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Directive (17 / 2017)

National Standard for Allowable Thickness Diminution of Hull Structure

Applicable to: Ship owners, Recognized Organizations, Shipping Companies, Flag State Surveyors

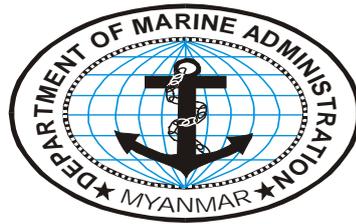
1. The Department of Marine Administration circulated this directive in the exercise of the power of Section 294(B), paragraph (b) of Myanmar Merchant Shipping Act.
2. Pursuant to the provision of Section 213(A) of Myanmar Merchant Shipping Act and the International Convention for the Safety of Life at Sea, 1974, the Department of Marine Administration circulated this National standard for allowable thickness diminution of hull structure of Myanmar ships engaged on International Voyages.
3. The purpose of this directive is to ensure National standard for allowable thickness diminution of hull structure of Myanmar ships engaged on International Voyage to be complied with the requirements of the International Convention for the Safety of Life at Sea, 1974 as amended.

Maung Maung Oo

Director General

Department of Marine Administration

THE REPUBLIC OF THE UNION OF MYNAMR



**MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF MARINE ADMINISTRATION**

**National Standard for Allowable Thickness
Diminution of Hull Structure**

Date: 29.1.2018

Revise - 00

National Standard for Allowable Thickness Diminution of Hull Structure

1. Scope

1.1 This national standard is established by Department of Marine Administration of the Government of the Republic of the Union of Myanmar, under the provision International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended for the Myanmar ships engaged on international voyage.

2. Purpose

2.1 The purpose of this National Standard is to provide the general information and methods for assessing the acceptance level of corrosion in hull structures of Myanmar ships engaged on international voyage.

3. Thickness measurement - Permissible diminution

3.1 The maximum permissible diminution of individual plates and stiffeners is given in Table I. The table provides the permissible diminution levels for the structural items by ship category.

3.1.1 Repairs will be required when the percentage diminutions given in Tables I and II are exceeded.

3.1.2 The maximum diminutions given in Tables I and II take account of additional average corrosion for a further five year period.

3.1.3 Where thickness measurement is considered necessary between Special Surveys, the values given in Tables I and II are to be applied.

3.2 Substantial corrosion is wastage of individual plates and stiffeners in excess of 75% of the permissible diminution given in Table I.

Substantial Corrosion

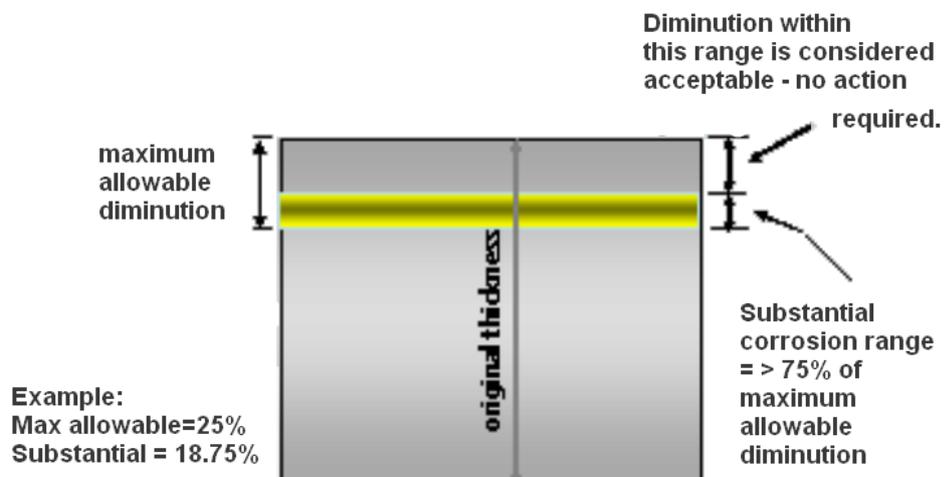


Figure 3.1 – Substantial Corrosion

- 3.2.1 For ships built in accordance with the Common Structural Rules (CSR), substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a gauged (or measured) thickness between $t_{net} + 0.5$ mm and t_{net} .

