
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part L Equipment

2009 AMENDMENT NO.1

Rule No.19 15th April 2009

Resolved by Technical Committee on 4th February 2009

Approved by Board of Directors on 24th February 2009

AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

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

Part L EQUIPMENT

Chapter 3 CHAINS

3.2 Offshore Mooring Chains

Paragraph 3.2.3 has been amended as follows.

3.2.3 Kinds of Offshore Chains

Offshore chains are to be subdivided into ~~three~~ five grades that are Grade *R3* offshore chain, Grade *R3S* offshore chain ~~and~~, Grade *R4* offshore chain, Grade *R4S* offshore chain and Grade *R5* offshore chain.

3.2.4 Materials

- 1** Offshore chains are to be made of the materials given in **Table L3.7** according to their grades and manufacturing processes, respectively.
- 2** The studs are to be made of steel whose the carbon content is in general less than 0.25% if the studs are welded in place however, the studs may be made of steel bars corresponding to that of the offshore chain or of equivalent thereto considered by the Society.
- 3** Accessories for offshore chains are to be made of the materials given in **Table L3.8** corresponding to the grades of the connected offshore chain.

Table L3.7 has been amended as follows.

Table L3.7 Materials for Offshore Chain Link

Grades of offshore chain	Materials	Grade of material
Grade <i>R3</i> offshore chain	Grade <i>R3</i> offshore chain bar	<i>KSBCR3</i>
Grade <i>R3S</i> offshore chain	Grade <i>R3S</i> offshore chain bar	<i>KSBCR3S</i>
Grade <i>R4</i> offshore chain	Grade <i>R4</i> offshore chain bar	<i>KSBCR4</i>
<u>Grade <i>R4S</i> offshore chain</u>	<u>Grade <i>R4S</i> offshore chain bar</u>	<u><i>KSBCR4S</i></u>
Grade <i>R5</i> offshore chain	Grade <i>R5</i> offshore chain bar	<i>KSBCR5</i>

Table L3.8 has been amended as follows.

Table L3.8 Materials for accessories of Offshore Chain

Kind of connected offshore chain	Manufacturing process			
	Casting	Grade of material	Forging	Grade of material
Grade R3 offshore chain	Grade R3 steel casting for offshore chain	<i>KSCCR3</i>	Grade R3 steel forging for offshore chain	<i>KSFCR3</i>
Grade R3S offshore chain	Grade R3S steel casting for offshore chain	<i>KSCCR3S</i>	Grade R3S steel forging for offshore chain	<i>KSFCR3S</i>
Grade R4 offshore chain	Grade R4 steel casting for offshore chain	<i>KSCCR4</i>	Grade R4 steel forging for offshore chain	<i>KSFCR4</i>
<u>Grade R4S offshore chain</u>	<u>Grade R4S steel casting for offshore chain</u>	<u><i>KSCCR4S</i></u>	<u>Grade R4S steel forging for offshore chain</u>	<u><i>KSFCR4S</i></u>
<u>Grade R5 offshore chain</u>	<u>Grade R5 steel casting for offshore chain</u>	<u><i>KSCCR5</i></u>	<u>Grade R5 steel forging for offshore chain</u>	<u><i>KSFCR5</i></u>

3.2.5 Processes of Manufacture

Sub-paragraph 3.3.5-2 and -3 have been amended as follows.

1 The manufacturers of offshore chains including connecting common links are to obtain approval of the Society in advance concerning their manufacturing methods.

2 ~~In cases where the studs are welded to offshore chain excluding Grade R4 offshore chain for Grade R3 offshore chains and Grade R3S offshore chains are welded, are to be complied with the following (1) to (3) are to be complied with:-~~

- (1) Both ends of the stud are to be a good fit into the link and are not to be fitted on the flash butt weld of the link as far as practicable, and the full periphery of the stud end is to be welded. Welding of both ends of the stud is not permitted unless specially approved by the Society.
- (2) Welding position is to be flat as possible.
- (3) All welds are to be carried out before the final heat treatment of offshore chains.

3 ~~Welding of studs in Grade R4 offshore chain, Grade R4S offshore chain and Grade R5 offshore chain is not permitted unless specially approved by the Society.~~

4 Accessories of offshore chains are to be made by casting or forging. Their manufacturers are to obtain approval by the Society in advance concerning their manufacturing methods.

5 Machining of kenter shackles is to result in fillet radius minimum 3% of nominal diameter.

6 Connecting common links are to be substituted for defective common links of offshore chain without necessity for re-heat treatment of the whole length and with the method of heat treatment which is not to affect the properties of the adjoining links whose temperature is nowhere exceed 250°C. However, an alternative procedure may be applied to this joining method where specially approved by the Society.

