however, these stiffening members are to have the same effectiveness as frames and beams.

6 Superstructures and deckhouses

The deckhouse protecting the entrance to pump rooms is to be in accordance with the following requirements.

(1) The strength of the front wall is to be equivalent to that of the wall of the bridge.

(2) The strength of side walls and after wall are to be equivalent to that of the front wall of the poop.

(3) The height of doorway coamings is not to be less than 600 *mm* above the freeboard deck. However, the height may be reduced to not less than 450 *mm* for ships with a class notation of *Coasting Service*.

CS24.4.2 Swash Bulkheads

1 Arrangements of swash bulkheads

Where the length or breadth of a cargo oil tank exceeds, 15 *m* or 0.1*L* (*m*), whichever is greater, swash bulkheads are to be provided in cargo oil tanks. However, this requirement may be dispensed with if special consideration is given to sloshing.

(1) The breadth and thickness of the uppermost and lowest strakes of the centreline swash bulkhead may be 90% of those required by the Rules for the uppermost and lowest strakes (respectively) of the longitudinal oiltight bulkhead.

(2) The "opening ratio" means the ratio of the sum of areas of openings (except slots and scallops) to the area of the bulkhead.

(3) The section modulus of stiffeners is to be obtained from the following formula.

It is not to be less than 2.0.

$CSh_s l^2$ (cm^3)

Where:

S: Spacing (*m*) of stiffeners

l : Span (*m*) of stiffener between supports

C : Coefficients given below:

Both ends effectively bracketed: 7.1

One end effectively bracketed and the other end supported by girder: 8.4

Both ends supported by girders: 10.0

h_s: Value obtained from the following formula

It is not to be less than 2.0.

$$\left(0.176 - \frac{0.025}{100}L\right)(1-\alpha)l_t$$

Where:

L: Length (*m*) of ship

α: Opening ratio of bulkhead plating

l_t: Length (*m*) of tank

(4) In applying the requirements of **24.7.1-1** to **24.7.1-3, Part CS** of the Rules, the scantlings of girders supporting stiffeners are to be obtained in such a way that values of *h* specified in the requirements under consideration referred to are not less than that obtained by substituting *h* with h_s specified in **(3)**.

CS24.9.4 Supporting Structures of Independent Prismatic Tanks

1 General

With respect to the provisions of **24.7.4, Part CS of the Rules,** the arrangement and scantlings of the supporting structures of the independent prismatic tanks are to comply with the requirements of this paragraph. However, other methods approved by the Society may be acceptable.

2 Strength Criteria

Compressive stress σ_a (N/mm^2) acting on each plate which composes the supporting structures, excluding top plate, is to comply with the following criteria:

$\sigma_a < \sigma_{cr}$

σ_a : The compressive stress acting on each plate which composes the supporting structures, excluding top plate, as given by the following:

$$\sigma_a = \frac{F_a}{A_{\min}} \quad (N/mm^2)$$

F_a : Load acting on the supporting structures as given by the following:

$$F_a = 1000\rho V_t(1+a_z)g \quad (N)$$

ρ : Cargo density (ton/m^3)

V_t : Tank volume (m^3) supported by the supporting structure under consideration

a_z : Maximum dimensionless vertical acceleration (i.e. relative to the acceleration of gravity) acting on the centre of the cargo tank under consideration obtained from the following formula. a_z does not include the component due to the static weight.

$$a_z = \pm a_0 \sqrt{1 + \left(5.3 - \frac{45}{L}\right)^2 \left(\frac{x}{L} + 0.05\right)^2 \left(\frac{0.6}{C_b}\right)^{1.5}}$$

a_0: As obtained from the following formula:

$$a_0 = 0.2\frac{V}{\sqrt{L}} + \frac{34 - \frac{600}{L}}{L}$$

V : Ship speed (kt) as define in **2.1.8, Part A of the Rules**

x : Longitudinal distance (m) from amidships to the centre of gravity of the cargo tank; x is positive forward of amidships

g: Acceleration due to gravity to be taken as 9.81 (m/s^2)

$A_{\min}$: Minimum horizontal sectional area (mm^2) which is obtained by subtracting 0.5 mm from all side of the plates (*See* **Fig.CS24.7.4-1**)

σ_{cr}: Allowable stress obtained by the following value, whichever is the lesser:

$\frac{\sigma_{yd}}{1.33}$ (N/mm^2)

$C_x\sigma_{yd}$ (N/mm^2)

σ_{yd}: Yield stress (N/mm^2) of the material used for the supporting structures

C_x : Reduction factor for each plate which composes the supporting structures, excluding top plate, as obtained by **Table CS24.7.4-1**. Assessed plate which is not rectangular may be approximated using **Table CS24.7.4-2**.

Fig. CS24.7.4-1 Example of Supporting Structure (Excluding Top Plate) and the Relevant Minimum Horizontal Sectional Area

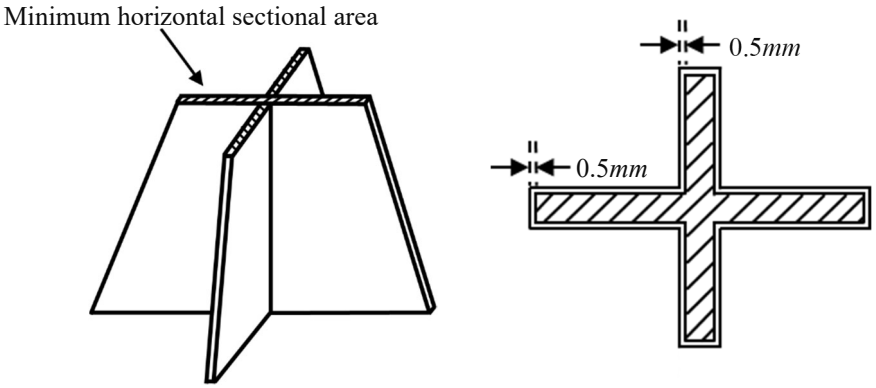
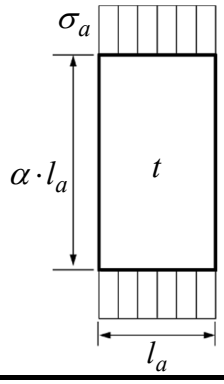
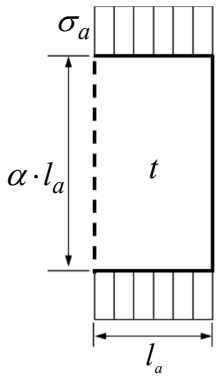


Table CS24.7.4-1 Reduction Factor for Plane Plate Panels

	Aspect ratio α	Buckling factor K	Reduction factor C_x
1  	$\alpha \geq 1$	$K = 4$	$C_x = 1$ for $\lambda \leq 0.8$ $C_x = 1.13\left(\frac{1}{\lambda} - \frac{0.22}{\lambda^2}\right)$ for $\lambda > 0.8$
2  	$\alpha > 0$	$K = 0.425 + \frac{1}{\alpha^2}$	$C_x = 1$ for $\lambda \leq 0.7$ $C_x = \frac{1}{\lambda^2 + 0.51}$ for $\lambda > 0.7$

Explanations for boundary conditions:

- - - - - plate edge free

——— plate edge simply supported

λ: Reference degree of slenderness, to be taken as:

$$\lambda = \sqrt{\frac{\sigma_{yd}}{K\sigma_E}}$$

σ_E: Reference stress (N/mm^2), to be taken as:

$$\sigma_E = 0.9E\left(\frac{t}{l_a}\right)^2$$

E: Modulus of elasticity, 206,000 (N/mm^2)

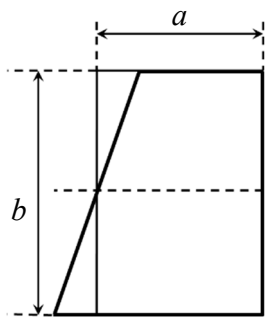
t: As obtained from the following formula

$$t = t_{as-built} - 1.0 \ (mm)$$

$t_{as-built}$: As-built thickness (mm)

l_a: Length of the side of the plate panel (mm)

Table CS24.7.4-2 Trapezoidal Panel Approximation

Shape	Approximation
	A rectangle is derived with *a* being the mean value of the bases and *b* being the height of the original panel.

CS24.11.5 Freeing Arrangement

1 Effective freeing arrangement

Open guardrails installed on more than half the length of the exposed parts of the freeboard deck may be replaced by freeing ports in the lower parts of the bulwarks, for at least 33% of the total area of bulwarks.

CS25 LOADING MANUAL

CS25.1 General

CS25.1.1 General

Sub-paragraph -1 has been amended as follows.

1 "Ships deemed appropriate by the Society" as stipulated in **25.1.1-2, Part CS** of the Rules, refers to the following types of ships when their maximum deadweight does not exceed 30 % of their maximum displacement.

(1) Ships with an arrangement that allows only small possibilities of variation in the distribution of cargo and ballast.

(2) Ships in regular service that perform standard loading. However, it is to be clearly stated either in the "Stability Information" as stipulated in **2.3.2-1, Part B** of the Rules, or in some other suitable document that no non-standard loading is to be performed.

(3) Ships other than those stipulated in ~~**34.1.1-2**~~**3.8.1.1-2, Part C** of the Rules.

Paragraph CS25.1.2 has been added as follows.

CS25.1.2 Loading Manual

1 The loading manual approved by the Society according to **25.1.2, Part CS of the Rules**, is to be prepared in compliance with **Annex3.8, Part 1, Part C of the Rules.** The manual is to be written with a language easily understood by the ship master. Where this language is not English, a translation into English is to be included.

2 The "standard loading conditions" specified in **25.1.2, Part CS of the Rules**, are the loading conditions specified for each ship type in **An1.3** of **Annex 3.8, Part 1, Part C of the Rules**.

CS26 MEANS OF ACCESS

Section CS26.1 has been added as follows.

CS26.1 General Rules

CS26.1.1 General

1 Means of access specified in **26.1.1, Part CS** of the Rules are arranged for the purpose of detecting disorders such as damage, corrosion, etc. which may occur on the boundaries of compartments and important internal structural members fitted thereon, such as transverse rings, web frames, girders, struts, etc. at an early stage. Accordingly, the arrangement is to be such that any one side of these members can be easily and safely inspected from within a distance of not more than 3 *m*. This distance may be properly modified, depending on the actual conditions, when easy access and/or ample illumination is available.

2 The means of access may be those permanently fixed to the hull, such as stagings, walkways, ladders, and steps (hereinafter, referred to as "permanent means of access") and those that are prepared for temporary use, such as inflatable rafts and portable ladders. Where structural members can be utilized as stagings or walkways, they can be regarded as permanent means of access.

CS26.1.2 Means of Access to Spaces

1 With respect to the provisions of **26.1.2, Part CS** of the Rules, permanent means of access where deemed as impracticable by the Society may be placed with portable ladders.

2 The openings of hatches or manholes for the means of access to the hold spaces for independent tanks are to be not less than those required by **g.** of **Table CS26.1.2**.

CS26.1.3 Means of Access within Spaces

1 With respect to the provisions of **26.1.3, Part CS** of the Rules, the following spaces and places are to be provided with permanent means of access.

(1) Fore peak tanks
(2) Aft peak tanks
(3) Cofferdams
(4) One side tank situated at or near the forward end of the parallel body of the hull and one or more tank(s) in other parts (water ballast tank if possible)
(5) Any one or more tank(s) from among centre tanks
(6) Watertight and oiltight bulkheads having horizontal girders
(7) Cargo holds with bilge hopper tanks whose height is over 3 *m* at side from the top of inner bottom plates to upper end of bilge hopper tanks

2 The permanent means of access in the spaces and places prescribed in **-1** above are to be arranged in accordance with the following:

(1) In side tanks, ladders or steps are to be so arranged that all corners and structural ends of one or more transverse ring(s) (preferably at mid-tank) can be inspected.
(2) In centre tanks, ladders or steps are to be so arranged that both ends of one or more bottom transverse(s) (preferably at mid-length of tank) can be inspected.
(3) For watertight and oiltight bulkheads with horizontal girders, ladders or steps are to be arranged for access to such girders.
(4) Ladders or steps for access to a height up to about 1.5 *m* above the bottom or a horizontal girder may be omitted where access is available by means of longitudinal frames, horizontal stiffeners, etc.
(5) On both sides of each cargo hold specified in **-1(7)** above at the forward, middle and aft parts,

ladders (or steps) and hand rails are to be available for inspection of lower parts of hold frames together with their end brackets. Hand rails are to be fitted within the spaces between three hold frames at least. However, a portable ladder may be acceptable instead of fixed ladders (or steps) and hand rails may be omitted subject to approval by the Society.

3 The clearances for inspections and means of access within the hold spaces for independent tanks is to be not less than those required by **a.** to **f.** of **Table CS26.1.2.**

Table CS26.1.2

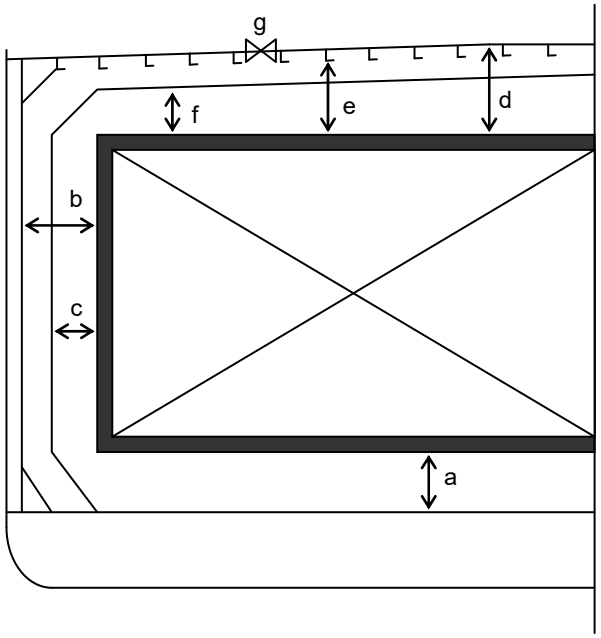
Location(1)	ships not less than 5,000 tonnes deadweight	ships less than 5,000 tonnes deadweight
a. insulation ~ inner bottom plate	600 *mm*	600 *mm*
b. insulation ~ side frame	600 *mm*	450 *mm*
c. insulation ~ girder	450 *mm*(2)	450 *mm*(2)
d. insulation ~ upper deck	600 *mm*	600 *mm*
e. insulation ~ deck beam	600 *mm*	450 *mm*
f. insulation ~ deck girder	450 *mm*(2)	450 *mm*(2)
g. horizontal opening	600 *mm* ×600 *mm*	500 *mm* ×500 *mm*

Notes:

(1) Refer to **Fig. CS26.1.2** for the relevant locations

(2) Where openings are provided in order to make the relevant location readily accessible from each side, it may be 0.5 times the width of face plate or 50 *mm*, whichever is smaller.

Fig. CS26.1.2



CS26.1.4 Specifications of Means of Access and Ladders

1 Means of access that are safe to use referred to in **26.1.4-1, Part CS** of the Rules mean those meeting the following conditions.

(1) Ladders and steps are not to be fitted on a surface which is unnecessarily outside the inside line of the hatch coaming.

(2) Hand grips are to be provided appropriately.

(3) Ladders and steps are to be extended upward and downward as deemed necessary.

(4) No hollows are to be allowed in flights of ladders.

2 With respect to the provisions of **26.1.4, Part CS** of the Rules, stagings and walkways forming

sections of permanent means of access are to be constructed as follows.

(1) The clear width of stagings and walkways is not to be less than 600 *mm*, except for going around vertical webs where the minimum clear width may be reduced to 450 *mm*, and have guard rails over the open side of their entire length.

(2) Elevated passageways forming sections of a permanent means of access are to be provided with guard rails of 750 *mm* in height on the open side.

(3) Where horizontal girders or similar structures are utilized as stagings, etc., lightening holes of a diameter exceeding 100 *mm* are to have fixed gratings.

3 With respect to the provisions of **26.1.4, Part CS** of the Rules, ladders and steps utilized for permanent means of access are to be constructed as follows.

(1) The width of ladders and steps is to be not less than 250 *mm* and the distance from the wall to the free edge of footsteps, not less than 120 *mm*. Footsteps are to be arranged at a regular interval not less than 250 *mm* but not more than 350 *mm*, or of an equivalent arrangement.

(2) Landings are to be provided at an interval not exceeding 9 *m* on vertical ladders and at a vertical interval of 12 *m* on inclined ladders.

4 Where portable ladders are utilized in accordance with the provisions of **CS26.1.3-2(5)**, appropriate measures such as horizontal bars which are provided between two transverse frames for hanging a ladder, are to be taken for their safe use.

5 Where rafts are utilized for means of access, they are to comply with the following conditions.

(1) The tanks are to have pumping arrangements for filling and discharging a capacity appropriate for ordinary water ballast tanks.

(2) Where swash bulkheads are provided in the tank, they are to have openings for passage in their upper part, or each part that is separated from others by such swash bulkheads is to have an access hatch or manhole. The dimensions of these hatches or manholes may be determined assuming that rafts will be inflated in the tanks.

(3) The raft is to be capable of carrying 3 persons, and where an inflatable type is used, be able to stay afloat safely even if one of the airtight chambers is broken. A ship is to have at least one raft, but it is recommended to have at least two.

CS26.2 Special Requirements for Oil Tankers

Paragraph CS26.1.2 has been added as follows.

CS26.2.1 Application

1 With respect to the provisions of **26.2, Part CS of the Rules**, this regulation does not apply to oil tankers other than those having integral tanks for the carriage of oil in bulk. Even in cases where the provisions of **26.2, Part CS of the Rules** are applied, **CS26.1.2-2** and **CS26.1.3-3** are also to be applied to the means of access to the hold spaces for independent tanks as well as and to the means of access within said hold spaces.

Paragraph CS26.2.2 has been added as follows.

CS26.2.2 General

1 For the purpose of **26.2, Part CS** of the Rules, appropriate means of access are to be provided to enable close-up examinations of positions where close-up examinations and thickness measurements are required in accordance with the provisions of **Part B** of the Rules and positions with critical structural areas. In application, “critical structural areas” are locations which have been identified from calculations to require monitoring or from the service history of similar or sister ships to be susceptible to cracking, buckling, deformation or corrosion which would impair the structural integrity of the ship. Each space for which close-up inspection is not required such as fuel oil tanks

and void spaces forward of cargo area, may be provided with a means of access necessary for overall survey intended to report on the overall conditions of the hull structure.

2 For the purpose of **26.2, Part CS** of the Rules, the following definitions apply.

(1) Rung means the step of a vertical ladder or step on a vertical surface.

(2) Tread means the step of an inclined ladder or step for a vertical access opening.

(3) Flight of an inclined ladder means the actual stringer length of an inclined ladder. For vertical ladders, it is the distance between the platforms.

