첨 부 (3)

Rules for the Classification of Steel Ships

(Part 14 Structural Rules for Container Ships)

HULL RULE DEVELOPMENT TEAM

Present	Amendment	Reason
Chapter 1 General Principles **Section 1 Application** **1 <omitted>** **2 Rule application** **2.1 <omitted>** **2.2 Rule requirement** **2.2.1 <omitted>** **2.2.2** The ship arrangement and scantlings are to comply with the relevant chapters of the Rules as it is given in **Figure 2**. **2.2.3 <omitted>** **2.3 ~ 2.4 <omitted>**	**Chapter 1 General Principles** **Section 1 Application** **1 <same as the present Rule>** **2 Rule application** **2.1 <same as the present Rule>** **2.2 Rule requirement** **2.2.1 <same as the present Rule>** **2.2.2 Application of the Rules** The ship arrangement and scantlings are to comply with the relevant chapters of the Rules as it is given in **Figure 2**. **2.2.3 <same as the present Rule>** **2.3 ~ 2.4 <same as the present Rule>**	요건 제목 추가

Present	Amendment	Reason
Section 2 Rule Principles	**Section 2 Rule Principles**	
1 <omitted>	**1 <same as the present Rule>**	
2 Design basis	**2 Design basis**	
2.1 ~ 2.3 <omitted>	**2.1 ~ 2.3 <same as the present Rule>**	
2.4 Environmental conditions	**2.4 Environmental conditions**	
2.4.1 ~ 2.4.3 <omitted>	**2.4.1 ~ 2.4.3 <same as the present Rule>**	
2.4.4 Design temperatures	**2.4.4 Design temperatures**	
The Rules assume that the structural assessment of hull strength members is valid for the following design temperatures: • Lowest mean daily average temperature in air is −10 C. • Lowest mean daily average temperature in seawater is 0 C.	The Rules assume that the structural assessment of hull strength members is valid for the following design temperatures: • Lowest mean daily average temperature in air is −10 C. • Lowest mean daily average temperature in seawater is 0 C.	
Ships intended to operate in areas with lower mean daily average temperature, e.g. regular service during winter seasons to Arctic or Antarctic waters are subject to the requirements as specified by the Society.	Materials for ships intended to operate in areas with lower mean daily average temperature are to be in accordance with **Pt 3, Ch 1, 406**.	선급이 인정하는 적절한 방법 대신 규칙 3편의 요건으로 대체함
In the above, the following definitions apply: • Mean : Statistical mean over observation period (at least 20 years). • Daily Average : Average during one day and night. • Lowest : Lowest during year. For seasonally restricted service the lowest value within the period of operation applies.	In the above, the following definitions apply: • Mean : Statistical mean over observation period (at least 20 years). • Daily Average : Average during one day and night. • Lowest : Lowest during year. For seasonally restricted service the lowest value within the period of operation applies.	
2.4.5 <omitted>	**2.4.5 <same as the present Rule>**	
2.5 ~ 2.7 <omitted>	**2.5 ~ 2.7 <same as the present Rule>**	

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>

3 Design principles

3.1 Overall principles

3.1.1 <omitted>

3.1.2 General

The Rules are based on the following overall principles:

- The safety of the structure can be assessed by addressing the potential structural failure mode(s) when the ship is subjected to operational loads and environmental loads/conditions.
- The design complies with the design basis, see **Ch 1, Sec 3**.
- The structural requirements are based on consistent design load sets which cover the appropriate operating modes of container ship.

~~The ship's structure is designed such that:~~

- ~~It has a degree of redundancy. The ship's structure should work in a hierarchical manner and, in principle, failure of structural elements lower down in the hierarchy do not result in immediate consequential failure of elements higher up in the hierarchy.~~
- ~~It has sufficient reserve strength to withstand the wave and internal loads in damaged conditions that are reasonably foreseeable e.g. collision, grounding or flooding scenarios.~~
- ~~The incidence of in-service cracking is minimised, particularly in locations which affect the structural integrity or containment integrity, affect the performance of structural or other systems or are difficult to inspect and repair.~~
- ~~It has adequate structural redundancy to survive in the event that the structure is accidentally damaged by a minor impact leading to flooding of any compartment.~~

3.1.3 <omitted>

3.2 ~ 3.3 <omitted>

</td><td>

3 Design principles

3.1 Overall principles

3.1.1 <same as the present Rule>

3.1.2 General

The Rules are based on the following overall principles:

- The safety of the structure can be assessed by addressing the potential structural failure mode(s) when the ship is subjected to operational loads and environmental loads/conditions.
- The design complies with the design basis, see **Ch 1, Sec 3**.
- The structural requirements are based on consistent design load sets which cover the appropriate operating modes of container ship.

3.1.3 <same as the present Rule>

3.2 ~ 3.3 <same as the present Rule>

</td><td>잔존강도와 관련된 규정 삭제</td></tr>
</table>

Present

4 Rule design method

4.1 ~ 4.2 <omitted>

4.3 Load-capacity based requirements

4.3.1 <omitted>

4.3.2

<omitted>

Table 5 : Load scenarios and corresponding rule requirements

Operation	Load type	Design load scenario	Acceptance criteria
<omitted>			
Harbour and sheltered operations			
Loading, unloading and ballasting	Typical maximum loads during loading, unloading and ballasting operations	S	AC-S
Special conditions in harbour	Typical maximum loads during special operations in harbour, e.g. propeller inspection afloat ~~or dry-docking loading conditions~~	S	AC-S
Accidental condition			
~~Overfilling of ballast water tanks~~	~~Overfilling of ballast water tanks with sustained liquid flow through air pipe~~	~~A~~	~~AC-A~~
Tank testing	Typical maximum loads during tank testing operations	A	AC-A
Flooded conditions	Typically maximum loads on internal watertight subdivision structure in accidental flooded conditions	A	AC-A

4.3.3 ~ 4.3.4 <omitted>

4.4 ~ 4.5 <omitted>

Amendment

4 Rule design method

4.1 ~ 4.2 <same as the present Rule>

4.3 Load-capacity based requirements

4.3.1 <same as the present Rule>

4.3.2

<omitted>

Table 6 : Load scenarios and corresponding rule requirements

Operation	Load type	Design load scenario	Acceptance criteria
<omitted>			
Harbour and sheltered operations			
Loading, unloading and ballasting	Typical maximum loads during loading, unloading and ballasting operations	S	AC-S
Special conditions in harbour	Typical maximum loads during special operations in harbour, e.g. propeller inspection afloat	S	AC-S
Accidental condition			
Tank testing	Typical maximum loads during tank testing operations	A	AC-A
Flooded conditions	Typically maximum loads on internal watertight subdivision structure in accidental flooded conditions	A	AC-A

4.3.3 ~ 4.3.4 <omitted>

4.4 ~ 4.5 <omitted>

Reason

Dry docking 관련 요건 삭제

Overfilling 요건 삭제

Present

Section 3 Verification of Compliance

1 <omitted>

2 Document to be submitted

2.1 <omitted>

2.2 Submission of plans and supporting calculations

2.2.1 Plans and supporting calculations are to be submitted for approval

<omitted>

Plan or supporting calculation	Containing also information on
Midship section Transverse sections Shell expansion Decks and profiles Double bottom Pillar arrangements Framing plan Deep tank and ballast tank bulkheads ~~Wash bulkhead~~ Standard construction details	Class characteristics Ship's main dimensions Minimum ballast draught Frame spacing Maximum service speed Density of cargoes Design loads on decks and double bottom Steel grades Corrosion protection Openings in decks and shell and relevant compensations Boundaries of flat areas in bottom and sides Details of structural reinforcements and/or discontinuities Bilge keel with details of connections to hull structures Welding
<omitted>	

2.2.3 ~ 2.2.3 <omitted>

3 ~ 6 <omitted>

Amendment

Section 3 Verification of Compliance

1 <same as the present Rule>

2 Document to be submitted

2.1 <same as the present Rule>

2.2 Submission of plans and supporting calculations

2.2.1 Plans and supporting calculations are to be submitted for approval

<omitted>

Plan or supporting calculation	Containing also information on
Midship section Transverse sections Shell expansion Decks and profiles Double bottom Pillar arrangements Framing plan Deep tank and ballast tank bulkheads Standard construction details	Class characteristics Ship's main dimensions Minimum ballast draught Frame spacing Maximum service speed Density of cargoes Design loads on decks and double bottom Steel grades Corrosion protection Openings in decks and shell and relevant compensations Boundaries of flat areas in bottom and sides Details of structural reinforcements and/or discontinuities Bilge keel with details of connections to hull structures Welding
<omitted>	

2.2.3 ~ 2.2.3 <same as the present Rule>

3 ~ 6 <same as the present Rule>

Reason

일반적인 컨테이너선에는 제수격벽이 없으므로 삭제

Present	Amendment	Reason

Present

Section 4 Symbols and Definitions

1 <omitted>

2 Document to be submitted

2.1 Ship's main data

2.1.1

<omitted>

Table 2 : Ship's main data

Symbols	Meaning	Units
L	Coefficient	m
L_{LL}	Force and concentrated loads	m
<omitted>		

2.2 <omitted>

2.3 Loads

2.3.1

<omitted>

Table 4 : Loads

Symbols	Meaning	Units
<omitted>		
P_{fs}	Static pressure in flooded conditions	kN/m^2
~~P_{fd}~~	~~Dynamic pressure in flooded conditions~~	~~kN/m^2~~
P_{ST}	Tank testing pressure (static)	kN/m^2
<omitted>		

2.4 <omitted>

Amendment

Section 4 Symbols and Definitions

1 <same as the present Rule>

2 Document to be submitted

2.1 Ship's main data

2.1.1

<omitted>

Table 2 : Ship's main data

Symbols	Meaning	Units
L	Rule length	m
L_{LL}	Freeboard length	m
<omitted>		

2.2 <same as the present Rule>

2.3 Loads

2.3.1

<same as the present Rule>

Table 4 : Loads

Symbols	Meaning	Units
<omitted>		
P_{fs}	Static pressure in flooded conditions	kN/m^2
P_{ST}	Tank testing pressure (static)	kN/m^2
<omitted>		

2.4 <same as the present Rule>

Reason

오기 수정

오기수정

침수시 동하중은 규칙에서 고려하지 않으므로 삭제

Present	Amendment	Reason
3. Definition **3.1 Principal Particulars** **3.1.1 ~ 3.1.4 <omitted>** **3.1.5 Draught** T, the draught in m, is the summer load line draught for the ship in operation, measured from the moulded baseline at midship. Note this may be less than the maximum permissible summer load waterline draught. T_{SC} is the scantling draught, in m, at which the strength requirements for the scantlings of the ship are met and represents the full load condition. The scantling draught T_{SC} is to be not less than that corresponding to the assigned freeboard. ~~The draught of ships to which timber freeboards are assigned corresponds to the loading condition of timber, and the requirements of the Society are to be applied to this draught.~~ T_{BAL} is the minimum design normal ballast draught amidships, in m, at which the strength requirements for the scantlings of the ship are met. This normal ballast draught is the minimum draught of ballast conditions including ballast water exchange operation, if any, for any ballast conditions in the loading manual including both departure and arrival conditions. **3.1.6 ~ 3.1.8 <omitted>**	**3. Definition** **3.1 Principal Particulars** **3.1.1 ~ 3.1.4 <omitted>** **3.1.5 Draught** T, the draught in m, is the summer load line draught for the ship in operation, measured from the moulded baseline at midship. Note this may be less than the maximum permissible summer load waterline draught. T_{SC} is the scantling draught, in m, at which the strength requirements for the scantlings of the ship are met and represents the full load condition. The scantling draught T_{SC} is to be not less than that corresponding to the assigned freeboard. T_{BAL} is the minimum design normal ballast draught amidships, in m, at which the strength requirements for the scantlings of the ship are met. This normal ballast draught is the minimum draught of ballast conditions including ballast water exchange operation, if any, for any ballast conditions in the loading manual including both departure and arrival conditions. **3.1.6 ~ 3.1.8 <same as the present Rule>**	일반적인 컨테이너선에는 최상층 갑판 상부에 timber 적재를 하지 않으므로 관련요건 삭제

Present	Amendment	Reason
3.1.9 Waterplane coefficient C_{WP}, the Waterplane coefficient at the draught, T_{SC} is defined in the following equation: $C_{WP} = \frac{A_{WP}}{LB}$ where: A_{WP} : Waterplane area at draught T_{SC}. $C_{B\text{-}BAL}$, the block coefficient at the draught, T_{BAL} is defined in the following equation: $C_{WP-BAL} = \frac{A_{WP-BAL}}{LB}$ where: A_{BAL} : Waterplane area at draught T_{BAL}. **3.1.10 ~ 3.1.17 <omitted>** **3.2 ~ 3.6 <omitted>**	**3.1.9 Waterplane coefficient** C_{WP}, the Waterplane coefficient at the draught, T_{SC} is defined in the following equation: $C_{WP} = \frac{A_{WP}}{LB}$ where: A_{WP} : Waterplane area at draught T_{SC}. $C_{WP\text{-}BAL}$, the Waterplane coefficient at the draught, T_{BAL} is defined in the following equation: $C_{WP-BAL} = \frac{A_{WP-BAL}}{LB}$ where: A_{WP-BAL} : Waterplane area at draught T_{BAL}. **3.1.10 ~ 3.1.17 <same as the present Rule>** **3.2 ~ 3.6 <same as the present Rule>**	오기 수정 오기 수정

Present

3.7 Glossary

3.7.1 Definitions of terms

Table 7 : Definition of terms

Terms	Definition
Accommodation deck	Deck used primarily for the accommodation of the crew
Accommodation ladder	Portable set of steps on a ship's side for people boarding from small boats or from a pier
Aft peak	Portable set of steps on a ship's side for people boarding from small boats or from a pier
<omitted>	
Local support members	Local stiffening members influencing only the structural integrity of a single panel, e.g. deck beams
~~Longitudinal hull girder structural members~~	~~Structural members contributing to the longitudinal strength of the hull girder, including decks, side, bottom, inner bottom, bilge plate, longitudinal bulkheads, double hull stringers and double bottom girders~~
~~Longitudinal hull girder shear structural members~~	~~Structural members contributing to strength against hull girder vertical shear loads, including side, inner hull longitudinal bulkheads, hopper, longitudinal bulkheads and double bottom girders~~
Manhole	Round or oval hole cut in decks, tanks, etc, for the purpose of providing access
<omitted>	
Sheerstrake	Top strake of a ship's side shell plating
Shelf plate	Horizontal plate located on the top of a bulkhead stool
Shell envelope plating	Shell plating forming the effective hull girder exclusive of the strength deck plating
<omitted>	

Amendment

3.7 Glossary

3.7.1 Definitions of terms

Table 7 : Definition of terms

Terms	Definition
Accommodation deck	Deck used primarily for the accommodation of the crew
Accommodation ladder	Portable set of steps on a ship's side for people boarding from small boats or from a pier
Aft peak	The area aft of the aft peak bulkhead
<omitted>	
Local support members	Local stiffening members influencing only the structural integrity of a single panel, e.g. deck beams
Manhole	Round or oval hole cut in decks, tanks, etc, for the purpose of providing access
<omitted>	
Sheerstrake	Top strake of a ship's side shell plating
Shell envelope plating	Shell plating forming the effective hull girder exclusive of the strength deck plating
<omitted>	

Reason

오기 수정

선체거더 요소 정의 삭제

Present	Amendment	Reason

Present

3.7 Glossary

3.7.1 Definitions of terms

Table 7 : Definition of terms

Terms	Definition
Accommodation deck	Deck used primarily for the accommodation of the crew
Accommodation ladder	Portable set of steps on a ship’s side for people boarding from small boats or from a pier
Aft peak	Portable set of steps on a ship’s side for people boarding from small boats or from a pier
<omitted>	
Local support members	Local stiffening members influencing only the structural integrity of a single panel, e.g. deck beams
~~Longitudinal hull girder structural members~~	~~Structural members contributing to the longitudinal strength of the hull girder, including decks, side, bottom, inner bottom, bilge plate, longitudinal bulkheads, double hull stringers and double bottom girders~~
~~Longitudinal hull girder shear structural members~~	~~Structural members contributing to strength against hull girder vertical shear loads, including side, inner hull longitudinal bulkheads, hopper, longitudinal bulkheads and double bottom girders~~
Manhole	Round or oval hole cut in decks, tanks, etc, for the purpose of providing access
<omitted>	
Sheerstrake	Top strake of a ship’s side shell plating
Shelf plate	Horizontal plate located on the top of a bulkhead stool
Shell envelope plating	Shell plating forming the effective hull girder exclusive of the strength deck plating
<omitted>	

Amendment

3.7 Glossary

3.7.1 Definitions of terms

Table 7 : Definition of terms

Terms	Definition
Accommodation deck	Deck used primarily for the accommodation of the crew
Accommodation ladder	Portable set of steps on a ship’s side for people boarding from small boats or from a pier
Aft peak	The area aft of the aft peak bulkhead
<omitted>	
Local support members	Local stiffening members influencing only the structural integrity of a single panel, e.g. deck beams
Manhole	Round or oval hole cut in decks, tanks, etc, for the purpose of providing access
<omitted>	
Sheerstrake	Top strake of a ship’s side shell plating
Shell envelope plating	Shell plating forming the effective hull girder exclusive of the strength deck plating
<omitted>	

Reason

오기 수정

선체거더 요소 정의 삭제

Present	Amendment	Reason
Section 5 Loading Manual and Loading Instrument	**Section 5 Loading Manual and Loading Instrument**	
1 <omitted>	**1 <same as the present Rule>**	
2 Loading manuals **2.1 Definition** **2.1.1** The approved loading manual is to be based on the final data of the ship. A loading manual is a document which describes: a) based for seagoing and harbour/sheltered water, including permissible limits of still water bending moment and shear force. ~~The conditions specified in the ballast water exchanging procedure and dry docking procedure are to be included in the loading manual,~~ <omitted> **2.1.2 ~ 2.1.4 <omitted>**	**2 Loading manuals** **2.1 Definition** **2.1.1** The approved loading manual is to be based on the final data of the ship. A loading manual is a document which describes: a) based for seagoing and harbour/sheltered water, including permissible limits of still water bending moment and shear force. <omitted> **2.1.2 ~ 2.1.4 <same as the present Rule>**	평형수 교환절차, 입거절차 요건 삭제
3. Loading instrument <newly added>	**3. Loading instrument** **3.1 General requirements** **3.1.1 Definition** A loading computer system is a system, which is either analog or digital, by means of which it can be easily and quickly ascertained that, at specified read-out points, relevant operational limitations, such as the still water bending moments, shear forces, and lateral loads, where applicable, in any load or ballast condition do not exceed the specified permissible values. The loading instrument is ship specific onboard equipment and the results of the calculations are only applicable to the ship for which it has been approved. An approved loading instrument can not replace an approved loading manual.	적하지침기기 요건 추가

Present	Amendment	Reason
<newly added>	**3.1.2 Conditions of approval of loading instruments** The loading instrument is subject to approval based on the Rules of the individual Society. The approval is to include: a) Verification of type approval, if any, b) Verification that the final data of the ship has been used, c) Acceptance of number and position of read-out points, d) Acceptance of relevant limits for all read-out points, e) 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.	

Present	Amendment	Reason
Chapter 2 General Arrangement **Section 1 ~ 2 <omitted>** **Section 3 Compartment Arrangement** **1 Cofferdam** **1.1 <omitted>** **1.2 Arrangement of cofferdams** **1.2.1 ~ 1.2.3 <omitted>** **1.2.4** The cofferdams specified in **[1.2.1]** may be waived when deemed impracticable or unreasonable by the Society in relation to the characteristics and dimensions of the spaces containing such tanks, provided that: ~~a) the thickness of common boundary plates of adjacent tanks is increased, with respect to the thickness obtained according to~~ **~~Ch 6, Sec 4~~**~~, by 2 mm in the case of tanks carrying fresh water or boiler feed water, and by 1 mm in all other cases,~~ ~~b) the sum of the throats of the weld fillets at the edges of these plates is not less than the thickness of the plates themselves,~~ ~~c) the structural test is carried out with a test pressure increased by 1 m.~~ **2 ~ 6 <omitted>**	**Chapter 2 General Arrangement** **Section 1 ~ 2 <omitted>** **Section 3 Compartment Arrangement** **1 Cofferdam** **1.1 <same as the present Rule>** **1.2 Arrangement of cofferdams** **1.2.1 ~ 1.2.3 <same as the present Rule>** **1.2.4** The cofferdams specified in **[1.2.1]** may be waived when deemed impracticable or unreasonable by the Society in relation to the characteristics and dimensions of the spaces containing such tanks, that the common boundaries of fuel oil and lubricating oil tank have full penetration welds. **2 ~ 6 <same as the present Rule>**	코퍼댐 요건을 RINA 요건 대신 Pt 3 Ch 7 105 요건으로 대체함 provided 삭제 (오기수정)

Present	Amendment	Reason
Chapter 3 Structural Design Principles **Section 1 Materials**	**Chapter 3 Structural Design Principles** **Section 1 Materials**	
1 General	**1 General**	
1.1 <omitted>	**1.1 <same as the present Rule>**	
1.2 Testing of materials	**1.2 Testing of materials**	
1.2.1 Materials are to be tested in compliance with the applicable requirements of Rules for Materials of the Society.	**1.2.1** Materials are to be tested in compliance with the applicable requirements of **Pt 2, Ch 1**.	선급규칙을 명확하게 2편 1장으로 정의함.
1.3 Manufacturing process	**1.3 Manufacturing process**	
1.3.1 The requirements of this section presume that welding and other cold or hot manufacturing processes are carried out in compliance with current sound working practice defined in the Rules and/or documents of the individual Society which incorporate IACS UR W and the applicable requirements of Rules for Materials of the Society. <omitted>	**1.3.1** The requirements of this section presume that welding and other cold or hot manufacturing processes are carried out in compliance with current sound working practice defined in the Rules and/or documents of the individual Society which incorporate IACS UR W and the applicable requirements of **Pt 2, Ch 1.** <omitted>	선급규칙을 명확하게 2편 1장으로 정의함.

Present	Amendment	Reason

Present

2. Hull structural steel

2.1 General

2.1.1 <omitted>

2.1.2

<omitted>

Table 1 : Rule numbering and abbreviations

Steel grades for plates with t_{as_built} ≤ 100 mm	ReH, specified minimum yield stress, in N/mm²	Rm, specified tensile strength, in N/mm²
<omitted>		

2.1.3 ~ 2.1.5 <omitted>

2.2 Material factor, *k*

2.2.1

<omitted>

Table 2 : Material factor, *k*

R_{eH}, specified minimum yield stress, in N/mm²	*k*
235	1.00
315	0.78
355	0.72
390	0.68
460	0.62
<newly added>	

2.3 Steel grades

2.3.1 ~ 2.3.2 <omitted>

2.3.3

~~The material classes required for the strength deck plating, the sheerstrake and the torsion box girder structure within 0.4 L amidships are to be maintained in way of the entire cargo hold region.~~

2.3.4

Plating materials for stern frames and shaft brackets are, in general, not to be of lower grades than those corresponding to Class II.

Amendment

2. Hull structural steel

2.1 General

2.1.1 <same as the present Rule>

2.1.2

<omitted>

Table 1 : Mechanical properties of hull steels

Steel grades for plates with t_{as_built} ≤ 100 mm	ReH, specified minimum yield stress, in N/mm²	Rm, specified tensile strength, in N/mm²
<omitted>		

2.1.3 ~ 2.1.5 <same as the present Rule>

2.2 Material factor, *k*

2.2.1

<omitted>

Table 2 : Material factor, *k*

R_{eH}, specified minimum yield stress, in N/mm²	*k*
235	1.00
315	0.78
355	0.72
390	0.68[1]
460	0.62
[1] 0.66 for material factor provided that a fatigue assessment of the structure is performed to verify compliance with the requirements of Ch 9.	