Substantial Corrosion - Common Structural Rules (CSR)

Applicable to newly built oil tankers & bulk carriers from April 2006

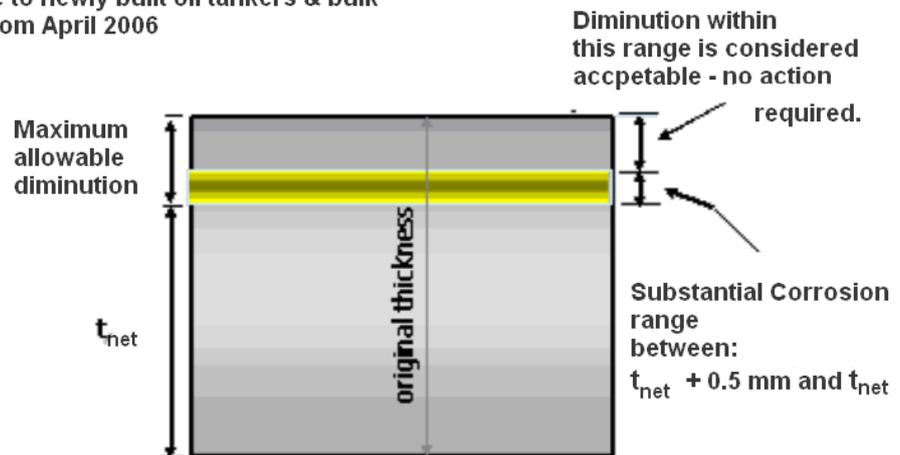


Fig 3.2 - Substantial Corrosion - Common Structural Rules (CSR)

Individual plates and stiffeners

- 3.3 Excessive diminution is wastage of individual plates and stiffeners in excess of the permissible diminution given in Table I. Where individual plates or stiffeners show excessive deterioration then additional measurements of the adjacent structure should be taken to ascertain the full extent of deterioration.

Topside and bottom areas

- 3.4 In order to maintain the required longitudinal strength of the hull girder an assessment of the topside area and bottom area is to be carried out at each transverse section. The maximum permissible diminution of topside and bottom areas is given in Table II.
- 3.5 In addition, for oil tankers (including ore/oil and ore/bulk/oil ships) of 130 m in length and upwards (as defined by the International Convention on Load Lines in force), the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced as appropriate, during the Special Surveys carried out after the ship reaches 10 years of age.
- 3.5.1 Summing the thickness of individual strakes of plating and comparing these with the sums of the original thickness.
- 3.5.2 Summing the thickness of individual longitudinals and comparing these with the sums of the original thickness.

- 3.5.3 In each case the resultant percentage deterioration is to be compared with the maximum diminution values for plating and longitudinals given in Table II.
- 3.6 Where deterioration of the topside area or bottom area of the plating or longitudinals is in excess of 0,75 of the values given in Table II, additional transverse sections are to be measured forward and aft of 0,5L amidships.
- 3.7 At surveys where only transverse sections of the deck plating is required to be measured (at Special Survey I of a tanker and Special Survey III of a dry cargo ship) and the general deterioration of the strength deck plating is equal to or in excess of the values given in Table II, measurements should also be carried out on the sheerstrake. An assessment is then to be made of the topside plating area to determine the overall percentage deterioration. In addition, where the diminution of the topside plating area is in excess of 0,75 of the values given in Table II, the topside longitudinals are to be gauged and reported on.

Oil Tankers – Evaluation of longitudinal strength

- 3.8 For oil tankers (including chemical, ore/oil and ore/bulk/oil ships) of 130 m in length and upwards (as defined by the International Convention on Load Lines in force), the ship's longitudinal strength is to be evaluated by using the thickness of structural members measured, renewed and reinforced as appropriate, during the Special Surveys carried out after the ship reaches 10 years of age, i.e., normally SS III and subsequent Special Surveys. And at Intermediate Surveys after the ship reaches 10 years of age if deemed necessary by the Surveyor.
- 3.9 At least three transverse sections are to be gauged for all ships to which these requirements are applicable. The selected transverse sections could be the same sections required by 3.4 - 3.7. In most cases no additional thickness gauging should be necessary.
- 3.10 The selected transverse sections are to be within 0,5L amidships. It is recommended that the sections be located about 0,2L fwd of amidships, and 0,2L aft of amidships.
- 3.11 At the recommended locations, the transverse sections should be chosen such that thickness measurements can be taken for as many different tanks in a corrosive environment as possible (e.g. selected transverse sections are to include ballast tanks sharing a common plane boundary with cargo tanks (fitted with heating coils) and other ballast tanks, or cargo tanks permitted to be filled with sea water sharing a common plane boundary with other ballast tanks or cargo tanks).
- 3.12 When selecting the transverse sections, consideration is to be given to selecting those locations where the largest thickness reductions are suspected to occur and/or are revealed from deck and bottom plating measurements. The selected locations should, as far as possible, be clear of areas that have been locally renewed or reinforced.