(4) Stringer means either:

(a) The frame of a ladder

(b) The stiffened horizontal plating structure fitted on the side shell, transverse bulkheads and/or longitudinal bulkheads in the space

For the purpose of ballast tanks of less than 5 *m* width forming double side spaces, the horizontal plating structure is credited as a stringer and a longitudinal permanent means of access, if it provides a continuous passage of 600 *mm* or more in width past frames or stiffeners on the side shell or longitudinal bulkhead. Openings in stringer plating utilized as permanent means of access shall be arranged with guard rails or grid covers to provide safe passage on the stringer or safe access to each transverse web.

(5) Vertical ladder means a ladder of which the inclined angle is 70 *degrees* and over up to 90 *degrees*. A vertical ladder shall not be skewed by more than 2 *degrees*.

(6) Overhead obstructions mean the deck or stringer structure including stiffeners above the means of access.

(7) Distance below deck head means the distance below the plating.

(8) Cross deck means the transverse area of the main deck which is located inboard and between hatch coamings.

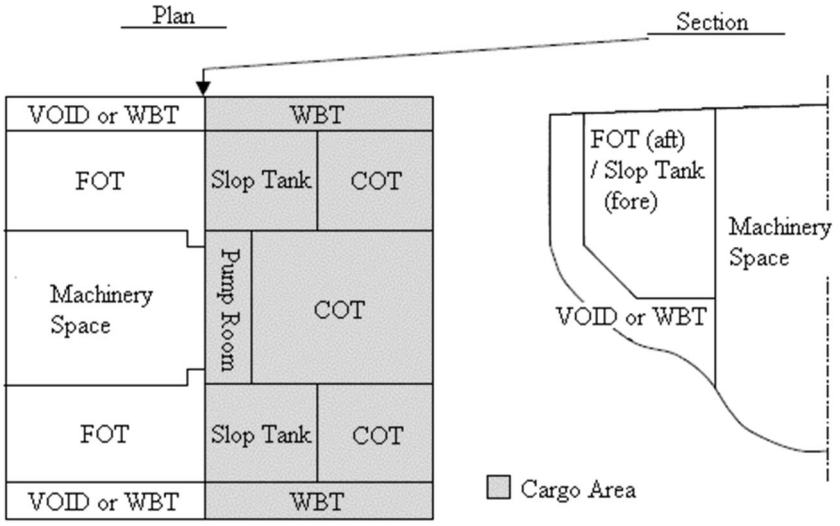
(9) Cargo area means either:

(a) For oil tankers, area as defined in **2.1.35, Part A** of the Rules but excluding deck areas

However, spaces protecting oil fuel tank(s) in the machinery space as shown in **Fig. CS26.2.2** need not be applicable to the provisions of **26.2, Part CS** of the Rules, even though they have a cruciform contact with the cargo oil tank or slop tank.

(b) For bulk carriers, cargo spaces and other spaces such as ballast tanks, cofferdams and void spaces within cargo spaces or adjacent to cargo spaces in the ship's transverse section

Fig. CS26.2.2



Paragraph CS26.2.3 has been added as follows.

CS26.2.3 Means of Access to Spaces

~~**1** With respect to the provisions of **26.2.3-2, Part CS** of the Rules, the wording "not intended for the carriage of oil or hazardous cargoes" applies only to "similar compartments", and access may be from pump-rooms, deep cofferdams, pipe tunnels, cargo holds and double hull spaces.~~

~~**2** "Deck" specified in **26.2.3-3, Part CS** of the Rules means "weather deck".~~

1 With respect to the provisions of **26.2.3**, **Part CS** of the Rules, the vertical distance between deck and horizontal stringer; horizontal stringers; deck or horizontal stringer and the bottom of the space; deck or horizontal stringer and platform; and platforms means the vertical distance between the upper surface of the lower deck, horizontal stringer or platform and the lower surface of the upper deck, horizontal stringer or platform

2 With respect to the provisions of **26.2.3**, **Part CS** of the Rules, special attention is to be paid to the structural strength where any access opening is provided in the main deck or cross deck.

3 With respect to the provisions of **26.2.3-2, Part CS** of the Rules, the wording "not intended for the carriage of oil or hazardous cargoes" applies only to "similar compartments", and access may be from pump-rooms, deep cofferdams, pipe tunnels, cargo holds and double hull spaces.

4 "Deck" specified in **26.2.3-3, Part CS** of the Rules means "weather deck".

5 With respect to the provisions of **26.2.3-4, Part CS** of the Rules, where deemed necessary for aligning resting platform arrangements with hull structures, the vertical distance from the deck to a platform, between such platforms, or a platform and the tank bottom may be not more than 6.6 *m*.

6 With respect to the provisions of **26.2.3-4(2)** and **(4), Part CS of the Rules**, adjacent sections of a vertical ladder are to be in accordance with following **(1)** to **(3)**. (Refer to **Fig. CS26.2.3-1**, **Fig. CS26.2.3-2** and **Table CS26.2.3**)

(1) The minimum "lateral offset" between two adjacent sections of a vertical ladder is the distance between the sections, upper and lower, so that the adjacent stringers are spaced at least 200 *mm* apart, measured from half thickness of each stringer.

(2) Adjacent sections of vertical ladder are to be installed so that the upper end of the lower section is vertically overlapped, in respect to the lower end of the upper section, to a height of 1,500 *mm* in order to permit a safe transfer between ladders. However, this requirement does not apply to cases where structural members (e.g. side stringers) are used to move between adjacent vertical ladders and are provided with safety measures such as handrails.

(3) No section of the access ladder is to be terminated directly or partly above an access opening.

Fig. CS26.2.3-1 Vertical Ladder – Ladder Passing through Linking Platform

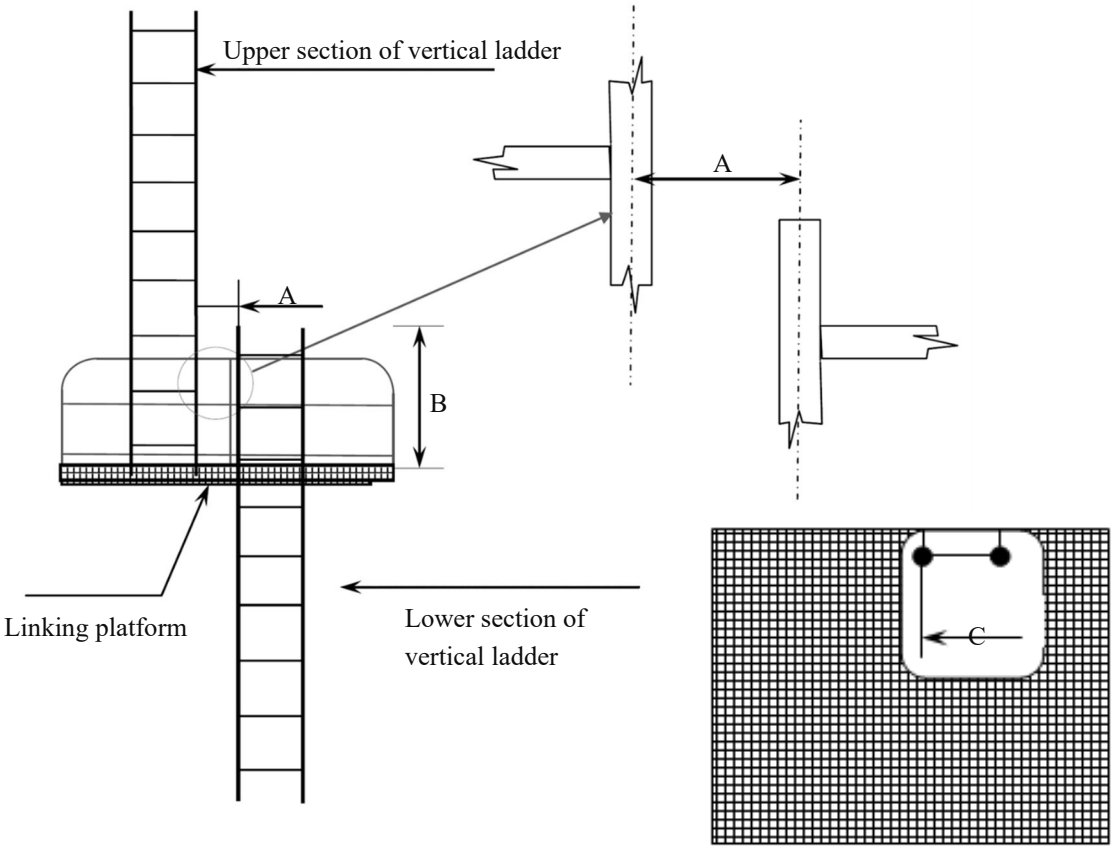


Fig. CS26.2.3-2 Vertical Ladder - Side Mount

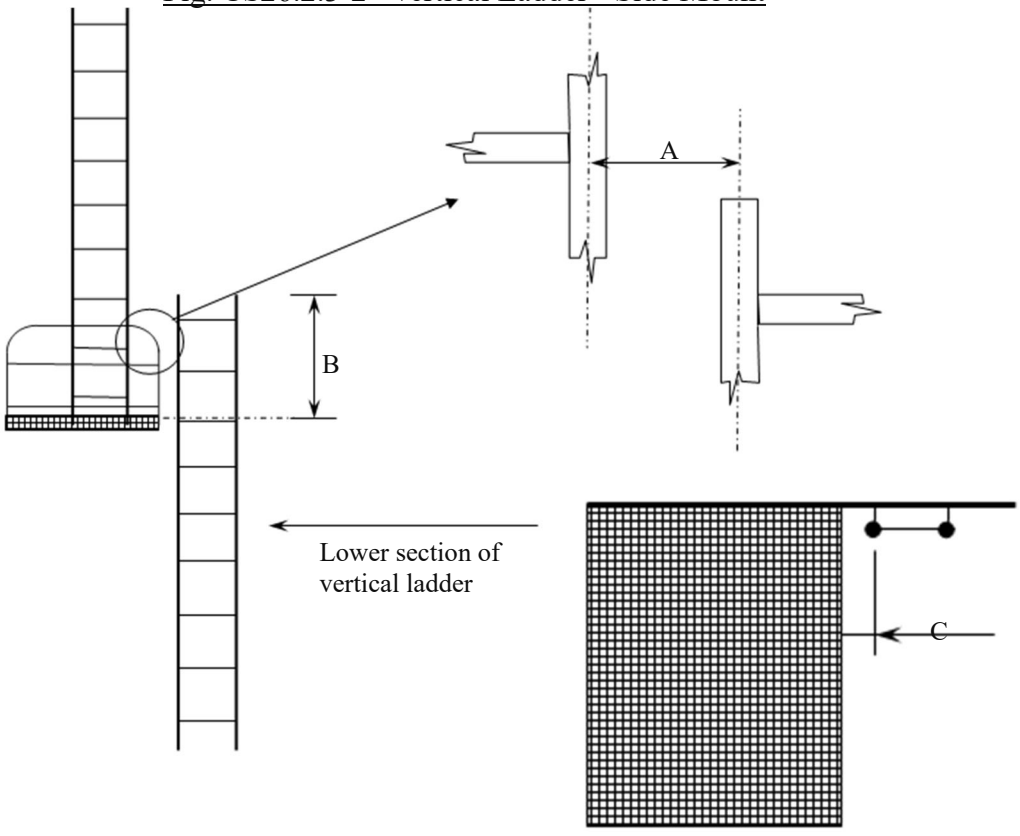


Table CS26.2.3 Dimensions

A	Horizontal separation between two vertical ladders, stringer to stringer	≥ 200 *mm*
B	Stringer height above landing or intermediate platform	≥ 1,500* *mm*
C	Horizontal separation between ladder and platform	100 *mm* ≤ C < 300 *mm*
Note * : the minimum height of the handrail of resting platform is 1,000 *mm*		

Paragraph CS26.2.4 has been added as follows.

CS26.2.4 Means of Access within Spaces

1 Alternative means of access specified in **26.2.4, Part CS** of the Rules include, but are not limited to, such devices as:

(1) Hydraulic arm fitted with a stable base

(2) Wire lift platform

(3) Staging

(4) Rafting

(5) Robot arm or remotely operated vehicle (*ROV*)

(6) Portable ladders more than 5 *m* long are only to be utilized if fitted with a mechanical device to secure the upper end of the ladder. Where hooks for securing at the upper end of a ladder are provided as a mechanical device, such hooks are to be designed so that a movement fore/aft and sideways can be prevented at the upper end of the ladder

(7) Other means of access, approved by and acceptable to the Society

2 With respect to the provisions of **26.2.4, Part CS** of the Rules, the selection of an alternative means of access is to be based on the following conditions. Refer to **Annex 14.16, Part 1, Part C of the Rules** for details.

(1) Such means provide accessibility and safety equivalent to permanent means

(2) Such means are suitable for use in an environment of the intended spaces

(3) Where the use of means such as *ROV* for the inspection of under deck structures, such means can be introduced into the space directly from a deck access

(4) Such means comply with or are based on appropriate safety standards

(5) Where the use of means other than those specified in **CS26.2.4-1(3)**, **(4)** or **(6)**, such means are approved by the Administration and the ship's owner

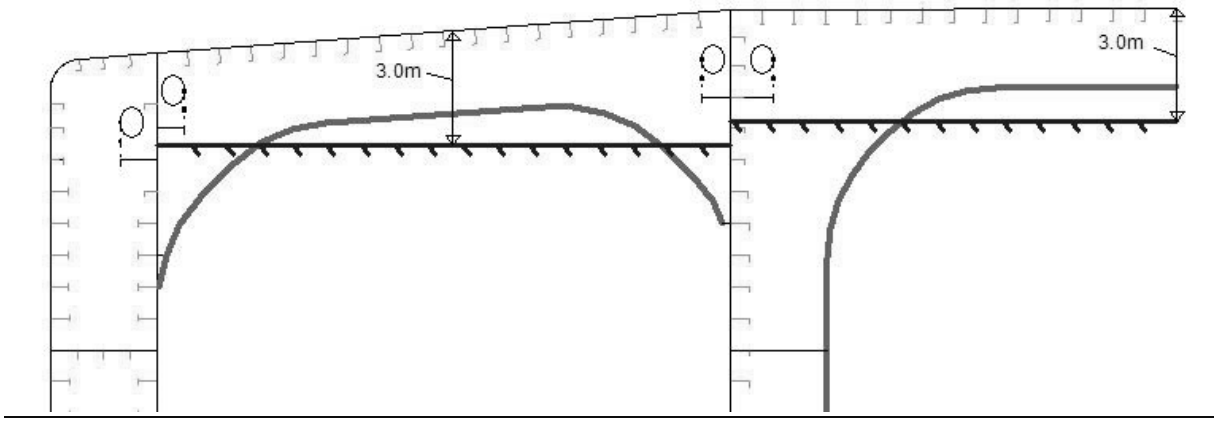
3 Where a boat is used as an alternative means, **CS26.1.4-5** is to apply. Rafts or boats alone may be allowed for survey of the under deck areas for tanks or spaces if the depth of the webs is not more than 1.5 *m*. If the depth of the webs is more than 1.5 *m*, rafts or boats alone may be allowed only if permanent means of access are provided to allow safe entry and exit. This means either:

(1) Access direct from the deck via a vertical ladder and small platform approximately 2 *m* below the deck in each bay

(2) Access to the deck from a longitudinal permanent platform having ladders to the deck at each end of the tank

The platform is to, for the full length of the tank, be arranged at or above the maximum water level needed for rafting of the under deck structure. For this purpose, the ullage corresponding to the maximum water level is to be assumed not more than 3 *m* from the deck plate measured at the midspan of the deck transverses and in the middle of the length of the tank. (Refer to **Fig. CS26.2.4**) A permanent means of access from the longitudinal permanent platform to the water level indicated above is to be fitted in each bay (*e.g.*, permanent rungs on one of the deck webs inboard of the longitudinal permanent platform).

Fig. CS26.2.4 Use of Rafts/Boats



4 With respect to the provisions of **26.2.4, Part CS** of the Rules, it is to be demonstrated that portable means for inspection can be deployed and made readily available in the areas where needed.

5 For the purpose of **26.2.4, Part CS** of the Rules, the height of a space means the vertical distance between the top surface of the bottom plate of the space and the lower surface of the top plate of the space. In general, the height is to be measured from the lowest position to the highest position in each tank. However, for a space the height of which varies at different bays/sections, the requirements of **26.2.4, Part C** of the Rules may be applied to such bays/sections of that space which fall under the criteria.

6 With respect to the provisions of **26.2.4, Part CS** of the Rules, special attention is to be paid to the structural strength where any access opening is provided in the structural members.

7 Unless stated otherwise in **26.2.4, Part CS** of the Rules, vertical ladders that are fitted on vertical structures for inspection are to comprise of one or more ladder linking platforms spaced not more than 6 *m* apart vertically and displaced to one side of the ladder. Adjacent sections of ladder are to be laterally offset from each other by at least the width of the ladder. For the purpose of complying with the above, adjacent sections of ladders are to be in accordance with **CS26.2.3-6.**

8 The requirements of **26.2.4-1, Part CS** of the Rules are also to be applied to void spaces in the cargo area, comparable in volume to cargo tanks and ballast tanks.

9 In the application of **26.2.4-1(1), Part CS** of the Rules, the provisions of **(a)** to **(c)** define access to underdeck structures and the provisions of **(d)** to **(f)** define access to vertical structures. These provisions are linked to the presence of underdeck structures and transverse webs on longitudinal bulkheads. If there are no underdeck structures (deck longitudinals and deck transverses) but there are vertical structures in the cargo tank supporting transverse and longitudinal bulkheads (including brackets supporting deck transverses), in addition to access in accordance with applicable provisions of **(d)** to **(f)** of **26.2.4-1(1), Part CS** of the Rules, access in accordance with the provisions of **(a)** to **(c)** of **26.2.4-1(1), Part CS** of the Rules is to be provided for inspection of the upper parts of vertical structure on transverse and longitudinal bulkheads. For example, there is need to provide continuous longitudinal permanent means of access in accordance with the provisions of **26.2.4-1(1)(b), Part CS** of the Rules when the deck longitudinals and deck transverses are fitted on the deck but supporting brackets are fitted under the deck.

10 In the application of **26.2.4-1(1)(d), Part CS of the Rules**, for water ballast tanks of 5 *m* or more in width, such as on an ore carrier, side shell plating shall be considered in the same way as "longitudinal bulkhead".

11 Notwithstanding **-1**, for the application of **26.2.4-1(1)(d), Part CS** of the Rules, wire lift platforms or other means which can provide an equal level of safety as permanent means of access

specified in that sub-paragraph, are assumed as alternative means of access. However, rafting and permanent fittings for rafting are not permitted as alternatives to the continuous longitudinal permanent means of access specified in **CS26.2.4-1(2).**

12 "Means of access deemed appropriate by the Society" stipulated in **26.2.4-1(4), Part CS** of the Rules generally presumes the use of boats. The provisions of **-3** above apply.