2.3 Steel grades

2.3.1 ~ 2.3.2 <same as the present Rule>

2.3.3

Plating materials for stern frames and shaft brackets are, in general, not to be of lower grades than those corresponding to Class II.

Reason

제목 오기 수정

항복응력 390 N/mm² 재료계수 UR S4 요건 반영.

Pt 9를 Ch 9로 수정 (오기 수정)

Present	Amendment	Reason

Present

Table 3 : Material classes and grades

	Structural member category	Within 0.4 *L* amidships	Outside 0.4 *L* and within 0.6 *L* amidships	Outside 0.6 *L* amidships
Secondary	<omitted>	I	A / AH	A / AH
Primary	<omitted>	II	A / AH	A / AH
Special	<omitted>	III	II	I
	• Strength deck plating at outboard corners of cargo hatch openings	III	II **Min. class III within cargo region**	I **Min. class III within cargo region**
	~~• Strength deck plating at corners of cargo hatch openings~~	~~III~~	~~III~~	~~II~~ ~~**within the rest of cargo region**~~
	• Bilge strake in ships with double bottom over the full breadth and with length less than 150 m	II	II	I
	• Bilge strake in other ships(1)	III	II	I
	• Longitudinal hatch coamings of length greater than 0.15 *L*, including coaming top plate and flange • End brackets and deckhouse transition of longitudinal cargo hatch coamings	III not to be less than grade D/DH	II **not to be less than grade D/DH**	I **not to be less than grade D/DH**
<omitted>				

2.4 <omitted>

2.5 Stainless steel

2.5.1

The reduction of strength of stainless steel with increasing temperature is to be taken into account in the calculation of the material factor, *k* and in the material Young's modulus, *E*.

Stainless steels are <u>considered by the Society on a case-by-case basis.</u>

Amendment

Table 3 : Material classes and grades

	Structural member category	Within 0.4 *L* amidships	Outside 0.4 *L* and within 0.6 *L* amidships	Outside 0.6 *L* amidships
Secondary	<omitted>	I	A / AH	A / AH
Primary	<omitted>	II	A / AH	A / AH
Special	<omitted>	III	II	I
	• Strength deck plating at outboard corners of cargo hatch openings	III	II **Min. class III within cargo region**	I **Min. class III within cargo region**
	• Bilge strake in ships with double bottom over the full breadth and with length less than 150 m	II	II	I
	• Bilge strake in other ships(1)	III	II	I
	• Longitudinal hatch coamings of length greater than 0.15 *L*, including coaming top plate and flange • End brackets and deckhouse transition of longitudinal cargo hatch coamings	III not to be less than grade D/DH	II **not to be less than grade D/DH**	I **not to be less than grade D/DH**
<omitted>				

2.4 <same as the present Rule>

2.5 Stainless steel

2.5.1

The reduction of strength of stainless steel with increasing temperature is to be taken into account in the calculation of the material factor, *k* and in the material Young's modulus, *E*.

Stainless steels are <u>to be in accordance with</u> **Pt 3, Ch 1, 401**.

Reason

강력갑판 창구코너 요건은 산적화물선, 광석운반선, 겸용선 및 이와 유사한 화물선에 대한 요건으로 삭제함

"선급에 따른다" 대신 규칙 3편 1장 401로 정의

Present	Amendment	Reason
3. Steels for forging and casting **3.1 General** **3.1.1 ~ 3.1.2 <omitted>** **3.1.3** The steels used are to be tested in accordance with the applicable requirements of the Rules for Materials of the Society.	**3. Steels for forging and casting** **3.1 General** **3.1.1 ~ 3.1.2 <same as the present Rule>** **3.1.3** The steels used are to be tested in accordance with the applicable requirements of the **Pt 2, Ch 1**.	선급규칙을 2장 1절로 정의

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>
Section 2 Net Scantling Approach

Symbols
<omitted>
d_e : Distance in mm, from the upper edge of the web to the top of the flange for L3 profiles, see Figure 3.
<Newly added>
t_{as_built} : As-built thickness, in mm, taken as the actual thickness provided at the newbuilding stage.
<omitted>

1. General
1.1 ~ 1.2 <omitted>
1.3 Scantling compliance
1.3.1 <omitted>
1.3.2
Scantling compliance in relation to the Rules is as follow:
a) The net offered thickness of plating is to be equal to or greater than the net required thickness of plating.
b) The required net section modulus, moment of inertia and shear area properties of local supporting members are to be calculated using the net thickness of the attached plate, web and flange. The net sectional dimensions of local supporting members are defined in <u>Figure 2.</u> The required section modulus and web net thickness apply to areas clear of the end brackets.
<omitted>
</td><td>
Section 2 Net Scantling Approach

Symbols
<omitted>
d_e : Distance in mm, from the upper edge of the web to the top of the flange for L3 profiles, see Figure 3.
<u>d_f : Distance in mm, for extension of flange for L2 profiles, see Figure 3.</u>
t_{as_built} : As-built thickness, in mm, taken as the actual thickness provided at the newbuilding stage.
<omitted>

1. General
1.1 ~ 1.2 <same as the present Rule>
1.3 Scantling compliance
1.3.1 <same as the present Rule>
1.3.2
Scantling compliance in relation to the Rules is as follow:
a) The net offered thickness of plating is to be equal to or greater than the net required thickness of plating.
b) The required net section modulus, moment of inertia and shear area properties of local supporting members are to be calculated using the net thickness of the attached plate, web and flange. The net sectional dimensions of local supporting members are defined in <u>Figure 2 and Figure 3.</u> The required section modulus and web net thickness apply to areas clear of the end brackets.
<omitted>
</td><td>
L2 형강관련 치수 추가

그림 번호 수정
</td></tr>
</table>

Present

Table 1 : Assessment for corrosion applied to the gross scantlings

Structural requirement	Property/analysis type	Applied corrosion addition
Minimum thickness (all members including PSM)	Thickness	t_c
Local strength (plates, stiffeners, and hold frames)	Thickness/sectional properties	t_c
	Stiffness / proportions / Buckling capacity	t_c
Primary supporting members (prescriptive)	Sectional properties	0.5 t_c
	Stiffness/proportions of web and flange Buckling capacity	t_c
Strength assessment by FEM	Cargo tank/cargo hold	0.5 t_c
	Buckling capacity	t_c
	Local fine mesh	0.5 t_c
	~~Specified fine mesh areas~~	~~0.5 t_c~~
Hull girder strength	Sectional properties	0.5 t_c
	Buckling capacity	t_c
Hull girder ultimate strength	Sectional properties	0.5 t_c
	Buckling/collapse capacity	0.5 t_c
Fatigue assessment (simplified stress analysis)	Hull girder section properties Local support member	0.5 t_c
Fatigue assessment (FE Stress analysis)	Coarse mesh FE model Very fine mesh portion	0.5 t_c

Amendment

Table 1 : Assessment for corrosion applied to the gross scantlings

Structural requirement	Property/analysis type	Applied corrosion addition
Minimum thickness (all members including PSM)	Thickness	t_c
Local strength (plates, stiffeners, and hold frames)	Thickness/sectional properties	t_c
	Stiffness / proportions / Buckling capacity	t_c
Primary supporting members (prescriptive)	Sectional properties	0.5 t_c
	Stiffness/proportions of web and flange Buckling capacity	t_c
Strength assessment by FEM	Cargo hold (stress determination)	0.5 t_c
	Buckling capacity	t_c
	Local fine mesh	0.5 t_c
Hull girder strength	Sectional properties	0.5 t_c
	Buckling capacity	t_c
Hull girder ultimate strength	Sectional properties	0.5 t_c
	Buckling/collapse capacity	0.5 t_c
Fatigue assessment (simplified stress analysis)	Hull girder section properties Local support member	0.5 t_c
Fatigue assessment (FE Stress analysis)	Coarse mesh FE model Very fine mesh portion	0.5 t_c

Reason

화물창 탱크 삭제

명확한 상세요소 분할지역 삭제

Present	Amendment	Reason
See "Present" below	See "Amendment" below	부식추가 관련 조항 배치 수정

Present

Section 3 Corrosion Additions

1. General

1.1 <omitted>

1.2 Corrosion addition determination

1.2.1

<omitted>

Table 1 : Corrosion addition for one side of a structural member

Compartment type	t_{c1} or t_{c2}
Ballast water tank, bilge tank, drain storage tank, chain locker[1]	1.0
Exposed to atmosphere	1.0
Exposed to sea water[2]	1.0
Fuel oil and lube oil tank	0.5
Fresh water tank	0.5
Void spaces and dry spaces	0.0[3][4]
Container holds	0.5[5]
Accommodation spaces	0.0
Compartments other than those mentioned above	0.5

(1) 1.0 mm is to be added to the plate surface within 3 m above the upper surface of the chain locker bottom.
(2) For the determination of the corrosion addition of the outer shell plating, the pipe tunnel is considered as for a ballast water tank.
(3) For the hull girder strength assessment according to **Ch 5**, t_{c1} or t_{c2} is to be taken equal to 0.5 mm.
(4) For bottom plate of compartment, t_{c1} or t_{c2} is to be taken equal to 0.5 mm.
(5) For the hull girder strength assessment according to **Ch 5**, t_{c1} or t_{c2} is to be taken equal to 1.0 mm.

Section 4 <omitted>

Amendment

Section 3 Corrosion Additions

1. General

1.1 <same as the present Rule>

1.2 Corrosion addition determination

1.2.1

<omitted>

Table 1 : Corrosion addition for one side of a structural member

Compartment type	t_{c1} or t_{c2}
Ballast water tank, bilge tank, drain storage tank, chain locker[1]	1.0
Exposed to atmosphere	1.0
Exposed to sea water	1.0
Fuel oil and lube oil tank	0.5
Fresh water tank	0.5
Void spaces and dry spaces[2][3][4]	0.0
Container holds[5]	0.5
Accommodation spaces	0.0
Compartments other than those mentioned above	0.5

(1) 1.0 mm is to be added to the plate surface within 3 m above the upper surface of the chain locker bottom.
(2) For the determination of the corrosion addition of the outer shell plating, the pipe tunnel is considered as for a ballast water tank.
(4) For bottom plate of compartment, t_{c1} or t_{c2} is to be taken equal to 0.5 mm.
(3) For the hull girder strength assessment according to **Ch 5**, t_{c1} or t_{c2} is to be taken equal to 0.5 mm.
(5) For the hull girder strength assessment according to **Ch 5**, t_{c1} or t_{c2} is to be taken equal to 1.0 mm.

Section 4 <same as the present Rule>

Present	Amendment	Reason
Section 5 Limit States	**Section 5 Limit States**	
1. <omitted>	**1. <same as the present Rule>**	
2. Criteria **2.1 ~ 2.4 <omitted>**	**2. Criteria** **2.1 ~ 2.4 <same as the present Rule>**	
2.5 Accidental limit state ~~**2.5.1 Hull girder**~~ ~~The yielding and ultimate strength of the hull girder in cargo hold flooded condition and in the damaged condition is to be assessed in accordance with **Ch 5, Sec 1** and **Ch 5, Sec 2**.~~	**2.5 Accidental limit state** **2.5.1 Plating, stiffeners and PSM** The plating, stiffeners and PSM are to be assessed in flooded conditions in accordance with **Ch 6** for yielding criteria.	침수시 종강도 삭제
2.5.2 Plating, stiffeners and PSM The plating, stiffeners and PSM are to be assessed in flooded conditions in accordance with **Ch 6** for yielding criteria ~~and with **Ch 8, Sec 3** for buckling criteria~~.		침수시 좌굴강도 평가 삭제
3. <omitted>	**3. <same as the present Rule>**	

Present	Amendment	Reason
Section 6 Structural Detail Principles	**Section 6 Structural Detail Principles**	
1. <omitted>	**1. <same as the present Rule>**	
2. General principles	**2. General principles**	
2.1 ~ 2.2 <omitted>	**2.1 ~ 2.2 <same as the present Rule>**	
2.3 <Newly added>	**2.3 Connection of longitudinal members not contributing to the hull girder longitudinal strength**	
	2.3.1 Where the hull girder stress at the strength deck or at the bottom as defined in **Ch 5, Sec 1, [2.2.2]** is higher than the permissible stress as defined in **Ch 5, Sec 1, [3.4.1]** for normal strength steel, longitudinal members not contributing to the hull girder longitudinal strength and welded to the strength deck or bottom plating and bilge strake, such as gutter bars, strengthening of deck openings, bilge keel, are to be made of steel with the same specified minimum yield stress as the strength deck or bottom structure steel.	종강도 부재가 아닌 종방향 부재 요건 추가
	2.3.2 The requirement in **[2.3.1]** is also applicable to non-continuous longitudinal stiffeners welded on the web of a primary structural member contributing to the hull girder longitudinal strength such as hatch coamings, stringers and girders or on the inner bottom are to be made of steel with the same specified minimum yield stress as attached plate when the hull girder stress on those members is higher than the permissible stress as defined in **Ch 5, Sec 1, [3.4.1]** for normal strength steel.	누락된 내용 추가

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>

3. Stiffeners

3.1 <omitted>

3.2 Bracketed end connections of non-continuous stiffeners

3.2.1 ~ 3.2.4 <omitted>

3.2.5

<omitted>

3.2.6 ~ 3.2.7 <omitted>

3.3 <omitted>

3.4 Sniped ends

3.4.1

Sniped ends may be used where dynamic loads are small, provided the net thickness of plating supported by the stiffener, t_p, is not less than:

$t_p = c_1\sqrt{(1000\,l - \frac{s}{2})\frac{sPk}{10^6}}$ (mm)

where:

P : Design pressure for the stiffener for the design load set being considered, in kN/m^2.

c_1 : Coefficient for the design load set being considered, to be taken as:

- c1 = 1.2 for acceptance criteria set AC-S.
- c1 = 1.1 for acceptance criteria set AC-SD.

Sniped stiffeners are not to be used on structures in the vicinity of engines or <u>generators or propeller impulse zone nor on the shell envelope.</u>

</td><td>

3. Stiffeners

3.1 <same as the present Rule>

3.2 Bracketed end connections of non-continuous stiffeners

3.2.1 ~ 3.2.4 <same as the present Rule>

3.2.5 <u>Brackets at the ends of non-continuous stiffeners</u>

<same as the present Rule>

3.2.6 ~ 3.2.7 <same as the present Rule>

3.3 <same as the present Rule>

3.4 Sniped ends

3.4.1

Sniped ends may be used where dynamic loads are small, provided the net thickness of plating supported by the stiffener, t_p, is not less than:

$t_p = c_1\sqrt{(1000\,l - \frac{s}{2})\frac{sPk}{10^6}}$ (mm)

where:

P : Design pressure for the stiffener for the design load set being considered, in kN/m^2.

c_1 : Coefficient for the design load set being considered, to be taken as:

- c1 = 1.2 for acceptance criteria set AC-S.
- c1 = 1.1 for acceptance criteria set AC-SD.

Sniped stiffeners are not to be used on structures in the vicinity of engines or <u>generators in the machinery space, propeller impulse zone in the stern area nor on the shell envelope.</u>

</td><td>

제목 추가

CSR 개정에 따른 개정 구역에 대한 명확한 정의

</td></tr>
</table>

Present	Amendment	Reason
3.4.2 Bracket toes and sniped stiffeners ends are to be terminated close to the adjacent member. The distance is not to exceed 40 mm unless the bracket or member is supported by another member on the opposite side of the plating. Tapering of the sniped end is not to be more than 30 deg, The depth of toe or sniped end is, generally, not to exceed the thickness of the bracket toe or sniped end member, but need not be less than 15 mm.	**3.4.2** Bracket toes and sniped stiffeners ends are to be terminated close to the adjacent member. The distance is not to exceed 40 mm unless the bracket or member is supported by another member on the opposite side of the plating. Tapering of the sniped end is not to be more than 30 deg, where it is not practical to comply with this requirement, alternative arrangements are specially considered. The depth of toe or sniped end is, generally, not to exceed the thickness of the bracket toe or sniped end member, but need not be less than 15 mm.	CSR 개정에 따른 개정 대안방법에 대한 고려
4. Primary support members **4.1 <omitted>**	**4. Primary support members** **4.1 <same as the present Rule>**	
4.2 Web stiffening arrangement Web stiffeners arranged on primary supporting members are to comply with the requirements to scantlings of such stiffeners are given in **Ch 8, Sec 2, [4.2]**.	**4.2 Web stiffening arrangement** Web stiffeners arranged on primary supporting members are to be arranged in such a way that they ensure adequate strength.	구조해석을 모든 화물창에 대하여 수행하는 것이 아니므로 적절한 강도를 가져야 한다로 변경 Primary supportmembers web stiffeners보다 Web stiffeners arranged on primary supporting members로 용어 변경
4.3 Tripping bracket arrangement a) At positions along the member span such that it satisfies the criteria of **Ch 8, Sec 2, [5.1]** for tripping bracket spacing and flange slenderness. b) At the toe of end brackets. c) At ends of continuous curved face plates. d) In way of concentrated loads. e) Near the change of section.	**4.3 Tripping bracket arrangement** a) At every fourth spacing of ordinary stiffeners, with an interval of about 3 m. b) At the toe of end brackets. c) At ends of continuous curved face plates. d) In way of concentrated loads. e) Near the change of section.	좌굴요건 대신 3편의 규정 준용. 4m에서 약 3m로 변경 (오기 수정)

Present	Amendment	Reason
4.4 <omitted>	**4.4 <same as the present Rule>**	
5. Intersection of stiffeners and primary supporting members **5.1 Cut-outs** **5.1.1 ~ 5.1.4 <omitted>**	**5. Intersection of stiffeners and primary supporting members** **5.1 Cut-outs** **5.1.1 ~ 5.1.4 <same as the present Rule>**	
~~**5.1.5**~~ ~~At connection to shell envelope longitudinals below the scantling draught T_{sc} and at connection to inner bottom longitudinals, a soft heel is to be provided in way of the heel of the primary supporting member web stiffeners when the calculated direct stress σ_w in the primary supporting member web stiffener according to **[5.2]** exceeds 80% of the allowable values. The soft heel is to have a keyhole similar to that shown in item (c) in **Figure 8**. A soft heel is not required at the intersection with watertight bulkheads and primary supporting members where a back bracket is fitted or where the primary supporting member web is welded to the stiffener face plate.~~		이 규정은 피로강도와 관련된 규정으로 CSR 선박은 만재흘수 운항과 평형수흘수 운항이 확실하게 구분이 되지만 컨테이너선의 경우에는 피로의 양상이 다르기 때문에 이 규정을 그대로 적용할 없으므로 삭제함
5.1.6 Cut-outs are to have rounded corners and the corner radii, R, are to be as large as practicable, with a minimum of 20% of the breadth, b, of the cut-out or 25 mm, whichever is greater. The corner radii, R, does not need to be greater than 50 mm, see **Figure 6**. Consideration is to be given to other shapes on the basis of maintaining equivalent strength and minimising stress concentration. Note 1: Except where specific dimensions are noted for the details of the keyhole in way of the soft heel, the details shown in this figure are only used to illustrate symbols and definitions and are not intended to represent design guidance or recommendations.	**<u>5.1.5</u>** Cut-outs are to have rounded corners and the corner radii, R, are to be as large as practicable, with a minimum of 20% of the breadth, b, of the cut-out or 25 mm, whichever is greater. The corner radii, R, does not need to be greater than 50 mm, see **Figure 6**. Consideration is to be given to other shapes on the basis of maintaining equivalent strength and minimising stress concentration. Note 1 : Except where specific dimensions are noted for the details of the keyhole in way of the soft heel, the details shown in this figure are only used to illustrate symbols and definitions and are not intended to represent design guidance or recommendations.	번호삭제로 인한 변경
5.2 <omitted>	**5.2 <same as the present Rule>**	

Present	Amendment	Reason
6. Openings	**6. Openings**	
6.1 ~ 6.2 <omitted>	**6.1 ~ 6.2 <same as the present Rule>**	
6.3 Openings in the strength deck	**6.3 Openings in the strength deck**	
6.3.1 <omitted>	**6.3.1 <same as the present Rule>**	
6.3.2	**6.3.2**	
Openings are generally to be located outside the limits as shown in **Figure 14** in dashed area, defined by: a) The bent area of a rounded sheer strake, if any, or the side shell. b) $e = 0.25(B - b)$ from the edge of opening. c) $c = 0.074\ell + 0.1b + 0.25b$, whichever is greater. <omitted>	Openings are generally to be located outside the limits as shown in **Figure 14** in dashed area, defined by: a) The bent area of a rounded sheer strake, if any, or the side shell. b) $e = 0.25(B - b)$ from the edge of opening. c) $c = 0.074\ell + 0.1b$ or $0.25b$, whichever is greater. <omitted>	오기 수정
7. Double bottom structure	**7. Double bottom structure**	
7.1 General	**7.1 General**	
7.1.1 Framing system	**7.1.1 Framing system**	
For ships greater than 120 m in length, the bottom shell, the inner bottom and the sloped bulkheads of hopper tanks, if any, are to be longitudinally framed within the cargo hold region. Where it is not practicable to apply the longitudinal framing system to fore and aft parts of the cargo hold region due to the hull form, transverse framing may be accepted on a case-by-case basis subject to appropriate brackets and other arrangements being incorporated to provide structural continuity in way of changes to the framing system.	For ships greater than 120 m in length, the bottom shell and the inner bottom are to be longitudinally framed within the cargo hold region. Where it is not practicable to apply the longitudinal framing system to fore and aft parts of the cargo hold region due to the hull form, transverse framing may be accepted on a case-by-case basis subject to appropriate brackets and other arrangements being incorporated to provide structural continuity in way of changes to the framing system.	호퍼탱크 관련 요건 삭제
7.1.2 ~ 7.1.3 <omitted>	**7.1.2 ~ 7.1.3 <same as the present Rule>**	

Present	Amendment	Reason
7.1.4 Drainage of tank top ~~For ships designed to carry solid cargoes, effective arrangements are to be provided for draining water from the tank top.~~ Where wells are provided for the drainage, such wells are not to extend for more than one-half height of the double bottom.	**7.1.4 Drainage of tank top** Where wells are provided for the drainage, such wells are not to extend for more than one-half height of the double bottom. The vertical distance from the bottom of such a well to a plane coinciding with the keel line shall not be less 500 mm.	컨테이너선은 강제요건이 아니므로 첫 요건 삭제. 500mm 규정은 SOLAS 요건으로 추가함 개정된 SOLAS 문구로 수정함
7.1.5 Cell guides The structure of the bottom and inner bottom on which cell guides rest is to be adequately stiffened with doublers, brackets or other equivalent reinforcements.	**7.1.5 Cell guides** The structure of the bottom and inner bottom on which cell guides rest is to be adequately stiffened with doublers, brackets or other equivalent reinforcements.	
~~**7.1.6 Striking plate**~~ ~~Striking plates of adequate thickness or other equivalent arrangements are to be provided under sounding pipes to prevent the sounding rod from damaging the plating.~~		일반적인 컨테이너선은 타격판이 없으므로 관련요건 삭제함.
7.1.7 Duct keel Where a duct keel is arranged, the centre girder may be replaced by two girders spaced, no more than 3 m apart. Otherwise, for a spacing wider than 3 m, the two girders are to be provided with support of adjacent structure and subject to the Society's approval. The structures in way of the floors are to provide sufficient continuity of the latter.	**7.1.6 Duct keel** Where a duct keel is arranged, the centre girder may be replaced by two girders spaced, no more than 3 m apart. Otherwise, for a spacing wider than 3 m, the two girders are to be provided with support of adjacent structure and subject to the Society's approval. The structures in way of the floors are to provide sufficient continuity of the latter.	번호 수정