3.2.8 Dimensions and Forms

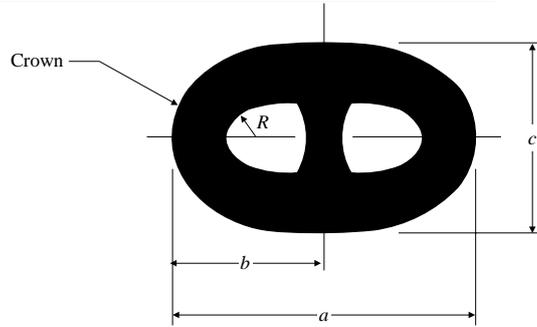
Sub-paragraph 3.2.8-1 has been amended as follows.

- 1 The standard dimensions and forms of each kind of link and accessory are to be as given in **Fig. L 3.12**.
- 2 The nominal diameter of offshore chains is to be denoted by the diameter at the crown of the common link.
- 3 Every kind of links and accessories are to be of uniform shape and their bent portions are to be sufficient to allow each link to work smoothly.

Fig L3.2 has been renumbered to Fig.3.3.
 Fig L3.2 has been added as follows.

Fig L3.2 Stud link and studless common link, proportions dimensions and tolerances

Stud link - The internal link radii (R) and external radii should be uniform

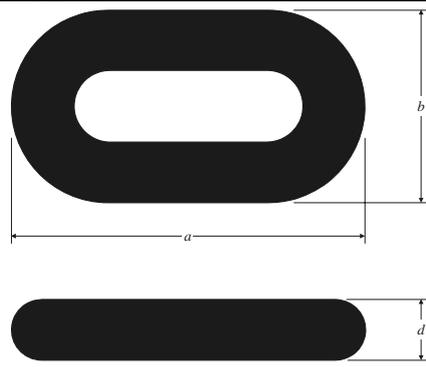


<u>Designation⁽¹⁾</u>	<u>Description</u>	<u>Nominal Dimension of the Link</u>	<u>Minus Tolerance</u>	<u>Plus Tolerance</u>
<i>a</i>	<u>Link Length</u>	$6d$	$0.15d$	$0.15d$
<i>b</i>	<u>Link Half Length</u>	$a^*/2$	$0.1d$	$0.1d$
<i>c</i>	<u>Link Width</u>	$3.6d$	$0.09d$	$0.09d$
<i>e</i>	<u>Stud Angular Misalignment</u>	0 degrees	4 degrees	4 degrees
<i>R</i>	<u>Inner Radius</u>	$0.65d$	0	-----

Notes:

- (1) Dimension designation is shown in above figure.
 d = Nominal diameter of chain
 a^* = Actual link length

Studless - The internal link radii (R) and external radii should be uniform.



<u>Designation⁽¹⁾</u>	<u>Description</u>	<u>Nominal Dimension of the Link</u>	<u>Minus Tolerance</u>	<u>Plus Tolerance</u>
<i>a</i>	<u>Link Length</u>	$6d$	$0.15d$	$0.15d$
<i>b</i>	<u>Link Width</u>	$3.35d$	$0.09d$	$0.09d$
<i>R</i>	<u>Inner Radius</u>	$0.60d$	0	-----

Notes:

- (1) Dimension designation is shown in above figure.
 d = Nominal diameter of chain

(2) Other dimension ratios are subject to special approval.

3.2.9 Dimensional Tolerances

Sub-paragraph 3.2.9-2, -4 and -7 have been amended as follows:

1 The dimensions of offshore chains are to be measured at least 5% of all links after the execution of a proof test.

2 The tolerances of offshore chains are to comply with the following requirements.

- (1) The negative tolerance at the crown part of each kind of link is to comply with the requirements in accordance with its nominal diameter as given in **Table L3.49**, and the plus tolerance may be up to 5 % of its nominal diameter. However, no negative tolerance of the cross sectional area of the crown part of the link is permitted.
- (2) The tolerances other than the crown part of each kind of link are to be up to +5%, but is not to be negative.
- (3) Notwithstanding to the requirements in (1) and (2) above, no negative tolerance of the diameter at welded part is permitted. The positive tolerances thereof are left to the discretion of the Society.
- (4) The tolerances with regard to the location of stud set are left to the discretion of the Society.
- (5) The tolerances except for the requirements specified in (1) to (4) above are to be $\pm 2.5\%$.