13 The requirements of **26.2.4-2, Part CS** of the Rules also apply to wing tanks designed as void spaces.

14 For the purpose of **26.2.4-2, Part CS** of the Rules, the continuous permanent means of access may be a wide longitudinal, which provides access to critical details on the opposite side by means of platforms attached as necessary on the web frames. Where the vertical opening of the web frame is located in way of the open part between the wide longitudinal and the longitudinal on the opposite side, platforms are to be provided on both sides of the web frames to allow safe passage through the web frame.

15 With respect to the vertical distance of 6 *m* specified in **26.2.4-2(1) (a)** and **(b), Part CS** of the Rules, excess of not more than 10% may be accepted as a reasonable deviation, where deemed necessary for the integration of the permanent means of access with the structure itself.

16 Means of access specified in **26.2.4-2(1)(a), Part CS** of the Rules are to be connected to an access ladder from the deck required in **26.2.3-1, Part CS** of the Rules. Where two access hatches are required, access ladders at each end of the tank are to lead to the means of access.

17 With respect to the provisions of **26.2.4-2(2), Part CS** of the Rules, notwithstanding the provisions of **-5**, the height of a bilge hopper tank located outside of the parallel part of the ship may be taken as the maximum of the clear vertical distance measured from the bottom plating to the hopper plating of the tank.

18 With respect to the provisions of **26.2.4-2(2), Part CS** of the Rules in regards to the foremost and aftermost bilge hopper ballast tanks with raised bottoms, a combination of transverse and vertical means of access for access to the upper knuckle point for each transverse web may be accepted in place of the longitudinal permanent means of access.

19 With respect to the provisions of **26.2.4-2(2), Part CS** of the Rules, a ladder or ladders are to be provided between the longitudinal continuous permanent means of access and the bottom of the space.

20 With respect to the provisions of **26.2.4-4, Part CS** of the Rules, the use of alternative means of access may be accepted where:

(1) Such means provide accessibility and safety equivalent to permanent means

(2) The use of such means are approved by the Administration and the ship's owner

Paragraph CS26.2.5 has been added as follows.

CS26.2.5 Specifications for Means of Access and Ladders

1 With respect to the provisions of **26.2.5-1, Part CS** of the Rules, permanent means of access are to be designed so as to ensure sufficient residual strength during the service life of the ship and, in general, the initial corrosion protection which is the same as the hull structural members is to be applied.

2 With respect to the provisions of **26.2.5-3, Part CS** of the Rules, slopping structures are structures that are sloped by 5 or more degrees from the horizontal plane when a ship is in the upright position at even-keel. Non-skid construction is to be such that the surface on which personnel walk provides sufficient friction to the sole of boots even when the surface is wet and covered with thin sediment.

3 Details of the guard rails required in **26.2.5-4, Part CS** of the Rules are to be in accordance with the following.

(1) Where guard rails are divided into several parts, the gaps of discontinuous top handrail are not

to exceed 50 *mm*. When the top and mid handrails are connected by a bent rail, the outside radius of the bent part is not to exceed 100 *mm* (see **Fig. CS26.2.5-1**).

(2) The gaps between the top handrail and other structural members are not to exceed 50 *mm*.

(3) Where guard rails are divided into several parts, the maximum distance between the adjacent stanchions across the handrail gaps is to be 350 *mm*. However, when the top and mid handrails are connected together, the maximum distance may be 550 *mm* (see **Fig. CS26.2.5-1**).

(4) The maximum distance between the stanchion and other structural members is not to exceed 200 *mm*. However, when the top and mid handrails are connected together, the maximum distance may be 300 *mm* (see **Fig. CS26.2.5-1**).

4 For guard rails required in **26.2.5-4, Part CS** of the Rules, use of alternative materials such as *GRP* is to be subject to compatibility with the liquid carried in the tank. Non-fire resistant materials are not to be used for means of access to a space with a view to securing an escape route at high temperatures.

5 The minimum clear opening of 600 *mm* × 600 *mm* specified in **26.2.5-5, Part CS** of the Rules is to be rounded appropriately and may have corner radii up to 100 *mm* maximum. Where larger corner radii are adopted for avoiding stress concentration, a larger opening is to be provided so as to ensure accessibility equivalent to a opening of 600 *mm* × 600 *mm*. For example, 600 *mm* × 800 *mm* with 300 *mm* of corner radii may be accepted.

6 The minimum clear opening of 600 *mm* × 800 *mm* specified in **26.2.5-6, Part CS** of the Rules is to be rounded appropriately and may have corner radii up to 300 *mm* maximum. Such openings, in general, are to be 800 *mm* in height. However, an opening of 600 *mm* in height and 800 *mm* in width may be accepted as access openings in vertical structures where it is not desirable to make large openings in the structural strength aspects, i.e. girders and floors in double bottom tanks.

7 With respect to the provisions of **26.2.5-6, Part CS** of the Rules, an access opening having other dimensions, i.e. an opening as shown in **Fig. CS26.2.5-2**, may be accepted subject to verification of easy evacuation of an injured person on a stretcher.

8 With respect to the provisions of **26.2.5-6, Part CS** of the Rules, where the vertical manhole is at a height of more than 600 *mm* above the bottom plate, it is to be demonstrated that an injured person can be easily evacuated.

9 Smaller dimensions of minimum clear opening stipulated in **26.2.5-7, Part CS** of the Rules are to be in accordance with **Table S3.4.4, Part S** of the Guidance.

Fig. CS26.2.5-1 Detail of Handrails

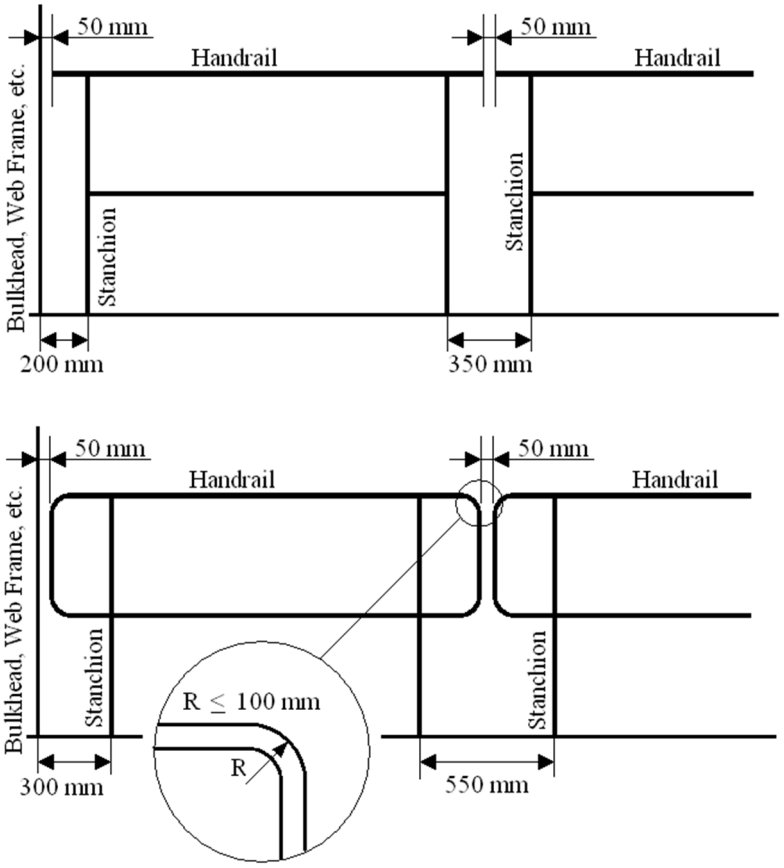
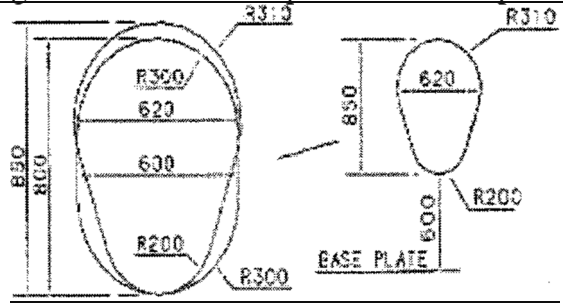


Fig. CS26.2.5-2 Example of Vertical Opening



10 With respect to the provisions of **26.2.5-8, Part CS** of the Rules, where the vertical manhole is at a height of more than 600 *mm* above the bottom plate, it is to be demonstrated that an injured person can be easily evacuated.

11 With respect to the provisions of **26.2.5-9, Part CS** of the Rules, details of ladders and other means are to be in accordance with the following.

(1) Permanent inclined ladders are to be inclined at an angle of less than 70 *degrees*. There is to be no obstructions within 750 *mm* of the face of the inclined ladder, except that in way of an opening this clearance may be reduced to 600 *mm*. Such clearance is to be measured perpendicular to the face of the ladder. A minimum climbing clearance in width is to be 600 *mm*. For this purpose, handrails may be provided within such climbing clearance. Resting platforms of adequate dimensions are to be provided, normally at a maximum of 6 *m* vertical height. Where deemed necessary for aligning resting platform arrangements with hull structures, the vertical distance from deck to such platforms, between such platforms or such platforms

and the tank bottom may be not more than 6.6 *m*. In this case, the flights of inclined ladders are not to be more than 9 *m* in actual length. Ladders and handrails are to be constructed of steel or equivalent material of adequate strength and stiffness and securely attached to the structure by stays. The method of support and length of stay is to be such that vibration is reduced to a practical minimum. In cargo holds, ladders are to be designed and arranged so that cargo handling difficulties are not increased and the risk of damage from cargo handling gear is minimized.

(2) The width of inclined ladders between stringers is not to be less than 400 *mm*. The width of inclined ladders for access to a cargo hold in bulk carriers is to be at least 450 *mm*. The treads are to be equally spaced at a distance apart, measured vertically, of between 200 *mm* and 300 *mm*. When steel is used, the treads are to be formed of two square bars of not less than 22 *mm* × 22 *mm* in section, fitted to form a horizontal step with the edges pointing upward. The treads are to be carried through the side stringers and attached thereto by double continuous welding. All inclined ladders are to be provided with handrails of substantial construction on both sides. The vertical height of handrails is not to be less than 890 *mm* from the centre of the step and two course handrails is to be provided where the gap between stringer and top handrail is greater than 500 *mm*.

(3) For vertical ladders, the width and construction are to be in accordance with the following. Other details are to be in accordance with international or national standards accepted by the Society.

(a) The minimum width of vertical ladders is to be 350 *mm*.

(b) The vertical distance between the rungs is to be equal and is to be between 250 *mm* and 350 *mm*.

(c) When steel is used, the rungs are to be formed of single square bars of not less than 22 *mm* × 22 *mm* in section, fitted to form a horizontal step with the edges pointing upward.

(d) Vertical ladders are to be secured at intervals not exceeding 2.5 *m* apart to prevent vibration.

(e) A minimum climbing clearance in width is to be 600 *mm* other than the ladders placed between the hold frames. A clearance of 600 *mm* perpendicular to the ladder is to be kept as far as possible.

(4) For spiral ladders, the width and construction are to be in accordance with international or national standards accepted by the Society.

(5) Resting platforms placed between ladders are to follow the provisions of **26.2.5-1** to **-4**, **Part CS** of the Rules.

(6) Portable ladders are to be in accordance with or are based on appropriate safety standards. No free-standing portable ladder is to be more than 5 *m* long unless accepted by the provisions of **CS26.2.4-1.(6)**.

(7) For the selection of portable and movable means of access, refer to **Annex 14.16, Part 1, Part C of the Rules**.

Paragraph CS26.2.6 has been added as follows.

CS26.2.6 Ship Structure Access Manual

1 The Ship Structure Access Manual required in **26.2.6-1, Part CS** of the Rules is to contain at least the following two parts.

(1) Part I

This part is to comprise plans, instructions and inventory required in **26.2.6-1.(1)** to **(7)**, **Part CS** of the Rules and the following matters are to be addressed. This part is to be approved by the Society when any content is changed.

(a) Approval/re-approval procedure for the manual, i.e. any changes of the permanent, portable, movable or alternative means of access within the scope of **26.2, Part CS** of

the Rules are subject to review and approval by the Society.

(b) Verification of means of access is to be part of a survey for continued effectiveness of the means of access in that space which is subject to the survey.

(c) Inspection of means of access is to be carried out by the crew and/or a competent inspector of the company as a part of regular inspection and maintenance.

(d) Actions to be taken if means of access are found unsafe to use.

(e) 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.

(2) Part II

This part is to comprise of forms for record of inspections and maintenance, and change of inventory of portable equipment due to additions or replacements after construction. The form in this part is approved by the Society when the ship is under survey for classification during construction.

2 The Ship Structure Access Manual required in **26.2.6-1(8), Part CS** of the Rules is to be prepared in a language(s) which all the crew can understand. As a minimum the English version is to be provided.

3 "Critical structural areas" specified in **26.2.6-1(3), Part CS** of the Rules are to be in accordance with the provisions of **CS26.2.2-1**.

Annex CS1.3.1-1 has been amended as follow

Annex CS1.3.1-1 GUIDANCE FOR HULL CONSTRUCTION CONTAINING HIGH TENSILE STEEL MEMBERS

1.1 General

1.1.1 Application

Where materials of high tensile steel *KA*32, *KD*32, *KE*32, *KF*32 (hereinafter to be referred to as "*HT*32"), *KA*36, *KD*36, *KE*36 and *KF*36 (hereinafter to be referred to as "*HT*36") and *KA*40, *KD*40, *KE*40 and *KF*40 (hereinafter to be referred to as "*HT*40") prescribed in **Chapter 3, Part K** of the Rules are used as structural members, the constructions and scantlings are to comply with the following provisions, in addition to those prescribed in the Rules. Where materials of high tensile steel other than *HT*32, *HT*36 and *HT*40 are used, the constructions and scantlings may be properly modified with due consideration for the mechanical properties of the materials to be used.

1.1.2 Details of Construction

1 Where materials of different strengths are mixed in the hull structure, due consideration is to be given to the stress in the lower tensile materials adjacent to high tensile materials.

2 Where stiffeners of lower tensile material are supported by girders of high tensile material, due consideration is to be given to the stiffness of girders and the dimensions of stiffeners to avoid excessive stress in the stiffeners.

3 For members of high tensile steel, special attention is to be paid to the details of constructions to avoid high concentration of stress.

4 Where materials of high tensile steel are extensively used in the hull structure, its designs are to be subjected to detailed study of strength, and their results are to be submitted to the Society.

1.2 Structural Members

1.2.1 General

1 Scantlings of Structural Members

(1) The scantlings of structural members of high tensile steel are not to be less than that obtained by the methods stipulated under **1.2.2** below.

(2) Where the section modulus of hull girder amidships is reduced by using high tensile steel in accordance with the provisions in **1.3.1-2(1), Part CS** of the Rules, the constructions and scantlings are to comply with the provisions under **1.2.3**, in addition to compliance with **(1)** above, if the strength deck and the bottom are constructed on the longitudinal framing system. If the strength deck or the bottom is constructed on the transverse framing system, the constructions and scantlings are to be subject to Society's special consideration.

2 Expressions

Unless specified otherwise, the expressions employed in this Guidance are to be as stipulated in **(1)** to **(4)** below.

(1) f_{DH} and f_{BH} are to be as follows:

$$f_{DH} = \frac{Z_{Mreq}}{Z_{DH\ ship}}$$

$$f_{BH} = \frac{Z_{Mreq}}{Z_{BH\ ship}}$$

Z_{Mreq}: Section modulus of hull determined according to the requirements in **Chapter 15, Part CS** of the Rules when mild steel is used.

$Z_{DH\ ship}$ and $Z_{BH\ ship}$: Actual hull section moduli at strength deck and bottom respectively.

(2) K is the coefficient corresponding to the kind of steel:

0.78 (for *HT*32)

0.72 (for *HT*36)

0.68 (for *HT*40, however, 0.66 may be taken where a fatigue assessment of the structure is performed to verify compliance with the requirements of the Society.)

The values specified in **1.3.1-4, Part CS** of the Rules (for stainless steel and stainless clad steel)

(3) Plate thickness t_M, section modulus Z_M and moment of inertia I_M are those required by the Rules for members and structures of mild steel, and t_H, Z_H and I_H are those for high tensile steel.

(4) Expressions not stipulated here are to be as defined in relevant provisions in **Part CS** of the Rules.

1.2.2 Determination of Scantlings of Structural Members

1 Double Bottoms

The formulae for determining the scantlings of structural members of the double bottom prescribed in **Chapter 6, Part CS** of the Rules, are to be replaced by the formulae in **Table 1.2-1.**

2 Frames

(1) The formulae for determining the scantlings of frames prescribed in **Chapter 7, Part CS** of the Rules, are to be replaced by the formulae in **Table 1.2-2**.

(2) Lower ends of frames

At the lower ends of hold frames and web frames, their section moduli in a range of about 300 *mm* from the upper end of lower brackets are not to be less than the values determined by the following formula:

$Z_H = Z_M$

Where appropriate considerations are given to the construction of the lower ends of frames, however, Z_H may be as determined by the formulae in **Table 1.2-2**.

3 Beams, Pillars and Deck Girders

The formulae in **Chapters 10**, **11** and **12, Part CS** of the Rules, for determining the scantlings of beams, pillars and deck girders are to be replaced by those in **Table 1.2-3**.

4 Watertight Bulkheads

The formulae in **Chapter 13, Part CS** of the Rules, for determining the scantlings of watertight bulkheads are to be replaced by those in **Table 1.2-4**.

5 Deep Tanks

The formulae in **Chapter 14, Part CS** of the Rules, for determining scantlings of deep tanks are to be replaced by those in **Table 1.2-5**.

6 Shell Plating

The formulae in **Chapter 16, Part CS** of the Rules, for shell plating are to be replaced by those in **Table 1.2-6**.

7 Decks

The formulae in **Chapter 17, Part CS** of the Rules, for thickness of deck plating are to be replaced by the following formula:

$t_H = \sqrt{K}(t_M - 2.5) + 2.5\ \ (mm)$

1.2.3 Special Rules for Longitudinal Strength Members

1 Application

The provisions under this paragraph apply to the use of high tensile steel for the reduction of the hull girder section modulus in the midship part according to **1.3.1-2(1), Part CS** of the Rules in ships having longitudinally framed strength deck and bottom.

2 Extents of Use of High Tensile Steel

Materials of high tensile steel are to be used in the following parts **(1)** to **(7)**.