- 3.13 For assessment of transverse sectional areas for the deck and bottom flanges at each selected section, all continuous longitudinal structure (i.e. plating and longitudinals) within $0,1 D$ of the deck plating and bottom shell plating should be measured and recorded (where D is the ship's moulded depth). If the results of the transverse sectional area evaluation are above the permitted minimum value (i.e. more than 90 per cent of the 'As built' sectional area) then no further input of thickness readings or section modulus calculation is necessary.
- 3.14 If the results of the transverse sectional area evaluation are below permitted minimum value (i.e. they are less than 90 per cent of the 'as built' sectional area), then the transverse sectional modulus is to be calculated. For this calculation to be performed by TMCalc, the thickness readings for all the longitudinal structure at that transverse section will need to be entered.
- 3.15 TMCalc requires entry of thickness readings for every span of plating (where a span is the width of plating between any two longitudinal members). Where plating is found in good condition with no evidence of corrosion/wastage, reduction in the number of readings could be considered. However, at least two points should be measured for each deck and shell plate for the selected transverse sections.
- 3.16 Every longitudinal member (including deck and bottom girders) should be measured on the web and flange (except for bulb sections). For bulb sections, only thickness readings for the web need to be recorded. If considered necessary this can then be further amended to reflect the actual condition of the bulb, e.g. there may be instances where the bulb may be completely wasted or alternatively the bulb may be fully intact with no corrosion and coated.
- 3.17 Where one or more of the transverse sections are found to be deficient in respect of the longitudinal strength requirements, the number of transverse sections for evaluation are to be increased such that each tank within the $0,5L$ amidships region has been evaluated. Tank spaces that are partially within, but extend beyond, the $0,5L$ region, may also need to be evaluated.
- 3.18 Additional thickness measurements are also required to be performed on one transverse section forward and one aft of each repaired area to an extent necessary to ensure that the areas bordering the repaired section also comply with the requirements. This is considered necessary only where substantial repairs/renewals have been carried out and the transverse sectional area/section modulus will increase appreciably after repairs. Where isolated repairs are carried out (due to localised corrosion/wastage), evaluation of additional sections forward and aft of the repairs is not considered necessary.

Oil Tankers - Upper deck plating residual buckling

- 3.19 Oil tankers - Upper deck plating allowable diminution/residual buckling:

- 3.19.1 For oil tankers having a length L of 90 m or greater the thickness requirement of upper deck plating is to be not less than that required by Table I or the residual buckling thickness (Table III). In some instances the residual buckling thickness may be the limiting factor for upper deck plating renewals.
- 3.19.2 When the actual thickness measurements of individual plates are found to be less than that required for compliance with the residual buckling thickness requirements, and the diminution does not exceed 20 per cent, then extensive thickness measurements are to be taken on a panel basis to determine accurately the actual mean thickness of individual panels. In this context a panel is deck plating bounded by adjacent deck transverses and two deck longitudinal stiffeners.

Sandwich Plate Systems (SPS)

- 3.20 For Sandwich Plate System [SPS] Construction, thickness measurements are required from the top and bottom plate of the SPS panels: Maximum permissible diminution: 20% of minimum thickness.

Chemical Tankers – Ships over 10 years old

- 3.21 At the Special Survey selected steel cargo pipes outside cargo tanks and ballast pipes passing through cargo tanks are to be:
- a) Thickness measured at random or selected pipe lengths to be opened for internal inspection.
 - b) Pressure tested to the maximum working pressure.