Present	Amendment	Reason
8. Double side structure	**8. Double side structure**	
8.1 <omitted>	**8.1 <same as the present Rule>**	
8.2 Structural arrangement	**8.2 Structural arrangement**	
8.2.1 Primary supporting members	**8.2.1 Primary supporting members**	
Side or double side web frames are to be fitted in line with the bottom web frames. Alternative framing arrangements may be considered by the Society on a case by case basis.	Side web frames are to be fitted in line with the bottom web frames. Alternative framing arrangements may be considered by the Society on a case by case basis.	선측 웨브 프레임으로 용어를 통일함
A vertical framing is to be fitted in way of the structure of the transverse bulkheads.	A vertical framing is to be fitted in way of the structure of the transverse bulkheads.	
8.2.2 ~ 8.2.4 <omitted>	**8.2.2 ~ 8.2.4 <same as the present Rule>**	
9. <omitted>	**9. <same as the present Rule>**	

Present	Amendment	Reason
10. Double side structure	**10. Double side structure**	
10.1 <omitted>	**10.1 <same as the present Rule>**	
10.2 Cargo hold bulkheads	**10.2 Cargo hold bulkheads**	
10.2.1 <omitted>	**10.2.1 <same as the present Rule>**	
~~**10.2.2 Transverse torsion box structures in way of transverse bulkheads**~~ ~~Transverse torsion box structures are generally to be provided at the top part of the transverse bulkheads.~~ ~~They are to be provided with sufficient strength to sustain stress resulting from the shear forces induced at their ends by hull girder torsion effects.~~ ~~Similar boxes might as well be provided at the bottom part of the transverse bulkheads.~~		torsion box 요건 삭제
10.2.3 Primary supporting members The vertical primary supporting members of the transverse bulkheads are to be fitted in line with bottom girders. Their flanges are to be in line with a double bottom floor. The strength of the connection between these members and the bottom structure is to be assessed.	**10.2.2 Primary supporting members** The vertical primary supporting members of the transverse bulkheads are to be fitted in line with bottom girders. Their flanges are to be in line with a double bottom floor. The strength of the connection between these members and the bottom structure is to be assessed.	삭제로 인한 번호수정
10.2.4 Reinforcements in way of cell guides When cell guides are fitted on transverse or longitudinal bulkheads which form boundaries of the hold, such structures are to be reinforced, taking into account the loads transmitted by the cell guides.	**10.2.3 Reinforcements in way of cell guides** When cell guides are fitted on transverse or longitudinal bulkheads which form boundaries of the hold, such structures are to be reinforced, taking into account the loads transmitted by the cell guides.	삭제로 인한 번호수정
10.3 ~ 10.4 <omitted>	**10.3 ~ 10.4 <same as the present Rule>**	
11. <omitted>	**11. <same as the present Rule>**	

Present	Amendment	Reason
Section 7 Structural Detail Principles	**Section 7 Structural Idealisation**	오기수정
Symbols For symbols not defined in this section, refer to **Ch 1, Sec 4**.	**Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**.	
φ_w : Angle, in deg, between the stiffener or primary supporting member web and the attached plating, see **Figure 14**. φ_w is to be taken equal to 90 deg if the angle is greater than or equal to 75 deg.	φ_w : Angle, in deg, between the stiffener or primary supporting member web and the attached plating, see **Figure 12**. φ_w is to be taken equal to 90 deg if the angle is greater than or equal to 75 deg.	오기 수정
<omitted>	<omitted>	
b_f : Breadth of flange, in mm, see **Ch 3, Sec 2, Figure 2**. For bulb profiles, see **Table 1** and **Table 2**.	b_f : Breadth of flange, in mm, see **Ch 3, Sec 2, Figure 2**. For bulb profiles, see **[1.4.1]**.	표 삭제로 인한 참조 변경
1. Structural idealisation of stiffeners and primary support members	**1. Structural idealisation of stiffeners and primary support members**	
1.1 <omitted>	**1.1 <omitted>**	
1.2 Spacing and load supporting breadth	**1.2 Spacing and load supporting breadth**	
1.2.1 Stiffeners Stiffeners spacing, s, in mm, for the calculation of the effective attached plating of stiffeners is to be taken as the mean spacing between stiffeners and taken equal to, see **Figure 11**.	**1.2.1 Stiffeners** Stiffeners spacing, s, in mm, for the calculation of the effective attached plating of stiffeners is to be taken as the mean spacing between stiffeners and taken equal to, see **Figure 9**.	그림번호 수정
<omitted>	<omitted>	
1.2.2 Primary supporting member Primary supporting member spacing, S, for the calculation of the effective attached plating of primary supporting members is to be taken as the mean spacing between adjacent primary supporting members, and taken equal to, see **Figure 11**.	**1.2.2 Primary supporting member** Primary supporting member spacing, S, for the calculation of the effective attached plating of primary supporting members is to be taken as the mean spacing between adjacent primary supporting members, and taken equal to, see **Figure 9**.	그림번호 수정
1.2.3 <omitted>	**1.2.3 <omitted>**	

Present	Amendment	Reason
1.3 Effective breadth **1.3.1 ~ 1.3.2 <omitted>** **1.3.3 Effective area of curved face plate and attached plating of primary supporting members** <omitted> t_{f-n50} : Net flange thickness, in mm. For calculation of Cf and Ω of unsymmetrical face plates, t_{w-n50} is not to be taken greater than tw-n50. t_{w-n50} : Net web plate thickness, in mm. r_f : Radius of curved face plate or attached plating, in mm, see **Figure 12** at mid thickness. b_f : Breadth of face plate or attached plating, in mm, see **Figure 12**. b) The effective net area, in mm2, of curved face plates supported by radial brackets, or attached plating supported by cylindrical stiffeners, is given by: $A_{eff-n50} = \left(\frac{3r_f t_{f-n50} + C_f s_r^2}{3r_f t_{f-n50} + s_r^2} \right) t_{f-n50} b_f \quad (mm^2)$ where: s_r : Spacing of tripping brackets or web stiffeners or stiffeners normal to the web plating, in mm, see **Figure 12**.	**1.3 Effective breadth** **1.3.1 ~ 1.3.2 <same as the present Rule>** **1.3.3 Effective area of curved face plate and attached plating of primary supporting members** <omitted> t_{f-n50} : Net flange thickness, in mm. For calculation of C_f and β of unsymmetrical face plates, t_{f-n50} is not to be taken greater than t_{w-n50}. t_{w-n50} : Net web plate thickness, in mm. r_f : Radius of curved face plate or attached plating, in mm, see **Figure 10** at mid thickness. b_f : Breadth of face plate or attached plating, in mm, see **Figure 10**. b) The effective net area, in mm^2, of curved face plates supported by radial brackets, or attached plating supported by cylindrical stiffeners, is given by: $A_{eff-n50} = \left(\frac{3r_f t_{f-n50} + C_f s_r^2}{3r_f t_{f-n50} + s_r^2} \right) t_{f-n50} b_f \quad (mm^2)$ where: s_r : Spacing of tripping brackets or web stiffeners or stiffeners normal to the web plating, in mm, see **Figure 10**.	오기 수정 그림번호 수정 그림번호 수정 그림번호 수정

Present	Amendment	Reason
1.4 Geometrical properties of stiffeners and primary supporting members	**1.4 Geometrical properties of stiffeners and primary supporting members**	
1.4.1 Stiffener profile with a bulb section	**1.4.1 Stiffener profile with a bulb section**	
<omitted>	<omitted>	
h'_w, t'_w : Net height and thickness of a bulb section, in mm, as shown in **Figure 13**.	h'_w, t'_w : Net height and thickness of a bulb section, in mm, as shown in **Figure 11**.	그림번호 수정
<omitted>	<omitted>	
1.4.2 <omitted>	**1.4.2 <same as the present Rule>**	
1.4.3 Effective shear depth of stiffeners	**1.4.3 Effective shear depth of stiffeners**	
<omitted>	<omitted>	
φ_w : Angle, in deg, as defined in **Figure 14**. φ_w is to be taken as 90 degrees if the angle is greater than or equal to 75 degrees.	φ_w : Angle, in deg, as defined in **Figure 12**. φ_w is to be taken as 90 degrees if the angle is greater than or equal to 75 degrees.	그림번호 수정
1.4.4 Elastic net section modulus of stiffeners	**1.4.4 Elastic net section modulus of stiffeners**	
<omitted>	<omitted>	
φ_w : Angle, in deg, as defined in **Figure 14**. φ_w is to be taken as 90 degrees if the angle is greater than or equal to 75 degrees.	φ_w : Angle, in deg, as defined in **Figure 12**. φ_w is to be taken as 90 degrees if the angle is greater than or equal to 75 degrees.	그림번호 수정
1.4.5 ~ 1.4.7 <omitted>	**1.4.5 ~ 1.4.7 <same as the present Rule>**	
1.4.8 Shear area of primary supporting members with web openings	**1.4.8 Shear area of primary supporting members with web openings**	
<omitted>	**<omitted>**	
h_{w1}, h_{w2}, h_{w3}, h_{w4} : Dimensions as shown in **Figure 15**.	h_{w1}, h_{w2}, h_{w3}, h_{w4} : Dimensions as shown in **Figure 13**.	그림번호 수정
where an opening is located at a distance less than $h_w/3$ from the cross-section considered, h_{eff} is to be taken as the smaller of the net height and the net distance through the opening. See **Figure 15**.	where an opening is located at a distance less than $h_w/3$ from the cross-section considered, h_{eff} is to be taken as the smaller of the net height and the net distance through the opening. See **Figure 13**.	그림번호 수정

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>2. Plate</td><td>2. Plate</td><td></td></tr>
<tr><td>2.1 Idealisation of EPP</td><td>2.1 Idealisation of EPP</td><td></td></tr>
<tr><td>2.1.1 EPP
An elementary plate panel (EPP) is the unstiffened part of the plating between stiffeners and/or primary supporting members. The plate panel length, a, and breadth, b, of the EPP are defined respectively as the longest and shortest plate edges, as shown in <u>Figure 16</u>.
<omitted></td><td>2.1.1 EPP
An elementary plate panel (EPP) is the unstiffened part of the plating between stiffeners and/or primary supporting members. The plate panel length, a, and breadth, b, of the EPP are defined respectively as the longest and shortest plate edges, as shown in <u>Figure 14</u>.
<omitted></td><td>그림번호 수정</td></tr>
<tr><td>2.1.2 Strake required thickness
The required thickness of a plate strake is to be taken as the greatest value required for each EPP within that strake. The requirements given in Table 1 are to be applied for the selection of strakes to be considered as shown in <u>Figure 17</u>.</td><td>2.1.2 Strake required thickness
The required thickness of a plate strake is to be taken as the greatest value required for each EPP within that strake. The requirements given in Table 1 are to be applied for the selection of strakes to be considered as shown in <u>Figure 15</u>.</td><td>그림번호 수정</td></tr>
<tr><td>The maximum corrosion addition within a strake is to be applied according to <u>Ch 3, Sec 3, [1.2.4]</u>.
2.1.3 <omitted></td><td>The maximum corrosion addition within a strake is to be applied according to <u>Ch 3, Sec 3, [1.2.3]</u>.
2.1.3 <omitted></td><td>오기 수정</td></tr>
<tr><td>2.2 Load calculation point
2.2.1 Yielding
Table 2 : LCP coordinates for yielding
<table>
<tr><th rowspan="2">LCP coordinates</th><th colspan="2">General[1]</th><th colspan="2">Horizontal plating</th><th colspan="2">Vertical transverse structure</th></tr>
<tr><th>Longitudinal framing (Figure 18)</th><th>Transverse framing (Figure 19)</th><th>Longitudinal framing</th><th>Transverse framing</th><th>Horizontal framing (Figure 20)</th><th>Vertical framing (Figure 21)</th></tr>
<tr><td>x coordinate</td><td colspan="2">Mid-length of the EPP</td><td colspan="2">Mid-length of the EPP</td><td colspan="2">Corresponding to y and z values</td></tr>
<tr><td colspan="7"><omitted></td></tr>
</table></td><td>2.2 Load calculation point
2.2.1 Yielding
Table 2 : LCP coordinates for yielding
<table>
<tr><th rowspan="2">LCP coordinates</th><th colspan="2">General[1]</th><th colspan="2">Horizontal plating</th><th colspan="2">Vertical transverse structure</th></tr>
<tr><th>Longitudinal framing (Figure 16)</th><th>Transverse framing (Figure 17)</th><th>Longitudinal framing</th><th>Transverse framing</th><th>Horizontal framing (Figure 18)</th><th>Vertical framing (Figure 19)</th></tr>
<tr><td>x coordinate</td><td colspan="2">Mid-length of the EPP</td><td colspan="2">Mid-length of the EPP</td><td colspan="2">Corresponding to y and z values</td></tr>
<tr><td colspan="7"><omitted></td></tr>
</table></td><td>그림번호 수정</td></tr>
<tr><td>2.2.2 Buckling
For the prescriptive buckling check of the EPP according to <u>Ch 8, Sec 3,</u> the LCP for the pressure and for the hull girder stresses are defined in Table 3. For the FE buckling check, <u>Ch 8, Sec 4</u> is applicable.</td><td>2.2.2 Buckling
For the prescriptive buckling check of the EPP according to <u>Ch 8, Sec 2,</u> the LCP for the pressure and for the hull girder stresses are defined in Table 3. For the FE buckling check, <u>Ch 8, Sec 3</u> is applicable.</td><td>오기 수정
오기 수정</td></tr>
</table>

Present	Amendment	Reason
Chapter 4 Loads **Section 1 Introduction** **1. General** **1.1 Application** **1.1.1 Scope** This Chapter provides the design load for strength assessments. <omitted> **1.1.2 <omitted>** <omitted> **1.1.3 Probability level for strength assessments** <omitted> **1.1.4 ~ 5 <omitted>** <omitted> **1.1.6 <Newly added>**	**Chapter 4 Loads** **Section 1 Introduction** **1. General** **1.1 Application** **1.1.1 Scope** This Chapter provides the design load for strength and fatigue assessments. <omitted> **1.1.2 <same as the present Rule>** <omitted> **1.1.3 Probability level for strength and fatigue assessments** <omitted> a) <omitted> b) Fatigue assessment means the assessment for the fatigue criteria for the loads corresponding to the probability level of 10^{-2}. **1.1.4 ~ 5 <same as the present Rule>** **1.1.6 Loads for fatigue assessment** Each design load scenario for fatigue assessment is composed of a Static + Dynamic (S+D) load case, where the static and dynamic loads are dependent on the loading condition being considered. The static loads are defined in the following Sections: a) Still water hull girder loads in **Ch 4, Sec 4**. b) External loads in **Ch 4, Sec 5**. c) Internal loads in **Ch 4, Sec 6**.	피로 평가 내용 추가 피로 평가 내용 추가 피로 평가 내용 추가

Present	Amendment	Reason
	The EDWs for the fatigue assessment are listed in **Ch 4, Sec 2, [2].** The dynamic load components are defined in the following Sections: a) Dynamic hull girder load components in **Ch 4, Sec 4**. b) External loads in **Ch 4, Sec 5**. c) Internal loads in **Ch 4, Sec 6**. <omitted>	

Present	Amendment	Reason
Section 2 Dynamic load cases **1. General** **1.1 <omitted>** **1.2 Application** **1.2.1** <omitted> a) <omitted> <omitted>	**Section 2 Dynamic load cases** **1. General** **1.1 <same as the present Rule>** **1.2 Application** **1.2.1** <omitted> a) <omitted> b) Fatigue assessment: • For structural details covered by simplified stress analysis. • For structural details covered by FE stress analysis. <omitted>	피로 평가 내용 추가

Present	Amendment	Reason
Section 3 <omitted> **Section 4 Hull girder loads** **1. ~ 2. <omitted>** **3. Dynamic hull girder loads** **3.1 <omitted>** **3.2 Vertical wave bending moment** <omitted> f_{NL-Hog} : Non-linear correction for hogging, to be taken as: $f_{NL-Hog} = 0.3 \frac{C_B}{C_{wp}} \sqrt{T}$, not to be taken greater than 1.1. f_{NL-Sag} : Non-linear correction for sagging, to be taken as: $f_{NL-Sag} = 4.5 \frac{1+0.2 f_{Bow}}{C_{wp} \sqrt{C_B} L^{0.3}}$, not to be taken less than 1.0. <omitted>	**Section 3 <omitted>** **Section 4 Hull girder loads** **1. ~ 2. <same as the present Rule>** **3. Dynamic hull girder loads** **3.1 <same as the present Rule>** **3.2 Vertical wave bending moment** <omitted> f_{NL-Hog} : Non-linear correction for hogging, to be taken as: $f_{NL-Hog} = 0.3 \frac{C_B}{C_{wp}} \sqrt{T}$, for strength assessment, not to be taken greater than 1.1. $f_{NL-Hog} = 1.0$, for fatigue assessment f_{NL-Sag} : Non-linear correction for sagging, to be taken as: $f_{NL-Sag} = 4.5 \frac{1+0.2 f_{Bow}}{C_{wp} \sqrt{C_B} L^{0.3}}$, for strength assessment, not to be taken less than 1.0. $f_{NL-Sag} = 1.0$, for fatigue assessment <omitted>	피로 평가 내용 추가 피로 평가 내용 추가

Present	Amendment	Reason
Section 5 External loads **1. Sea pressure** **1.1 ~ 1.3 <omitted>** **1.4 <Newly added>** <omitted>	**Section 5 External loads** **1. Sea pressure** **1.1 ~ 1.3 <same as the present Rule>** **1.4 Static pressure in flooded conditions** **1.4.1 Static pressure in flooded compartments** The static pressure, P_{fs} at any load point, in $\mathrm{kN/m^2}$, is to be taken as: $P_{fs} = \rho g h_{fs}$ but not less than 0. where: h_{fs} : Pressure height, in m, in flooded condition, to be taken as: $h_{fs} = y\sin\theta_{DAM} + (z_{DAM} - z)\cos\theta_{DAM}$ for direct strength analysis according to **Ch 7.** z_{DAM} : Z coordinate, in m, of the deepest equilibrium waterline at centre line in the damaged condition (or in intermediate stages of flooding) θ_{DAM} : Angle, in degrees, between the deepest equilibrium waterline in the damaged condition (or in intermediate stages of flooding) and the base line. <omitted>	누락 내용 추가

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr>
<td>
2. External pressures on exposed decks
2.1 <omitted>
2.2 Green sea loads
2.2.1 ~ 2.2.2 <omitted>
2.2.3 HSM, HSA and FSM load cases
<omitted>
Table 13 : Minimum pressures on exposed decks for HSM, HSA, FSM load cases
<table>
<tr><td rowspan="2">Location</td><td colspan="2">Minimum pressure on exposed deck, $P_{D-\min}$, in $\mathrm{kN/m^2}$</td></tr>
<tr><td>$L_{LL} \geq 100\mathrm{m}$</td><td>$L_{LL} < 100\mathrm{m}$</td></tr>
<tr><td colspan="3"><omitted></td></tr>
<tr><td colspan="3">a : ~~Coefficient taken equal to:~~
~~$a = 0.356$, for Type A, Type B-60 and Type B-100 freeboard ships~~
$a = 0.0726$, ~~for Type B freeboard ships.~~
x_{LL} : X-coordinate of the load point measured from the aft end of the freeboard length L_{LL}.</td></tr>
</table>
<omitted>
3~4 <omitted>
</td>
<td>
2. External pressures on exposed decks
2.1 <same as the present Rule>
2.2 Green sea loads
2.2.1 ~ 2.2.2 <same as the present Rule>
2.2.3 HSM, HSA and FSM load cases
<omitted>
Table 13 : Minimum pressures on exposed decks for HSM, HSA, FSM load cases
<table>
<tr><td rowspan="2">Location</td><td colspan="2">Minimum pressure on exposed deck, $P_{D-\min}$, in $\mathrm{kN/m^2}$</td></tr>
<tr><td>$L_{LL} \geq 100\mathrm{m}$</td><td>$L_{LL} < 100\mathrm{m}$</td></tr>
<tr><td colspan="3"><omitted></td></tr>
<tr><td colspan="3">a : 0.0726
x_{LL} : X-coordinate of the load point measured from the aft end of the freeboard length L_{LL}.</td></tr>
</table>
<omitted>
3~4 <same as the present Rule>
</td>
<td>불필요한 문구 삭제</td>
</tr>
</table>

Present	Amendment	Reason
5. External pressures on hatch covers **5.1 Application** **5.1.1** The external pressures on hatch covers are only to be applied for strength assessment. **5.2 Green sea loads** **5.2.1** The green sea loads at any load point of a hatch cover, P_{HC}, in $\mathrm{kN/mm^2}$, is to be taken as follows: a) For cargo hold analysis according to **Ch 7**: $P_{HC} = P_D - \rho g (z_{HC} - D)$ without being less than 0. b) For other cases: $P_{HC} = P_{D,min}$ as defined in **Table 13**. P_D : Green sea pressure, in $\mathrm{kN/mm^2}$, on the deck in way of the hatch cover obtained according to [2.2], considering χ, equal to 1.0. z_{HC} : Z coordinate of the top of the hatch cover, in m. **5.3 Load carried on hatch covers** **5.3.1** If a distributed load or a unit load is carried on a hatch cover, the pressure is to be obtained according to **[2.3]**.		불필요한 문구 삭제

Present	Amendment	Reason
Section 6 Internal loads **Symbols** <omitted> ρ_L : Density of liquid in the tank, in t/m^3, but not less than: a) For strength assessment : $\rho_L = 1.025$ for all liquids including oil cargoes. If a tank filled at 98% is intended to carry heavier liquid cargoes than 1.025 (i.e. $\rho_{max-LM} > 1.025$), then $\rho_L = \rho_{max-LM}$. <omitted> **1. Pressure due to liquids** **1.1 ~ 2 <omitted>** **1.3 Dynamic liquid pressure** **1.3.1** The dynamic pressure, P_{ld} due to liquid in tanks, in kN/m^2, is to be taken as: $P_{ld} = f_\beta f_{cd} \rho_L [a_Z(z_0 - z) + f_{ull-l} a_X(x_0 - x) + f_{ull-t} a_Y(y_0 - y)]$ where: f_{ull-l} : Longitudinal acceleration correction factor for the ullage space above the liquid in tanks, taken as: $f_{ull-l} = 1.0$ ~~ℓ_{fs} : Cargo tank length at the top of the tank or length of the ballast hold hatch coaming, in m.~~ f_{ull-t} : Transverse acceleration correction factor to account for the ullage space above the liquid in tanks, taken as: $f_{ull-t} = 1.0$	**Section 6 Internal loads** **Symbols** <omitted> ρ_L : Density of liquid in the tank, in t/m^3, but not less than: a) For strength assessment : $\rho_L = 1.025$ for all liquids including oil cargoes. If a tank filled at 98% is intended to carry heavier liquid cargoes than 1.025 (i.e. $\rho_{max-LM} > 1.025$), then $\rho_L = \rho_{max-LM}$. b) For fatigue assessment : $\rho_L = 0.9$ for liquid cargoes. $\rho_L = 1.025$ for all other liquids. <omitted> **1. Pressure due to liquids** **1.1 ~ 2 <same as the present Rule>** **1.3 Dynamic liquid pressure** **1.3.1** The dynamic pressure, P_{ld} due to liquid in tanks, in kN/m^2, is to be taken as: $P_{ld} = f_\beta f_{cd} \rho_L [a_Z(z_0 - z) + f_{ull-l} a_X(x_0 - x) + f_{ull-t} a_Y(y_0 - y)]$ where: f_{ull-l} : Longitudinal acceleration correction factor for the ullage space above the liquid in tanks, taken as: $f_{ull-l} = 1.0$ f_{ull-t} : Transverse acceleration correction factor to account for the ullage space above the liquid in tanks, taken as: $f_{ull-t} = 1.0$	피로 평가 내용 추가 불필요한 문구 삭제