(1) Longitudinal strength members from the strength deck or the bottom to the points specified below respectively. (*See* **Fig. 1.2-1** and **Fig. 1.2-2**)

(a) Strength deck part

$$b_D = y_D\left(1 - \frac{1}{f_{DH}}\right) \ (m)$$

Where y_D is the distance (m) from the neutral axis of the cross-section of hull to the strength deck

(b) Bottom part

$$b_B = y_B\left(1 - \frac{1}{f_{BH}}\right) \ (m)$$

Where y_B is the distance (m) from the neutral axis of the cross-section of hull to the top of the keel

Fig. 1.2-1. High Tensile Steel Used in Deck and Bottom

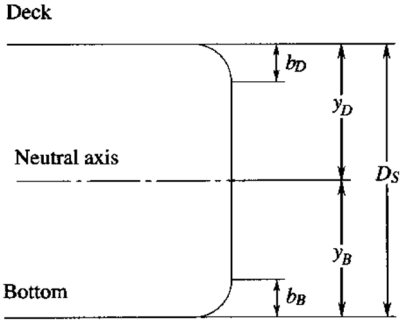
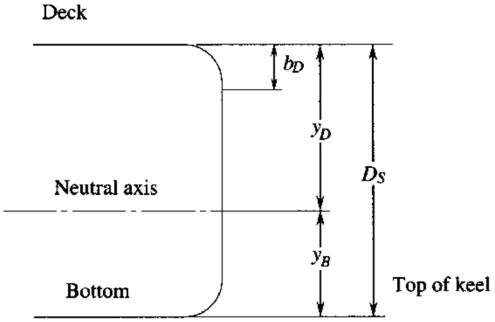


Fig. 1.2-2 High Tensile Steel Used in Deck only



(2) Longitudinal strength members on strength deck

(3) Portions as shown in **Fig. 1.2-3** of the deck inside the line of openings

(4) Hatch coamings and their horizontal stiffeners within the extents shown in **Fig. 1.2-4**.

(5) Gutter bars and bilge keels welded to high tensile steel materials

Where bilge keels are of riveted construction, materials except flat bars welded to shell plating do not need to be of high tensile steel.

(6) Doubling plates fitted to longitudinal strength members of high tensile steel for reinforcing openings, etc.

(7) It is recommended that the range of 0.5L amidships be constructed of high tensile steel. If the

range of 0.5L amidships is not covered by high tensile steel, special consideration should be given to the continuity of section modulus of hull girder between the ranges of 0.4L and 0.5L amidships.

Fig. 1.2-3 Deck

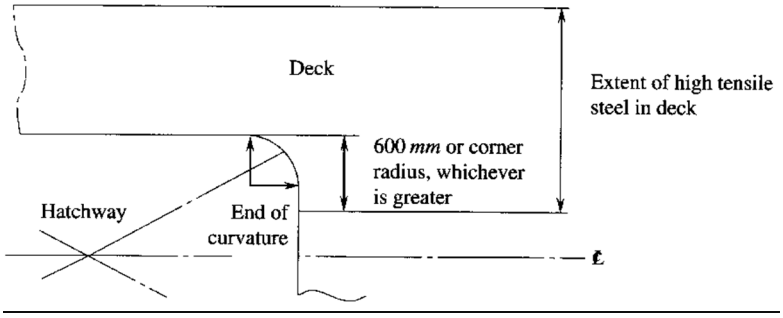
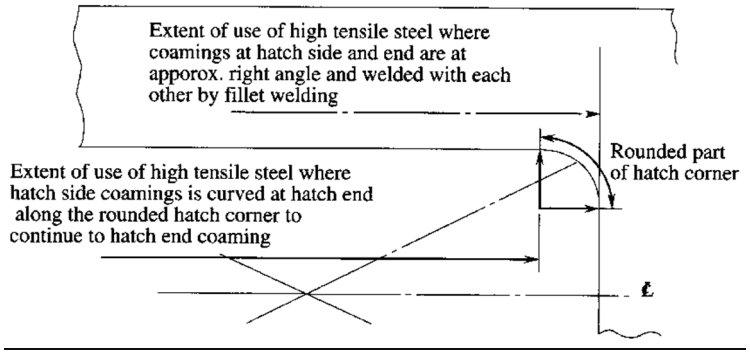


Fig. 1.2-4 Hatch Coaming



3 Scantlings of Structural Members

(1) The scantlings of structural members of high tensile steel are to be in accordance with **(3)** below, in addition to compliance with **1.2.2** above.

(2) The scantlings of structural members of mild steel are to be in accordance with **(3)** below, in addition to compliance with the Rules, provided that f_D and f_B in the formulae in the provisions concerned are to be replaced by f_{DH} and f_{BH} in **1.2.1-2** above respectively.

(3) The ratio of depth to thickness of flat bars used in longitudinal beams and frames, and the slenderness ratio of longitudinal side frames attached to longitudinal beams and shear strakes are to be as specified in the Rules.

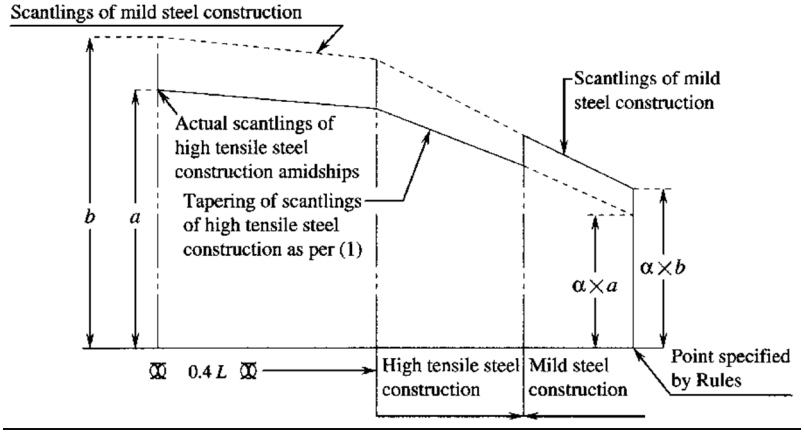
4 Tapering of Longitudinal Strength Members

(1) The manner of tapering of longitudinal strength members of high tensile steel is to comply with the provisions of the Rules, assuming that the entire hull be constructed of high tensile steel.

(2) Where the midship part is constructed of high tensile steel, the scantlings of mild steel members forward of and abaft the midship part are to be in accordance with **Fig. 1.2-5**.

(3) At the connection point of high tensile steel materials and mild steel materials, due consideration should be given to the continuity of strength so that an appreciable difference of plate thickness may be avoided.

Fig. 1.2-5 Scantlings of Mild Steel Members at Fore and Aft Part of Ship



Where:

α: Rule reduction ratio at the point specified by the Rules

a: Actual scantlings of high tensile steel members at the middle of L

b: Scantlings of members at the middle of L for mild steel construction given as follows:

(a) Thickness of shell plating and longitudinal bulkheads

$$\frac{1}{\sqrt{K}}(a - t_c) + t_c \ (mm)$$

t_c: As follows:

Side shell plating

2.5 (mm), for tankers (however, 3.0, where side shell plating forms boundaries of cargo oil tanks planned to carry ballast as well)

2.5 (mm), for other ships

Longitudinal bulkhead

3.5 (mm), for tankers

2.5, for other ships (mm)

(b) Effective sectional area of longitudinal strength members of strength deck

$b = \beta a$

Where β is to be as follows:

For tankers

1.27 (for $HT32$)

1.38 (for $HT36$)

1.46 (for $HT40$)

For other ships

1.34 (for $HT32$)

1.45 (for $HT36$)

1.54 (for $HT40$)

However, where the effective sectional area of longitudinal strength members of the strength deck in the middle of L has been determined, where mild steel construction is assumed, the value may be given as follows:

$$\beta = \frac{S_{e1}}{S_{e2}}$$

S_{e1}: Effective sectional area of the strength deck at the middle of L, where mild steel construction is assumed

S_{e2}: Effective sectional area of the strength deck at the middle of L, for ships made of high tensile steels

(c) Section modulus of stiffeners of longitudinal frames, beams and bulkheads

$\frac{a}{K}$

Table 1.2-1 Double Bottoms

Members	Paragraph No.	Scantlings
Open floors	**6.5.2-1.**	Section modulus: $KCShl^2 (cm^3)$
Bottom longitudinals	**6.6.2-1.**	Section modulus: $KCShl^2 (cm^3)$
Vertical struts	**6.6.3-2.**	Sectional area: $2.2KSbh\ (cm^2)$
Inner bottom plating	**6.7.1**	Thickness of inner bottom plating: $3.8S\sqrt{dK} + 2.5\ (mm)$
Longitudinal shell stiffeners & bottom longitudinals in strengthened bottom forward	**6.9.4**	Section modulus: $0.53KP\lambda l^2\ (cm^3)$

Table 1.2-2 Frames

Members	Paragraph No.	Scantlings
Hold frames	**7.3.2**	Section modulus: $Z_H = KZ_M$
Longitudinals on side shell plating	**7.4.1**	Section modulus: $Z_H = KZ_M$
Web frames	**7.4.2**	Section modulus: $Z_H = KZ_M$ Web thickness: $\frac{C_2K}{1000} \cdot \frac{Shl}{d_1} + 2.5\ (mm)$
Tween-deck frames	**7.5.2**	Section modulus: $Z_H = KZ_M$
Transverse frames below freeboard decks forward of collision bulkhead	**7.6.1**	Section modulus: $Z_H = KZ_M$
Longitudinals below freeboard decks forward of collision bulkhead	**7.6.2**	Section modulus: $Z_H = KZ_M$

Table 1.2-3 Beams, Pillars and Deck Girders

Members	Paragraph No.	Scantlings
Longitudinal beams and Transverse beams	**10.2.3** **10.3.3**	Section modulus: $Z_H = KZ_M$
Pillars	**11.2.1**	Sectional area: $\frac{0.223K\omega}{2.72-\frac{l}{k_0\sqrt{K}}}\ (cm^2)$
Deck girders	**12.2.1** and **12.3.1** **12.2.2** and **12.3.2** **12.2.3** and **12.3.3**	Section modulus: $Z_H = KZ_M$ Moment of inertia: $I_H = I_M$ Web thickness (i) Longitudinal girders under strength deck outside the line of openings in midship part $10\sqrt{f_{DH}}S_1 + 2.5\ (mm)$ Other longitudinal and transverse girders $10S_1 + 2.5\ (mm)$ (ii)Within 0.2/ from ends $\frac{4.43K}{1000} \cdot \frac{bhl}{d_0} + 2.5\ (mm)$ $0.813 \cdot \sqrt[3]{\frac{bhlS_1^2}{d_0}} + 2.5\ (mm)$

Table 1.2-4 Watertight Bulkhead

Members	Paragraph No.	Scantlings
Bulkhead plating	**13.2.1**	Thickness: $3.2S\sqrt{Kh}+2.5$ (mm), but not to be less than $5.9S+2.5$ (mm)
Stiffeners	**13.2.3**	Section modulus: $Z_H = KZ_M$
Girders supporting stiffeners	**13.2.5**	Section modulus: $Z_H = KZ_M$ Moment of inertia of section: $I_H = KI_M$
Corrugated bulkheads	**13.2.9**	Thickness: $3.4CS_1\sqrt{Kh}+2.5$ (mm), but not to be less than $5.9CS_1+2.5$ (mm) Section modulus per half pitch: $Z_H = KZ_M$ Plate thickness within 0.2l from ends of generating line: Web part $0.0417\frac{CKShl}{d_0}+2.5$ (mm) $1.74\cdot\sqrt[3]{\frac{CShlb^2}{d_0}}+2.5$ (mm) Flange part $\frac{12}{\sqrt{K}}a+2.5$ (mm)

Table 1.2-5 Deep Tanks

Members	Paragraph No.	Scantlings
Bulkhead plating	**14.2.2**	Thickness: $3.6S\sqrt{Kh}+3.5$ (mm)
Stiffeners	**14.2.3**	Section modulus: $Z_H = KZ_M$
Girders supporting stiffeners	**14.2.4**	Section modulus: $Z_H = KZ_M$ Moment of inertia of section: $I_H = KI_M$
Corrugated bulkheads	**14.2.8**	Thickness: $3.6CS_1\sqrt{Kh}+3.5$ (mm) Section modulus per half pitch: $Z_H = KZ_M$ Plate thickness within 0.2l from ends: Web plate $0.0417\frac{CKShl}{d_0}+3.5$ (mm) $1.74\cdot\sqrt[3]{\frac{CShlb^2}{d_0}}+3.5$ (mm) Flange plate $\frac{12}{\sqrt{K}}a+3.5$ (mm)

Table 1.2-6 Shell Plating

Members	Paragraph No.	Scantlings
Shell plating under strength deck	**16.3.1**	Minimum thickness: $(0.044L+5.6)\sqrt{K}$ (mm)
Side shell	**16.3.2**	Thickness for transverse framing system: $4.1S\sqrt{(d+0.04L)K}+2.5$ (mm)
Bottom shell	**16.3.4**	(1) Thickness for transverse framing system: $4.7S\sqrt{(d+0.035L)K}+2.5$ (mm) (2) Thickness for longitudinal framing system: $4.0S\sqrt{(d+0.035L)K}+2.5(mm)$
Shell Plating for End Parts	**16.4.1**	Thickness: $(0.044L+5.6)\sqrt{K}$ (mm)
Shell Plating for 0.3 L from the Fore End	**16.4.2**	Thickness: $1.34S\sqrt{KL}+2.5$ (mm)
Shell Plating for 0.3 L from the After End	**16.4.3**	Thickness: $1.20S\sqrt{KL}+2.5$ (mm)
Shell plating at strengthened bottom forward	**16.4.4**	Thickness: $CS\sqrt{KP}+2.5$ (mm)

Appendix 1 has been deleted.

~~Appendix 1 APPLICATION OF PART C OF THE GUIDANCE~~

~~The Part C of the Guidance is to be applied as the Guidance related to the prescriptions in Part CS of the Rules, as shown in the Table CS.~~

~~Table CS Correspondence Table of Guidance between Part CS and Part C~~

Part CS	Part C	Part CS	Part C	Part CS	Part C
1.1.3	C1.1.3[See Note 1]	14.1.3	C14.1.3	21.1.2	C23.1.2[See Note 21]
1.3.1	C1.1.7 C1.1.11 and C1.1.12	14.2.3	C14.2.3	21.1.3	C23.1.3[See Note 22]
		15.1.1	C15.1.1	21.2.1	C23.2.1[See Note 23]
		15.2.1	C15.2.1	21.2.2	C23.2.2[See Note 24]
2.1.1	C2.1.1	15.2.3	C15.2.3	21.2.3	C23.2.3
2.2.2	C2.2.2	16.3.3	C16.3.3	21.3	C23.3
2.2.3	C2.2.3	16.4.4	C16.4.4	21.4	C23.4[See Note 25]
2.2.4	C2.2.4	16.5.3	C16.6.1	21.5.1	C23.5.1[See Note 26]
3	C3	16.6.1	C16.7.1	21.5.3	C23.5.3[See Note 27]
4	C4[See Note 2]	16.6.2	C16.7.2	21.5.7	C23.5.7[See Note 28]
5	C5	17.1.1 1	C10.2.1[See Note 10]	21.6.5	C23.6.5[See Note 29]
6.6.2 1	C6.4.3 2	17.2.1	C17.1.1	21.6.7	C23.6.7[See Note 30]
6.7.1	C6.5.1 1 and 4	17.2.2	C17.1.2	21.6.8	C23.6.8
6.9	C6.8	17.2.4	C17.1.4[See Note 11]	21.7.1	C23.7.1[See Note 31]
7.5.2	C7.6.2[See Note 5]	17.2.5	C17.1.5	21.7.2	C23.7.2
7.5.3	C7.6.3[See Note 6]	17.3.2	C17.2.2	21.8.1	C23.8.1[See Note 32]
8.3	C7.5.3	17.3.4	C17.2.4	22.2.1	C24.2.1
9.1.2	C9.1.2[See Note 7]	17.3.5	C17.2.5	22.4.1	C25.2.1[See Note 33]
9.1.3	C9.1.3	17.4.1	C17.3.1	22.4.2	C25.2.2
10.1.2	C10.1.2	17.4.5	C17.3.5	22.4.3	C25.2.3 [See Note 34]
10.2.3	C10.3.3[See Note 8]	18	C18	23	C27
10.3.2	C10.4.2	19.1.2	C20.1.2[See Note 12]	24.1.1	C29.1.1[See Note 35] [See Note 36]
10.7.1	C10.9.1	19.2.4	C20.2.4[See Note 13]		
11.1.2	C11.1.2	19.2.5	C20.2.5[See Note 14]	24.1.2	C29.1.2[See Note 37]
11.2.1	C11.2.1	19.2.6	C20.2.6[See Note 15]	24.3.2	C29.4.2
12.1.3	C12.1.3	19.2.10	C20.2.10[See Note 16]	24.9.4	C29.7.4[See Note 38]
12.1.4	C12.1.4	19.2.12	C20.2.12[See Note 17]	24.11.5	C29.12.4
12.2.1	C12.2.1[See Note 9]	19.2.13	C20.2.13[See Note 18]	25.1.2	C34.1.2[See Note 39]
13.1.1	C13.1.1	19.3.5	C20.3.5[See Note 19]	26	C35
13.1.4	C13.1.4	19.4.2	C20.4.2		
13.2.3	C13.2.3	20.2.2	C21.2.2		
13.3	C13.3	21.1.1	C23.1.1[See Note 20]		

~~Notes:~~

~~1. In Guidance C1.1.3 2(2)(a), 5.5.2, Part C of the Rules is to be read as 5.4.3, Part CS of the Rules.~~
~~In Guidance C1.1.3 2(2)(b), 7.6.2 2, Part C of the Rules is to be read as 7.5.2 1, Part CS of the Rules.~~
~~In Guidance C1.1.3 2(2)(c), 10.2.1 2, Part C of the Rules is to be read as 17.1.1 2, Part CS of the Rules.~~
~~In Guidance C1.1.3 2(2)(e), 18.2.1 1, Part C of the Rules is to be read as 18.2.1 1, Part CS of the Rules.~~
~~In Guidance C1.1.3 2(2)(g), 20.1.2, Part C of the Rules is to be read as 19.1.2, Part CS of the Rules.~~
~~In Guidance C1.1.3 4, 1.1.3 5, Part C of the Rules is to be read as 1.1.3 2, Part CS of the Rules.~~
~~2. In Guidance C4.2.3 2, 23.6.5 2, Part C of the Rules is to be read as 21.6.5 2, Part CS of the Rules.~~
~~3. (Deleted)~~
~~4. (Deleted)~~
~~5. In Guidance C7.6.2, 7.6.2, Part C of the Rules is to be read as 7.5.2, Part CS of the Rules.~~

