Appendix 1 CRITERIA FOR RENEWAL OF HULL STRUCTURAL MEMBERS

This Appendix does not apply to the ships constructed in accordance with Common Structural Rules[①].

1 Criteria for longitudinal strength

1.1 For ships of 65 m and over in length, the hull girder section modulus at deck and bottom within 0.4 *L* amidships is not to be less than 0.9 times the hull girder section modulus required in the Rules.

1.2 The criteria for longitudinal strength for hull girders of oil tankers of 130 m in length and upwards are given in Appendix 2 of this Chapter.

2 Criteria for local strength

2.1 For a ship constructed in accordance with CCS rules and the keel of which was laid before 15 January 1983, the renewal thickness of hull plating and structural members is not to be less than the value obtained by multiplying their as-built thickness and the relevant percentage shown in Table 2.1 below:

Table 2.1

Structural member	Minimum renewal thickness		
	Unrestricted service	Service category 1	Service categories 2 and 3
Strength deck, side and bottom shell	75%	70%	65%
Continuous longitudinal strength members and web frames	75%	70%	65%
Foundations of main engines, cranes and windlasses	75%	75%	75%
Other structural members defined in the Rules	70%	60%	55%

2.2 For a ship constructed in accordance with CCS rules and the keel of which was laid on or after 15 January 1983, the renewal thickness of hull plating and structural members is not to be less than the value obtained by multiplying their as-built thickness and the relevant percentage shown in Table 2.2 below:

Table 2.2

Structural member	Minimum renewal thickness	
	$L \geq 90$ m	$L < 90$ m
① Strength deck plating, side shell, top strake, bilge strake, bottom shell, flat plate keel, inner bottom, continuous longitudinal bulkhead, hopper tank and topside tank plating. ② Main longitudinal continuous members, e.g. deck girders, hatch side girders, side girders, bottom girders, bulkhead girders, continuous hatch coamings. ③ Main transverse members, e.g. side frame webs, deck transverses, double plate floors, bulkhead webs, watertight and oiltight transverse bracket plates. ④ Transverse bulkhead plating in holds, upper and lower bulkhead stool sloping plating, watertight bulkhead plating in deep tanks	80%	75%
Other plating and members, e.g. deck within line of openings, deck longitudinals, side longitudinals, bottom longitudinals, inner bottom longitudinals, bulkhead longitudinals, face plates of side frames, brackets of structural members, hatch covers, non-continuous hatch coamings, sea chests	75%	70%
Note: For bulk carriers designed in accordance with the Rules and assigned the class notations of "Strengthened for Heavy Cargoes" and "Grab* (×)", the minimum renewal thickness of inner bottom may be taken as the value obtained by multiplying the as-built thickness and 75%		

2.3 For a ship constructed in accordance with the Rules and the scantlings of which as required by the Rules are indicated in their plans, or for a ship the scantlings of which are to be assessed in accordance with the Rules, the renewal thickness of hull plating and structural members is not to be less than the value obtained by multiplying the thickness specified in the Rules and the relevant percentage shown in Table 2.2 above.

2.4 For bulk carriers of 150 m in length and upwards, contracted for construction on or after 1 July 1998 and carrying solid bulk cargoes having a density of 1.0 t/m^3 and above, steel renewal is required where the gauged thickness of watertight corrugated bulkheads is less than t_{net} + 0.5 mm and coating (applied in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as an

① PART NINE or TEN of the Rules (2012 version) and its 2013 and 2014 amendments or PART NINE of the Rules (2015 version) and its subsequent versions (including amendments).

alternative to steel renewal where the gauged thickness is within the range t_{net} + 0.5 mm and t_{net} + 1.0 mm, with t_{net} being net thickness and obtained in accordance with Section 9, Chapter 8 of PART TWO of the Rules, except for:

(1) double skin bulk carriers the keels of which were laid or which were at a similar stage of construction before 1 July 1999;

(2) double skin bulk carriers the keels of which were laid or which were at a similar stage of construction before 1 January 2000, with distance between inner and outer skins being not less than 760 mm;

(3) double skin bulk carriers the keels of which were laid or which were at a similar stage of construction after 1 January 2000, with distance between inner and outer skins being not less than 1,000 mm.

2.5 For bulk carriers contracted for construction on or after 1 July 1998 and complying with Section 11, Chapter 8, PART TWO of the Rules, steel renewal is required where the gauged thickness of hatch covers is less than t_{net} + 0.5 mm. Where the gauged thickness is within the range t_{net} + 0.5 mm and t_{net} + 1.0 mm, coating (applied in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as an alternative to steel renewal. For internal members of double skin hatch covers, steel renewal is required where the gauged thickness is less than t_{net} or the Surveyor deems it necessary based on the corrosion or deformation. t_{net} is net thickness and to be obtained in accordance with Section 11, Chapter 8 of PART TWO of the Rules.

For bulk carriers, ore carriers and combination carriers① contracted for construction on or after 1 January 2004 and complying with Section 11, Chapter 8, PART TWO of the Rules, steel renewal is required where the gauged thickness is less than t_{net} + 0.5 mm for single skin hatch cover and double skin hatch cover platings, hatching coamings and coaming stays. Where the gauged thickness is within the range t_{net} + 0.5 mm and t_{net} + 1.0 mm, coating (applied in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as an alternative to steel renewal. For internal members of double skin hatch covers, thickness measurement is required when CCS Surveyor deems it necessary based on the corrosion or deformation. Where the gauged thickness is less than t_{net}, the internal structure is to be renewed.