3 For all offshore chain, a length of 5 common links which are connected is to be measured. The measurement of a length of 5 links are to be carried out in accordance with the following procedures while the offshore chain is loaded to 5 - 10% of the minimum proof load.

- (1) The first five links is to be measured.
- (2) The next set of five links, at least two links from the previous five links are to be included, is to be measured.
- (3) The measurement procedure specified in (2) is to be followed for the entire offshore chain length.
- (4) The links held in the end blocks may be excluded from this measurement.

4 The allowable manufacturing tolerance on a length of five links by measuring procedure specified in -3 is to comply with the requirements as given in **Table L3.910**.

5 If a length of five links is shorter than allowable value, offshore chain may be stretched by tensile loading. In this case, however, tensile load is not to exceed 110% of minimum proof load required.

6 If links are found to be defective or not to meet the dimensional tolerance requirement specified in -1, defective links may be cut off and a connecting common link or joining shackle inserted in their place. In this case, proof tests are to be carried out again after insertion of a connecting common link or a joining shackle, and dimensions of a connecting common link or a joining shackle are to measured.

7 At least one accessories (of the same type, size and nominal strength) out of 25 is to be measured for dimensions after proof load testing. Dimensions are subjected to a manufacturing tolerances of the following (1) and (2). These tolerances do not apply to machined surface.

- (1) The tolerances of the diameter of accessories are to be up to +5% of their nominal diameters, but are not to be negative.
- (2) The tolerances other than diameter of accessories are to be $\pm 2.5\%$.

Table L3.9 to Table L3.11 have been renumbered to Table L3.10 to Table L3.12.
Table L3.9 has been added as follows.

Table L3.9 Negative Tolerances of Diameters

Nominal Diameter (mm)	Negative Tolerances (mm)
up to 40	1
over 40 up to 84	2
over 84 up to 122	3
over 122 up to 152	4
over 152 up to 184	6
over 184 up to 210	7.5

Paragraph 3.2.10 has been amended as follows.

3.2.10 Mass

The mass of offshore chains is to comply with the standard mass given in **Table L3.9~~10~~**, in accordance with their kind, and to be measured after the execution of proof tests.

Table L3.10 has been amended as follows.

Table L3.9~~10~~ Braking and Proof Test Loads, Mass and Length over 5 Links for Offshore Chains

King of Offshore chain Item	Grade R3 offshore chain	Grade R3S offshore chain	Grade R4 offshore chain
Proof test load (kN)	$0.0148d^2 (44-0.08d)$	$0.0180d^2 (44-0.08d)$	$0.0216d^2 (44-0.08d)$
Breaking test load (kN)	$0.0223d^2 (44-0.08d)$	$0.0249d^2 (44-0.08d)$	$0.0274d^2 (44-0.08d)$
Mass of offshore chain (kg/m)	$0.0219d^2$		
Length over 5 links (mm)	$22d$ min. — $22.55d$ max.		

Test Load	Grade R3 Stud Link	Grade R3S Stud Link	Grade R4 Stud Link	Grade R4S Stud Link	Grade R5 Stud Link
Proof test load (kN)	$0.0148d^2 (44-0.08d)$	$0.0180d^2 (44-0.08d)$	$0.0216d^2 (44-0.08d)$	$0.0240d^2 (44-0.08d)$	$0.0251d^2 (44-0.08d)$
Breaking test load (kN)	$0.0223d^2 (44-0.08d)$	$0.0249d^2 (44-0.08d)$	$0.0274d^2 (44-0.08d)$	$0.0304d^2 (44-0.08d)$	$0.0320d^2 (44-0.08d)$
Test Load	Grade R3 Studless	Grade R3S Studless	Grade R4 Studless	Grade R4S Studless	Grade R5 Studless
Proof test load (kN)	$0.0148d^2 (44-0.08d)$	$0.0174d^2 (44-0.08d)$	$0.0192d^2 (44-0.08d)$	$0.0213d^2 (44-0.08d)$	$0.0223d^2 (44-0.08d)$
Breaking test load (kN)	$0.0223d^2 (44-0.08d)$	$0.0249d^2 (44-0.08d)$	$0.0274d^2 (44-0.08d)$	$0.0304d^2 (44-0.08d)$	$0.0320d^2 (44-0.08d)$
Chain Weight (kg/m)	Stud Link		$0.0219d^2$		
	Studless chain		Weight calculations for each design are to be submitted.		
Length over 5 links (mm)	$over 22d$ up to $22.55d$				

3.2.11 Breaking Tests

Sub-paragraph 3.2.11-1 has been amended as follows.