6. In Guidance C7.6.3, 7.6.2-2, 7.7.1 and 7.8.1, Part C of the Rules are to be read as 7.5.2-1, 7.6.1 and 7.6.3, Part CS of the Rules.
7. In Guidance C9.1.2, 9.2.2-2(2), Part C of the Rules is to be read as 9.2.2-5, Part CS of the Rules.
8. In Guidance C10.3.3, 10.3.3-1 and 10.3.3-2, Part C of the Rules are to be read as 10.2.3-1 and 10.2.3-2, Part CS of the Rules.
9. In Guidance C12.2.1, 12.2.1-1 and 12.2.1-2, Part C of the Rules are to be read as 12.2.1-1 and 12.2.1-2, Part CS of the Rules.
10. In Guidance C10.2.1, 10.2.1-1, Part C of the Rules is to be read as 17.1.1-1, Part CS of the Rules.
11. In Guidance C17.1.4, 17.1.4-2, Part C of the Rules is to be read as 17.2.4-2, Part CS of the Rules.
12. In Guidance C20.1.2, 20.1.2, Part C of the Rules is to be read as 19.1.2, Part CS of the Rules.
13. In Guidance C20.2.4, 20.2.4 and 20.2.10, Part C of the Rules are to be read as 19.2.4 and 19.2.10, Part CS of the Rules.
14. In Guidance C20.2.5, 20.2.4 and 20.2.5, Part C of the Rules are to be read as 19.2.4 and 19.2.5, Part CS of the Rules.
15. In Guidance C20.2.6, 20.2, 20.2.4, 20.2.6 and 20.2.5, Part C of the Rules are to be read as 19.2, 19.2.4, 19.2.6 and 19.2.5, Part CS of the Rules.
16. In Guidance C20.2.10, 20.2.10-2, Part C of the Rules is to be read as 19.2.10-2, Part CS of the Rules.
17. In Guidance C20.2.12, 20.2.12, Part C of the Rules is to be read as 19.2.12, Part CS of the Rules.
18. In Guidance C20.2.13, 20.2.13, Part C of the Rules is to be read as 19.2.13, Part CS of the Rules.
19. In Guidance C20.3.5, 20.3.5 and 20.1.2, Part C of the Rules are to be read as 19.3.5 and 19.1.2, Part CS of the Rules.
20. In Guidance C23.1.1, 23.1.1-2(2), Part C of the Rules is to be read as 21.1.1-2(2), Part CS of the Rules.
21. In Guidance C23.1.2, 23.1.2, Part C of the Rules is to be read as 21.1.2, Part CS of the Rules.
22. In Guidance C23.1.3, 23.1.3-4, Part C of the Rules is to be read as 21.1.3-4, Part CS of the Rules.
23. In Guidance C23.2.1, 23.2.1-3, 23.2.1-4 and 23.2.2-4, Part C of the Rules are to be read as 21.2.1-3, 21.2.1-4 and 21.2.2-4, Part CS of the Rules.
24. In Guidance C23.2.2, 23.2.2, 23.2.2-1, 23.2.2-2 and 23.2.2-3, Part C of the Rules are to be read as 21.2.2, 21.2.2-1, 21.2.2-2 and 21.2.2-3, Part CS of the Rules.
25. In Guidance C23.4.5-2, "$L^{\pm}$" is to be read as "L". L is ship's length specified in 2.1.2, Part A of the Rules.
26. In Guidance C23.5.1-2, 23.5.1-1 and Table C23.5, Part C of the Rules is to be read as 21.5.1-1 and Table CS21.5, Part CS of the Rules.
27. In Guidance C23.5.3, 23.5.3-5, Part C of the Rules is to be read as 21.5.3-5, Part CS of the Rules.
28. In Guidance C23.5.7, 23.5.7-3, Part C of the Rules is to be read as 21.5.7-3, Part CS of the Rules.
29. In Guidance C23.6.5, 23.6.5 and 23.6.5-1, Part C of the Rules are to be read as 21.6.5 and 21.6.5-1, Part CS of the Rules.
30. In Guidance C23.6.7, 23.6.7, 23.6.1 and 20.1.2, Part C of the Rules are to be read as 21.6.7, 21.6.1 and 19.1.2, Part CS of the Rules.
31. In Guidance C23.7.1, Chapter 19, 23.1.2-2 and 23.7.1, Part C of the Rules are to be read as Chapter 18, 21.1.2-2 and 21.7.1, Part CS of the Rules.
32. In Guidance C23.8.1, 23.8.1, Part C of the Rules is to be read as 21.8.1, Part CS of the Rules.
33. Ships not engaged on international voyages need not to apply the provisions of C25.2.1-2.
34. In Guidance C25.2.3, 25.2.3, Part C of the Rules is to be read as 22.4.3, Part CS of the Rules.
35. In Guidance C29.1.1-1(1), Chapter 29, Part C of the Rules is to be read as Chapter 24, Part CS of the Rules.
36. In Guidance C29.1.1-3(1)(b)i), 29.4, 29.5 and 29.6, Part C of the Rules are to be read as 24.3, 24.4 and 24.7, Part CS of the Rules.
37. In Guidance C29.1.2-4(1), 29.1.2-2, Part C of the Rules is to be read as 24.1.2-2, Part CS of the Rules.
38. In Guidance C29.7.4, 29.7.4, Part C of the Rules is to be read as 24.9.4, Part CS of the Rules.
39. In Guidance C34.1.2, 34.1.2-1, Part C of the Rules is to be read as 25.1.2-1, Part CS of the Rules.

Part D MACHINERY INSTALLATIONS

D13 PIPING SYSTEMS

D13.2 Piping

D13.2.5 Bulkhead Valves

Sub-paragraph -3 has been amended as follows.

3 The requirements for pipes piercing collision bulkheads specified in **13.2.5-1 and -2, Part D of the Rules** apply only to those extending below the freeboard deck. However, in accordance with the provisions of ~~**13.1.5(2), Part C of the Rules**~~**2.2.1.5(2), Part 1, Part C of the Rules**, those pipes piercing the extension part of the collision bulkhead (the weathertight part above the freeboard deck) and opening into enclosed spaces behind such bulkheads, are to be fitted with non-return valves on the aft side of the bulkhead.

D13.5 Bilge and Ballast Piping

D13.5.3 Size of Bilge Suction Pipes

Sub-paragraph -3 has been amended as follows.

3 Internal diameters of the bilge suction pipes for ships with unusually large freeboard

~~For information on~~ When calculating internal diameters of bilge suction pipes for ships with unusually large freeboards, ~~see **C1.1.3-2(2)(i)**~~ "*D*" may be replaced with the vertical distance from the top of the keel to an assumed freeboard deck.

D13.8 Sounding Pipes

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

Sub-paragraph -3(2) has been amended as follows.

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

(1) (Omitted)

(2) Protection of the enclosures of electrical components for the systems is to satisfy the following **(a)** to **(c)**:

(a) The requirements of IP68 for those installed in spaces, tanks or cargo holds. This includes all adjacent spaces considered to be simultaneously flooded under damage stability calculations of the spaces/tanks/cargo holds required by the provisions of ~~**Chapter 4,**~~ **2.3, Part 1, Part C of the Rules** or the requirements for ships to be assigned reduced freeboard

in accordance with **Part V of the Rules**;

(b) The requirements of IP56 for those installed on exposed decks above the spaces/tanks/cargo holds; and

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

((3) to (8) are omitted.)

D14 PIPING SYSTEMS FOR TANKERS

D14.3 Piping Systems for Cargo Oil Pump Rooms, Cofferdams and Tanks adjacent to Cargo Oil Tanks

D14.3.2 Ballast Tanks adjacent to Cargo Oil Tanks

Sub-paragraph -3(2) has been amended as follows.

3 Air vent pipes of ballast tanks adjacent to cargo oil tanks (**14.3.2-4, Part D of the Rules**)

(1) (Omitted)

(2) The total sectional area of air vent pipes in cases where high level alarms or hatchways specified in ~~**29.12.2**~~**14.1.2.1, Part 2-7, Part C of the Rules** are provided in ballast tanks adjacent to cargo oil tanks may be larger than the sectional area under the requirements of **13.6.3(1), Part D of the Rules** or 1,000 cm^2 whichever is smaller.

D15 STEERING GEARS

D15.1 General

D15.1.1 Scope

Sub-paragraph -2 has been amended as follows.

2 Quadrants, chains, rods and leading-block of manual steering gears are to be as specified in the following requirements:

(1) The scantlings of quadrants are to comply with the following requirements in **(a)** to **(c)**:

(a) In cases where three arms are provided, scantlings of quadrants are not to be less than those given in the following:

i) Boss:

$$H_c = 4.27 \cdot \sqrt[3]{T_R K_Q}$$

$$D_c = 7.69 \cdot \sqrt[3]{T_R K_Q}$$

ii) Arm at its root:

$$B_c = 3.29 \cdot \sqrt[3]{T_R K_Q}$$

$$T_c = 1.67 \cdot \sqrt[3]{T_R K_Q}$$

iii) Arm at its outer end:

$$B_0 = 2.22 \cdot \sqrt[3]{T_R K_Q}$$

$$T_0 = 1.07 \cdot \sqrt[3]{T_R K_Q}$$

where

T_R : Rudder torque specified in ~~3.3,~~**13.2.3, Part 1, Part C of the Rules** (*N-m*).

K_Q : Material coefficient of the quadrant, specified in ~~3.1.2~~**13.2.1.2, Part 1, Part C of the Rules**.

H_c : Required depth of boss (*mm*).

D_c : Required outer diameter of boss (*mm*).

B_c : Required breadth of arm at its root (*mm*).

T_c : Required thickness of arm at its root (*mm*).

B_0 : Required breadth of arm at its end (*mm*).

T_0 : Required thickness of arm at its end (*mm*).

(b) In cases where two arms are provided, the breadth and thickness of such arms are to be not less than 1.1 *times* those specified in **(a)**. In cases where four arms are provided, the breadth and thickness of such arms may be reduced to 0.9 *times* those specified in **(a)**.

(c) In cases where loose quadrants are used in addition to tillers fixed to rudder stocks, any arms of loose quadrants may be of the dimensions given in **(a)iii)** throughout their length.

(2) The diameter of studless chains for steering is not to be either less than 9.5 *mm* or less than the value obtained from the following formula, whichever is greater.

$$d_s = 3.36\sqrt{\frac{T_R K_c}{R}}$$

where

d_s : Required diameter of chains for steering (*mm*).

T_R : Rudder torque specified in ~~3.3,~~**13.2.3, Part 1, Part C of the Rules** (*mm*).

K_c : Material coefficient of the chain, specified in ~~**3.1.2,**~~ **13.2.1.2, Part 1, Part C of the Rules**.
R : Length of tiller or radius of quadrant measured from the centre of rudder stock to the centre line of steering chains (mm).
((3) to (8) are omitted.)

D15.4 Materials, Constructions and Strength of Steering Gears

D15.4.7 Tillers, etc.

Sub-paragraph -2 has been amended as follows.

2 The wording "to the satisfaction of the Society" specified in **15.4.7-5, Part D of the Rules** means to comply with the requirements specified in ~~**1.2**~~ **1.1 of the Appendix C1 "Reference Data for Design**", of **Part C**.

D16 WINDLASSES AND MOORING WINCHES

D16.2 Windlasses

D16.2.4 Design

Sub-paragraph -1 has been amended as follows.

1 The continuous duty pull specified in **16.2.4-2(2)(a)** is based on the following conditions:

(1) Ordinary stockless anchors are used.

(2) The anchor masses are assumed to be the masses as given in ~~**Chapter 27,**~~ **14.3, Part 1, Part C of the Rules** and **Chapter 2, Part L of the Rules**.

(3) One anchor is hoisted at a time.

(4) The effects of buoyancy and hawse pipe efficiency (assumed to be 70 %) have been accounted for.

Part GF SHIPS USING LOW-FLASHPOINT FUELS

GF6 FUEL CONTAINMENT SYSTEM

GF6.4 Liquefied Gas Fuel Containment

GF6.4.6 Supporting Arrangements

Sub-paragraph -2 has been amended as follows.

2 The analysis of supporting structures against the load conditions specified in the requirements in **6.4.9-3(3)(h)** and **6.4.9-4(1)(a)**, **Part GF of the Rules** is to be done while giving considerations to the following conditions **(1)** and **(2)**:

(1) A condition where, at a static heel angle of 30°, static load by the weight of liquefied gas fuel tank containing the liquefied gas fuel and the static sea water pressure without dynamic pressure due to waves is imposed.

(2) A condition where load by the weight of liquefied gas fuel tank containing the liquefied gas fuel with the acceleration caused by ship motions specified in the requirements in **6.4.9-4(1)(a)**, **Part GF of the Rules** and the dynamic sea water pressure due to waves are imposed. Such dynamic sea water pressure due to waves may be determined by the requirements in ~~**C31.1.3, Part C of the Guidance**~~**4.3, Part 2-9, Part C of the Rules**.

GF6.4 Liquefied Gas Fuel Containment

Paragraph 6.4.15 has been amended as follows.

GF6.4.15 Tank Types

1 (Omitted)

2 The "classical analysis procedures" referred to in the requirements in **6.4.15-1(3)(a)**, **Part GF of the Rules** means ~~the beam theory where the type of stress to be assessed is the combined stress of bending stress and axial stress~~ to meet the requirements in **Chapter 6, Part 2-9, Part C of the Rules**.

3 (Omitted)

4 For the purpose of the requirements in **6.4.15-1(3)(b)**, **Part GF of the Rules**, in structures where the membrane or axial force due to internal pressure can not be neglected, the calculation equation specified in ~~**Chapter 14,**~~ **Chapter 6, Part 2-9, Part C of the Rules** may be used after suitable modification.

~~**5** For the purpose of the requirements in **6.4.15-1(3)(b), Part GF of the Rules**, in case where no corrosion allowance specified in **6.4.1-7, Part GF of the Rules** is required, stiffeners may have section modulus more than 1/1.2 of one required in **14.2.3, Part C of the Rules.**~~

Table GF6.4.15 Allowable Stresses for the Primary Equivalent Stress

Ferrite steels	Austenic steels	Aluminium alloys
$0.79R_e$	$0.84R_e$	$0.79R_e$
$0.53R_m$	$0.42R_m$	$0.42R_m$

Note:
For each member, the smaller of the above values is to be used with R_e and R_m as specified in **6.4.12-1(1)(c), Part GF of the Rules**.

~~6~~5 (Omitted)
~~7~~6 (Omitted)
~~8~~7 (Omitted)
~~9~~8 The "calculations using accepted pressure vessel buckling theory" referred to in the requirements in **6.4.15-3(3)(b)**, **Part GF of the Rules** means calculations based on standards such as *JIS*, *ASME*, etc. P_4 among design external pressure P_e is to be the value computed by applying the requirements in ~~10.2, 18.2~~4.4.2.7, 4.4.2.8 and ~~19.2,~~ 4.9.2.2, Part 1, **Part C of the Rules** corresponding to the location of the tanks.
~~10~~9 (Omitted)
~~11~~10 (Omitted)
~~12~~11 In the assessments referred to in the preceding ~~-11~~0, verification is to be made through fatigue tests on a model combining the elements of the tank, second barrier, insulation structure and tank supporting structure considering the dimensional effects on real tank and the effects of dispersions in materials and fabrication accuracy as an integral part of the test specified in **16.5.5-1(1)**, **Part GF of the Rules**.
~~13~~12 (Omitted)
~~14~~13 For the purpose of the requirements in **6.4.15-4(4)(b)**, **Part GF of the Rules**, the hull structure adjacent to membrane tanks is to comply with the requirements in ~~Chapter 14,~~ **Chapter 6, Part 1, Part C of the Rules** and, in addition, the stress in the hull structure is to be restricted in consideration of the structural strength of membrane tanks, if necessary. The allowable stresses of the membrane, membrane supporting structures and insulation materials are to be determined in each case according to the mechanical properties of materials, records of construction, product specifications and levels of product quality control practice.

Part L EQUIPMENT

L3 CHAINS

L3.1 Chains

L3.1.7 Dimensions and Forms

Sub-paragraph -2 has been amended as follows.

2 For anchor chain cables for anchor specified in ~~**27.1.4,**~~**14.3, Part 1, Part C of the Rules**, the length of the shackle and accessories may be included in one length of chain.

Part M WELDING

M2 WELDING WORKS

M2.4 Welding Process

M2.4.1 Selection of Welding Consumables

Sub-paragraph -5 has been amended as follows.

5 The wording "measures deemed appropriate by the Society" stipulated in **Note (4)** of **Table M2.1, Part M of the Rules** means applying corrosion protection in accordance with ~~**25.2.3(1),**~~ **3.3.5.4-1(1), Part 1, Part C of the Rules** or **22.4.3(1), Part CS of the Rules** to welded parts.

M8 NON-DESTRUCTIVE INSPECTION FOR THE WELDED JOINTS OF HULL CONSTRUCTIONS

M8.6 Non-destructive Testing Criteria

Paragraph M8.6.2 has been amended as follows.

M8.6.2 Quality Level

The wording "Where it is deemed necessary by the Society" in **8.6.2-1, Part M of the Rules** means the cases in which electro-gas welding is applied to container carrier hatch side coamings that are constructed of extremely thick steel plates which comply with ~~**32.13,**~~**10.5, Part 2-1, Part C of the Rules**.

Part N SHIPS CARRYING LIQUEFIED GASES IN BULK

N2 SHIP SURVIVAL CAPABILITY AND LOCATION OF CARGO TANKS

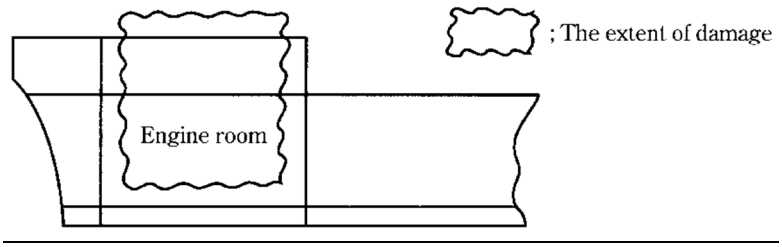
N2.5 Flooding Assumptions

N2.5.8 Buoyancy of Superstructures

Sub-paragraph -2 has been amended as follows.

2 The sliding watertight doors specified in **2.5.8(2), Part N of the Rules** are to satisfy the requirements of ~~**13.13.3,**~~ **2.2.2, Part 1, Part C of the Rules**, unless otherwise specified in this chapter and to be remotely operable from a readily accessible place in case of damage. Further, the openings of weathertight accepted within the minimum range of residual stability are to be capable of being securely closed at final equilibrium.

Fig. N2.5.8



N2.7 Survival Requirements

N2.7.1 Survival Requirements

Sub-paragraph -2 has been amended as follows.

2 The "remotely operated watertight sliding doors" referred to in **2.7.1-2(1), Part N of the Rules** are such doors satisfying the requirements of ~~**13.13.3,**~~**2.2.2, Part 1, Part C of the Rules**, unless otherwise specified in this chapter.

Sub-paragraph -4 has been amended as follows.

4 In applying the requirements of **2.7.1-3(1), Part N of the Rules**, "other openings capable of being closed weathertight" do not include ventilators provided with weathertight closing appliances in accordance with the requirements of ~~**23.6.5-2,**~~**14.12.3.1-3, Part 1, Part C of the Rules** or **21.6.5-2, Part CS of the Rules** that for operational reasons have to remain open to supply air to the engine room or emergency generator room (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship.

N3 SHIP ARRANGEMENTS

N3.1 Segregation of the Cargo Area

Paragraph N3.1.7 has been amended as follows.