Present	Amendment	Reason
~~b_{top} : Cargo tank breadth at the top of the tank or breadth of the ballast hold hatch coaming, in m, determined at mid length of the tank or ballast hold hatch coaming.~~ x_0 : X coordinate, in m, of the reference point. y_0 : Y coordinate, in m, of the reference point. z_0 : Z coordinate, in m, of the reference point. <omitted>	x_0 : X coordinate, in m, of the reference point. y_0 : Y coordinate, in m, of the reference point. z_0 : Z coordinate, in m, of the reference point. <omitted>	불필요한 문구 삭제

Present	Amendment	Reason
Section 7 Design load scenarios **1. General** **1.1 Application** **1.1.1** Strength assessment by prescriptive and direct analysis (Finite Element Method, FEM) methods, as given in [2]. <omitted>	**Section 7 Design load scenarios** **1. General** **1.1 Application** **1.1.1** This Section gives the design load scenarios that are to be used for: a) Strength assessment by prescriptive and direct analysis (Finite Element Method, FEM) methods, as given in [2]. b) Fatigue assessment by prescriptive and direct analysis (FEM) methods, as given in [3]. <omitted>	피로 평가 내용 추가

Present	Amendment	Reason

Section 8 Loading Conditions

1 <Omitted>

2 Design loading conditions

2.1 ~ 2.3 <Omitted>

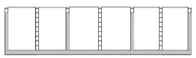
2.4 Loading conditions

2.4.1 <Omitted>

2.4.2 Standard loading conditions for cargo holds strength check

<Omitted>

Table 1 : Standard loading conditions for cargo holds strength check to cargo hold region

No	Loading Pattern	Still water loads					Dynamic load cases
		Draught	Container load		% of perm. SWBM	% of perm. SWSF	Midship cargo region
			In hold	On deck			
Seagoing conditions							
B1[3]		T_{BAL}[1]	all ballast tanks full	-	SWBM in Ballast Condition[2]	≤100%	HSM-2 HSA-2 FSM-2 BSR-1P BSR-2P BSP-1P BSP-2P
F1[3]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F2[3]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F3[3]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F4[3]	<Omitted>	<Omitted>	16.5 t/FEU all tanks empty	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F5	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F6	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F7[3]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
Flooded conditions							
A1[4]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
heavy cargo	light cargo	ballast tank	fuel oil tank				
Note : <Omitted>							

Present	Amendment	Reason

Section 8 Loading Conditions

1 <same as the present Rule>

2 Design loading conditions

2.1 ~ 2.3 <same as the present Rule>

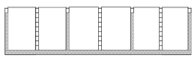
2.4 Loading conditions

2.4.1 <same as the present Rule>

2.4.2 Standard loading conditions for cargo holds strength check

<Omitted>

Table 1 : Standard loading conditions for cargo holds strength check to cargo hold region

No	Loading Pattern	Still water loads						Dynamic load cases
		Draught	Container load		% of perm. SWBM	% of perm. SWSF	Midship cargo region
			In hold	On deck			
Seagoing conditions							
B1[3)]		T_{BAL}[1)]	all ballast tanks full	-	SWBM in Ballast Condition[2)]	≤100%	HSM-2 HSA-2 FSM-2 BSR-1P BSR-2P BSP-1P BSP-2P
F1[3)]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F2[3)]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F3[3)]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F4[3)]	<Omitted>	<Omitted>	55% of max 40 ft stack weight not exceeding 16.5 t/FEU all tanks empty	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F5	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F6	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
F7[3)]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
Flooded conditions							
A1[4)]	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
heavy cargo	light cargo	ballast tank	fuel oil tank				
Note : <Omitted>							

B1 case를 삭제하려 하였으나 유일한 평형수 상태의 하중조건이기 때문에 고려할 필요가 있다고 판단되어 삭제하지 않기로 결정함.

- 문구 수정

Present	Amendment	Reason

2.4.3 Standard loading conditions for fuel oil tanks strength check

<Omitted>

Table 2 : Standard loading conditions for fuel oil tanks strength check in cargo hold region

No	Loading Pattern	Still water loads					Dynamic load cases
		Draught	Container load		% of perm. SWBM	% of perm. SWSF	Midship cargo region
			In hold	On deck			
Seagoing conditions							
OF1	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OF2	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OF3	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OF4	<Omitted>	<Omitted>	16 t/FEU all ballast tanks empty all fuel oil tanks empty	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OF5	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
Ballast conditions							
OB1	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OB2	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OB3	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
Testing conditions							
OT1	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OT2	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
OT3	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>	<Omitted>
heavy cargo	light cargo	ballast tank	fuel oil tank				
Note : <Omitted>							

<hereafter Omitted>

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td></td><td>

2.4.3 Standard loading conditions for fuel oil tanks strength check

<Omitted>

Table 2 : Standard loading conditions for fuel oil tanks strength check in cargo hold region

<table>
<tr><th rowspan="3">No</th><th rowspan="3">Loading Pattern</th><th colspan="5">Still water loads</th><th>Dynamic load cases</th></tr>
<tr><th rowspan="2">Draught</th><th colspan="2">Container load</th><th rowspan="2">% of perm. SWBM</th><th rowspan="2">% of perm. SWSF</th><th rowspan="2">Midship cargo region</th></tr>
<tr><th>In hold</th><th>On deck</th></tr>
<tr><td colspan="8">Seagoing conditions</td></tr>
<tr><td>OF1</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OF2</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OF3</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OF4</td><td><Omitted></td><td><Omitted></td><td><u>55% of max 40 ft stack weight not exceeding 16.5 t/FEU</u>
all ballast tanks empty
all fuel oil tanks empty</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OF5</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td colspan="8">Ballast conditions</td></tr>
<tr><td>OB1</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OB2</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OB3</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td colspan="8">Testing conditions</td></tr>
<tr><td>OT1</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OT2</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td>OT3</td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td><td><Omitted></td></tr>
<tr><td colspan="8">heavy cargo   light cargo   ballast tank   fuel oil tank</td></tr>
<tr><td colspan="8">Note :
<Omitted></td></tr>
</table>

<hereafter, Same as the present Rule>

</td><td>- 문구 수정</td></tr>
</table>

Present	Amendment	Reason
Chapter 5 Hull Girder Strength **Section 1 Hull Girder Strength**	**Chapter 5 Hull Girder Strength** **Section 1 Hull Girder Yield Strength**	
Symbols For symbols not defined in this section, refer to **Ch 1, Sec 4**.	**Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**.	
M_{sw} : Permissible hogging and sagging vertical still water bending moment in intact seagoing condition, in kNm, at the hull transverse section considered, defined in **Ch 4, Sec 4, [2.2.2]**.	M_{sw} : Permissible hogging and sagging vertical still water bending moment in seagoing operation, in kNm, at the hull transverse section considered, defined in **Ch 4, Sec 4, [2.2.2]**.	용어 통일
M_{sw-p} : <omitted>	M_{sw-p} : <same as the present Rule>	
M_{sw-f} : <omitted>	M_{sw-f} : <same as the present Rule>	
M_{wv} : Vertical wave bending moment in seagoing condition, in kNm, in intact or flooded conditions at the hull transverse section considered, defined in **Ch 4, Sec 4, [3.2]**.	M_{wv} : Vertical wave bending moment in seagoing condition, in kNm, in seagoing operation at the hull transverse section considered, defined in **Ch 4, Sec 4, [3.2.1]**.	용어 통일
M_{wh} : <omitted>	M_{wh} : <same as the present Rule>	
Q_{sw} : <omitted>	Q_{sw} : <same as the present Rule>	
Q_{sw-p} : <omitted>	Q_{sw-p} : <same as the present Rule>	
Q_{sw-f} : Permissible positive or negative still water shear force for in flooded condition at sea, in kN, at the hull transverse section considered, as defined in **Ch 4, Sec 4, [2.3.3]**.	Q_{sw-f} : Permissible positive or negative still water shear force for in flooded condition at sea, in kN, at the hull transverse section considered, as defined in **Ch 4, Sec 4, [2.3.3]**.	
Q_{sw-f} : Vertical wave shear force in seagoing condition, in kN, in intact or flooded conditions at the hull transverse section considered, defined in **Ch 4, Sec 4, [3.3]**.	Q_{wv} : Vertical wave shear force in seagoing condition, in kN, in seagoing operation at the hull transverse section considered, defined in **Ch 4, Sec 4, [3.3]**.	오기 수정
~~Q_{sw-Lcd} : Vertical still water shear force for the considered loading condition in seagoing operation, in kN, at the hull transverse section considered.~~		불필요한 항목 삭제
~~$Q_{sw-Lcd-p}$: Vertical still water shear force for the considered loading condition in harbour/sheltered operation, in kN, at the hull transverse section considered.~~		불필요한 항목 삭제

Present	Amendment	Reason
$Q_{sw-Lcd-f}$: Vertical still water shear force for the considered flooded condition in seagoing operation, in kN, at the hull transverse section considered.		
<Newly added>	Q_{wh} : Horizontal wave shear force in seagoing condition, in kN, at the hull transverse section considered, defined in **Ch 4, Sec 4, [3.3]**.	수평전단력 추가
x : X coordinate, in m, of the calculation point with respect to the reference coordinate system defined in **Ch 1, Sec 4, [3.5]**.	x : X coordinate, in m, of the calculation point with respect to the reference coordinate system defined in **Ch 1, Sec 4, [3.5]**.	
V_D : <omitted>	V_D : <same as the present Rule>	
z : <omitted>	z : <same as the present Rule>	
z_n : <omitted>	z_n : <same as the present Rule>	
I_{y-n50} : <omitted>	I_{y-n50} : <same as the present Rule>	
I_{Z-n50} : <omitted>	I_{Z-n50} : <same as the present Rule>	
Z_{A-n50} : <omitted>	Z_{A-n50} : <same as the present Rule>	
Z_{B-n50} : <omitted>	Z_{B-n50} : <same as the present Rule>	
Z_{D-n50} : <omitted>	Z_{D-n50} : <same as the present Rule>	
z_{VD} : <omitted>	z_{VD} : <same as the present Rule>	
C_w : <omitted>	C_w : <same as the present Rule>	
ρ : <omitted>	ρ : <same as the present Rule>	

Present	Amendment	Reason
1. Strength characteristics of hull girder transverse sections	**1. Strength characteristics of hull girder transverse sections**	
1.1 <omitted>	**1.1 <omitted>**	
1.2 Hull girder transverse sections	**1.2 Hull girder transverse sections**	
1.2.1 General	**1.2.1 General**	
Hull girder transverse sections are to be considered as being constituted by the members contributing to the hull girder longitudinal strength, ~~i.e. all continuous longitudinal members below and including the strength deck defined in **[1.3]**~~, taking into account the requirements in **[1.2.2]** to **[1.2.12]**.	Hull girder transverse sections are to be considered as being constituted by the members contributing to the hull girder longitudinal strength, taking into account the requirements in **[1.2.2]** to **[1.2.12]**.	컨테이너선은 강력갑판 상부에도 종강도 부재가 있으므로 삭제
1.2.2 ~ 1.2.12 <omitted>	**1.2.2 ~ 1.2.12 <same as the present Rule>**	
1.3 Structures contributing to the longitudinal strength	**1.3 Structures contributing to the longitudinal strength**	
1.3.1 <omitted>	**1.3.1 <same as the present Rule>**	
~~**1.3.2 Other structures**~~		
~~A superstructure extending at least $0.15L$ within $0.4L$ amidships may generally be considered as contributing to the longitudinal strength. For the other superstructures and for deckhouses, their contribution to the longitudinal strength is to be assessed on a case-by-case basis, through a finite element analysis of the whole ship, which takes into account the general arrangement of the longitudinal elements (side, decks, bulkheads).~~		컨테이너선에는 선루가 거의 없으므로 관련 조항 삭제

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr>
<td>

2. Hull girder stress
2.1 Normal stress
2.1.1 Normal stress induced by vertical still water bending moment
The normal stress induced, at any point, by vertical still water bending moments is to be obtained, in N/mm², from the following formula:
b) for seagoing condition:
$\sigma_{sw} = \frac{M_{sw}}{I_{y-n50}}(z - z_n) \times 10^{-3}$
c) for harbour / sheltered condition:
$\sigma_{sw-p} = \frac{M_{sw-p}}{I_{y-n50}}(z - z_n) \times 10^{-3}$
2.1.2 ~ 2.1.3 <omitted>

</td>
<td>

2. Hull girder stress
2.1 Normal stress
2.1.1 Normal stress induced by vertical still water bending moment
The normal stress induced, at any point, by vertical still water bending moments is to be obtained, in N/mm², from the following formula:
Table : Normal stress induced by vertical still water bending moment
<table>
<tr><th></th><th>At any point located below z_D</th><th>At any point located above z_D</th></tr>
<tr><td>Seagoing condition</td><td>$\sigma_{sw} = \frac{M_{sw}}{I_{y-n50}}(z - z_n) \times 10^{-3}$</td><td>$\sigma_{sw} = \frac{M_{sw}}{I_{y-n50}} V_D \times 10^{-3}$</td></tr>
<tr><td>Harbour/sheltered condition</td><td>$\sigma_{sw-p} = \frac{M_{sw-p}}{I_{y-n50}}(z - z_n) \times 10^{-3}$</td><td>$\sigma_{sw-p} = \frac{M_{sw-p}}{I_{y-n50}} V_D \times 10^{-3}$</td></tr>
</table>
2.1.2 ~ 2.1.3 <omitted>

</td>
<td>컨테이너선은 강력갑판 상부에도 종강도 부재가 있으므로 삭제</td>
</tr>
</table>

Present

2.1.4 Normal stress induced by wave torsional moment (Conventional type)

<omitted>

$$\sigma_{wt} = C_L C_A C_F C_{I\omega M} C_{JM} C_{I\omega A} C_{I\omega F} C_{JF} C_{\omega A} C_{\omega F} C_{AA} C_{AF} \frac{M_{wt\max}}{I_{\omega M}} \frac{-\omega}{\omega_{Nominal}} \sigma_{Nominal}$$

<omitted>

Table 15 : Nominal warping stress – Conventional Type

x/L	$a=0.2$	$a=0.3$	$a=0.4$	$a=0.5$	$a=0.6$	x/L	$a=0.2$	$a=0.3$	$a=0.4$	$a=0.5$	$a=0.6$
0.20	2.58	3.09	3.51	3.85	4.12	0.60	-3.76	-3.12	-2.61	-2.19	-1.87
0.21	2.33	2.84	3.26	3.60	3.87	0.61	-3.78	-3.13	-2.61	-2.18	-1.85
0.22	2.08	2.59	3.01	3.35	3.62	0.62	-3.77	-3.12	-2.59	-2.16	-1.83
0.23	1.83	2.34	2.76	3.10	3.37	0.63	-3.74	-3.08	-2.55	-2.12	-1.79
0.24	1.58	2.09	2.51	2.85	3.12	0.64	-3.70	-3.04	-2.51	-2.08	-1.74
0.25	1.33	1.84	2.26	2.60	2.87	0.65	-3.65	-2.99	-2.45	-2.02	-1.68
0.26	1.18	1.70	2.11	2.45	2.72	0.66	-3.63	-2.97	-2.43	-1.99	-1.65
0.27	0.88	1.39	1.81	2.15	2.41	0.67	-3.58	-2.91	-2.37	-1.93	-1.60
0.28	0.71	1.23	1.64	1.98	2.24	0.68	-3.51	-2.86	-2.32	-1.88	-1.54
0.29	0.39	0.90	1.31	1.65	1.91	0.69	-3.37	-2.74	-2.22	-1.78	-1.45
0.30	0.26	0.77	1.18	1.52	1.78	0.70	-3.25	-2.66	-2.14	-1.72	-1.39
0.31	-0.02	0.49	0.90	1.24	1.50	0.71	-3.03	-2.49	-2.01	-1.60	-1.28
0.32	-0.17	0.33	0.75	1.08	1.35	0.72	-2.80	-2.33	-1.88	-1.49	-1.19
0.33	-0.47	0.03	0.45	0.78	1.04	0.73	-2.39	-2.06	-1.67	-1.32	-1.05
0.34	-0.60	-0.09	0.32	0.66	0.92	0.74	-2.10	-1.86	-1.53	-1.21	-0.95
0.35	-0.86	-0.35	0.07	0.41	0.67	0.75	-1.55	-1.51	-1.27	-1.01	-0.79
0.36	-1.01	-0.49	-0.08	0.27	0.53	0.76	-1.05	-1.19	-1.05	-0.84	-0.66
0.37	-1.29	-0.77	-0.35	-0.01	0.26	0.77	-0.22	-0.66	-0.68	-0.57	-0.45
0.38	-1.40	-0.88	-0.46	-0.12	0.15	0.78	0.33	-0.30	-0.44	-0.40	-0.32
0.39	-1.63	-1.11	-0.68	-0.34	-0.07	0.79	1.26	0.32	-0.02	-0.10	-0.11
0.40	-1.76	-1.24	-0.81	-0.46	-0.19	0.80	2.04	0.85	0.34	0.15	0.08
0.41	-2.00	-1.47	-1.04	-0.69	-0.41	0.81	3.20	1.69	0.90	0.54	0.35
0.42	-2.10	-1.57	-1.13	-0.78	-0.50	0.82	3.87	2.21	1.27	0.78	0.52
0.43	-2.29	-1.76	-1.32	-0.96	-0.69	0.83	4.95	3.09	1.88	1.20	0.80
0.44	-2.40	-1.86	-1.42	-1.07	-0.79	0.84	5.74	3.78	2.39	1.54	1.03
0.45	-2.60	-2.05	-1.61	-1.25	-0.97	0.85	6.82	4.79	3.16	2.07	1.38
0.46	-2.68	-2.14	-1.69	-1.33	-1.04	0.86	6.94	5.02	3.39	2.24	1.49
0.47	-2.84	-2.29	-1.84	-1.47	-1.19	0.87	6.83	5.15	3.60	2.41	1.60
0.48	-2.93	-2.37	-1.92	-1.55	-1.27	0.88	6.56	5.08	3.65	2.47	1.64
0.49	-3.08	-2.52	-2.07	-1.69	-1.40	0.89	5.97	4.76	3.54	2.45	1.62
0.5	-3.15	-2.58	-2.12	-1.75	-1.46	0.90	5.51	4.46	3.37	2.36	1.56
0.51	-3.26	-2.69	-2.23	-1.85	-1.56	0.91	5.49	4.52	3.50	2.50	1.66
0.52	-3.33	-2.75	-2.29	-1.91	-1.61	0.92	5.78	4.83	3.79	2.75	1.83
0.53	-3.43	-2.85	-2.38	-2.00	-1.70	0.93	6.29	5.33	4.27	3.15	2.11
0.54	-3.48	-2.90	-2.42	-2.03	-1.73	0.94	6.64	5.67	4.60	3.42	2.31
0.55	-3.56	-2.96	-2.48	-2.09	-1.78	0.95	6.27	5.45	4.52	3.45	2.38
0.56	-3.60	-3.00	-2.51	-2.12	-1.81	0.96	6.27	5.45	4.52	3.45	2.38
0.57	-3.66	-3.05	-2.56	-2.16	-1.84						
0.58	-3.68	-3.07	-2.57	-2.17	-1.85						
0.59	-3.72	-3.10	-2.59	-2.18	-1.86						
0.60	-3.76	-3.12	-2.61	-2.19	-1.87						

Amendment

2.1.4 Normal stress induced by wave torsional moment (Conventional type)

<omitted>

$$\sigma_{wt} = 0.67 C_L C_A C_F C_{I\omega M} C_{JM} C_{I\omega A} C_{I\omega F} C_{JF} C_{\omega A} C_{\omega F} C_{AA} C_{AF} \frac{M_{wt\max}}{I_{\omega M}} \frac{-\omega}{\omega_{Nominal}} \sigma_{Nominal}$$

<omitted>

Table 16 : Nominal warping stress – Conventional Type

x/L	$a=0.2$	$a=0.3$	$a=0.4$	$a=0.5$	$a=0.6$
0.20	2.58	3.09	3.51	3.85	4.12
0.25	1.33	1.84	2.26	2.60	2.87
0.30	0.26	0.77	1.18	1.52	1.78
0.35	-0.86	-0.35	0.07	0.41	0.67
0.40	-1.76	-1.24	-0.81	-0.46	-0.19
0.45	-2.60	-2.05	-1.61	-1.25	-0.97
0.5	-3.15	-2.58	-2.12	-1.75	-1.46
0.55	-3.56	-2.96	-2.48	-2.09	-1.78
0.60	-3.76	-3.12	-2.61	-2.19	-1.87
0.65	-3.65	-2.99	-2.45	-2.02	-1.68
0.70	-3.25	-2.66	-2.14	-1.72	-1.39
0.75	-1.55	-1.51	-1.27	-1.01	-0.79
0.80	2.04	0.85	0.34	0.15	0.08
0.85	6.82	4.79	3.16	2.07	1.38
0.90	5.51	4.46	3.37	2.36	1.56
0.95	6.27	5.45	4.52	3.45	2.38
0.97	6.27	5.45	4.52	3.45	2.38

Reason

와핑응력 계산식 수정

공칭와핑응력 표 간소화

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>2.1.5 Normal stress induced by wave torsional moment (2-Island type : Aft Part)
<omitted>
$\sigma_{wt} = C_{I\omega M} C_{JM} C_{I\omega A1} C_{\omega A1} C_{\omega F1} C_{AA1} C_{AF1} \frac{M_{wt\max}}{I_{\omega M}} \frac{-\omega}{\omega_{Nominal}} \sigma_{Nominal}$
<omitted></td><td>2.1.5 Normal stress induced by wave torsional moment (2-Island type : Aft Part)
<omitted>
$\sigma_{wt} = 0.67 C_{I\omega M} C_{JM} C_{I\omega A1} C_{\omega A1} C_{\omega F1} C_{AA1} C_{AF1} \frac{M_{wt\max}}{I_{\omega M}} \frac{-\omega}{\omega_{Nominal}} \sigma_{Nominal}$
<omitted></td><td>와핑응력 계산식 수정</td></tr>
<tr><td>J_N : Nominal St. Venant's moment of inertia as defined in Table 16.
<Newly added></td><td>J_N : Nominal St. Venant's moment of inertia as defined in Table 16.
ω : Warping function of the point being considered, in m^2.</td><td>와핑함수 추가</td></tr>
<tr><td>ω_{A1} : Warping function at the inboard edge (port side) of the strength deck plating, clear of the hatch corner x_{A1}, in m^2.
<omitted></td><td>ω_{A1} : Warping function at the inboard edge (port side) of the strength deck plating, clear of the hatch corner x_{A1}, in m^2.
<omitted></td><td></td></tr>
<tr><td>Table 19 : Correction factor for sectorial moment of inertia at x_A - $C_{I\omega A1}$
<table><tr><td></td><td>x_{A1}</td><td>$0.45L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>Table 20 : Correction factor for sectorial moment of inertia at x_{A1} - $C_{I\omega A1}$
<table><tr><td></td><td>x_{A1}</td><td>$0.45L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>오기수정</td></tr>
<tr><td>Table 20 : Correction factor for warping function at x_A - $C_{\omega A1}$
<table><tr><td></td><td>x_{A1}</td><td>$0.45L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>Table 21 : Correction factor for warping function at x_{A1} - $C_{\omega A1}$
<table><tr><td></td><td>x_{A1}</td><td>$0.45L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>오기수정</td></tr>
<tr><td>Table 21 : Correction factor for warping function at x_F - $C_{\omega F1}$
<table><tr><td></td><td>x_{A1}</td><td>$0.55L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>Table 22 : Correction factor for warping function at x_{F1} - $C_{\omega F1}$
<table><tr><td></td><td>x_{A1}</td><td>$0.55L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>오기수정</td></tr>
<tr><td>Table 22 : Correction factor for cross section area at x_A - C_{AA1}
<table><tr><td></td><td>x_{A1}</td><td>$0.35L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>Table 23 : Correction factor for cross section area at x_{A1} - C_{AA1}
<table><tr><td></td><td>x_{A1}</td><td>$0.35L$</td><td>x_{F1}</td></tr><tr><td colspan="4"><omitted></td></tr></table></td><td>오기수정</td></tr>
</table>