NOTE:

Special attention is to be given to cargo/slop discharge piping through ballast tanks and void spaces

- 3.22 The following may be used for general guidance for acceptance of acceptable diminution for renewal of pipes:

3.22.1 Cargo piping for chemical carriers is required to have a minimum design pressure of 10 bar and suitable corrosion allowance.

3.22.2 Carbon steel pipes: Cargo pipes operating at less than 10 bar.

Where general pipe thickness or isolated pockets have a diminution of more than 30% of the original nominal thickness then they should be further assessed.

Where general pipe thickness or isolated pockets have a diminution of more than 50% of the original nominal thickness then the pipe should be replaced.

3.22.3 Stainless steel: Cargo pipes operating at less than 10 bar.

Where general pipe thickness or isolated pockets have a diminution of more than 20% of the original nominal thickness then they should be further assessed.

Where general pipe thickness or isolated pockets have a diminution of more than 30% of the original nominal thickness then the pipe should be replaced.

3.22.4 High pressure piping: High pressure piping systems generally need to be individually assessed.

Thickness Measurement – Maximum Diminution

Table I Maximum diminution of individual plates and stiffeners

Structural item	Category 1 ships	Category 2 & 3 ships
Hull envelope: individual plates, shell and deck plating recorded along the strake (deck, bottom, side, wind and water)	20% <i>See Note 1</i>	30%
Hull envelope: transverse section, plates recorded by frame number and strake position (deck and sheer/bottom and side)	20%	30%
Longitudinal structural members (including deck and shell longitudinal stiffeners, longitudinal bulkhead plating and stiffeners, inner bottom plating and stiffeners, hopper sloping plating and stiffeners. <i>See Note 3 for additional bulk carrier diminution criteria)</i>	Plating 20% Stiffeners 25%	Plating 30% Stiffeners 25%
Transverse structural members in C.O. and W.B. tanks (including web frame plating and face plates)	20%	25%
W.T. and O.T. transverse bulkheads including deep tank bulkheads (<i>See Note 3 for additional bulk carrier diminution criteria</i>)	Plating 25% Stiffeners and corrugated bulkhead plating 25%	Plating 30% Stiffeners and corrugated bulkhead plating 25%
Miscellaneous structural members (including deck plating inside the line of cargo hatch openings)	Plating 25% Stiffeners 25%	Plating 30% Stiffeners 25%
Cargo hold transverse frames and end brackets <i>(See Note 3 for additional bulk carrier diminution criteria)</i>	20%	25%
NOTES		
1. For oil tankers of Category 1 the strength deck residual buckling thickness requirement is to be complied with in accordance with Lloyd's Register requirements as advised by the attending Surveyor.		
2. Where extensive additional measurements are taken of continuous longitudinal plating, these may be reported.		
3. Additional Bulk Carrier diminution criteria:		
3.1 Cargo hold transverse bulkheads		
(a) Corrugated parts within cargo holds designed to be fully filled with salt water ballast (deep tank) - 25%.		

- (b) Corrugated parts within cargo holds designed to be partially filled with salt water ballast - 15%.
- (c) Corrugated parts of the aft transverse bulkhead of the forward cargo hold - 15%.
- (d) Corrugated parts of the remaining transverse bulkheads in cargo holds - 20%.
- (e) All plain transverse bulkhead plating (including stool plating) - 25%.

3.2 Cargo hold inner bottom and hopper sloping plating

(a) Where the notation Strengthened For Heavy Cargoes is assigned and length L is greater than 150 metres then the maximum diminution applicable is 25%. For all other Bulk Carriers refer to longitudinal structural members above.

4. For definition of ship category, see Table II, Note 5.

5. The maximum diminutions are for the average thickness measured over the plate area or over the length between supports.

Table II Maximum permissible diminution of topside and bottom areas

Structural item		Category 1 ships		Category 2 ships		Category 3 ships	
		Over 0.5L Amidships	At 0.075L from ends	Over 0.5L Amidships	At 0.075L from ends	Over 0.5L Amidships	At 0.075L from ends
Topside Area Assessment	Plating	10%	20%	10%	30%	15%	30%
	Longitudinals	15%	25%	15%	25%	20%	30%
Bottom Area Assessment	Plating – single bottom construction	10%	20%	10%	30%	15%	30%
	Plating – double bottom construction	15%	20%	15%	30%	20%	30%
	Longitudinals	15%	25%	15%	25%	20%	30%

NOTES

Note 1: Intermediate values are to be obtained by linear interpolation.