N3.1.7 Openings for Cargo Containment System

"Arrangements for sealing the weather decks in way of openings for cargo containments systems" referred to in **3.1.7, Part N of the Rules** means the arrangements complying with the requirements in ~~**20.2.1, 20.2.2, 20.2.3**~~**14.6.1, 14.6.2,** and ~~**20.2.5-4(3),**~~**14.6.3, Part 1, Part C of the Rules**.

N4 CARGO CONTAINMENT

N4.8 Supporting Arrangements

N4.8.1 General

Sub-paragraph -2 has been amended as follows.

2 The analysis of supporting structures against the load conditions specified in the requirements in **4.13.9** and **4.14.1**, **Part N of the Rules** is to be done while giving considerations to the following conditions **(1)** and **(2)**:

(1) A condition where static load by the weight of cargo tank containing the cargo at a static heel angle of 30° and the static sea water pressure without dynamic pressure due to waves is imposed.

(2) A condition where load by the weight of cargo tank containing the cargo with the acceleration caused by ship motions specified in the requirements in **4.14.1**, **Part N of the Rules** and the dynamic sea water pressure due to waves are imposed. Such dynamic sea water pressure due to waves may be determined by the requirements in ~~**C31.1.3**~~**4.6, Part 1 and 4.3, Part 2-9, Part C of the Rules**.

N4.23 Type *C* Independent Tanks

N4.23.3 Ultimate Design Condition

Sub-paragraph -2 has been amended as follows.

2 The "calculations using accepted pressure vessel buckling theory" referred to in the requirements in **4.23.3-2, Part N of the Rules** means calculations based on standards such as *JIS*, *ASME*, etc. P_4 among design external pressure P_e is to be the value computed by applying the requirements in ~~**10.2, 18.2**~~**4.4.2.7, 4.4.2.8** and ~~**19.2,**~~**4.9.2.2, Part 1, Part C of the Rules** corresponding to the location of the tanks.

N4.24 Membrane Tanks

Paragraph N4.24.4 has been amended as follows.

N4.24.4 Structural Analyses

For the purpose of the requirements in **4.24.4-2, Part N of the Rules,** the hull structure adjacent to membrane tanks is to comply with the requirements in ~~**Chapter 14,**~~ **Chapter 6, Part 1, Part C of the Rules** and, in addition, the stress in the hull structure is to be restricted in consideration of the structural strength of membrane tanks, if necessary. The allowable stresses of the membrane, membrane supporting structures and insulation materials are to be determined in each case according to the mechanical properties of materials, records of construction, product specifications and levels of product quality control practice.

N4.25 Integral Tanks

Paragraph N4.25.3 has been amended as follows.

N4.25.3 Ultimate Design Condition

The allowable stresses specified in **4.25.3-2, Part N of the Rules** are to be those specified in ~~**C31.1.3**~~**8.6.1.2, Part 1, Part C of the Rules.**

N14 PERSONNEL PROTECTION

N14.4 Personnel Protection Requirements for Individual Products (*IGC Code* 14.4)

Paragraph N14.4.3 has been amended as follows.

N14.4.3 Decontamination Shower and Eyewash Stations

Decontamination showers and eyewash stations are to be located in the vicinity of cargo manifolds, cargo pump rooms, etc. which are vulnerable to cargo splashes, and shielding walls are to be provided to prevent crew members from being sprayed by any additional cargo splashes during eye washing. The construction of a special locker for the storage of protective equipment provided in the cargo area is to comply with the requirement in ~~**Chapter 19,**~~**11.3.3, Part 1, Part C of the Rules**. The piping for decontamination showers and eyewash is to be permanent metal piping complying with the requirements in **Chapter 12, Part D of the Rules**, and it is also to be provided with thermal insulation or drain connections at suitable locations to prevent freeze damage.

Part S SHIPS CARRYING DANGEROUS CHEMICALS IN BULK

S2 SHIP SURVIVAL CAPABILITY AND LOCATION OF CARGO TANKS

S2.7 Flooding Assumptions

S2.7.8 Buoyancy of Superstructure

Sub-paragraph -2 has been amended as follows.

2 In **2.7.8(2), Part S of the Rules**, the remotely operated sliding watertight doors are to satisfy the requirements of ~~**13.3,**~~ **2.2.2, Part 1, Part C of the Rules,** unless otherwise specified in this chapter and to be capable of being controlled from a safe and readily accessible place. Weathertight openings submerge in water under the minimum range of residual stability are to be capable of closing securely in a state of equilibrium.

S2.9 Survival Requirements

S2.9.2 Stability Criteria at Any Stage of Flooding

Sub-paragraph -1 has been amended as follows.

1 The "watertight sliding doors" referred to in **2.9.2(1), Part S of the Rules** means such doors satisfying the requirements of ~~**13.3,**~~ **2.2.2, Part 1, Part C of the Rules,** unless otherwise specified in this chapter.

S2.9 Survival Requirements

S2.9.3 Stability Criteria at Final Equilibrium after Flooding

Sub-paragraph -3 has been amended as follows.

3 In applying the requirements of **2.9.3(1), Part S of the Rules**, "other openings capable of being closed weathertight" do not include ventilators provided with weathertight closing appliances in accordance with the requirements of ~~**23.6.5-2,**~~ **14.12.3.1-3, Part 1, Part C of the Rules or 21.6.5-2, Part CS of the Rules** that for operational reasons have to remain open to supply air to the engine room or emergency generator room (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship.

Part O WORK-SHIPS

O4 VESSELS ENGAGED IN TOWING OPERATION

O4.3 Hull Construction

Paragraph O4.3.5 has been amended as follows.

O4.3.5 Supporting Structures of Towing Equipment

With respect to the provisions of **4.3.5, Part O of the Rules**, the allowable stress values for each member of the supporting structures of towing equipment are, in principle, to be as given below. Different values, however, may be used in consideration of the arrangements, etc. of the supporting structures.

$\sigma = 166/K(N/mm^2)$
$\tau = 96/K(N/mm^2)$
$\sigma_e = 196/K(N/mm^2)$

σ: $\sigma_a + \sigma_b$(Normal stress)
σ_a: Axial stress
σ_b: Bending stress
τ: Shearing stress in plane
σ_e: $\sigma_e = \sqrt{\sigma^2 + 3\tau^2}$ (Equivalent stress)
K: Coefficient corresponding to the kind of steel
e.g. 1.0 for mild steel, the values specified in ~~**1.1.7-2(1),**~~ **3.2.1.2-2, Part 1, Part C of the Rules** for high tensile steel

O8 ANCHOR HANDLING VESSELS

O8.3 Hull Construction

Paragraph O8.3.2 has been amended as follows.

O8.3.2 Supporting Structures of Anchor Handling Equipment

With respect to the provisions of **8.3.2, Part O of the Rules**, the allowable stress values for each member of the supporting structures of anchor handling equipment and in way of parts where anchors are stored as cargo are, in principle, to be as given below. Different values, however, may be used in consideration of the arrangements, etc. of the supporting structures.

$\sigma = 166/K(N/mm^2)$

$\tau = 96/K(N/mm^2)$

$\sigma_e = 196/K(N/mm^2)$

σ: $\sigma_a + \sigma_b$ (Normal stress)

σ_a: Axial stress

σ_b: Bending stress

τ: Shearing stress in plane

σ_e: $\sigma_e = \sqrt{\sigma^2 + 3\tau^2}$ (Equivalent stress)

K: Coefficient corresponding to the kind of steel
e.g. 1.0 for mild steel, the values specified in ~~**1.1.7-2(1),**~~ **3.2.1.2-2, Part 1, Part C of the Rules** for high tensile steel

O11 WIND TURBINE INSTALLATION SHIPS

O11.5 Hull Equipment

Paragraph O11.5.1 has been amended as follows.

O11.5.1 General

Where **11.5.1-2, Part O of the Rules** is applied and dynamic positioning systems (hereinafter referred to as "DPS") are provided in accordance with **10.2.1(2), Part P of the Rules**, the number of required mooring equipment for temporary mooring may be reduced to one. However, the DPS provided in such cases are to satisfy the following:

(1) They are either a the Class 2 or Class 3 DPS specified in **10.2.3, Part P of the Rules**.

(2) They take into account the environmental conditions specified in ~~**Table C27.1, Chapter 27 of**~~ **Table 14.3.1-1, Part 1, Part C of the Rules** and the assumed position keeping time. However, in the case of ships for restricted service, the environmental conditions may be specified by the owner.

(3) The operational procedure followed when they are used in conjunction with mooring equipment for temporary mooring is to be included in the operation manual specified in **18.2.2, Part P of the Rules**.

Part P MOBILE OFFSHORE DRILLING UNITS AND SPECIAL PURPOSE BARGES

P9 HULL EQUIPMENTS

P9.6 Means of Access

P9.6.3 Means of Access within Spaces

Sub-paragraph -2 has been amended as follows.

2 With respect to the provisions of **9.6.3, Part P of the Rules**, the selection of an alternative means of access is to be based on the following conditions. Refer to ~~**Annex C35.2.4, Part C of the Guidance**~~ **Annex 14.16, Part 1, Part C of the Rules** for details.
((1) to (5) are omitted.)

Sub-paragraph -3 has been amended as follows.

3 Where a boat is used as an alternative means, ~~**C35.1.4-5, Part C of the Guidance**~~**14.16.2.4-6, Part 1, Part C of the Rules** is to apply. Rafts or boats alone may be allowed for survey of the under deck areas for tanks or spaces if the depth of the webs is not more than 1.5 *m*. If the depth of the webs is more than 1.5 *m*, rafts or boats alone may be allowed only if permanent means of access are provided to allow safe entry and exit. This means either:
((1) and (2) are omitted.)

P9.6.4 Specifications for Means of Access and Ladders

Sub-paragraph -11(7) has been amended as follows.

11 With respect to the provisions of **9.6.4-9, Part P of the Rules**, details of ladders and other means are to be in accordance with the following.
((1) to (6) are omitted.)
(7) For the selection of portable and movable means of access, refer to ~~**Annex C35.2.4 of the Guidance**~~**Annex 14.16, Part 1, Part C of the Rules**.

Part PS FLOATING OFFSHORE FACILITIES FOR CRUDE OIL/PETROLEUM GAS PRODUCTION, STORAGE AND OFFLOADING

PS3 HULL CONSTRUCTION AND EQUIPMENT

PS3.7 Fatigue Strength

Paragraph PS3.7.2 has been amended as follows.

PS3.7.2 Fatigue Strength Evaluation

Fatigue Strength may be estimated using cumulative fatigue damage ratio in correspondence to **Appendix P1, Part P of the Guidance** ~~or one of the following requirements~~**, Chapter 9, Part 1, Part C of the Rules** or **Chapter 9, Part C Part CSR-B&T of the Rules**. ~~However, the reference stresses of stiffeners are to be calculated in accordance with the 10^{-4} probability level of design loads.~~

~~(1) In the case of longitudinal stiffeners~~

~~(a) **Annex C1.1.23-1, Part C of the Guidance,** in cases where correction coefficients are 1.0.~~

~~(b) **Chapter 9, Part 1, Part CSR-B&T of the Rules**~~

~~(2) In the case of the members, excluding longitudinal stiffeners, of ship-type Floating Offshore Facilities, **Chapter 9, Part 1, Part CSR-B&T of the Rules**~~

Part Q STEEL BARGES

Q12 LONGITUDINAL STRENGTH

Q12.1 Longitudinal Strength

Paragraph Q12.1.3 has been amended as follows.

Q12.1.3 Loading Manual

The requirements in ~~**C34.1.2**~~ **3.8.2, Part 1, Part C of the Rules** are applied with necessary modifications to the loading manual required to the steel barge.

Q13.6 Local Compensation of Shell Plating

Paragraph Q13.6.2 has been amended as follows.

Q13.6.2 Shell Plating with Transverse Framing

1 Where both deck and side constructions are transversely framed, calculations for the buckling strength are to submitted for the approval.

2 Carlings (100×10 FB as standard) are to be fitted in a longitudinal direction at the carling spaces which satisfy the following formula to the side plating of a transverse system when the strength deck and bottom plating is of a transverse system, and the strength deck plating of a transverse system in the midship part; except where approved otherwise by the Society.

$$16.6\left(\frac{t}{10S}\right)^2\left(1+\frac{S^2}{C^2}\right)^2 \geq \alpha\gamma$$

t : Thickness (mm) of deck or shell plating

C : Spacing (m) of carling

S : Spacing (m) of transverse beams

α : As given by the following

$\frac{-(M_{S.\min}+M_W(-))}{Z_D}\times 10^3$ (N/mm^2) for strength deck

$\frac{(M_{S.\max}+M_W(+))}{Z_B}\times 10^3$ (N/mm^2) for bottom shell

$M_{S.\min}$ and $M_{S.\max}$: Min. and Max. values respectively, of longitudinal bending moment (kN-m) in still water as required in **12.1.1-2, Part Q of the Rules**

$M_W(-)$ and $M_W(+)$: As specified in **4.3.2.3, Part 1, Part C of the Rules**

Z_D and Z_B : Actual section moduli (cm^3) of transverse section of hull whose values are determined against the strength deck and ship bottom according to the requirements in **12.1.2, Part Q of the Rules**

γ : 1.0 for strength deck plating and bottom shell plating, and the value given by the following for side shell plating:

$\frac{y_1}{y_D}$ for members located above the neutral axis of athwartship considered

$\frac{y_2}{y_B}$ for members located below the neutral axis of athwartship considered

y_D: Vertical distance (m) from neutral axis to deck

y_B: Vertical distance (m) from base line to neutral axis

y_1: Vertical distance (m) from neutral axis to upper edge of each strake, but it does not need to be greater than y_D

y_2: Vertical distance (m) from neutral axis to lower edge of each strake, but it does not need to be greater than y_B

Appendix 1 has been amended as follows.

Appendix 1 APPLICATION OF PART ~~C~~CS OF THE GUIDANCE

The **Part ~~C~~CS** of the Guidance is to be correspondingly applied as the Guidance for the prescriptions in **Part Q of the Rules**, as shown in the **Table Q** correspondence Table of Guidance.

Table Q Correspondence Table of Guidance

Part Q	Part ~~C~~CS	Part Q	Part ~~C~~CS	Part Q	Part ~~C~~CS
1.1.1	~~C1.1.3~~CS1.1.3	8.2.1	~~C11.2.1~~CS11.2.1	13.3.3	~~C16.3.3~~CS16.3.3
1.16	~~C1.1.10~~CS26.1	9.1.3	~~C12.1.3~~CS12.1.3	14.1.1-1	~~C10.2.1~~CS17.1.1 [1]
~~2.1.1~~	~~C1.1.11~~ ~~&~~ ~~C1.1.12~~	9.1.4	~~C12.1.4~~CS12.1.4	14.2.1	~~C17.1.1~~CS17.2.1
		9.2.1	~~C12.2.1~~CS12.2.1	14.2.3	~~C17.1.4~~CS17.2.4
2.1.2	~~C1.1.7~~CS1.3.1	10.2.3	~~C13.2.3~~CS13.2.3	14.3.2	~~C17.2.2~~CS17.3.2
7.1.2	~~C10.1.2~~CS10.1.2	11.1.3	~~C14.1.3~~CS14.1.3	14.4.1	~~C17.3.1~~CS17.4.1
7.3.2	~~C10.4.2~~CS10.3.2	11.2.2	~~C14.2.3~~CS14.2.3	15.3.1	~~C18.3.1~~CS18.3.1
				19.1.1	CS23.1.1
8.1.1	~~C11.1.2~~CS11.1.2	12.1.1	~~C15.2.1~~CS15.2.1	19.1.3	~~C27.1.2~~CS23.1.2
~~8.1.1~~	~~C11.1.2~~	12.1.2	~~C15.2.3~~CS15.2.3	~~19.1.5~~	~~C27.1.5~~ [2]

Remark

1) In **~~C10.2.1, Part C of the Guidance~~CS17.1.1**, "**~~10.2.1-1(2), Part C~~17.1.1-1, Part CS of the Rules**" is to be construed as "**14.1.1-1(2), Part Q of the Rules**".

~~2) In C27.1.5, Part C of the Guidance, "27.1.5, Part C of the Rules" is to be construed as "19.1.5, Part Q of the Rules".~~

Part R FIRE PROTECTION, DETECTION AND EXTINCTION

R3 DEFINITIONS

R3.2 Definitions

Paragraph R3.2.14 has been deleted.

~~**R3.2.14 Combination Carrier**~~

~~Ore/oil carriers specified in **30.7.1, Part C of the Rules** and B/O carriers specified in **31.8.1, Part C of the Rules** are regarded as "combination carriers" specified in **3.2.14, Part R of the Rules**.~~

R4 PROBABILITY OF IGNITION

R4.5 Cargo Areas of Tankers

R4.5.1 Separation of Cargo Tanks and Location of Fuel Tanks

Sub-paragraph -8 has been deleted, and Sub-paragraphs -9 to -12 have been renumbered to Sub-paragraphs -8 to -11 as follows.

~~**8** With respect to the requirements of **4.5.1-4(1), Part R of the Rules**, the arrangements and isolation of divisions in combination carriers are to comply also with the requirements for bulk ore/oil carriers specified in **30.7, Part C of the Rules**, and the requirements for bulk/oil carriers specified in **31.8, Part C of the Rules**.~~

~~**9**~~**8** The cofferdams specified in **4.5.1-4(1), Part R of the Rules** may be commonly used for permanent ballast tanks.

~~**10**~~**9** "A permanent continuous coaming of a height of at least 300 *mm*" specified in the requirements of **4.5.1-6, Part R of the Rules** is to be as shown in **Fig.R4.5.1-4** and not to be made lower than 50 *mm* above the upper edge of shear strakes.

~~**11**~~**10** As "the arrangements associated with stern loading" specified in the requirements of **4.5.1-6, Part R of the Rules**, foam extinguishers or equivalent are to be provided in addition to the requirements of **14.2.4-4, Part D** and **4.5.2-6, Part R of the Rules**, and further, oil drip pans in sufficient size or spillage coaming are to be provided.

~~**12**~~**11** An example of the "cargo tank block" defined in **4.5.1-8, Part R of the Rules** is shown in **Fig. R4.5.1-5**.

R5 FIRE GROWTH POTENTIAL

R5.2 Control of Air Supply and Flammable Liquid to the Space

R5.2.1 Closing Appliances and Stopping Devices of Ventilation

Sub-paragraph -1(2) has been amended as follows.

1 With respect to the requirements of **5.2.1-1, Part R of the Rules**, the provision of closing appliances for the ventilation of battery rooms may be exempted, subject to the following **(1)** to **(3)**:
(1) The battery room only opens directly onto an exposed deck;
(2) The height of the ventilation opening for the battery room above the deck is not less than 4.5*m* in the position I and not less than 2.3 *m* in the position II specified in ~~**20.1.2,**~~ **1.4.3.2, Part 1, Part C of the Rules**; and
(3) The battery room is not fitted with a fixed gas fire-extinguishing system.