Present	Amendment	Reason
Table 23 : Correction factor for cross section area at x_F - C_{AF1}	**Table 24 : Correction factor for cross section area at x_{F1} - C_{AF1}**	오기수정

Present:

	x_{A1}	$0.55L$	x_{F1}
<omitted>			

Amendment:

	x_{A1}	$0.55L$	x_{F1}
<omitted>			

Present — Table 24 : Nominal warping function, $\omega_{Nominal}$

x	$\omega_{Nominal}$
x_A	240
$0.35L \sim 0.6L$	300
x_F	294 ($x_{F1} = 0.58L$), 279 ($x_{F1} = 0.63L$), 264 ($x_{F1} = 0.68L$)

Amendment — Table 100 : Nominal warping function, $\omega_{Nominal}$

	x_{A1}	$0.35L$	$0.55L$	$0.7L$
$\omega_{Nominal}$	240	300	300	255

Reason: 공칭와핑함수 수정

Present — Table 25 : Correction factor for cross section area at x_{F1} - C_{xF1}

	$x_{F1} \le 0.63L$	$x_{F1} > 0.63L$
〈omitted〉		

Amendment — Table 26 : Correction factor for x_{F1} - C_{xF1}

	$x_{F1} \le 0.63L$	$x_{F1} > 0.63L$
〈omitted〉		

Reason: 오기수정

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td>

2.1.6 Normal stress induced by wave torsional moment (2-Island type : FWD Part)

<omitted>

$\sigma_{wt} = C_{I\omega M} C_{I\omega A2} C_{I\omega F2} C_{JA2} C_{JF2} C_{\omega F2} C_{AF2} \frac{M_{wt\max}}{I_{\omega M}} \frac{-\omega}{\omega_{Nominal}} \sigma_{Nominal}$

<omitted>

</td><td>

2.1.6 Normal stress induced by wave torsional moment (2-Island type : FWD Part)

<omitted>

$\sigma_{wt} = 0.67 C_{I\omega M} C_{I\omega A2} C_{I\omega F2} C_{JA2} C_{JF2} C_{\omega F2} C_{AF2} \frac{M_{wt\max}}{I_{\omega M}} \frac{-\omega}{\omega_{Nominal}} \sigma_{Nominal}$

<omitted>

</td><td>와핑응력 계산식 수정
누락된 0.67 추가</td></tr>
<tr><td>

C_{xA2} : Correction factor for x_{A2} as defined in **Table 36**.

$\sigma_{0.67}$: Nominal stress coefficient as defined in **Table 37**.

Note 1 : For intermediate value of x, correction factors, nominal stress and section property are to be obtained by linear interpolation.

<omitted>

</td><td>

C_{xA2} : Correction factor for x_{A2} as defined in **Table 36**.

σ_{FWD} : Nominal stress coefficient as defined in **Table 37**.

Note 1 : For intermediate value of x, correction factors, nominal stress and section property are to be obtained by linear interpolation.

<omitted>

</td><td>오기수정</td></tr>
<tr><td>

Table 29 : Correction factor for St. Venant's moment of inertia amidships - C_{JA2}

<table><tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>

Table 30 : Correction factor for St. Venant's moment of inertia at x_{A2} - C_{JA2}

<table><tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>오기수정</td></tr>
<tr><td>

Table 30 : Correction factor for sectorial moment of inertia at x_A - $C_{I\omega A2}$

<table><tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>

Table 31 : Correction factor for sectorial moment of inertia at x_{A2} - $C_{I\omega A2}$

<table><tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>오기수정</td></tr>
<tr><td>

Table 31 : Correction factor for St. Venant's moment of inertia amidships - J_{F2}

<table><tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>

Table 32 : Correction factor for St. Venant's moment of inertia at x_{F2} - C_{JF2}

<table><tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>오기수정</td></tr>
<tr><td>

Table 32 : Correction factor for sectorial moment of inertia at x_F - $C_{I\omega F2}$

<table><tr><td></td><td>x_{A2}</td><td>$0.9L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>

Table 33 : Correction factor for sectorial moment of inertia at x_{F2} - $C_{I\omega F2}$

<table><tr><td></td><td>x_{A2}</td><td>$0.9L$</td><td>x_{F2}</td></tr><tr><td colspan="4"><omitted></td></tr></table>

</td><td>오기수정</td></tr>
</table>

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr>
<td>

Table 33 : Correction factor for warping function at $\underline{x_F}$ - $C_{\omega F2}$

<table>
<tr><td></td><td>$x_{A2} \sim 0.75L$</td><td>$0.9L$</td><td>x_{F2}</td></tr>
<tr><td colspan="4"><omitted></td></tr>
</table>

</td>
<td>

Table 34 : Correction factor for warping function at $\underline{x_{F2}}$ - $C_{\omega F2}$

<table>
<tr><td></td><td>$x_{A2} \sim 0.75L$</td><td>$0.9L$</td><td>x_{F2}</td></tr>
<tr><td colspan="4"><omitted></td></tr>
</table>

</td>
<td>오기수정</td>
</tr>
<tr>
<td>

Table 34 : Correction factor for cross section area at $\underline{x_F}$ - C_{AF2}

<table>
<tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr>
<tr><td colspan="4"><omitted></td></tr>
</table>

</td>
<td>

Table 35 : Correction factor for cross section area at $\underline{x_{F2}}$ - C_{AF2}

<table>
<tr><td></td><td>x_{A2}</td><td>$0.75L$</td><td>x_{F2}</td></tr>
<tr><td colspan="4"><omitted></td></tr>
</table>

</td>
<td>오기수정</td>
</tr>
<tr><td><omitted></td><td><omitted></td><td></td></tr>
<tr>
<td>

Table 36 : Correction factor for cross section area at $\underline{x_{F1}}$ - C_{xA2}

<table>
<tr><td></td><td>$x_{A2} \leq 0.67L$</td><td>$x_{A2} > 0.67L$</td></tr>
<tr><td colspan="3"><omitted></td></tr>
</table>

</td>
<td>

Table 37 : Correction factor for cross section area at $\underline{x_{A2}}$ - C_{xA2}

<table>
<tr><td></td><td>$x_{A2} \leq 0.67L$</td><td>$x_{A2} > 0.67L$</td></tr>
<tr><td colspan="3"><omitted></td></tr>
</table>

</td>
<td>오기수정</td>
</tr>
</table>

Present	Amendment	Reason

Present

3.3 <omitted>

3.4 Hull girder bending assessment

3.4.1 General acceptance criteria

The normal stress, σ_{hg} is to be assessed for all conditions, along the full length of the hull girder, from AE to FE. The normal stress, σ_{hg}, at any point of the hull transverse section is to comply with the following formula:

$\sigma_{hg} \le \sigma_{perm}$

$\sigma_{hg} = \sigma_{sw} + C_{wv}\sigma_{wv} + C_{wh}\sigma_{wh} + C$

~~C_{sw},~~ C_{wv}, C_{wh} : Load combination factors, as given in **Ch 4, Sec 2, [2.2.1]**

C : 1.0 (OST-1P, OST-2S), -1.0 (OST-2P, OST-1S), -0.6 (OSA-1P, OSA-2S), 0.6 (OSA-2P, OSA-1S)

<omitted>

Table 38 : Permissible longitudinal stress

Operation	Design load	Permissible hull girder bending stress, σ_{perm}
Seagoing	(S+D)	$190/k$
Harbour/sheltered water	(S)	$143/k$

Amendment

3.3 <same as the present Rule>

3.4 Hull girder bending assessment

3.4.1 General acceptance criteria

The normal stress, σ_{hg} is to be assessed for all conditions, along the full length of the hull girder, from AE to FE. The normal stress, σ_{hg}, at any point of the hull transverse section is to comply with the following formula:

$\sigma_{hg} \le \sigma_{perm}$

$\sigma_{hg} = \sigma_{sw} + C_{wv}\sigma_{wv} + C_{wh}\sigma_{wh} + C$

C_{wv}, C_{wh} : Load combination factors, as given in **Ch 4, Sec 2, [2.2.1]**

C : Warping stress combination factors, to be taken as:

- C for HSM, HSA, FSM, BSR, BSP load cases
- C for OST-1P, OST-2S load cases
- C for OST-2P, OST-1S load cases
- C for OSA-1P, OSA-2S load cases
- C for OSA-2P, OSA-1S load cases

<omitted>

Table 39: Permissible hull girder bending stress

Operation	Design load	Permissible hull girder bending stress, σ_{perm}
Seagoing	(S+D)	$\frac{235}{1.24k}$
Harbour/sheltered water	(S)	$143/k$

Reason

응력조합계수 수정

UR S11A와 같이 수정

Present	Amendment	Reason

Present

3.5 Extent of high tensile steel

3.5.1 Vertical extent

The vertical extent of higher strength steel, $z_{hts,i}$, in m, used in the deck zone or bottom zone and measured respectively from the moulded deck line at side or baseline is not to be taken less the value obtained from the following formula, see **Figure 8**:

$$z_{hts,i} = z_1\left(\frac{1-\sigma_{perm,i}}{\sigma_{hg}}\right)$$

<Newly added>

where:

z_1 : Distance from horizontal neutral axis to moulded deck line or baseline respectively, in m.

$\sigma_{perm,i}$: Permissible hull girder bending stress of the considered steel, in N/mm^2, as given in **Table 38 and Figure 8**.

σ_{hg} : Hull girder bending stress, σ_{dk} at moulded deck line or σ_{bl} at baseline respectively, in N/mm^2 given in **Table 39**.

Table 122 : Hull girder stresses at baseline and moulded deck line

Operation	At baseline	At moulded deck line
Seagoing	$\sigma_{bl} = \frac{\lvert M_{sw}+M_{wv}\rvert}{I_{y-n50}} z_n \times 10^{-3}$	$\sigma_{dk} = \frac{\lvert M_{sw}+M_{wv}\rvert}{I_{y-n50}}(z_{dk-s}-z_n)\times$
Harbour/sheltered water	$\sigma_{bl} = \frac{\lvert M_{sw-p}\rvert}{I_{y-n50}} z_n \times 10^{-3}$	$\sigma_{dk} = \frac{\lvert M_{sw-p}\rvert}{I_{y-n50}}(z_{dk-s}-z_n)\times 10$
<Newly added>	<Newly added>	<Newly added>

z_{dk-s} : Distance from baseline to moulded deck line at side, in m..

<Newly added>

Amendment

3.5 Extent of high tensile steel

3.5.1 Vertical extent

The vertical extent of higher strength steel, $z_{hts,i}$, in m, used in the deck zone or bottom zone and measured respectively from the moulded deck line at side or baseline is not to be taken less the value obtained from the following formula, see **Figure 9**:

$$z_{hts,i} = z_1\left(1-\frac{\sigma_{perm,i}}{\sigma_L}\right)$$ for structural members located below strength deck

$$z_{hts,i} = \frac{(\sigma_{perm,i}-\sigma_{dk})}{(\sigma_{VD}-\sigma_{dk})}(z_T - z_{dk})$$ for effective longitudinal members

where:

z_1 : Distance from horizontal neutral axis to moulded deck line or baseline respectively, in m.

$\sigma_{perm,i}$: Permissible hull girder bending stress of the considered steel, in N/mm^2, as given in **Table 39 and Figure 8**.

σ_L : Hull girder bending stress, σ_{dk} at moulded deck line or σ_{bl} at baseline respectively, in N/mm^2 given in **Table 40**.

σ_{VD} : Hull girder bending stress at equivalent deck line, in N/mm^2 given in **Table 40**.

Table 123 : Hull girder stresses at baseline and moulded deck line

Operation	Seagoing	Harbour/sheltered water
At baseline	$\sigma_{bl} = \frac{\lvert M_{sw}+M_{wv}\rvert}{I_{y-n50}} z_n \times 10^{-3}$	$\sigma_{bl} = \frac{\lvert M_{sw-p}\rvert}{I_{y-n50}} z_n \times 10^{-3}$
At moulded deck line	$\sigma_{dk} = \frac{\lvert M_{sw}+M_{wv}\rvert}{I_{y-n50}}(z_{dk-s}-z_n)\times 10^{-3}$	$\sigma_{dk} = \frac{\lvert M_{sw-p}\rvert}{I_{y-n50}}(z_{dk-s}-z_n)\times$
At equivalent deck line	$\sigma_{bl} = \frac{\lvert M_{sw}+M_{wv}\rvert}{I_{y-n50}} V_D \times 10^{-3}$	$\sigma_{bl} = \frac{\lvert M_{sw-p}\rvert}{I_{y-n50}} z_n \times 10^{-3}$

z_{dk-s} : Distance from baseline to moulded deck line at side, in m.

V_D : Vertical distance of the equivalent deck line, in m, defined in **[1.4.3]**

Reason

강력갑판 상부와 하부를 구분하여 고장력강 범위 수정

강력갑판상부 응력 추가

강력갑판상부 응력 추가

Present	Amendment	Reason
Section 2 Hull girder ultimate strength ~~**Symbols**~~ ~~For symbols not defined in this section, refer to **Ch 1, Sec 4**~~ ~~M_{sw-h}, M_{sw-s} : Permissible hogging and sagging vertical still water bending moment in intact seagoing condition, in kNm, at the hull transverse section considered, defined in **Ch 4, Sec 4, [2.2.2]**.~~ ~~M_{sw-p-h}, M_{sw-p-s} : Permissible hogging and sagging vertical still water bending moment for harbour/sheltered water operation, in kNm, at the hull transverse section considered, as defined in **Ch 4, Sec 4, [2.2.3]**.~~ ~~M_{sw-f} : Permissible hogging and sagging vertical still water bending moment in flooded condition at sea, in kNm, at the hull transverse section considered, as defined in **Ch 4, Sec 4, [2.2.4]**.~~ **1. <omitted>** **2. Checking criteria** **2.1 ~ 2.2 <omitted>** **2.3 Hull girder ultimate bending moment capacity** **2.3.1 <omitted>**	**Section 2 Hull girder ultimate strength** **1. <same as the present Rule>** **2. Checking criteria** **2.1 ~ 2.2 <same as the present Rule>** **2.3 Hull girder ultimate bending moment capacity** **2.3.1 <same as the present Rule>**	 불필요한 계수 삭제

Present	Amendment	Reason
2.3.2 Determination of hull girder ultimate bending moment capacity The ultimate bending moment capacities of a hull girder transverse section, in hogging and sagging conditions, are defined as the maximum values of the curve of bending moment <u>M</u> versus the curvature χ of the transverse section considered (M_{UH} for hogging condition and M_{US} for sagging condition, see **Figure 1**). The curvature χ is positive for hogging condition and negative for sagging condition. The hull girder ultimate bending moment capacity M_U is to be calculated according to **App 2**. **2.3.3 <omitted>** **2.4 <omitted>**	**2.3.2 Determination of hull girder ultimate bending moment capacity** The ultimate bending moment capacities of a hull girder transverse section, in hogging and sagging conditions, are defined as the maximum values of the curve of bending moment <u>M_U</u> versus the curvature χ of the transverse section considered (M_{UH} for hogging condition and M_{US} for sagging condition, see **Figure 1**). The curvature χ is positive for hogging condition and negative for sagging condition. The hull girder ultimate bending moment capacity M_U is to be calculated according to **App 2**. **2.3.3 <same as the present Rule>** **2.4 <same as the present Rule>**	오기 수정

Present	Amendment	Reason
Appendix 2 Hull Girder Ultimate Bending Capacity **1. <omitted>** **2. Incremental-iterative method** **2.1 <omitted>** **2.2 Procedure** **2.2.1 <omitted>** **2.2.2 Modelling of the hull girder cross-section** <omitted> a) Hard corner element Hard corner elements are sturdier elements composing the hull girder transverse section, which collapse mainly according to an elasto-plastic mode of failure (material yielding); they are generally constituted by two plates not lying in the same plane. The extent of a hard corner element from the point of intersection of the plates is taken equal to (see **Figure 2**): • 20 t_{n-50} on a transversely stiffened panel, and • 0.5 s on a longitudinally stiffened panel, where: t_{n-50} : Net offered thickness of the plate, in mm s : Spacing of the adjacent longitudinal stiffener, in m. Bilge, sheer strake-deck stringer elements, girder-deck connections and face plate-web connections on large girders are typical hard corners. ~~Enlarged stiffeners, with or without web stiffening, used for Permanent Means of Access (PMA) are not to be considered as a large girder, so the attached plate/web connection is only considered as a hard corner, see **Figure 3**.~~	**Appendix 2 Hull Girder Ultimate Bending Capacity** **1. <same as the present Rule>** **2. Incremental-iterative method** **2.1 <same as the present Rule>** **2.2 Procedure** **2.2.1 <same as the present Rule>** **2.2.2 Modelling of the hull girder cross-section** <omitted> a) Hard corner element Hard corner elements are sturdier elements composing the hull girder transverse section, which collapse mainly according to an elasto-plastic mode of failure (material yielding); they are generally constituted by two plates not lying in the same plane. The extent of a hard corner element from the point of intersection of the plates is taken equal to 20 t_{n-50} on a transversely stiffened panel and to 0.5 s on a longitudinally stiffened panel, see **Figure 2**. where: t_{n-50} : Net offered thickness of the plate, in mm s : Spacing of the adjacent longitudinal stiffener, in m. Bilge, sheer strake-deck stringer elements, girder-deck connections and face plate-web connections on large girders are typical hard corners.	UR S11A와 같게 수정 PMA 관련 조항 삭제

Present	Amendment	Reason
3. Alternative methods **3.1 General** **3.1.1** <Newly added> The bending moment-curvature relationship M-χ may be established by alternative methods. Such models are to consider all the relevant effects important to the non-linear response, with due consideration to: <omitted>	**3. Alternative methods** **3.1 General** **3.1.1** Application of alternative methods is to be agreed by the Society prior to commencement. Documentation of the analysis methodology and detailed comparison of its results are to be submitted for review and acceptance. The use of such methods may require the partial safety factors to be recalibrated. **3.1.2** The bending moment-curvature relationship M-χ may be established by alternative methods. Such models are to consider all the relevant effects important to the non-linear response, with due consideration to: <omitted>	대안 방법에 대한 선급의 승인요건 추가

Present	Amendment	Reason
Chapter 6 Hull Local Scantling **Section 1 <omitted>** **Section 2 Load Application** **1. <omitted>** **2. Design load sets** **2.1 Application of load components** **2.1.1 ~ 2.1.3 <omitted>**	**Chapter 6 Hull Local Scantling** **Section 1 <same as the present Rule>** **Section 2 Load Application** **1. <same as the present Rule>** **2. Design load sets** **2.1 Application of load components** **2.1.1 ~ 2.1.3 <same as the present Rule>**	

Present – Table 1 : Design load sets

Item	Design load set	Load component	Draught	Design load	Loading condition
<omitted>					
Tanks other than water ballast tank	TK-3	$P_{in} - P_{ex}$ (1)	$0.25\,T_{SC}$	A	Test condition
Cargo hold region only	FD-1(2)	P_{in}	-	A	Flooded condition

Notes:
(1) P_{ex} is to be considered for external shell only.
(2) FD-1 is not applicable to external shell.

<omitted>

Amendment – Table 1 : Design load sets

Structural member	Design load set	Load component	Draught	Design load	Loading condition
<omitted>					
Tanks other than water ballast tank	TK-3	$P_{in} - P_{ex}$ (1)	$0.25\,T_{SC}$	A	Test condition
Watertight boundaries	FD-1(2)	P_{in}	-	A	Flooded condition
~~All longitudinal members(3)~~	~~SEA-1~~	~~-~~	~~-~~	~~S+D~~	~~Full load condition~~

Notes:
(1) P_{ex} is to be considered for external shell only.
(2) FD-1 is not applicable to external shell.
~~(3) For buckling strength assessment only.~~

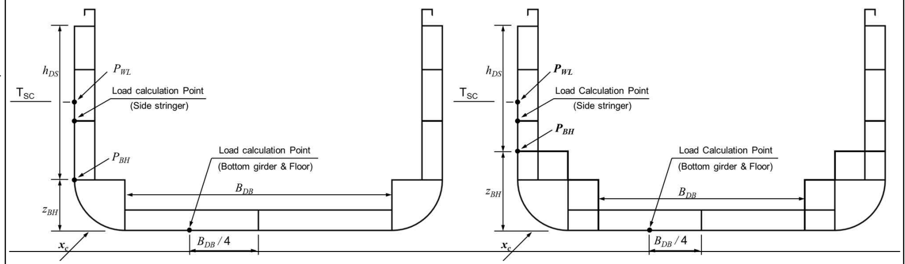
<omitted>

Reason:

UR s11A 내용 반영
-전 구조 부재에 대해 평가

SeaTrust-HullScan에 기본 설계하중조합으로 추가하는 것으로 결정함.