Note 2: Topside area comprises deck (outside line of openings for dry cargo ships), stringer and sheer strake (including rounded gunwales) together with associated longitudinals.

Note 3: Bottom area comprises keel, bottom and bilge plating together with associated longitudinals.

Note 4: For ships of Category 1 and 2 a greater diminution may be permitted over 0,5L amidships provided the hull girder section modulus, using the actual gauged thicknesses, is not less than 90 per cent of the Rule section modulus as a new ship. A reassessment of scantlings would be required where consideration of this is required.

Note 5: Ship categories are defined as follows:

Category 1: Oil tankers, chemical tankers, dry bulk cargo ships, combination carriers and liquefied gas ships having a length L equal to or greater than 90 metres.

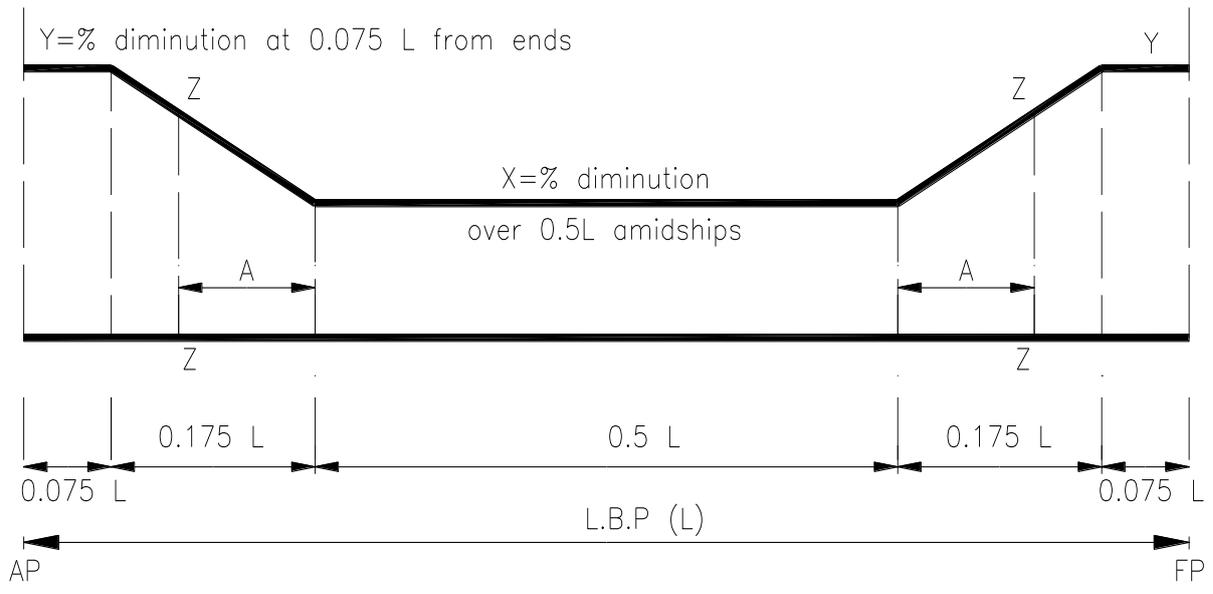
Category 2: All remaining ship types not included in Category 1 and having a length L equal to or greater than 90 metres.

Category 3: All ship types having a length L less than 90 metres.

L is the length of the vessel.

Note 6: Where the diminution of the topside or bottom area (plating and longitudinals) is in excess of 0,75 of the values given above, additional transverse sections are to be measured as recommended by the Surveyor.

Note 7: For oil tankers of 130 metres in length and upwards (as defined by the International Convention on Load Lines in force), in addition to topside and bottom area assessment, the ship's longitudinal strength is to be evaluated by using the thickness of longitudinal structural members (deck plating, deck longitudinals, bottom shell plating and bottom longitudinals) measured, renewed or reinforced as appropriate, during the Special Surveys carried out after the ship reaches 10 years of age.