R9 CONTAINMENT OF FIRE

R9.4 Protection of Openings in Fire Resisting Divisions

R9.4.1 Doors in Fire-resisting Divisions

Sub-paragraph -2 has been amended as follows.

2 With respect to the requirements of **9.4.1, Part R of the Rules**, for weathertight doors which are required by the provisions of ~~**13.1.1-3, -4 or 13.1.5(2),**~~ **2.2.1.1-5, -6** or **2.2.1.5(2), Part 1, Part C of the Rules** and are independently arranged away from a group of accommodation spaces, the fire integrity of them may be in accordance with **9.4.4, Part R of the Rules**.

R10 FIRE FIGHTING

R10.7 Fire-extinguishing Arrangements in Cargo Spaces

R10.7.1 Fixed Fire-extinguishing Systems for General Cargo

Sub-paragraph -1 has been amended as follows.

1 With respect to the provisions of **10.7, Part R of the Rules**, for container cargo holds fitted with partially weathertight hatch covers in accordance with the provisions of ~~**20.2.7,**~~ **14.6.7, Part 1, Part C of the Rules**, closing appliances for such holds may be omitted, provided that the amount of carbon dioxide is increased in accordance with the provisions of **R25.2.2-4**.

R19 CARRIAGE OF DANGEROUS GOODS

R19.2 General Requirements

R19.2.1 Application

Sub-paragraph -2 has been amended as follows.

2 With respect to the requirements of **19.2.1, Part R of the Rules**, for carrying dangerous goods in container cargo holds fitted with partially weathertight hatch covers in accordance with the provisions of ~~**20.2.7,**~~ **14.6.7, Part 1, Part C of the Rules**, attentions are to be paid to the provisions in Section 3 of the Guidelines adopted as the *MSC*/*Circ*.1087.

R19.3 Special Requirements

R19.3.1 Water Supplies

Sub-paragraph -4 has been amended as follows.

4 The wording "suitable measures to limit the adverse effect upon stability of the added weight and free surface of water" required in **19.3.1-3, Part R of the Rules** means that the ships is to comply with the stability criteria specified in **2.2.1-1, Part U of the Rules** in any stage of accumulating water discharged from the fixed spraying or flooding system in the cargo space. The initial condition of loading is to be in accordance with the provisions specified in ~~**C31A.2**~~ **An2., Annex 1.1, Part 2-2, Part C of the Rules**.

R19.3.9 Water Spray System

Sub-paragraph -3 has been amended as follows.

3 The wording "the suitable measures to limit the adverse effect upon stability of the added weight and free surface of water" required in **19.3.9, Part R of the Rules** means that the ship is to comply with the stability criteria specified in **2.2.1-1, Part U of the Rules** in any stage of accumulating water discharged from the fixed pressure water-spraying system in the cargo space. The initial condition of loading is to be in accordance with the provisions specified in ~~**C31A.2**~~ **An2., Annex 1.1, Part 2-2, Part C of the Rules**.

R20 PROTECTION OF VEHICLE AND RO-RO SPACES

R20.5 Fire-extinction

R20.5.1 Fixed Fire-extinguishing Systems

Sub-paragraph -2 has been amended as follows.

2 With respect to the requirements of **20.5.1, Part R of the Rules**, where container cargo holds fitted with partially weathertight hatch covers in accordance with the provisions of ~~**20.2.7,**~~ **14.6.7, Part 1, Part C of the Rules**, are intended for carriage of motor vehicles with fuel in their tanks for their own propulsion, such holds may be protected by a fixed carbon dioxide system, provided that the amount of carbon dioxide is increased in accordance with the provisions of **R25.2.2-5**.

Sub-paragraph -4(1) has been amended as follows.

4 The "drainage systems" required by **20.5.1-4, Part R of the Rules** are to comply with the following **(1)** and **(2)**. However, in cases where the direct overboard discharge provisions or the bilge systems have a capacity sufficient for the additional flow from the fixed fire-extinguishing system and the required number of fire hoses, additional drainage facilities are not required.

(1) Arrangements above the bulkhead deck are to comply with the following **(a)** to **(d)**:

((a) to (c) are omitted.)

(d) The minimum capacity of scuppers, freeing ports or a combination thereof are to be determined in accordance with the following **(i)** or **(ii)** respectively.

(i) (Omitted)

(ii) The minimum required area of freeing ports is to be determined by the following formula. If the cross-sectional area of freeing ports required by ~~**23.2.2,**~~ **14.9.2, Part 1, Part C of the Rules** is equal to or greater than determined above, additional freeing ports are not required:

$$A = \frac{Q}{0.5\sqrt{19.62(h_1 - h_2)}}$$

where

A: The total required sectional area of freeing ports on each side of the ship (m^2);

Q: The combined waterflow from the fixed fire-extinguishing system and the required number of fire hoses (m^3/s); and

$h_1 - h_2$: The depth of water on each deck .This value is to be calculated by multiplying the maximum flow rate of the installed fire-extinguishing system water pumps plus the flow from two fire hoses (four if required by **19.3.1-2, Part R of the Rules**) by an operating time of 30 *min*. This volume of water is to be divided by the area of the affected deck (m).

(2) (Omitted)

Sub-paragraph -5 has been amended as follows.

5 The wording "suitable measures to limit the adverse effect upon stability of the added weight and free surface of water" required in **20.5.1-4, Part R of the Rules** means that the ship is to comply

with the stability criteria specified in **2.2.1-1, Part U of the Rules** in any stage of accumulating water discharged from the fixed pressure water-spraying system in the cargo space. The initial condition of loading is to be in accordance with the provisions specified in ~~**C31A.2**~~ **An2., Annex 1.1, Part 2-2, Part C of the Rules**.

R25 FIXED GAS FIRE-EXTINGUISHING SYSTEMS

R25.2 Engineering Specifications

R25.2.2 Carbon Dioxide Systems

Sub-paragraph -5 has been amended as follows.

5 With respect to the provisions of **25.2.2-1(1), Part R of the Rules**, for container cargo holds fitted with partially weathertight hatch covers in accordance with the provisions of ~~**20.2.7,**~~ **14.6.7, Part 1, Part C of the Rules**, the quantity of carbon dioxide is not to be less than the following values. (1) and (2) are omitted.)

R29 FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS

R29.2 Engineering Specifications

R29.2.1 General Requirements

Sub-paragraph -1 has been amended as follows.

1 In applying **29.2.1-2(4), Part R of the Rules**, watertight doors complying with ~~**13.3.3,**~~ **2.2.2.3, Part 1, Part C of the Rules** which also serve as fire doors are not to close automatically in the case of fire detection.

"Guidance for marine pollution prevention systems" has been partly amended as follows:

Part 3 CONSTRUCTION AND EQUIPMENT FOR THE PREVENTION OF POLLUTION BY OIL

Chapter 3 CONSTRUCTION AND EQUIPMENT FOR THE PREVENTION OF POLLUTION BY OIL CARRIED IN BULK

3.2 Hull Construction

3.2.2 Subdivision and Stability

Sub-paragraphs -7 and -8 have been amended as follows.

7 The "watertight sliding doors" referred to in **3.2.2-3(1) in Part 3 of the Rules** means such doors satisfying the requirements of ~~**13.13.3, Part C of the Rules**~~ **2.2.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, unless otherwise specified in this chapter.

8 In applying the requirements of **3.2.2-3(3) in Part 3 of the Rules**, "other openings which can be closed with a weathertight cover" do not include ventilators provided with weathertight closing appliances in accordance with the requirements of ~~**23.6.5-2, Part C of the Rules**~~**14.12.3.1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** or **21.6.5-2, Part CS of the Rules** that for operational reasons have to remain open to supply air to the engine room or emergency generator room (if the same is considered buoyant in the stability calculation or protecting openings leading below) for the effective operation of the ship.

Chapter 4 EQUIPMENT FOR THE PREVENTION OF DISCHARGE OF NOXIOUS LIQUID SUBSTANCES

4.7 Segregated Ballast Tanks

Table 4.4.7-1 has been amended as follows.

Table 4.4.7-1 Capacity Requirements for Segregated Ballast Tanks

Case	Moulded draught amidships	Aft trim	Additional requirements
1	○	○	-
2	○	×	Fwd draught> $0.025\ L_f$
3	○	×	Fwd draught≤ $0.025\ L_f$ To comply with ~~**16.4.4(1) in**~~**10.6.2.4(1), Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**

(Remark)

○ : The relevant requirements are complied with.

× : The relevant requirements are not complied with.

"Guidance for safety equipment" has been partly amended as follows:

Chapter 3 ARRANGEMENTS AND PERFORMANCE

3.1 General

3.1.1 General

Sub-paragraph -24 has been amended as follows.

24 Lifebuoys required by ~~**C23.8.1-2(10), Part C of the Guidance for the Survey and Construction of Steel Ships**~~**14.14.1.1-2(10), Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are not to be taken into account when determining the minimum number and distribution of lifebuoys as required by **Regulation 32.1.1, Chapter III of the Annex to the Convention**.

"Guidance for cargo handling appliances" has been partly amended as follows:

Chapter 1 GENERAL

1.3 Arrangement, Construction, Materials and Welding

1.3.5 Welding

Sub-paragraph -1(3) has been amended as follows.

1 Welding of derrick posts is to comply with the following requirements **(1)** through **(8)**:
((1) and (2) are omitted.)
(3) As for the welding of side plates to upper and lower plates constituting portal, the fillet size, at the portal ends and at the portions where topping brackets, eyes, etc. are fitted are to be of *F*1 weld specified in ~~**Table C1.5,**~~ **Table 12.2.1-2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.
((4) to (8) are omitted.)

Sub-paragraph -2(4) has been amended as follows.

2 Welding for cranes is to comply with the following requirements **(1)** to **(4)**:
((1) to (3) are omitted.)
(4) The fillet weld applied to the primary structural members is, as a rule, to be *F*1 weld specified in ~~**Table C1.4,**~~ **Table 12.2.1-1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, or equivalent thereto.

Sub-paragraph -5 has been amended as follows.

5 When cast steel or forged steel parts are connected to steel plates by butt welding or lap welding, the details of welded joints are to comply with the requirements specified in ~~**1.2.3,**~~ **12.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

"Guidance for high speed craft" has been partly amended as follows:

Part 1 GENERAL RULES

Chapter 1 GENERAL

1.1 General

Paragraph 1.1.5 has been amended as follows.

1.1.5 Craft of Unusual Form or Proportion

1 Craft with unusual large freeboards

(1) "Craft with unusual large freeboards" are the craft which comply with the condition prescribed in ~~**C1.1.3-2(1) of the Guidance**~~**1.4.3.5, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

(2) Craft with unusual large freeboards may be treated as follows in case that the requirements in **Part 7** and **Part 9 of the Rules for High Speed Craft** (hereinafter referred to as "the Rules" in this guidance) apply.

(a) **Chapter 2 in Part 7 of the Rules**:
In determination of "Position of Exposed Decks" prescribed in **2.1.2 in Part 7 of the Rules**, the exposed deck in question may be regarded as follows in accordance with H_D and h_s. In this case, H_D is the vertical distance from an imaginary freeboard deck to the weather deck at side and h_s is the standard height of superstructure determined by the requirements in **V2.2.1 of the Guidance for the Survey and Construction of Steel Ships**.

$h_s \leq H_D < 2h_s$:
Superstructure deck of first tier above an imaginary freeboard deck

$2h_s \leq H_D < 3h_s$:
Superstructure deck of second tier above an imaginary freeboard deck

$3h_s \leq H_D$:
Superstructure deck of third tier above an imaginary freeboard deck

(b) **Chapter 8 in Part 9 of the Rules**:
In determining of the diameters of bilge suction pipes prescribed in **13.5.3, Part D of the Rules for the Survey and Construction of Steel Ships** quoted by **8.4 in Part 9 of the Rules**, D' may be used in place of D in determing the diameters of bilge suction pipes. In this case, D' is the vertical distance from the top of keel to an imaginary freeboard deck (refer to ~~**Fig. C1.1.3-2 of the Guidance**~~ **Fig. 1.4.3-4, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**).

Chapter 2 DEFINITIONS

2.1 General

2.1.15 Freeboard Deck

Sub-paragraph -1 has been amended as follows.

1 "Adequate width" specified in **2.1.15-3, Part 1 of the Rules** is to be determined by taking into account the ship's construction, and operation, and at the minimum, is to accommodate the passages specified in ~~**23.7, Part C of the Rules**~~ **14.13, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Part 6 SCANTLING DETERMINATION OF HULL CONSTRUCTION

Chapter 4 BUCKLING CONTROL

4.1 General

Paragraph 4.1.1 has been amended as follows.

4.1.1 General

Where detailed assessment of buckling strength is required, the ~~**Annex C1.1.22-2 "GUIDANCE FOR BUCKLING STRENGTH CALCULATION" in Part C of the Guidance for the Survey and Construction of Steel Ships**~~**8.6.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** may be applied.

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

Part 2 CLASS SURVEY

Chapter 1 GENERAL

1.1 Surveys

1.1.3 Intervals of Class Maintenance Surveys

Sub-paragraph -1(3) has been amended as follows.

1 For the application of the requirements of **1.1.3-3, Part 2 of the Rules**, in addition to the requirements specified in **B1.1.3-9** (except for **(22)**), **Part B of the Guidance for the Survey and Construction of Steel Ships**, occasional surveys are to be in accordance with those specified in **(1)** to **(7)** below:

((1) and (2) are omitted.)

(3) For ships engaged on international voyages which had been at the beginning stage of construction prior to 1 January 2010, a survey is to be carried out to verify compliance with the emergency towing procedures requirements (~~**27.4**~~**14.5.3, Part 1, Part C** or **23.3, Part CS of the Rules for the Survey and Construction of Steel Ships**) referred to in **1.1.1-4, Part 3 of the Rules** by 1 January 2010.

((4) to (7) are omitted.)

Part 3 HULL CONSTRUCTION AND EQUIPMENT

Chapter 1 GENERAL

1.1.4 Direct Calculations

Sub-paragraphs -1 and -2 have been amended as follows.

1 The procedure of determining the scantlings of hull structural members by the direct calculations of the requirements in **1.1.4, Part 3** of the Rules is also to comply with the ~~**Annex C1.1.22-1** "GUIDANCE FOR DIRECT CALCULATIONS", **Part C of the Guidance**~~ **Chapter 8, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. In case where the application of this Guidance and **Part 3** of the Rules are considered to be difficult, however, the analytical procedure, load conditions, allowable stresses, etc. may be determined at the discretion of the Society.

2 In case where the scantlings of each structural member are determined by the direct calculations, the procedure of examining the buckling strength of each structural member on the basis of the results of direct calculations is to comply with the ~~**Annex C1.1.22-2** "GUIDANCE FOR BUCKLING STRENGTH CALCULATION", **Part C of the Guidance**~~**8.6.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Chapter 2 MATERIALS AND WELDING

2.1 Materials

Paragraph 2.2.1 has been amended as follows.

2.1.1 Application

Where materials of high tensile steel are used, the construction and scantlings are to be determined with special reference to ~~**Annex C1.1.7-1** "GUIDANCE FOR HULL CONSTRUCTION CONTAINING HIGH TENSILE STEEL MEMBERS",~~ the relevant requirements of **Part C of the ~~Guidance~~Rules for the Survey and Construction of Steel Ships**, unless otherwise specified.

Chapter 3 has been amended as follows.

Chapter 3 LONGITUDINAL STRENGTH

3.~~2~~1 Bending Strength

3.~~2~~1.1 Bending Strength at the Midship Part

1 Bending strength at the midship part of ships having long multi-deckhouses on strength deck is to be in accordance with the follows:

(1) The requirements in **3.~~2~~1.1-1, Part 3** of the Rules are to be complied with.

(2) The calculation of section modulus and moment of inertia for hull cross section, in addition to sub-paragraph **(1)**, is to apply the requirement in **~~15.2,~~ 5.2.1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** for each deck which the deck directly below the deckhouse that the ratio of the length of ship length direction of deckhouse of each every layer and the circumference of cross section of deckhouse (the value of two times of the sum of width and height of the deckhouse) is less than 5, hereinafter referred to as "the deck which is needed to examine the longitudinal strength", and all longitudinal member which are located below the deck and are considered effective to the longitudinal strength are to be included in the calculation. In this case, the openings of deck except for strength deck is to be handled as well as the openings of strength deck. Where, however, longitudinal plate member that compressive buckling strength is not enough and which is considered to give no contribution to the longitudinal strength is located above the strength deck, the sagging moment which arises under navigation is to be in accordance with the following requirements in **(a)** and **(b)**.

(a) The sub-paragraph **(2)** is to be applied, provided the longitudinal plate member that compressive buckling strength is not enough and which is considered to give no contribution to the longitudinal strength is removed from inclusion member of hull cross section modulus and moment of inertia.

(b) For frame members, the plate members having the effective width calculated by the requirement in **~~31.9.3,~~ 14.6.5.6(3), Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** may be considered as flange of the frame members and may be added to the inclusion members.

(3) Where an approval by the Society is obtained, bending strength may be examined by other method which is specially considered, notwithstanding the provisions of **(1)** and **(2)**.

2 In case of the stairway rooms including atrium and elevator centralized in midship deck of hull, bending strength around openings is to be confirmed by the result of direct calculations. Allowable stress is to be suited to the provision of **~~Chapter 15,~~ Chapter 5, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. However, allowable stress around corner may be applied corresponding to the provision of **~~C31.1.3,~~ 8.6, Part 1, Part C of the ~~Guidance~~ Rules for the Survey and Construction of Steel Ships**.

3.~~3~~2 Buckling Strength

3.~~3~~2.1 Compressive Buckling Strength

1 Compressive buckling strength at the midship part of ships having long multi-deckhouses on strength deck is to be in accordance with the follows:

(1) (Omitted)

(2) The application of the compressive buckling strength of the deck which requires the examination specified in **3.~~2~~1.1** of the Rules and all shell platings, decks, superstructure side platings and plate members of longitudinal bulkhead which is located below the deck and

contribute to the longitudinal strength, compressive buckling, torsional buckling of its longitudinal stiffeners and compressive buckling strength of web are to be in accordance with the requirements in ~~**15.4,**~~ **Annex 5.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. In this case, the determination of moment of inertia for the hull cross section is to be in accordance with the requirements in **3.~~2~~1.1-1(2)** of the Rules, except for proviso. And, the minimum value of the compressive stress of members specified in ~~**15.4.2,**~~ **5.3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** needs not to be taken 30/K (N/mm^2), hereinafter K is the material factor and is in accordance with the requirements in **5.2.1-1(1)**, **Part 3** of the Rules. Where, however, longitudinal plate member that compressive buckling strength is not enough and which is considered to give no contribution to the longitudinal strength is located above the strength deck, the sagging moment which arises under navigation is to be in accordance with the following requirements in **(a)** and **(b)**.