Present	Amendment	Reason
Section 3 <omitted> **Section 4 Plating** **Symbols** <omitted> χ : Coefficient taken equal to: a) In intact condition • $\chi = 1.00$ b) In flooded condition • $\chi = 0.95$ for collision bulkheads for acceptance criteria set AC-A <omitted>	**Section 3 <same as the present Rule>** **Section 4 Plating** **Symbols** <omitted> χ : Coefficient taken equal to: a) In intact condition • $\chi = 1.00$ b) In flooded condition • $\chi = 0.95$ for collision bulkheads for acceptance criteria set AC-A • $\chi = 1.15$ for other watertight boundaries of compartments <omitted>	누락 내용 추가

Present	Amendment	Reason
Section 6 Primary Support members and Pillars	**Section 6 Primary Support members and Pillars**	
Symbols For symbols not defined in this section, refer to **Ch 1, Sec 4**. l_{bdg} : <omitted> l_{shr} : <omitted> ~~χ : Coefficient taken equal to:~~ ~~• In intact condition: $\chi = 1.0$~~ ~~• In flooded condition: χ as defined in **Ch 6, Sec 4** for flooded condition.~~ ℓ_h : <omitted> B_{DB} : Breadth of inner bottom, in m, defined in **Ch 3, Sec 6, [7.1.3]** <omitted>	**Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**. l_{bdg} : <same as the present Rule> l_{shr} : <same as the present Rule> ℓ_h : <same as the present Rule> B_{DB} : Breadth of inner bottom, within hold under consideration, in m, as shown in **Figure 2**. <omitted>  **Figure 20 : Load calculation point for design pressure**	컨테이너선의 경우 침수시 1차 지지부재의 강도계산이 필요없으므로 계수 χ 삭제 이중저의 폭에 대하여 명확하게 정의함
1. <omitted>	**1. <omitted>**	
2. Primary support members within cargo hold region **2.1 <omitted>** **2.2 Cargo hold region of container ship having a length *L* less than 150 m and outside midship cargo hold region of container ship having a length *L* of 150 m and above** **2.2.1 ~ 2.2.3 <omitted>**	**2. Primary support members within cargo hold region** **2.1 <same as the present Rule>** **2.2 Cargo hold region of container ship having a length *L* less than 150 m and outside midship cargo hold region of container ship having a length *L* of 150 m and above** **2.2.1 ~ 2.2.3 <same as the present Rule>**	

Present

2.2.4 Design load sets

<omitted>

Table 1 : Design load sets for primary supporting members in cargo hold region

Item	Design load set	Load component	Draught	Design load	Loading condition	Dynamic load cases
Bottom girders & Floors	SEA-1	P_{ex}	T_{SC}	S+D	Full load condition	HSM-2, HSA-2, FSM-2
Stringers & Transverse webs	SEA-1	P_{ex}	T_{SC}	S+D	Full load condition	BSR-1P, BSP-1S

2.2.5 Centre girders and side girders

<omitted>

C_{t-pr1} : Permissible shear stress coefficient for primary supporting members taken equal to:

$C_{t-pr1} = 0.92$

<omitted>

2.2.6 Floors

<omitted>

P : <omitted>

S_{gir} : Distance between the centres of the two spaces adjacent to the centre or side girder under consideration, in m.

~~n_{floor} : Number of floors between double bottom structure.~~

d_0 : Depth of the solid floor at the point of under consideration, in m.

<omitted>

C_{t-pr2} : Permissible shear stress coefficient for primary supporting members taken equal to:

$C_{t-pr2} = 0.97$

Amendment

2.2.4 Design load sets

<omitted>

Table 1 : Design load sets for primary supporting members in cargo hold region

Item	Design load set	Load component	Draught	Design load	Loading condition	Dynamic load cases
Bottom girders & Floors	SEA-1	P_{ex}	T_{SC}	S+D	Full load condition	HSM, HSA, FSM OST, OSA
Stringers & Transverse webs	SEA-1	P_{ex}	T_{SC}	S+D	Full load condition	BSR, BSP, OST, OSA

2.2.5 Centre girders and side girders

<same as the present Rule>

C_{t-pr1} : Permissible shear stress coefficient for centre girders and side girders taken equal to:

$C_{t-pr1} = 0.92$

<same as the present Rule>

2.2.6 Floors

<same as the present Rule>

P : <omitted>

S_{floor} : Spacing of solid floors, in m.

d_0 : Depth of the solid floor at the point of under consideration, in m.

<same as the present Rule>

C_{t-pr2} : Permissible shear stress coefficient for floors taken equal to:

$C_{t-pr2} = 0.97$

Reason

동하중 조건 수정
고려하는 하중조건 1, 2 모두 고려하며, OST, OSA 하중조건 추가함

부재명칭 표기

오기 수정

불필요한 계수 삭제

부재명칭 표기

Present	Amendment	Reason
2.2.7 Stringer of double side structure	**2.2.7 Stringer of double side structure**	
<omitted>	<same as the present Rule>	
C_{t-pr3} : Permissible shear stress coefficient for primary supporting members taken equal to: $C_{t-pr3} = 0.92$	C_{t-pr3} : Permissible shear stress coefficient for stringer of double side structure taken equal to: $C_{t-pr3} = 0.92$	부재명칭 표기
a : Depth of stringers at the point under consideration, in m. However, where horizontal stiffeners are fitted on the stringer, a is the distance from the horizontal stiffener under consideration to the side shell plating or the longitudinal bulkhead of double side structure or the distance between the horizontal stiffeners under consideration.	a : Depth of stringers at the point under consideration, in m. However, where longitudinal stiffeners are fitted on the stringer, a is the distance from the horizontal stiffener under consideration to the side shell plating or the longitudinal bulkhead of double side structure or the distance between the horizontal stiffeners under consideration.	오기 수정
S_1 : <omitted>	S_1 : <omitted>	
C_3' : <omitted>	C_3' : <omitted>	
H : Value obtained from the following formulae: • Where the girder is provided with an unreinforced opening:	H : Value obtained from the following formulae: • Where the stringer is provided with an unreinforced opening:	오기수정
<omitted>	<same as the present Rule>	
2.2.8 Transverse web in double side structure	**2.2.8 Transverse web in double side structure**	
<omitted>	<omitted>	
S_{floor} : Breadth of part supported by transverses, in m.	S_{trans} : Breadth of part supported by transverses, in m.	오기 수정
<omitted>	<omitted>	
C_{t-pr4} : Permissible shear stress coefficient for primary supporting members taken equal to: $C_{t-pr4} = 0.97$	C_{t-pr4} : Permissible shear stress coefficient for transverse web in double side structure taken equal to: $C_{t-pr4} = 0.97$	부재명칭 표기
<omitted>	<omitted>	
H : Value obtained from the following formulae: • Where the girder is provided with an unreinforced opening: $H = 1 + 0.5\frac{\phi}{\alpha}$	H : Value obtained from the following formulae: • Where the transverse web is provided with an unreinforced opening: $H = 1 + 0.5\frac{\phi}{\alpha}$	오기수정
<omitted>	<omitted>	

Present	Amendment	Reason
3. Primary supporting members outside cargo hold region **3.1 <omitted>**	**3. Primary supporting members outside cargo hold region** **3.1 <omitted>**	
3.2 Scantling requirements **3.2.1 Net section modulus** <omitted> $Z_{n50} = 1000 \frac{\|P\| S l_{bdg}^2}{\chi f_{bdg} C_s R_{eH}}$ <omitted>	**3.2 Scantling requirements** **3.2.1 Net section modulus** <omitted> $Z_{n50} = 1000 \frac{\|P\| S l_{bdg}^2}{f_{bdg} C_s R_{eH}}$ <omitted>	계수 χ 삭제에 따른 식 변경
3.2.2 Net shear area <omitted> $A_{shr-n50} = 10 \frac{f_{shr} \|P\| S l_{shr}}{\chi C_t \tau_{eH}}$ <omitted>	**3.2.2 Net shear area** <omitted> $A_{shr-n50} = 10 \frac{f_{shr} \|P\| S l_{shr}}{C_t \tau_{eH}}$ <omitted>	계수 χ 삭제에 따른 식 변경
3.3 Advanced calculation methods **3.3.1 <omitted>** **3.3.2 Analysis criteria** The calculated stresses are to comply with the following criteria where the coefficients C_t and C_s, are defined in **[3.2]**: • <u>$\sigma \le \chi C_s R_{eH}$</u> • <u>$\tau \le \chi C_t \tau_{eH}$</u> where: τ : Shear stress in member, in N/mm^2, based on t_{n50}. σ : Normal stress in member, in N/mm^2, based on t_{n50}.	**3.3 Advanced calculation methods** **3.3.1 <omitted>** **3.3.2 Analysis criteria** The calculated stresses are to comply with the following criteria where the coefficients C_t and C_s, are defined in **[3.2]**: • <u>$\sigma \le C_s R_{eH}$</u> • <u>$\tau \le C_t \tau_{eH}$</u> where: τ : Shear stress in member, in N/mm^2, based on t_{n50}. σ : Normal stress in member, in N/mm^2, based on t_{n50}.	계수 χ 삭제에 따른 식 변경
4. <omitted>	**4. <omitted>**	

Present	Amendment	Reason
Chapter 7 Direct Strength Analysis **Section 1 <Omitted>** **Section 2 Cargo Hold Structural Strength Analysis** **1 Objective and scope** **1.1 <Omitted>** **1.2 Cargo hold structural strength analysis procedure** **1.2.1 ~ 1.2.2 <Omitted>** **1.2.3 General acceptance criteria** The scantling assessment is carried out according to Ch 7, Sec 1 for each individual cargo hold using the FE load combinations defined in Ch 4, Sec 8 applicable to the considered cargo hold. The FE analysis results are applicable to the evaluation area as defined in [5.1.1], of the considered cargo hold. ~~The individual transverse bulkhead structural elements, inclusive plating, stiffeners and horizontal stringers, are to be assessed considering two cargo hold finite element analyses, i.e. the analysis for the hold forward and the one for the hold aft of the considered transverse bulkhead.~~	**Chapter 7 Direct Strength Analysis** **Section 1 <Same as the present Rule>** **Section 2 Cargo Hold Structural Strength Analysis** **1 Objective and scope** **1.1 <Same as the present Rule>** **1.2 Cargo hold structural strength analysis procedure** **1.2.1 ~ 1.2.2 <Same as the present Rule>** **1.2.3 General acceptance criteria** The scantling assessment is carried out according to Ch 7, Sec 1 for each individual cargo hold using the FE load combinations defined in Ch 4, Sec 8 applicable to the considered cargo hold. The FE analysis results are applicable to the evaluation area as defined in [5.1.1], of the considered cargo hold.	- 컨테이너선에 해당되지 않아 삭제

Present	Amendment	Reason

2 Structural model

2.1 ~ 2.3 <Omitted>

2.4 Structural modelling

2.4.1 ~ 2.4.7 <Omitted>

2.4.8 Openings

<Omitted>

Table 140 : Representation of openings in primary supporting member webs

Criteria	Modelling decision	Analysis
$h_o/h < 0.5$ and $g_o < 2.0$	Openings do not need to be modelled	~~To be evaluated by the screening procedure as given in~~ **Ch 7, Sec 3, [3.1.1]**
Manholes	The geometry of the opening is to be modelled by removing the adequate elements	~~To be evaluated by the screening procedure as given in~~ **Ch 7, Sec 3, [3.1.1]**
$h_o/h \geq 0.5$ or $g_o \geq 2.0$	The geometry of the opening is to be modelled	To be evaluated by fine mesh as given in **Ch 7, Sec 3, [2.1.1]**

where:

$$g_0 = \left(1 + \frac{\ell_0^2}{2.6(h-h_0)^2}\right)$$

ℓ_o : Length of opening parallel to primary supporting member web direction, in m, see Figure 8. For sequential openings where the distance, d_o between openings is less than 0.25 h, the length ℓ_o is to be taken as the length across openings as shown in **Figure 9**.

h_o : Height of opening parallel to depth of web, in m, see **Figure 8** and **Figure 9**.

h : Height of web of primary supporting member in way of opening, in m, see **Figure 8** and **Figure 9**.

2.5 <Omitted>

3 <Omitted>

Present	Amendment	Reason
	(see below)	- 심사기준이 삭제되어 참조 수정

2 Structural model

2.1 ~ 2.3 <Same as the present Rule>

2.4 Structural modelling

2.4.1 ~ 2.4.7 <Same as the present Rule>

2.4.8 Openings

<Omitted>

Table 1 : Representation of openings in primary supporting member webs

Criteria	Modelling decision	Analysis
$h_o/h < 0.5$ and $g_o < 2.0$	Openings do not need to be modelled	To be evaluated by fine mesh as given in **Ch 7, Sec 3, [1.2]**
Manholes	The geometry of the opening is to be modelled by removing the adequate elements	
$h_o/h \geq 0.5$ or $g_o \geq 2.0$	The geometry of the opening is to be modelled	

where:

$$g_0 = \left(1 + \frac{\ell_0^2}{2.6(h - h_0)^2}\right)$$

ℓ_o : Length of opening parallel to primary supporting member web direction, in m, see **Figure 8**.
For sequential openings where the distance, d_o between openings is less than $0.25h$, the length ℓ_o is to be taken as the length across openings as shown in **Figure 9.**

h_o : Height of opening parallel to depth of web, in m, see **Figure 8** and **Figure 9**.

h : Height of web of primary supporting member in way of opening, in m, see **Figure 8** and **Figure 9**.

2.5 <Same as the present Rule>

3 <Same as the present Rule>

Reason: - 심사기준이 삭제되어 참조 수정

Present	Amendment	Reason
4 Load application **4.1 ~ 4.2 <Omitted>** **4.3 Hull girder loads** **4.3.1 ~ 4.3.4 <Omitted>** **4.3.5 Target hull girder torsional moment** For dynamic load cases, hull girder torsional moment $M_{wt-targ}$, at middle of mid-hold is to be adjusted to zero. **4.4 ~ 4.6 <Omitted>**	**4 Load application** **4.1 ~ 4.2 <Same as the present Rule>** **4.3 Hull girder loads** **4.3.1 ~ 4.3.4 <Same as the present Rule>** **4.3.5 Target hull girder torsional moment** For dynamic load cases, hull girder torsional moment $M_{wt-targ}$, at the middle of the mid-hold is to be adjusted to zero. **4.4 ~ 4.6 <Same as the present Rule>**	- 오기 수정

Present	Amendment	Reason
5 Analysis criteria **5.1 <Omitted>** **5.2 Structural modelling** **5.2.1 ~ 5.2.3 <Omitted>** **5.2.4 Yield criteria** <Omitted> The yield check criteria is to be based on axial stress for the flange of primary supporting members. Where the von Mises stress of the elements in the cargo hold FE model in way of the area under investigation by fine mesh exceeds the yield criteria, average von Mises stress, obtained from the fine mesh analysis, calculated over an area equivalent to the mesh size of the cargo hold finite element model is to satisfy the yield criteria above. **5.2.5 ~ 5.2.6 <Omitted>** **5.3 <Omitted>**	**5 Analysis criteria** **5.1 <Same as the present Rule>** **5.2 Structural modelling** **5.2.1 ~ 5.2.3 <Same as the present Rule>** **5.2.4 Yield criteria** <Omitted> The yield check criteria is to be based on axial stress for the flange of primary supporting members. Where the von Mises stress of the elements in the cargo hold FE model in way of the area under investigation by fine mesh exceeds the yield criteria, average von Mises stress, obtained from the fine mesh analysis, calculated over an area equivalent to the mesh size of the cargo hold finite element model is to satisfy the yield criteria above. In way of cut-outs, yield utilisation factor is to be obtained with shear stress correction, as given in **[5.2.5]**. **5.2.5 ~ 5.2.6 <Same as the present Rule>** **5.3 <Same as the present Rule>**	- 컷아웃에 대한 전단력 수정 추가

Present	Amendment	Reason
Section 3 Local Structural Strength Analysis	**Section 3 Local Structural Strength Analysis**	
1 <Omitted>	**1 <Same as the present Rule>**	
2 Structural modelling	**2 Structural modelling**	
2.1 ~ 2.3 <Omitted>	**2.1 ~ 2.3 <Same as the present Rule>**	
2.4 Elements	**2.4 Elements**	
2.4.1 <Omitted>	**2.4.1 <Same as the present Rule>**	
2.4.2	**2.4.2**	
Where fine mesh analysis is required for main bracket end connections and hatch corners, the fine mesh zone is to be extended at least 10 elements in all directions from the area subject to assessment, see **Figure 2**.	Where fine mesh analysis is required for main bracket end connections and hatch opening, the fine mesh zone is to be extended at least 10 elements in all directions from the area subject to assessment, see **Figure 2**.	- 문구 수정
2.4.3 ~ 2.4.4 <Omitted>	**2.4.3 ~ 2.4.4 <Same as the present Rule>**	
2.5 Transverse web frames	**2.5 Transverse web frames**	
2.5.1 <Omitted>	**2.5.1 <Same as the present Rule>**	
2.5.2	**2.5.2**	
Where a FE sub model is used, the model is to have an extent of at least 1+1 web frame spaces, i.e. one web frame space extending either side of the transverse web frame under investigation. ~~The web frame space is the longer space of web frames in the upper wing and the lower hopper tanks. The transverse web frames forward and aft of the web frame under investigation need not be included in the sub model.~~	Where a FE sub model is used, the model is to have an extent of at least 1+1 web frame spaces, i.e. one web frame space extending either side of the transverse web frame under investigation.	- 컨테이너선에 없는 구조
<hereafter Omitted>	<hereafter, Same as the present Rule>	

Present	Amendment	Reason
Chapter 8 Buckling **Section 1 General** **1. <omitted>** **2. Application** **2.1 scope** **2.1.1 ~ 2.1.2 <omitted>** **2.1.3 Enlarged stiffener** Enlarged stiffeners, with or without web stiffening, ~~used for Permanent Means of Access (PMA)~~ are to comply with the following requirements: a) Buckling strength of prescriptive requirements as follows: • For enlarged stiffener web, see **Ch 8, Sec 2, [3.2].** • For stiffeners fitted on enlarged stiffener web, see **Ch 8, Sec 2, [3.1]** and **Ch 8, Sec 2, [3.3].** b) ~~All structural elements used for PMA~~ are to be complied with for the buckling requirements of the FE analysis in **Ch 8, Sec 3** ~~when applicable.~~ ~~c) Buckling strength of longitudinal PMA platforms without stiffeners fitted on enlarged stiffener web is to be checked using the criteria for local supporting members in **Ch 8, Sec 2, [3.1]** and **Ch 8, Sec 2, [3.3]**.~~ <omitted>	**Chapter 8 Buckling** **Section 1 General** **1. <omitted>** **2. Application** **2.1 scope** **2.1.1 ~ 2.1.2 <omitted>** **2.1.3 Enlarged stiffener** Enlarged stiffeners, with or without web stiffening, are to comply with the following requirements: a) Buckling strength of prescriptive requirements as follows: • For enlarged stiffener web, see **Ch 8, Sec 2, [3.2].** • For stiffeners fitted on enlarged stiffener web, see **Ch 8, Sec 2, [3.1]** and **Ch 8, Sec 2, [3.3].** b) Enlarged stiffeners are to be complied with for the buckling requirements of the FE analysis in **Ch 8, Sec 3.** <omitted>	불필요한 내용 삭제

Present	Amendment	Reason

Present

3. Definitions

3.1 ~ 3.2 <omitted>

3.3 Allowable buckling utilisation factor

3.3.1 General structural elements

<omitted>

Table 1 : Allowable buckling utilisation factor

Structural component	η_{all}, Allowable buckling utilisation factor
Plates and stiffeners Stiffened and unstiffened panels Web plate in ways of openings	1.00 for load combination: S+D 0.80 for load combination: S 1.00 for load combination: A

<omitted>

Amendment

3. Definitions

3.1 ~ 3.2 <same as the present Rule>

3.3 Allowable buckling utilisation factor

3.3.1 General structural elements

<omitted>

Table 1 : Allowable buckling utilisation factor

Structural component	η_{all}, Allowable buckling utilisation factor
Plates and stiffeners Stiffened and unstiffened panels Web plate in ways of openings	1.00 for load combination: S+D 0.80 for load combination: S 1.00 for load combination: A
Pillars	0.75 for load combination: S+D 0.65 for load combination: S 0.75 for load combination: A

<omitted>

Reason

필러에 대한 좌굴 평가 추가

Present	Amendment	Reason
Section 2 Prescriptive buckling requirements **1. General** **1.1 Scope** **1.1.1** This Section applies to plate panels including curved plate panels and stiffeners subject to hull girder compression and shear stresses. <omitted>	**Section 2 Prescriptive buckling requirements** **1. General** **1.1 Scope** **1.1.1** This Section applies to plate panels including curved plate panels and stiffeners subject to hull girder compression and shear stresses. In addition the pillar subject to compressive stresses is to be checked. <omitted>	필러에 대한 좌굴 평가 추가
2. <omitted> **3. Buckling criteria** **3.1 ~ 3.3 <omitted>** **3.4 <Newly added>**	**2. <same as the present Rule>** **3. Buckling criteria** **3.1 ~ 3.3 <same as the present Rule>** **3.4 Pillars** **3.4.1** The compressive buckling strength of pillars is to satisfy the following criterion: $\eta_{Pillar} \le \eta_{all}$ where: η_{Pillar} : Maximum buckling utilisation factor of pillars defined in **Ch 8, Sec 4, [3.1].** <omitted>	필러에 대한 좌굴 평가 추가

Present	Amendment	Reason
Section 3 Buckling requirements for DSA **1. General** **1.1 Scope** **1.1.1 <omitted>** **1.1.2** All structural elements in the FE analysis carried out according to **Ch 7** are to be assessed individually. The buckling checks have to be performed for the following structural elements: a) Stiffened and unstiffened panels, inclusive curved panels. b) Web plate in way of openings. <omitted> **2. Stiffened and unstiffened panels** **2.1 <omitted>** **2.2 Stiffened panels** **2.2.1** ~~To represent the overall buckling behaviour, each stiffener with attached plate is to be modelled as a stiffened panel of the extent defined in **Table 1**.~~ ~~**2.2.2**~~ If the stiffener properties or stiffener spacing varies within the stiffened panel, the calculations are to be performed separately for all configurations of the panels, i.e. for each stiffener and plate between the stiffeners. Plate thickness, stiffener properties and stiffener spacing at the considered location are to be assumed for the whole panel. <omitted> **2.3 <omitted>**	**Section 3 Buckling requirements for DSA** **1. General** **1.1 Scope** **1.1.1 <same as the present Rule>** **1.1.2** All structural elements in the FE analysis carried out according to **Ch 7** are to be assessed individually. The buckling checks have to be performed for the following structural elements: a) Stiffened and unstiffened panels, inclusive curved panels. b) Web plate in way of openings. c) Pillars <omitted> **2. Stiffened and unstiffened panels** **2.1 <same as the present Rule>** **2.2 Stiffened panels** **2.2.1** If the stiffener properties or stiffener spacing varies within the stiffened panel, the calculations are to be performed separately for all configurations of the panels, i.e. for each stiffener and plate between the stiffeners. Plate thickness, stiffener properties and stiffener spacing at the considered location are to be assumed for the whole panel. <omitted> **2.3 <same as the present Rule>**	필러에 대한 좌굴 평가 추가 불필요한 내용 삭제

Present	Amendment	Reason
2.4 Reference stress **2.4.1** <omitted> **2.4.2** The reference stresses are to be calculated using the Stress based reference stresses as defined in **Ch 8, Sec 4.** **2.5 ~ 2.6 <omitted>** <omitted> **3. <Newly added>**	**2.4 Reference stress** **2.4.1** <omitted> **2.4.2** The reference stresses are to be calculated using the Stress based reference stresses as defined in **Ch 8, Sec 5.** **2.5 ~ 2.6 <same as the present Rule>** **3. Pillars** **3.1 Buckling criteria** **3.1.1** The compressive buckling strength of pillars is to satisfy the following criterion: $\eta_{Pillar} \leq \eta_{all}$ where: η_{Pillar} : Maximum buckling utilisation factor of pillars defined in **Ch 8, Sec 4, [3.1].** <omitted>	오타 수정 필러에 대한 좌굴 평가 추가