2.6 For ships other than bulk carriers, ore carriers and combination carriers, contracted for construction on or after 1 July 2012 and complying with Section 20, Chapter 2, PART TWO of the Rules②, and for all weathertight steel cargo hatch covers on exposed decks, steel renewal is required where the gauged thickness of the plating of double skin hatch covers, single skin hatch covers, hatch coamings, coaming stays and stiffeners is less than t_{net} + 0.5 mm. Where the gauged thickness is within the range t_{net} + 0.5 mm and t_{net} + 1.0 mm, coating③ or annual gauging may be adopted as an alternative to steel renewal. For the internal structure of double skin hatch covers, thickness gauging is required when hatch cover top or bottom plating renewal is to be carried out or when deemed necessary, at the discretion of CCS Surveyor, on the basis of the plating corrosion or deformation condition. In these cases, steel renewal for the internal structures is required where the gauged thickness is less than t_{net}. For corrosion addition t_S = 1.0 mm, the thickness for steel renewal is t_{net}, and when gauged thickness is between t_{net} and t_{net} + 0.5 mm, coating or annual gauging may be adopted as an alternative to steel renewal, where t_{net} being the net thickness, to be calculated in accordance with 2.20.2, Section 20, Chapter 2, PART TWO of the Rules.

2.7 For the following bulk carriers of 150 m in length and upwards and carrying solid bulk cargoes having a density of 1.78 t/m^3 and above, steel renewal is required where the gauged thickness of transverse watertight corrugated bulkheads between cargo holds Nos.1 and 2 is less than t_{net} + 0.5 mm and coating (applied in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as an alternative to steel renewal where the gauged thickness is within the range t_{net} + 0.5 mm and t_{net} + 1.0 mm, with t_{net} being calculated in accordance with IACS UR S19:

(1) bulk carriers contracted for construction before 1 July 1998 and not complying with IACS UR S18;

(2) bulk carriers the keels of which were laid or which were at a similar stage of construction before 1 July 1999 and not complying with IACS UR S18.

2.8 For bulk carriers which were not built in accordance with Section 3, Chapter 8 of PART TWO of the Rules, steel renewal is required where the gauged thickness of side shell frames of cargo holds is less than t_{REN} mm. Where the gauged thickness is within the range t_{REN} mm and t_{COAT} mm, sand blasting, coating and reinforcements are to be done and the coating is to be maintained in "as-new" or an equivalent condition (i.e. without breakdown or rusting) at special and intermediate surveys. The t_{REN} and t_{COAT} above are to be calculated in accordance with IACS UR S31.

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① Bulk carriers, ore carriers and combination carriers are defined in Appendix 2, Chapter 2 of this PART.

② For the definitions of bulk carriers, ore carriers and combination carriers, refer to Appendix 2, Chapter 2 of this PART.

③ Coating is to be maintained in GOOD condition, as defined in 5.1.5.1(15) of this Chapter.

Appendix 2 CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS

1 General requirements

1.1 These criteria are to be used for the evaluation of longitudinal strength of the ship's hull girder as required by 5.6.1.3 of Section 6, Chapter 5 of this PART.

1.2 In order that ship's longitudinal strength to be evaluated can be recognized as valid, fillet welding between longitudinal internal members and hull envelopes are to be in sound condition so as to keep integrity of longitudinal internal members with hull envelopes.

2 Evaluation of longitudinal strength

On oil tankers of 130 m in length and upwards and of over 10 years of age, the longitudinal strength of the ship's hull girder is to be evaluated in compliance with the requirements of this Appendix on the basis of the thickness measured, renewed or reinforced, as appropriate, during the special survey.

The condition of the hull girder for longitudinal strength evaluation is to be determined in accordance with the methods specified in Annex 3 of this Appendix.

2.1 Calculation of transverse sectional areas of deck and bottom flanges of hull girder

2.1.1 The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder are to be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the special survey.

2.1.2 If the diminution of sectional areas of either deck or bottom flange exceeds 10% of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures is to be taken:

(1) to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or

(2) to calculate the actual section moduli (Z_{act}) of transverse section of the ship's hull girder by applying the calculation method specified in Annex 1 of this Appendix, by using the thickness measured, renewed or reinforced, as appropriate, during the special survey.

2.2 Requirements for transverse section modulus of hull girder

2.2.1 The actual section moduli of transverse section of the ship's hull girder calculated in accordance with 2.1.2(2) above is to satisfy either of the following provisions, as applicable:

(1) for ships constructed on or after 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of 2.1.2(2) above is not to be less than the diminution limits determined by CCS①; or

(2) for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of 2.1.2(2) above is to meet the criteria for minimum section modulus for ships in service required by CCS, provided that in no case Z_{act} is to be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in Annex 2 of this Appendix.

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① The actual transverse section modulus of the hull girder of oil tankers calculated under paragraph 2.2.1(1) of this Appendix is not to be less than 90% of the required section modulus for new buildings specified in IACS Unified Requirements S7(C = 1.0 C_n is to be used for the purpose of this calculation.) or S11, whichever is the greater.