(a) The sub-paragraph **(2)** is to be applied only considering frame members, provided the longitudinal plate member that compressive buckling strength is not enough and which is considered to give no contribution to the longitudinal strength is removed from inclusion member of hull cross section modulus and moment of inertia.

(b) Frame members may be in accordance with the requirements in **3.~~2~~1.1-1(2)(b)** of the Rules.

(3) (Omitted)

2 (Omitted)

Chapter 4 has been amended as follows.

Chapter 4 DOUBLE BOTTOM CONSTRUCTION

4.~~2~~1 Arrangement

4.~~2~~1.1 Arrangement

1 (Omitted)

2 "provided the safety of the ship is not impaired" specified in **4.~~2~~1.1-2, Part 3** of the Rules means to satisfy the requirement of damaged stability specified in **Part 4** of the Rules.

3 Application for the omission of double bottom or unusual bottom arrangements given by requirements of **4.~~2~~1.1-2, Part 3** of the Rules is to be in accordance with following **(1)** and **(2)**. For example, arrangements in which parts of the double bottom do not extend for the full width of the ship or in which the inner bottom is located higher than the partial subdivision draught (d_p) defined in **2.1.12, Part 1** of the Rules are to be considered to be unusual bottom arrangements.

(1) When it is assumed that such spaces are subject to a bottom damage, compartments are to be arranged to demonstrate that the factor s_i, when calculated in accordance with **2.3.6, Part 4** of the Rules, is not less than 1 for those service conditions which are the three loading conditions used to calculate the Attained Subdivision Index (A) specified in **2.3.4-2, Part 4** of the Rules. Assumed extent of damage is to be in accordance with following **Table 3.4.~~2~~1.1**. If any damage of a lesser extent than the maximum damage specified in **Table 3.4.~~2~~1.1** would result in a more severe condition, such damage is to be considered.

(2) Flooding of such spaces is not to render emergency power and lighting, internal communication, signals or other emergency devices inoperable in other parts of the ship.

Table 3.4.~~2~~1.1 Assumed Extent of Damage

	For 0.3L from the forward perpendicular of the ship	Any other part of the ship
Longitudinal extent	$1/3\,L_f{}^{2/3}$ or 14.5m, whichever is less	$1/3\,L_f{}^{2/3}$ or 14.5m, whichever is less
Transverse extent	B'/6 or 10m, whichever is less	B'/6 or 5m, whichever is less
Vertical extent, measured from the keel line	B'/20, to be taken not less than 0.76 m and not more than 2 m	B'/20, to be taken not less than 0.76 m and not more than 2 m

Notes:
1. Keel line is to be in accordance with **2.1.22, Part 1** of the Rules.
2. Ship breadth (B') is to be in accordance with **2.1.5-1, Part 1** of the Rules.

4 "As deemed appropriate by the Society" stipulated in **4.~~2~~1.1-4, Part 3** of the Rules means that the requirements specified in **-3(1)** above are satisfied.

5 "Protection equivalent to that afforded by a double bottom complying with this regulation" stipulated in **4.~~2~~1.1-4, Part 3** of the Rules means that the requirements specified in **-3(1)** above are satisfied. However, wells for lubricating oil below main engines may protrude into the double bottom below the boundary line defined by the distance h (h is specified in **4.~~2~~1.1-3, Part 3** of the Rules) provided that the vertical distance between the well bottom and a plane coinciding with the keel line is not less than 0.5h or 500 mm, whichever is greater.

6 With respect to the provisions of **4.~~2~~1.1-5, Part 3** of the Rules, when flooding calculation is

carried out in accordance with **-3** above, assuming an increased vertical extent is to be required.

Chapter 6 WATERTIGHT BULKHEAD AND THE OPENING

6.4 Watertight Door

6.4.1 General

Sub-paragraph -2 has been amended as follows.

2 In the application of **6.4.1-2, Part 3 of the Rules**, prototype tests (refer to ~~**C13.3.3-1**~~**2.2.2.3-1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** or **CS13.3.3-1**, **Guidance of the Survey and Construction of Steel Ships**) are to be carried out from each side of the door to verify its closing capabilities under forces that may act upon it when water is flowing through it by applying a static head equivalent to a water height of at least 1*m* above the sill of the door.

Part 5 MACHINERY INSTALLATIONS

Chapter 3 STEERING GEARS

3.1 General

3.1.1 Scope

Sub-paragraphs -2(1) and (2) have been amended as follows.

2 Quadrants, chains, rods and leading-block of manual steering gears are to be as specified in the following requirements:

(1) The scantlings of quadrants are to comply with the following requirements in **(a)** to **(c)**.

(a) Where three arms are provided, the scantlings of quadrants are not to be less than those given in the following;

i) Boss:

$$H_C = 4.27 \cdot \sqrt[3]{T_R K_Q} \ (mm)$$

$$D_C = 7.69 \cdot \sqrt[3]{T_R K_Q} \ (mm)$$

ii) Arm at its root:

$$B_C = 3.29 \cdot \sqrt[3]{T_R K_Q} \ (mm)$$

$$T_C = 1.67 \cdot \sqrt[3]{T_R K_Q} \ (mm)$$

iii) Arm at its outer end:

$$B_0 = 2.22 \cdot \sqrt[3]{T_R K_Q} \ (mm)$$

$$T_0 = 1.07 \cdot \sqrt[3]{T_R K_Q} \ (mm)$$

where:

T_R : Rudder torque specified in ~~**3.3,**~~ **13.2.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** (*N-m*)

K_Q : Material coefficient of the quadrant, specified in ~~**3.1.2,**~~ **13.2.1.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships.**

H_C : Required depth of boss (*mm*)

D_C : Required outer diameter of boss (*mm*)

B_C : Required breadth of arm at its root (*mm*)

T_C : Required thickness of arm at its root (*mm*)

B_0 : Required breadth of arm at its end (*mm*)

T_0 : Required thickness of arm at its end (*mm*)

(b) Where two arms are provided, the breadth and thickness of arms are to be not less than 1.1 *times* those specified in **(a)**. Where four arms are provided, the breadth and thickness of arms may be reduced to 0.9 *times* those specified in **(a)**.

(c) Where loose quadrants are used in addition to the tiller fixed to the rudder stocks, arms of loose quadrants may be of the dimensions given in **(a)iii)** throughout their length.

(2) The diameter of studless steering chains is not to be less than 9.5*mm* or that obtained from the following formula, whichever is the greater.

$$d_S = 3.36\sqrt{\frac{T_R K_C}{R}} \ (mm)$$

where

d_S : Requirement diameter of steering chains (*mm*)

T_R : Rudder torque specified in ~~**3.3,**~~ **13.2.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships.** (*N-m*)

K_C : Material coefficient of the chain, specified in ~~**3.1.2,**~~ **13.2.1.2, Part 1 Part C of the Rules for the Survey and Construction of Steel Ships.**

R : Length of tiller or radius of quadrant measured from the centre of rudder stock to the centre line of steering chains (*mm*)

((3) to (8) are omitted.)

Annex 7-1 INTERPRETATION OF PROVISION OF CHAPTER II-2, *SOLAS* CONVENTION ON PASSENGER SHIPS

2 INTERPRETATION OF PROVISION OF FIRE SAFETY SYSTEMS CODE

2.1 Interpretation

Interpretation of provision of the International Code for Fire Safety Systems (Res. MSC.98(73), hereinafter, referred to as *FSS* Code) on passenger ships are to be in accordance with **Table 7-1-B1**. Figures and tables referred to in interpretations of provision are to comply with **2.2**.

Table 7-1-B1 has been amended as follows.

Table 7-1-B1 Interpretations of FSS Code

Number	*FSS* Code	Interpretations
FSS 9.2.1.2.4	The system may be arranged with output signals to other fire safety systems including; .1 paging systems, fire alarm orpublic address systems; .2 fan stops; .3 ***fire doors****; .4 fire dampers; .5 sprinkler systems .6 smoke extraction systems .7 low-location lighting systems .8 fixed local application fire-extinguishing systems; .9 closed circuit television (CCTV) systems; and .10 other fire safety systems.	* : Watertight doors complying with ~~**13.3.3**~~**2.2.2.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** which also serve as fire doors are not to close automatically in the case of fire detection.

"Guidance for the survey and construction of inland waterway ships" has been partly amended as follows:

Part 4 HULL CONSTRUCTION AND EQUIPMENT OF TUGS AND PUSHERS

Chapter 2 RUDDERS AND STERN FRAMES

2.1 Rudders

2.1.1 Application

Sub-paragraph -1 has been amended as follows.

1 For Mariner-type rudders (*See* **Fig. 4.2.1.1-1**), the scantling of rudders is to be determined in accordance with the requirements in **Chapter ~~3~~13,Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.

Chapter 10 LONGITUDINAL STRENGTH

10.2 Bending Strength

10.2.3 Calculation of Section Modulus of Transverse Section of Hall

Sub-paragraph -2(1) has been amended as follows.

2 Members included in longitudinal strength
The ratio of inclusion of members effective for longitudinal strength is to be as follows.
(1) All intercostal plates may be included if the fillet welding complies with **~~Note 1 of Table C1.5~~ 12.2.1.3-2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.
((2) to (5) are omitted.)

Paragraph 10.2.4 has been amended as follows.

10.2.4 Loading Manual

For loading manuals required for ships greater than *L* 65 (*m*), the provisions of **~~C34.1.2, Part C of the Guidance~~ 3.8.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are to be applied.

Part 5 HULL CONSTRUCTION AND EQUIPMENT OF BARGES

Chapter 9 LONGITUDINAL STRENGTH

9.1 Longitudinal Strength

9.1.2 Calculation of Section Modulus of Transverse Section of Hull

Sub-paragraph 2(1) has been amended as follows.

2 Members included in longitudinal strength
The ratio of inclusion of members effective for longitudinal strength is to be as follows.
(1) All intercostal plates may be included if the fillet welding complies with ~~**Note 1 of Table C1.5**~~**12.2.1.3-2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**.
((2) to (6) are omitted.)

Paragraph 9.1.3 has been amended as follows.

9.1.3 Loading Manual

For loading manuals required for ships, the provisions of ~~**C34.1.2, Part C of the Guidance**~~**3.8.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are to be applied.

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

Part 2 EQUIPMENT

Chapter 1 APPROVAL OF MANUFACTURING PROCESS OF ANCHORS

1.1 General

1.1.1 Scope

Sub-paragraph -1 has been amended as follows.

1 This chapter applies to the procedures and testing requirements for the approval of the manufacturing process of anchors to be equipped on ships in accordance with the requirements of in ~~**Chapter 27, Part C of the Rules**~~**14.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** and anchors used for positioning systems (hereinafter collectively referred to in this chapter as "anchors") in accordance with the requirements in **2.1.4** and **2.2.4, Part L of the Rules for the Survey and Construction of Steel Ships** (hereinafter referred to as "the Rules") respectively.

1.6 Approval of Manufacturing Process of High Holding Power Anchors

Paragraph 1.6.1 has been amended as follows.

1.6.1 High Holding Power Anchors

The approval procedure for manufacturing of high holding power anchor (the anchor specified in **2.1.4-2, Part L of the Rules**, having the holding power two times or more of that of ordinary anchor, and if it is used without subjected to the reduction as specified in ~~**27.1.3-3**~~**14.3.1.2-6, Part 1, Part C of the Rules**, such anchor may not be dealt with as a high holding power anchor), is to be as follows in addition to the requirements specified in **1.2** through **1.5** of this chapter.
((1) to (5) are omitted.)

1.7 Approval of Manufacturing Process of Super High Holding Power Anchors

Paragraph 1.7.1 has been amended as follows.

1.7.1 Super High Holding Power Anchor

The approval procedure for manufacturing of super high holding power anchor (the anchor specified in **2.1.4-2**, **Part L of the Rules**, having the holding power four times or more that of ordinary anchor. If it is used without the reduction of mass as specified in ~~**27.1.3-4, Part C of the Rules**~~ **14.3.1.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, such anchor may not be dealt with as a super high holding power anchor), is to follow the requirements in **1.2** through **1.6** of this chapter. However, the anchor for holding test specified in **1.6** are to be three test anchors having different masses (the bottom, middle and top of the approval mass range.) and three anchors for comparison, each having a mass equivalent to that of the test anchor. Any approved high holding power anchor or super high holding anchor may be used in place of an ordinary anchor.

Chapter 6 EMERGENCY TOWING ARRANGEMENTS

6.1 General

6.1.1 Scope

Sub-paragraph -1 has been amended as follows.

1 This Chapter applies to the approval of prototype of emergency towing arrangements (Hereinafter referred to as "ETA" in this Chapter.) and examinations, tests and inspection of products of ETA based upon the requirements specified in ~~**C27.3.2-1, Part C of the Guidance**~~**14.5.2.4, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. Where tests for approval of prototype of ETA mean the examinations and tests in order to confirm that the prototype of ETA made of components listed in ~~**Table C27.3.2-2, Part C of the Guidance**~~**14.5.2.3, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** complies with the requirements specified in ~~**C27.3, Part C of the Guidance**~~**14.5.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, and production tests of ETA mean the examinations and tests to be carried out against the products of each component of ETA which has obtained the approval of the prototype.

Chapter 9 APPROVAL OF USE OF FIBER REINFORCED PLASTIC (FRP)

9.1 General

Paragraph 9.1.1 has been amended as follows.

9.1.1 Scope

In accordance with the requirements in ~~**Annex C1.1.7-5, Part C of the Guidance**~~ **Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**, the requirements in this Chapter apply to tests and inspection for the approval of use of fiber reinforced plastic (hereinafter referred to as "FRP").

9.4 Approval Tests

Paragraph 9.4.2 has been amended as follows.

9.4.2 Testing Procedures and Criteria

1 Fire Integrity

Test procedures are to be in accordance with the following:

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

(4) The test procedures for FRP products used for safe access to tanker bows specified in ~~**23.7.2, Part C of the Rules**~~**14.13.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** are to be in accordance with the level 2 (L2) fire integrity test specified in *ASTM F*3059-14, *Standard Specification for Fiber-Reinforced Polymer* (*FRP*) *Gratings Used in Marine Construction and Shipbuilding*.

2 Fire Retardance

The requirements of fire retardance for FRP are given in ~~**Table 1.3.1, Annex C1.1.7-5, Part C of the Guidance**~~ **Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. The test procedures are to be in accordance with *ASTM E*-84, *Standard Test Method for the Surface Burning Characteristics of Building Materials*. The testing criterion is not to exceed a fire spread rating of 25. Alternatively, where the FRP passes the test specified in **9.4.2-3**, it can be regarded as a fire retardence FRP.

3 Flame Spread and Surface Flammability

The requirements of flame spread and surface flammability for FRP are given in ~~**Table 1.3.1, Annex C1.1.7-5, Part C of the Guidance**~~ **Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. The conditions, procedures and criteria of the test are to be in accordance with the following **(1)** or **(2)**;

(1) When testing flame spread characteristics according to *ASTM E*-84, the flame spread rating is not to exceed 20; or

(2) When testing surface flammability by "Test for Surface Flammability" carried out in accordance with the *FTP* Code defined in **3.2.23, Part R of the Rules for the Survey and Construction of Steel Ships**, the criteria established for materials used for bulkheads, linings, or ceilings are to be complied with.

4 Smoke Generation

The requirements of smoke generation for FRP are given in ~~**Table 1.3.1, Annex C1.1.7-5, Part C of the Guidance**~~ **Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. The conditions, procedures and criteria of the test are to be in accordance with the following **(1)** or **(2)**;

(1) When testing according to *ASTM E*-84, the smoke developed rating is not to exceed 10; or

(2) When testing smoke generation by "Smoke and Toxicity Test" carried out in accordance with

the *FTP* Code defined in **3.2.23, Part R of the Rules for the Survey and Construction of Steel Ships**, the criteria established for materials used as bulkheads, linings, or ceilings are to be complied with.

5 Toxicity Test

Requirements related to the toxicity tests for FRP products are specified in ~~**Table 1.3.1, Annex C1.1.7-5, Part C of the Guidance**~~ **Table An1, Annex 3.2, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships**. The conditions, procedures and standards for such tests are to be in accordance with the following:

(1) Tested toxicity is to comply with the standards of the "Smoke and Toxicity Test" carried out in accordance with the *FTP* Code defined in **3.2.23, Part R of the Rules for the Survey and Construction of Steel Ships**.

Part 4 NON-METALLIC MATERIALS AND COATING MATERIALS FOR HULL

Chapter 5 APPROVAL OF MANUFACTURING PROCESS OF NON-METALLIC BEARING MATERIAL FOR RUDDERS

5.1 General

Paragraph 5.1.1 has been amended as follows.

5.1.1 Scope

This chapter applies to the testing and inspection for the approval of manufacturing process of non-metallic bearing material for rudders specified in the requirements of ~~**3.10, Part C**~~**13.2.10, Part 1, Part C** and **3.11, Part CS of the Rules for the Survey and Construction of Steel Ships.**

5.4 Approval Test

Table 5.1 has been amended as follows.

Table 5.1

Items of investigation	Contents	Test procedure
Hardness[1)]	Greater than 60 Shore D Maximum surface pressure	Shore hardness test (*JIS Z* 2246)
Swelling	To ascertaining if unreasonable swelling caused by absorbing water is occurred	Water absorption (*JIS K* 6911)
Thermal expansion	To ascertaining if unreasonable thermal expansion is occurred	Heat shrinkage Percentage (*JIS K* 6911)
Allowable Surface Pressure[2)]	To ascertain whether there is unreasonable wear, cracking or peeling caused by surface pressure and friction.	Test procedure is to be at the Society's discretion.

Notes:

1) A hardness test may be carried out with the method as deemed appropriate by the Society at the temperature of 23℃ and the humidity of 50%.

2) Applied in cases where allowable surface pressures exceeding 5.5 N/mm^2 are approved based on ~~**Table 3.3,**~~ **Table 13.2.10-1, Part 1, Part C** or **Table 3.3, Part CS of the Rules for the Survey and Construction of Steel Ships**.

5.6 Dealing after Approval

Paragraph 5.6.1 has been amended as follows.

5.6.1 General

Bearing materials which conform to the requirements of this chapter may be dealt with as "the type as deemed appropriate by the Society" in the requirements in ~~**Table C3.3,**~~ **Table 13.2.10-1, Part 1, Part C** or **Table CS3.3, Part CS of the Rules for the Survey and Construction of Steel Ships**, unless the Society gives additional instructions.

Part 7 CONTROL AND INSTRUMENTATION EQUIPMENT AND ELECTRICAL INSTALLATIONS

Chapter 2 APPROVAL OF USE OF LOADING COMPUTER

2.1 General

Paragraph 2.1.1 has been amended as follows.

2.1.1 Application

The requirements in this chapter apply to tests for loading computers required to be installed in accordance with the requirements of ~~**34.1.1**~~**3.8.1, Part 1, Part C of the Rules for the Survey and Construction of Steel Ships** and stability computers applied the provisions of **1.3.1-1 of Annex U1.2.2 "GUIDANCE FOR STABILITY COMPUTER"**.