Maximum allowable diminution at transverse section

$$Z - Z = X + \frac{A(Y - X)}{0.175L} \%$$

Table III Upper deck plating t_r and J_r values for residual buckling thickness calculations

Longitudinal stiffener spacing s (mm)	Location									
	OVER 0.4L amidships			AT 0.25L from amidships			AT 0.35L from amidships		AT 0.35L from ends	
	Steel Grade									
	MILD steel	HT32	HT36	MILD steel	HT32	HT36	MILD steel	HT32	HT36	ALL grades
	J_r									
	56.7	52.1	51.3	65.2	61.6	61.0	82.2	80.7	80.4	95.0
550	9.7	10.6	10.7	8.4	8.9	9.0	6.7	6.8	6.8	5.6
575	10.1	11.0	11.2	8.8	9.3	9.4	7.0	7.1	7.2	6.1
600	10.6	11.5	11.7	9.2	9.7	9.8	7.3	7.4	7.5	6.3
625	11.0	12.0	12.2	9.6	10.1	10.2	7.6	7.7	7.8	6.6
650	11.5	12.5	12.7	10.0	10.6	10.7	7.9	8.1	8.1	6.8
675	11.9	13.0	13.2	10.4	11.0	11.1	8.2	8.4	8.4	7.1
700	12.3	13.4	13.6	10.7	11.4	11.5	8.5	8.7	8.7	7.4
725	12.8	13.9	14.1	11.1	11.8	11.9	8.8	9.0	9.0	7.6
750	13.2	14.4	14.6	11.5	12.2	12.3	9.1	9.3	9.3	7.9
775	13.7	14.9	15.1	11.9	12.6	12.7	9.4	9.6	9.6	8.2
800	14.1	15.4	15.6	12.3	13.0	13.1	9.7	9.9	10.0	8.4
825	14.6	15.8	16.1	12.7	13.4	13.5	10.0	10.2	10.3	8.7
850	15.0	16.3	16.6	13.0	13.8	13.9	10.3	10.5	10.6	8.9
875	15.4	16.8	17.1	13.4	14.2	14.3	10.6	10.8	10.9	9.2
900	15.9	17.3	17.5	13.8	14.6	14.8	10.9	11.2	11.2	9.5
925	16.3	17.8	18.0	14.2	15.0	15.2	11.3	11.5	11.5	9.7
950	16.8	18.2	18.5	14.6	15.4	15.6	11.6	11.8	11.8	10.0
975	17.2	18.7	19.0	15.0	15.8	16.0	11.9	12.1	12.1	10.3
1000	17.6	19.2	19.5	15.3	16.2	16.4	12.2	12.4	12.4	10.5
1025	18.1	19.7	20.0	15.7	16.6	16.8	12.5	12.7	12.7	10.8
1050	18.5	20.2	20.5	16.1	17.0	17.2	12.8	13.0	13.1	11.1
1075	19.0	20.6	21.0	16.5	17.5	17.6	13.1	13.3	13.4	11.3
1100	19.4	21.1	21.4	16.9	17.9	18.0	13.4	13.6	13.7	11.6

1125	19.8	21.6	21.9	17.3	18.3	18.4	13.7	13.9	14.0	11.8
1150	20.3	22.1	22.4	17.6	18.7	18.9	14.0	14.3	14.3	12.1
1175	20.7	22.6	22.9	18.0	19.1	19.3	14.3	14.6	14.6	12.4
1200	21.2	23.0	23.4	18.4	19.5	19.7	14.6	14.9	14.9	12.6

NOTE

The Table gives values of J_r and residual thickness, t_r , for the equation below at specific locations and longitudinal stiffener spacings. When necessary intermediate values may be obtained by linear interpolation.

The residual buckling thickness, t_r , is to be not less than the smaller of the following two equations, where t_0 is the original thickness, s the spacing of deck longitudinals, in mm and J_r a factor dependent on location and steel type.

$$(1) t_r = (t_0 - 1.5) \text{ mm}$$

$$(2) t_r = \frac{s}{J_r} \text{ mm}$$

Where,

- $J_r = 56.7$ over 0.4L amidships (mild steel)
- $J_r = 52.1$ over 0.4L amidships (Higher tensile steel Grade 32)
- $J_r = 51.3$ over 0.4L amidships (Higher tensile steel Grade 36)
- $J_r = 95.0$ at 0.075L from ends

Intermediate values are to be obtained by linear interpolation.

For ships built with excess hull girder section modulus the diminution will be specially considered.