Present	Amendment	Reason
Section 4 Buckling capacity	**Section 4 Buckling capacity**	
1. General	**1. General**	
1.1 Scope	**1.1 Scope**	
1.1.1	**1.1.1**	
This section contains the methods for determination of the buckling capacity of plate panels, stiffeners, primary supporting members. <omitted>	This section contains the methods for determination of the buckling capacity of plate panels, stiffeners, primary supporting members <u>and pillars.</u> <omitted>	필러에 대한 좌굴 평가 추가
1.1.2 ~ 1.1.5 <omitted>	**1.1.2 ~ 1.1.5 <same as the present Rule>**	
2. Buckling capacity of plates and stiffeners	**2. Buckling capacity of plates and stiffeners**	
2.1 ~ 2.2 <omitted>	**2.1 ~ 2.2 <same as the present Rule>**	
2.3 Stiffeners	**2.3 Stiffeners**	
2.3.5 Effective width of the attached plating~~, b_{eff1}~~ <omitted>	**2.3.5 Effective width of the attached plating** <omitted>	오타 수정
2.4 Primary supporting members	**2.4 Primary supporting members**	
2.4.1 Web plate in way of openings <omitted>	**2.4.1 Web plate in way of openings** <omitted>	
σ_{av} : Weighted average compressive stress, in <u>N/mm2</u>, in the area of web plate being considered, i.e. P1, P2 or P3 as shown in **Table 6.**	σ_{av} : Weighted average compressive stress, in <u>N/mm^2</u>, in the area of web plate being considered, i.e. P1, P2 or P3 as shown in **Table 6.**	단위 오타 수정
For the application of the **Table 6**, the weighted average shear stress is to be taken as: • Opening modelled in primary supporting members:	For the application of the **Table 6**, the weighted average shear stress is to be taken as: • Opening modelled in primary supporting members:	
τ_{av} : Weighted average shear stress, in <u>N/mm2</u>, in the area of web plate being considered, i.e. P1, P2 or P3 as shown in **Table 6.**	τ_{av} : Weighted average shear stress, in <u>N/mm^2</u>, in the area of web plate being considered, i.e. P1, P2 or P3 as shown in **Table 6.**	단위 오타 수정
• Opening not modelled in primary supporting members:	• Opening not modelled in primary supporting members:	
τ_{av} : Weighted average shear stress, in <u>N/mm2</u>, given in **Table 6.** <omitted>	τ_{av} : Weighted average shear stress, in <u>N/mm^2</u>, given in **Table 6.** <omitted>	단위 오타 수정

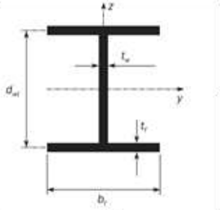
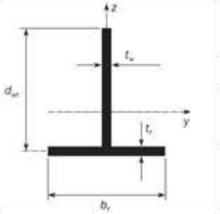
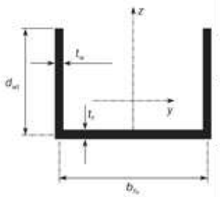
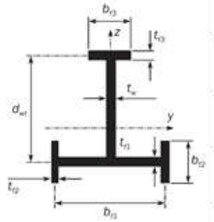
Present	Amendment	Reason
3. <Newly added>	**3. Buckling capacity of other structures** **3.1 Pillars** **3.1.1 Buckling utilisation factor** The buckling utilisation factor, η, for axially compressed pillars is to be taken as: $\eta_{Pillar} = \frac{\sigma_{av}}{\sigma_{cr}}$ where: σ_{av} : Average axial compressive stress in the member, in N/mm^2. σ_{cr} : Minimum critical buckling stress, in N/mm^2, taken as: $\sigma_{cr} = \sigma_E$ for $\sigma_E \le 0.5 R_{eH\_s}$ $\sigma_{cr} = \left(1 - \frac{R_{eH\_s}}{4\sigma_E}\right) R_{eH\_s}$ for $\sigma_E > 0.5 R_{eH\_s}$ σ_E : Minimum elastic compressive buckling stress, in N/mm^2, according to **[3.1.2]** to **[3.1.4]**. R_{eH_s} : Specified minimum yield stress of the considered member, in N/mm^2. For built up members, the lowest specified minimum yield stress is to be used. **3.1.2 Elastic column buckling stress** The elastic compressive column buckling stress, σ_{EC}, in N/mm^2 of members subject to axial compression is to be taken as: $\sigma_{EC} = \pi^2 E f_{end} \frac{I}{A \ell_{pill}^2} 10^{-4}$ where: I : Net moment of inertia about the weakest axis of the cross Section, in cm^4. A : Net cross Sectional area of the member, in cm^2.	필러에 대한 좌굴 평가 추가

Present	Amendment	Reason
	ℓ_{pill} : Length of the member, in m, taken as: a) For pillar : unsupported length of the member f_{end} : End constraint factor, taken as: a) For pillar • $f_{end} = 1.0$ where both ends are simply supported. • $f_{end} = 2.0$ where one end is simply supported and the other end is fixed. • $f_{end} = 4.0$ where both ends are fixed. A pillar end may be considered fixed when brackets of adequate size are fitted. Such brackets are to be supported by structural members with greater bending stiffness than the pillar. **1.1.2 Elastic torsional buckling stress** The elastic torsional buckling stress, σ_{ET}, in N/mm^2, with respect to axial compression of members is to be taken as: $$\sigma_{ET} = \frac{GI_{sv}}{I_{pol}} + \frac{\pi^2 f_{end} E c_{warp}}{I_{pol} \ell_{pill}^2} 10^{-4}$$ where: I_{sv} : Net St. Venant's moment of inertia, in cm^4, see **Table 7** for examples of cross Sections. I_{pol} : Net polar moment of inertia about the shear centre of cross Section, in cm^4. $I_{pol} = I_y + I_z + A(y_0^2 + z_0^2)$ c_{warp} : Warping constant, in cm^6, see **Table 7** for examples of cross Sections. ℓ_{pill} : Length of the member, in m as defined in **[3.1.2]**. y_0 : Transverse position of shear centre relative to the cross Sectional centroid, in cm, see **Table 7** for examples of cross Sections.	필러에 대한 좌굴 평가 추가

Present	Amendment	Reason
	z_0 : Vertical position of shear centre relative to the cross Sectional centroid, in cm, see **Table 7** for examples of cross Sections. A : Net cross Sectional area, in cm^2, as defined in **[3.1.2]**. I_y : Net moment of inertia about y axis, in cm^4. I_z : Net moment of inertia about z axis, in cm^4. **1.1.3 Elastic torsional/column buckling stress** For cross Sections where the centroid and the shear centre do not coincide, the interaction between the torsional and column buckling mode is to be examined. The elastic torsional/column buckling stress, σ_{ETF}, with respect to axial compression is to be taken as: $\sigma_{ETF} = \frac{1}{2\zeta}[(\sigma_{EC}+\sigma_{ET}) - \sqrt{(\sigma_{EC}+\sigma_{ET})^2 - 4\zeta\sigma_{EC}\sigma_{ET}}]$ where: ζ : Coefficient taken as: $\zeta = 1 - \frac{(y_0^2 + z_0^2)A}{I_{pol}}$ y_0 : Transverse position of shear centre relative to the cross Sectional centroid, in cm, as defined in **[3.1.3]**. z_0 : Vertical position of shear centre relative to the cross Sectional centroid, in cm, as defined in **[3.1.3]**. A : Net cross Sectional area, in cm^2, as defined in **[3.1.2]**. I_{pol} : Net polar moment of inertia about the shear centre of cross Section, in cm^4 as defined in **[3.1.3]**. σ_{EC} : Elastic column compressive buckling stress, as defined in **[3.1.2]**. σ_{ET} : Elastic torsional buckling stress, as defined in **[3.1.3]**.	필러에 대한 좌굴 평가 추가

<table>
<tr><th>Present</th><th>Amendment</th><th>Reason</th></tr>
<tr><td></td><td>

Table 7 : Cross sectional properties

<table>
<tr><td rowspan="2"></td><td>$I_{sv}=\frac{1}{3}(2b_f t_f^3+d_{wt}t_w^3)10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$c_{warp}=\frac{d_{wt}^2 b_f^3 t_f}{24}10^{-6}$</td><td>$cm^6$</td></tr>
<tr><td rowspan="4"></td><td>$I_{sv}=\frac{1}{3}(b_f t_f^3+d_{wt}t_w^3)10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$y_0=0$</td><td>cm</td></tr>
<tr><td>$z_0=-\frac{0.5d_{wt}^2 t_w}{d_{wt}t_w+b_f t_f}10^{-1}$</td><td>cm</td></tr>
<tr><td>$c_{warp}=\frac{b_f^3 t_f^3+4d_{wt}^3 t_w^3}{144}10^{-6}$</td><td>$cm^6$</td></tr>
<tr><td rowspan="4"></td><td>$I_{sv-n50}=\frac{1}{3}(b_{fu}t_f^3+2d_{wt}t_w^3)10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$y_0=0$</td><td>cm</td></tr>
<tr><td>$z_0=-\frac{d_{wt}^2 t_w 10^{-1}}{2d_{wt}t_w+b_{fu}t_f}-\frac{0.5d_{wt}^2 t_w 10^{-1}}{d_{wt}t_w+b_{fu}t_f/6}$</td><td>cm</td></tr>
<tr><td>$c_{warp}=\frac{b_{fu}^2 d_{wt}^3 t_w(3d_{wt}t_w+2b_{fu}t_f)}{12(6d_{wt}t_w+b_{fu}t_f)}10^{-6}$</td><td>$cm^6$</td></tr>
<tr><td rowspan="8"></td><td>$I_{sv}=\frac{1}{3}(b_{f1}t_{f1}^3+2b_{f2}t_{f2}^3+b_{f3}t_{f3}^3+d_{wt}t_w^3)10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$y_0=0$</td><td>cm</td></tr>
<tr><td>$z_0=z_s-\frac{(b_{f3}d_{wt}t_{f3}+0.5d_{wt}^2 t_w)10^{-1}}{d_{wt}t_w+b_{f1}t_{f1}+2b_{f2}t_{f2}+b_{f3}t_{f3}}$</td><td>cm</td></tr>
<tr><td>$c_{warp}=\left(I_{f1}z_0^2+\frac{I_{f2}b_{f1}^2}{200}+I_{f3}\left(\frac{d_{wt}}{10}-z_s\right)^2\right)$</td><td>$cm^6$</td></tr>
<tr><td>$I_{f1}=\left(\frac{(b_{f1}-t_{f2})^3 t_{f1}}{12}+\frac{b_{f2}t_{f2}b_{f1}^2}{2}\right)10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$I_{f2}=\frac{b_{f2}^3 t_{f2}}{12}10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$I_{f3}=\frac{b_{f3}^3 t_{f3}}{12}10^{-4}$</td><td>$cm^4$</td></tr>
<tr><td>$z_s=\frac{I_{f3}d_{wt}}{I_{f1}+I_{f3}}10^{-1}$</td><td>cm</td></tr>
<tr><td colspan="3">Note 1: All dimensions are in mm.
Note 2: Cross sectional properties are given for typical cross sections. Properties for other cross sections are to be determined by direct calculation.</td></tr>
</table>

<omitted>

</td><td>필러에 대한 좌굴 평가 추가</td></tr>
</table>

Present	Amendment	Reason
Chapter 9 Fatigue **Section 1 General Considerations** **1 ~ 3 <Omitted>** **4 Methodology** **4.1 Principles** **4.1.1 General** Appropriate fatigue strength of structural details is ensured by use of: • Fatigue strength assessment by fatigue life calculation, based on three different methods for hot spot stress calculation: simplified stress analysis, very fine mesh finite element stress analysis ~~and fatigue screening assessment.~~ **4.2 ~ 4.3 <Omitted>** **4.4 <Newly added>** **5 ~ 7 <Omitted>**	**Chapter 9 Fatigue** **Section 1 General Considerations** **1 ~ 3 <Same as the present Rule>** **4 Methodology** **4.1 Principles** **4.1.1 General** Appropriate fatigue strength of structural details is ensured by use of: • Fatigue strength assessment by fatigue life calculation, based on two different methods for hot spot stress calculation: simplified stress analysis and very fine mesh finite element stress analysis. **4.2 ~ 4.3 <Same as the present Rule>** **4.4 Fatigue design standards** **4.4.1** Detail design standards given in Ch 9, Sec 6 are provided to ensure improved fatigue performance of critical structural details. Alternative detail design configurations may be accepted subject to demonstration of satisfactory fatigue performance. **5 ~ 7 <Same as the present Rule>**	- 피로심사평가 삭제 - 상세설계기준 추가

Present	Amendment	Reason
Section 2 Structural Details to be Assessed **Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**. ~~*EA* : Empty cargo hold in alternate loading condition.~~ ~~*FA* : Full cargo hold in alternate loading condition.~~ **1 ~ 2 <Omitted>**	**Section 2 Structural Details to be Assessed** **Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**. **1 ~ 2 <Same as the present Rule>**	- 불필요한 용어 삭제

Present	Amendment	Reason
Section 3 Fatigue Evaluation **Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**. <Omitted> (j) : Suffix which denotes loading condition: Full load or normal ballast as defined in **Ch 9, Sec 1, [6.2]**. <Omitted> **1 ~ 2 <Omitted>** **3 Reference Stresses for Fatigue Assessment** **3.1 <Omitted>** **3.2 Mean stress effect** **3.2.1 Correction factor for mean stress effect** <Omitted> $\sigma_{mean,i(j)}$: Fatigue mean stress, in N/mm², for base material or welded joint calculated according to **[3.2.2]**. **3.2.2 ~ 3.2.4 <Omitted>**	**Section 3 Fatigue Evaluation** **Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**. <Omitted> (j) : Suffix which denotes loading condition: Loading conditions as defined in **Ch 9, Sec 1, [6.2]**. <Omitted> **1 ~ 2 <Same as the present Rule>** **3 Reference Stresses for Fatigue Assessment** **3.1 <Same as the present Rule>** **3.2 Mean stress effect** **3.2.1 Correction factor for mean stress effect** <Omitted> $\sigma_{mean,i(j)}$: Fatigue mean stress, in N/mm², for base material according to **[3.2.2]** or welded joint calculated according to **[3.2.3]** or **[3.2.4]** as applicable. **3.2.2 ~ 3.2.4 <Same as the present Rule>**	- 컨테이너선 피로평가시 평형수 조건은 없으므로 삭제 - 참조 수정

Present	Amendment	Reason
(see below)		- 오기 수정

3.3 Thickness effect

3.3.1

<Omitted>

Table 162 : Welded joints: thickness exponents

No	Joint category description	Geometry	Condition	n
1	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
2	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
3	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
4	<Omitted>	<Omitted>	As-welded	<Omitted>
			Weld toe treated by post-weld improvement method	<Omitted>
5	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
6	<Omitted>	<Omitted>	Any	<Omitted>
			Weld toe treated by post-weld improvement method	<Omitted>
(1) No benefit applicable for post-weld treatment of longitudinal end connections.				

4 ~ 7 <Omitted>

Present	Amendment	Reason

3.3 Thickness effect

3.3.1

<Omitted>

Table 164 : Welded joints: thickness exponents

No	Joint category description	Geometry	Condition	n
1	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
2	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
3	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
4	<Omitted>	<Omitted>	Any	<Omitted>
			Weld toe treated by post-weld improvement method (1)	<Omitted>
5	<Omitted>	<Omitted>	<Omitted>	<Omitted>
			<Omitted>	<Omitted>
6	<Omitted>	<Omitted>	As-welded	<Omitted>
			Weld toe treated by post-weld improvement method (1)	<Omitted>
(1) No benefit applicable for post-weld treatment of longitudinal end connections.				

4 ~ 7 <Same as the present Rule>

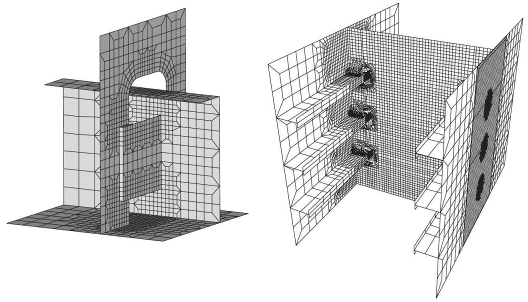
- 오기수정

Present	Amendment	Reason
Section 4 Hull Girder Loads **1 ~ 3 <Omitted>** **4 Local Stiffener Stress** **4.1 Hull girder bending strength assessment** **4.1.1 <Omitted>** **4.1.2 Stress due to static pressure** <Omitted> $P_{ls,(j)}$: Static liquid tank pressure, in kN/m^2, in loading condition (j) specified in **Ch 4, Sec 6, [1.1.1]**. Pressure acting on both sides could be simultaneously considered if relevant in the loading condition. <Omitted> **4.2 <Omitted>**	**Section 4 Simplified Stress Analysis** **1 ~ 3 <Same as the present Rule>** **4 Local Stiffener Stress** **4.1 Stress due to stiffener bending** **4.1.1 <Same as the present Rule>** **4.1.2 Stress due to static pressure** <Omitted> $P_{ls,(j)}$: Static liquid tank pressure, in kN/m^2, in loading condition (j) specified in **Ch 4, Sec 6, [1.2]**. Pressure acting on both sides could be simultaneously considered if relevant in the loading condition. <Omitted> **4.2 <Same as the present Rule>**	- 참조 수정

Present	Amendment	Reason
5 Stress Concentration Factors **5.1 <Omitted>** **5.2 Longitudinal stiffener end connections** **5.2.1 ~ 5.2.3 <Omitted>** **5.2.4 End stiffener without connection to web stiffener** <Omitted> Where the web stiffener is omitted or not connected to the longitudinal flange in way of: • Side shell below 1.1 T_{sc}. • Bottom. • Inner hull longitudinal bulkhead below 1.1 T_{sc}. • Inner bottom. the following is required: • A complete collar as defined in **Figure 6** (i.e. connection type ID 31 of **Table 3**). **5.2.5 <Omitted>** **5.3 <Omitted>**	**5 Stress Concentration Factors** **5.1 <Same as the present Rule>** **5.2 Longitudinal stiffener end connections** **5.2.1 ~ 5.2.3 <Same as the present Rule>** **5.2.4 End stiffener without connection to web stiffener** <Omitted> Where the web stiffener is omitted or not connected to the longitudinal flange in way of: • Side shell below 1.1 T_{sc}. • Bottom. • Inner hull longitudinal bulkhead below 1.1 T_{sc}. • Inner bottom. the following is required: • A complete collar as defined in **Figure 6** (i.e. connection type ID 31 of **Table 3**), or, • A detail design for cut-outs as described in **Ch 9, Sec 6, [2.1]**. Equivalence to cut-outs given in **Ch 9, Sec 6, [2.1]** may be accepted provided it is assessed for fatigue by using comparative FE analysis which is based on hot spot stress around the cut-out in the web plate of the primary supporting member inclusive of the collar, as given in **Ch 9, Sec 6, [2.2]**. **5.2.5 <Same as the present Rule>** **5.3 <Same as the present Rule>**	- 상세 설계 기준 추가에 따른 문구 수정

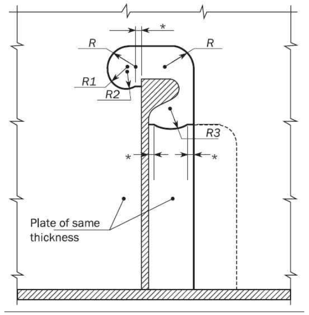
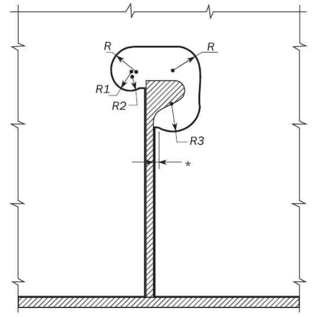
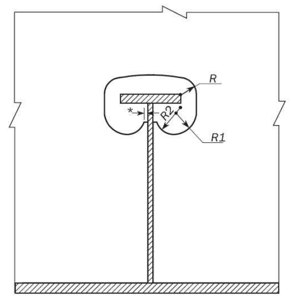
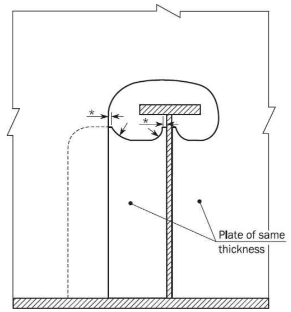
Present	Amendment	Reason
Section 6 <Newly added>	**Section 6 Detail Design Standard** **Symbols** For symbols not defined in this section, refer to **Ch 1, Sec 4**. **1 General** **1.1 Purpose** **1.1.1** Design standard provides fatigue resistant detail design at an early stage in the structural design process by giving consideration to the following aspects: • Application of fatigue design principles. • Construction tolerances and other practical considerations. • In-service experience and fatigue performance. **1.1.2** The design standard is to be applied to the design of ship structural details in following steps: • Highlighting potential critical areas within the ship structure. • Identification of the fatigue hot spot locations for each of the critical structural details. • Provision of a set of alternative improved configurations from which a suitable solution can be selected. • Requirements on geometrical configurations, scantlings, welding requirements and construction tolerances. • Post fabrication method of improving fatigue life, such as weld toe grinding.	- 상세설계 추가

Present	Amendment	Reason
	1.2 Application **1.2.1** The structural details described in this section are to be designed according to the given design standard but alternative detail design configurations may be accepted subject to demonstration of satisfactory fatigue performance. For the details given in **Ch 9, Sec 2, Table 3**, the fatigue assessment by very fine mesh finite element analysis may be omitted if the detail is designed in accordance with the design standard given in this section. **2 Stiffener-Frame Connections** **2.1 Design standard A** **2.1.1** Designs for cut outs in cases where web stiffeners are omitted or not connected to the longitudinals are required to adopt tight collar or the improved design standard “A” as shown in **Table 1** or equivalent, for the following members: • Side shell below $1.1\,T_{SC}$. • Bottom. • Inner hull longitudinal bulkhead below $1.1\,T_{SC}$. • Inner bottom. For designs that are different from those shown in **Table 1**, satisfactory fatigue performance may be demonstrated by, e.g., using comparative FE analysis according to **[2.2]**. **2.1.1** Designs that are different from those shown in **Table 1** are acceptable subject to demonstration of satisfactory fatigue performance, e.g. by using comparative finite element analysis. The comparative FE analysis is to be performed following the modelling guidance given in **Figure 1**.	- 대안방법 추가

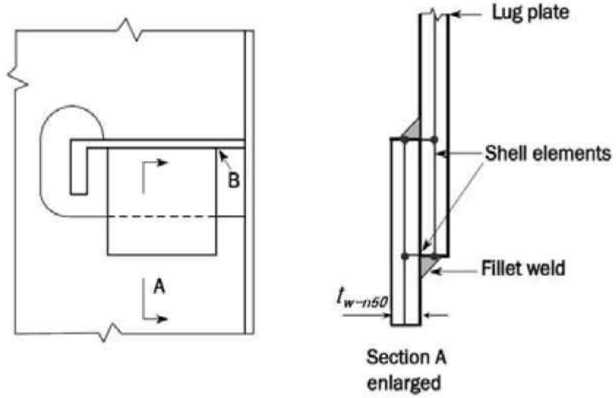
Present	Amendment	Reason
	 **Figure 22 : Finite element model for verification of equivalent design** **2.2 Equivalent design of stiffener-frame connections** **2.2.1** If the required designs for stiffener-frame connections in **[2.1]** are not followed, the alternative design is to be verified to have equivalent fatigue strength to the design standard "A" or to be verified to have satisfactory fatigue performance. The alternative design is to be verified according to the procedure given in **[2.2.2]** to **[2.2.5]** and documentation of results is to be submitted to the Society. **2.2.2** The procedure of **[2.2.3]** and **[2.2.4]** is provided to verify the alternative design to have equivalent fatigue strength with respect to any position in the transverse ring, i.e. double bottom and double side. The hot spot stress of the alternative design and that of the required design is to be compared to the critical hot spots in way of the cut-out. The critical hot spots depend on the detail design and are to be selected in agreement with the Society. The hot spot stress is to be derived according to **Ch 9, Sec 5, [3.1]** and **Ch 9, Sec 5, [3.2]**. It is to be noted that welded hot spots at the free edge are classified as hot spot type 'b'. Example of typical hot spots for checking is shown in **Ch 9, Sec 2, [2]**.	

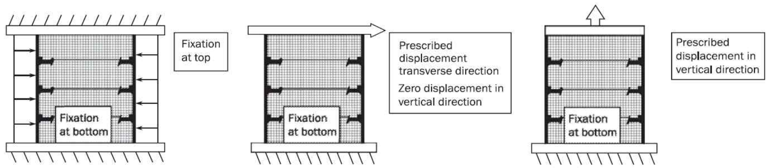
Present	Amendment	Reason

Table 171 : Finite element model for verification of equivalent design

<table>
<tr><td colspan="2">Cut outs for longitudinals in transverse webs where web stiffeners
are omitted or not connected to the longitudinal flange</td></tr>
<tr><td colspan="2">Design Standard A</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>3</td><td>4</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td colspan="2">Note 1: Soft toes marked ‘*’ are to be dimensioned to suit the weld leg length such that smooth transition from the weld to the curved part can be achieved. Maximum 15 mm or thickness of transverse web/collar plates/lug plates whichever is the greater.
Note 2: Configurations 1 and 4 indicate acceptable lapped lug plate connections.</td></tr>
</table>

Critical location	Locations around cut-out with high stress concentration and locations in way of weld terminations.
Detail design standard	Improved slot shape to avoid high stress concentrations in transverse webs due to shear loads and local pressure loads transmitted via welded joints.
Building tolerances	Ensure alignment of all connecting members and accurate dimensional control of cut-outs according to IACS Recommendation No. 47.
Welding requirements	A wraparound weld, free of undercut or notches, around the transverse web connection to longitudinal stiffener web.

Present	Amendment	Reason
	2.2.3 The very fine mesh finite element models are made to analyse the behaviour in way of double side or double bottom. The models should have an extent of 3 stiffeners in cross section, i.e. 4 stiffener spacings, and the longitudinal extent is to be one half frame spacing in both forward and aft direction. A typical model is shown in Figure 1. No cut-outs for access openings are to be included in the models. Connection between the lug or the web-frame to the longitudinal stiffener web, connections of the lug to the web-frame and free edges on lugs and cut-outs in web-frame are to be modelled with elements of net plate thickness size ($t_{n50} \times t_{n50}$). The mesh with net plate thickness size should extend at least five elements in all directions. Outside this area, the mesh size may gradually be increased in accordance with the requirements in **Ch 9, Sec 5, [2]**. The eccentricity of the lapped lug plates is to be included in the model. Transverse web and lug plates are to be connected by eccentricity elements (transverse plate elements). The height of eccentricity element is to be the distance between mid-layers of transverse web and lug plates having a thickness equal to 2 times the net thickness of web-frame plate t_{w-n50}. Eccentricity elements representing fillet welds are shown in **Figure 2**.  **Figure 27 : Modelling of eccentric lug plate by shell elements**	

Present	Amendment	Reason
	2.2.4 Three load cases are to be applied to the models of the design standard and alternative designs: • External pressure of unit value, fixed boundary conditions at top and bottom of model. • Shear stress by prescribed unit displacement at the model top and fixed boundary conditions at the model bottom. • Axial load by prescribed unit displacement at the model top and fixed boundary conditions at the model bottom. The forward and aft part of the model should have symmetry condition describing the behaviour in a double hull structure. Load application and boundary conditions are provided in **Figure 3**. **2.2.5** The alternative design may also be verified to have satisfactory fatigue performance using sub-modelling technique where a very fine mesh model of the alternative design located at the actual position of the stiffener-frame connection is analysed. The alternative design is considered acceptable if the fatigue acceptance criterion of **Ch 9, Sec 1** is achieved. The fatigue acceptance criterion is checked by applying the methodology described in **Ch 9, Sec 1**, **Ch 9, Sec 3** and **Ch 9, Sec 5**. The alternative design is considered acceptable only for the particular position where it is analysed.  **Figure 28 : Load application and boundary conditions - FE model for verification of alternative design**	
Chapter 10 Other Structure <omitted>	**Chapter 10 Other Structure** <same as the present Rule>	

Present	Amendment	Reason
Chapter 10 Other structure **Section 1 Fore part** **1. ~ 2. <Omitted>** **3. Structure subjected to impact loads** **3.1 <Omitted>** **3.2 Bottom slamming** **3.2.1 ~ 3.2.3 <Omitted>** **3.2.4 Shell plating** The net thickness of the hull envelope plating, t, in mm, is not to be less than: $t = \frac{0.0158\alpha_p b}{C_d}\sqrt{\frac{P_{SL}}{C_a R_{eH}}}$ where: C_d : plate capacity correction coefficient taken as: $C_d = 1.3$. C_a : Permissible bending stress coefficient taken as: $C_a = 1.0$ for acceptance criteria set AC-I <omitted>	**Chapter 10 Other structure** **Section 1 Fore part** **1. ~ 2. <Same as the present Rule>** **3. Structure subjected to impact loads** **3.1 <Same as the present Rule>** **3.2 Bottom slamming** **3.2.1 ~ 3.2.3 <Same as the present Rule>** **3.2.4 Shell plating** The net thickness of the hull envelope plating, t, in mm, except for the transversely stiffened bilge plating within the cylindrical part of the ship, is not to be less than: $t = \frac{0.0158\alpha_p b}{C_d}\sqrt{\frac{P_{SL}}{C_a R_{eH}}}$ where: C_d : plate capacity correction coefficient taken as: $C_d = 1.3$. C_a : Permissible bending stress coefficient taken as: $C_a = 1.0$ for acceptance criteria set AC-I The transversely stiffened bilge plating within the cylindrical part of the ship is to comply with the requirement given in **Ch 6, Sec 4, [2.2].** <omitted>	슬래밍 하중을 적용받는 선체외판 적용 범위를 명확하게 함 만곡부 외판 적용 범위를 명확하게 함

Present	Amendment	Reason
Section 2 <Omitted> **Section 3 Aft part** **1. ~ 2. <Omitted>** **3. Stern frames** **3.1 <Omitted>** **3.2 Propeller posts** **3.2.1 <Omitted>** ~~**3.2.2 Section modulus below the propeller shaft bossing**~~ ~~In the case of a propeller post without a sole piece, the section modulus of the propeller post may be gradually reduced below the propeller shaft bossing down to 85% of the value calculated with the scantlings in Table 1 or Table 2, as applicable.~~ ~~In any case, the thicknesses of the propeller posts are not to be less than those obtained from the formulae in the **Table 1** and **Table 2.**~~ <omitted>	**Section 2 <Same as the present Rule>** **Section 3 Aft part** **1. ~ 2. <Same as the present Rule>** **3. Stern frames** **3.1 <Same as the present Rule>** **3.2 Propeller posts** **3.2.1 <Same as the present Rule>** **3.2.2 (Void)** <omitted>	프로펠러 포스트 단면계수 요건과 관련하여 서로 상충되는 규정 삭제

Present	Amendment	Reason
Chapter 11 Superstructure, Deckhouses and Hull Outfitting **Section 1 Superstructures, Deckhouses and Companionways** **1. ~ 2. <omitted>** **3. Scantlings** **3.1 <omitted>** **3.2 Deckhouses** **3.2.1 Plating** The gross thickness of the plating, $t_{gr-\exp}$, in mm, is not to be less than $t_{gr-\exp} = 7.5\sqrt{\frac{ks}{s_{std}}}$, on first tier. $t_{gr-\exp} = 7.0\sqrt{\frac{ks}{s_{std}}}$, on second tier. $t_{gr-\exp} = 7.5\sqrt{\frac{ks}{s_{std}}}$, on third tier and above. <hereafter, omitted> **Section 2 <omitted>** **Section 4 Supporting Structure for Deck Equipment and Fittings** **1. ~ 4. <omitted>** **5. Bollards and bitts, fairleads, stand rollers, chocks and capstans** **5.1 General** **5.1.1 <omitted>**	**Chapter 11 Superstructure, Deckhouses and Hull Outfitting** **Section 1 Superstructures, Deckhouses and Companionways** **1. ~ 2. <same as the present Rules>** **3. Scantlings** **3.1 <same as the present Rules>** **3.2 Deckhouses** **3.2.1 Plating** The gross thickness of the plating, $t_{gr-\exp}$, in mm, is not to be less than $t_{gr-\exp} = 7.5\sqrt{\frac{ks}{s_{std}}}$, on first tier. $t_{gr-\exp} = 7.0\sqrt{\frac{ks}{s_{std}}}$, on second tier. $t_{gr-\exp} = 6.5\sqrt{\frac{ks}{s_{std}}}$, on third tier and above. <hereafter, same as the present Rules> **Section 2 <same as the present Rules>** **Section 4 Supporting Structure for Deck Equipment and Fittings** **1. ~ 4. <same as the present Rules>** **5. Bollards and bitts, fairleads, stand rollers, chocks and capstans** **5.1 General** **5.1.1 <same as the present Rules>**	오기수정

Present	Amendment	Reason
Section 3 Equipment **1. ~ 2. <omitted>** **3. Anchoring equipment** **3.1~3.2 <omitted>** **3.3 Ordinary anchors** **3.1.1 ~3.2.2 <omitted>** **3.3.3 Application** High holding power anchors are to be of a design that will ensure that the anchors will take effective hold of the sea bed without undue delay and will remain stable, for holding forces up to those required by **[3.3.4]**, irrespective of the angle or position at which they first settle on the sea bed when dropped from a normal type of hawse pipe. A demonstration of these abilities may be required. The design approval of high holding power anchors may be given as a general/type approval, and listed in a published document by the Society. **3.4~3.9 <omitted>**	**Section 3 Equipment** **1. ~ 2. <same as the present Rule>** **3. Anchoring equipment** **3.1~3.2 <same as the present Rule>** **3.3 Ordinary anchors** **3.1.1 ~3.2.2 <same as the present Rule>** **3.3.3 Application** High holding power anchors are to be of a design that will ensure that the anchors will take effective hold of the sea bed without undue delay and will remain stable, for holding forces up to those required by the Society, irrespective of the angle or position at which they first settle on the sea bed when dropped from a normal type of hawse pipe. A demonstration of these abilities may be required. The design approval of high holding power anchors may be given as a general/type approval, and listed in a published document by the Society. **3.4~3.9 <omitted>**	CSR CORR2 반영

Present	Amendment	Reason
5.1.2 Article 5 is not applicable to design and construction of shipboard fittings and supporting structures used for special towing services defined as: b) Escort towing: Towing service, in particular, for laden oil tankers required in specific estuaries. Its main purpose is to control the ship in case of failures of the propulsion or steering system. It should be refered to local escort requirements and guidance given by,e.g., the Oil Companies International Marine Forum (OCIMF) c) Canal transit towing: Towing service for ships transiting, e.g. the Panama Canal. It should be refereed to local canal transit requirements. ~~d) Emergency towing for oil tankers: Towing service to assist tankers in case of emergency. For the emergency towing arrangements, ships subject to SOLAS regulation II-1/3-4 Paragraph 1 are to comply with that regulation and resolution MSC.35(63) as may be amended.~~ <hereafter, omitted>	**5.1.2** Article 5 is not applicable to design and construction of shipboard fittings and supporting structures used for special towing services defined as: a) Escort towing: Towing service required in specific estuaries. Its main purpose is to control the ship in case of failures of the propulsion or steering system. b) Canal transit towing: Towing service for ships transiting, e.g. the Panama Canal. It should be refereed to local canal transit requirements. <hereafter, same as the present Rules>	컨테이너선과 관련 없는 규정 삭제
Section 5 Hatchways **1. Hatchways and other deck openings** **1.1 <omitted>** **1.2 Design load** **1.2.1 <omitted>** **1.2.2 Vertical weather design load** <omitted> **Table 178 : Vertical weather load p_H of weather deck hatches** <hereafter, omitted> **1.2.3 Horizontal weather design load** <omitted>	**Section 5 Hatchways** **1. Hatchways and other deck openings** **1.1 <same as the present Rules>** **1.2 Design load** **1.2.1 <same as the present Rules>** **1.2.2 Vertical weather design load** <same as the present Rules> **Table 178 : Vertical weather load P_V of weather deck hatches** <hereafter, same as the present Rules> **1.2.3 Horizontal weather design load** <same as the present Rules>	오기수정

Present	Amendment	Reason
$0.6 \le C_{b1} \le 0.8$, when determining scantlings of aft ends of coamings and aft hatch cover skirt plates forward of amidships, C_{b1} need not be taken less than 0.8. <newly added> <hereafter, omitted>	$0.6 \le C_{b1} \le 0.8$, when determining scantlings of aft ends of coamings and aft hatch cover skirt plates forward of amidships, C_{b1} need not be taken less than 0.8. x' = distance in m between the transverse coaming or hatch cover skirt plate considered and aft end of the length L. When determining side coamings or side hatch cover skirt plates, the side is to be subdivided into parts of approximately equal length, not exceeding 0.15 L each, and x' is to be taken as the distance between aft end of the length L and the centre of each part considered. z = vertical distance in m from the summer load line to the midpoint of stiffener span, or to the middle of the plate field $c = 0.3+0.7b'/B'$ b' = breadth of coaming in m at the position considered B' = actual maximum breadth of ship in m on the exposed weather deck at the position considered. b'/B' is not to be taken less than 0.25. <hereafter, same as the present Rules>	누락된 정의 추가
1.2.5 Container loads The loads defined in the followings are to be applied where containers are stowed on the hatch cover. <omitted> b) Where containers are stowed on hatch covers the following loads (kN) due to heave, pitch, and the ship's rolling motion(i.e. ship in heel condition) are to be considered, see also **Figure 3**. <omitted> W_i = weight of ith container (t) <newly added>	**1.2.5 Container loads** The loads defined in the followings are to be applied where containers are stowed on the hatch cover. <same as the present Rules> b) Where containers are stowed on hatch covers the following loads (kN) due to heave, pitch, and the ship's rolling motion(i.e. ship in heel condition) are to be considered, see also **Figure 3**. <same as the present Rules> W_i = weight of ith container (t) b = distance between midpoints of foot points in m	누락된 정의 추가

Present	Amendment	Reason
<hereafter, omitted>	A_z, B_z = support forces in z-direction at the forward and aft stack corners B_y : support force in y-direction at the forward and aft stack corners <hereafter, same as the present Rules>	누락된 정의 추가
1.3 Hatch cover strength criteria **1.3.1 ~ 1.3.6 <omitted>** **1.3.7 Buckling strength of hatch cover** <omitted> b) Definitions(refer **Figure 7**) <omitted> λ = reference degree of slenderness, taken equal to: $= \sqrt{\frac{\sigma_F}{K \cdot \sigma_e}}$ <hereafter, omitted>	**1.3 Hatch cover strength criteria** **1.3.1 ~ 1.3.6 <same as the present Rules>** **1.3.7 Buckling strength of hatch cover** <same as the present Rules> b) Definitions(refer **Figure 7**) <same as the present Rules> λ = reference degree of slenderness, taken equal to: $= \sqrt{\frac{\sigma_Y}{K \cdot \sigma_e}}$ <hereafter, same as the present Rules>	오기수정
1.4 Hatch Coamings strength criteria **1.4.1 ~ 1.4.3 <omitted>** **1.4.4 Coaming stays** a) Coaming stay section modulus (1) The net section modulus Z of coaming stays at the connection with deck shall not be less than: $Z = \frac{526}{\sigma_y} e h_s^2 p_A$ (cm^3)	**1.4 Hatch Coamings strength criteria** **1.4.1 ~ 1.4.3 <same as the present Rules>** **1.4.4 Coaming stays** a) Coaming stay section modulus (1) The net section modulus Z of coaming stays at the connection with deck shall not be less than: $Z = \frac{526}{\sigma_y} e h_s^2 P_H$ (cm^3)	오기수정

Present	Amendment	Reason
<hereafter, omitted>	<hereafter, same as the present Rules>	
1.5 Hatch cover details – Closing Arrangement, Securing Devices and Stoppers	**1.5 Hatch cover details – Closing Arrangement, Securing Devices and Stoppers**	
1.5.1 ~ 1.5.5 <omitted>	**1.5.1 ~ 1.5.5 <same as the present Rules>**	
1.5.6 Anti lifting devices	**1.5.6 Anti lifting devices**	
a) <omitted>	a) <same as the present Rules>	
b) Under these loadings of Par a) the equivalent stress in the anti lifting devices is not to exceed: $\sigma_E = 150/k_l$ (N/mm^2) <newly added>	b) Under these loadings of Par a) the equivalent stress in the anti lifting devices is not to exceed: $\sigma_E = 150/k_l$ (N/mm^2) k_l = according to **[1.5.4]** d) (1)	누락된 정의 추가
<hereafter, omitted>	<hereafter, same as the present Rules>	
1.6 iscellaneous Openings	**1.6 Miscellaneous Openings**	오기수정
<hereafter, omitted>	<hereafter, same as the present Rules>	
2. <omitted>	**2. <same as the present Rules>**	
3. Small hatchways fitted on the exposed fore deck	**3. Small hatchways fitted on the exposed fore deck**	
3.1 <omitted>	**3.1 <same as the present Rules>**	
3.2 Strength	**3.2 Strength**	
3.2.1	**3.2.1**	
For small rectangular steel hatch covers, the gross plate thickness, stiffener arrangement and scantlings are to be not less than those obtained, in mm, from **Table 1** and **Figure 2**. Stiffeners, where fitted, are to be aligned with the metal-to-metal contact points, required in **[3.4.1]** and shown in **Figure 2**. Primary stiffeners are to be continuous. All stiffeners are to be welded to the inner edge stiffener, see **Figure 1**.	For small rectangular steel hatch covers, the gross plate thickness, stiffener arrangement and scantlings are to be not less than those obtained, in mm, from **Table 12** and **Figure 18**. Stiffeners, where fitted, are to be aligned with the metal-to-metal contact points, required in **[3.4.1]** and shown in **Figure 18**. Primary stiffeners are to be continuous. All stiffeners are to be welded to the inner edge stiffener, see **Figure 17**.	오기수정

Present	Amendment	Reason
<hereafter, omitted> **Table 1 : Gross scantlings for small steel hatch covers on the fore deck** <hereafter, omitted>	<hereafter, same as the present Rules> **Table 12 : Gross scantlings for small steel hatch covers on the fore deck** <hereafter, same as the present Rules>	오기수정
3.3 <omitted> **3.4 Requirement to primary securing** **3.4.1** The hatch cover is to be fitted with a gasket of elastic material. This is to be designed to allow a metal to metal contact at a designed compression and to prevent over compression of the gasket by green sea forces that may cause the securing devices to be loosened or dislodged. The metal-to-metal contacts are to be arranged close to each securing device in accordance with Figure 2 and of sufficient capacity to withstand the bearing force.	**3.3 <omitted>** **3.4 Requirement to primary securing** **3.4.1** The hatch cover is to be fitted with a gasket of elastic material. This is to be designed to allow a metal to metal contact at a designed compression and to prevent over compression of the gasket by green sea forces that may cause the securing devices to be loosened or dislodged. The metal-to-metal contacts are to be arranged close to each securing device in accordance with **Figure 18** and of sufficient capacity to withstand the bearing force.	오기수정
3.4.2 <omitted> **3.4.3** For a primary securing method using butterfly nuts, the forks (clamps) are to be of robust design. They are to be designed to minimise the risk of butterfly nuts being dislodged while in use; by means of curving the forks upward, a raised surface on the free end, or a similar method. The plate thickness of unstiffened steel forks is to be not less than 16 mm. An example arrangement is shown in Figure 1. <hereafter, omitted>	**3.4.2 <same as the present Rules>** **3.4.3** For a primary securing method using butterfly nuts, the forks (clamps) are to be of robust design. They are to be designed to minimise the risk of butterfly nuts being dislodged while in use; by means of curving the forks upward, a raised surface on the free end, or a similar method. The plate thickness of unstiffened steel forks is to be not less than 16 mm. An example arrangement is shown in **Figure 17**. <hereafter, same as the present Rules>	오기수정
Figure 1 : Example or primary securing device **Figure 2 : Arrangement of stiffeners** <hereafter, omitted>	**Figure 17 : Example or primary securing device** **Figure 18 : Arrangement of stiffeners** <hereafter, same as the present Rules>	오기수정

Present	Amendment	Reason

Chapter 12 Construction

Section 1~2 <omitted>

Section 3 Design of Welding Joints

1. <omitted>

2. Tee or Cross Joint

2.2~2.4 <omitted>

2.5 Weld size criteria

<omitted>

Table 184 : Weld factors for different structural members

Hull area	Connection of	Connection to		f_{weld}
<omitted>				
Deck	Strength deck	<omitted>		
	Other deck	<omitted>		
	Hatch coamings	Deck plating	At corners of hatchways for 15% of the hatch length	FPW(4)(1)
			Elsewhere	0.38
	Web stiffeners	Coaming webs		0.20(2)
Bulkheads(5)	<omitted>			
Machinery space	<omitted>			
Superstructure	External bulkhead (first and second tier erections)	Deck, external bulkhead		0.48
	External bulkheads and internal bulkheads	Elsewhere		0.2

(1) f_{weld} =0.43 for hatch coaming other than in cargo holds.
(2) Continuous welding.
(3) PPW: Partial penetration welding in accordance with **[2.4.2]**.
(4) FPW: Full penetration welding in accordance with **[2.4.2]**.
<Newly added>

Present	Amendment	Reason

Chapter 12 Construction

Section 1~2 <omitted>

Section 3 Design of Welding Joints

1. <same as the present Rule>

2. Tee or Cross Joint

2.2~2.4 <same as the present Rule>

2.5 Weld size criteria

<omitted>

Table 186 : Weld factors for different structural members

Hull area	Connection			f_{weld}
	of	to		
<omitted>				
Deck	Strength deck	<omitted>		
	Other deck	<omitted>		
	Hatch coamings	Deck plating	Longitudinal hatch coaming corners of hatchways in a length of 15% of the hatch coaming heigth	FPW[(1)(4)] or PPW[(3)]
			Longitudinal hatch coaming on a length starting from 15% of the hatch coaming height from the corners of hatchways up to 15% of the hatch length	0.48 or PPW[(3)]
			Elsewhere	0.38 or PPW[(3)]
	Web stiffeners	Coaming webs		0.20[(2)]
Bulkheads[(5)]	<omitted>			
Machinery space	<omitted>			
Superstructure and deckhouse	External bulkhead (first and second tier erections)	Deck, external bulkhead		0.48
	External bulkheads and internal bulkheads	Elsewhere		0.2

(1) f_{weld} =0.43 for hatch coaming other than in cargo holds.
(2) Continuous welding.
(3) PPW: Partial penetration welding in accordance with **[2.4.2]**.
(4) FPW: Full penetration welding in accordance with **[2.4.2]**.
(5) Bulkheads of superstructure and deckhouse are to be considered in the row corresponding to "Superstructure and deck house".

Reason:

- CSR 개정에 따른 개정
창구코밍과 갑판과의 연결부에 대한 용접 계수 개정
컨테이너선은 두께가 두꺼우므로 FPW 또는 필렛용접을 하기 어려우므로 대안방법으로 PPW를 적용함

갑판실에 대한 용접계수 신설

Present	Amendment	Reason
Chapter 13 Ship in Operation - Renewal Criteria <omitted> **Chapter 14 Lashing Equipment** <omitted>	**Chapter 13 Ship in Operation - Renewal Criteria** <same as the present Rule> **Chapter 14 Lashing Equipment** <same as the present Rule>	