1 The breaking test for offshore chain is to be carried out by the following procedures after final heat treatment.

- (1) A breaking test specimen consisting of at least 3 links is to be either taken from the offshore chain or produced at the same time and in the same manner as the offshore chain.
- (2) The breaking test frequency is to be based on tests at sampling intervals according to **Table L3.4011** corresponding to its nominal diameter provided that every cast is represented.
- (3) Each specimen is to be capable of withstanding the break load specified in **Table L3.910** without fracture maintained at that load for 30 *seconds*.
- (4) Where the capacity of the testing machine does not reach the breaking test loads specified in **Table L3.910**, the breaking test may be substituted by a method approved by the Society.
- (5) If a breaking test fails, a thorough examination is to be carried out to identify the cause of failure.
- (6) If a breaking test fails, two additional breaking test specimens representing the same sampling length of offshore chain are to be subjected to the breaking test. If two additional breaking test result satisfactorily, it will be decided what lengths of offshore chain can be accepted based upon the results of the failure investigation specified in (5).
- (7) If either or both results of the additional test and failure investigation specified in (5) and (6) fail, the sampling length of offshore chain represented will be rejected. If a single link is found to be defective or not to meet the requirement of breaking test, defective links may be cut out and connecting common link or joining shackle inserted in its place and retest of breaking test may be carried out. If the result of the retest is found satisfactory, the sampling length of offshore chain represented may be passed.

Table L3.11 has been amended as follows.

Table L3.4011 Number of Breaking Test

Nominal diameter of offshore chain d (mm)	Maximum sampling interval (m)
$d \leq 48$	91
$48 < d \leq 60$	110
$60 < d \leq 73$	131
$73 < d \leq 85$	152
$85 < d \leq 98$	175
$98 < d \leq 111$	198
$111 < d \leq 124$	222
$124 < d \leq 137$	250
$137 < d \leq 149$	274
$149 < d \leq 162$	297
$162 < d \leq 175$	322
$175 < d \leq 186$	322 346
$186 < d \leq 199$	370
$199 < d \leq 210$	395

Paragraph 3.2.12 has been amended as follows.

3.2.12 Proof Tests

1 The proof test is to be carried out for the entire length of offshore chain by the following procedures after final heat treatment.

- (1) Offshore chains are to withstand the proof test loads specified in **Table L3.910** without crack, breakage or any other defects.
- (2) Notwithstanding the requirements of (1) above, where plastic straining is used to set studs, the applied proof load is not to be greater than that in approval tests for manufacturing.
- (3) If a link fails during proof load testing, a thorough examination is to be carried out to identify the probable cause of failure of the proof test from the manufacturing records. Where the cause of failure is identified and the presence in other lengths of factors or conditions thought to be causal to failure is not found from the above failure investigation, this length of chain except a failure link may be accepted.
- (4) In the event that two or more links in the proof loaded length fail, that length of offshore chain is to be rejected. An investigation and retest are to be carried out in accordance with the following (a) to (c) and where these results are found satisfactorily, this length of offshore chain may be accepted.
 - (a) A thorough examination is to be carried out to identify the probable cause of failure of the proof test from the manufacturing records. The tests in order to identify the cause of failure may be required where deemed necessary by the Society.
 - (b) A breaking test specimen is to be taken from each side of the one failed link according to **3.2.11-1(1)**, and subjected to the breaking test.
 - (c) Defective links may be cut out and connecting common link or joining shackle inserted in its place and retest of proof load test is to be carried out.

2 All kinds of accessories and connecting common links are to be tested to the proof test loads specified in **Table L3.910**, in accordance with the kinds and diameters of the offshore chains to be connected therewith, and they are to be withstand the tests without crack, breakage or any other defects. This test may be carried out simultaneously with the proof test for the offshore chains or together with any offshore chains of the same diameter with which accessories are connected.

Paragraph 3.2.13 has been amended as follows.

3.2.13 Mechanical Tests

1 Mechanical tests for offshore chains are to be carried out in accordance with following manner after final heat treatment.

- (1) One tensile test specimen and 3 sets (9 pieces) impact test specimens are to be taken from the maximum sampling interval corresponding to the nominal diameter of offshore chain specified in **Table L3.4011**. Test specimens are to be taken from the location given in **Fig. L3.23** of the part specified in the followings.
 - (a) The tensile test specimen is to be taken in the side opposite the flash weld.
 - (b) One set (3 pieces) impact test specimens are to be taken across the flash butt weld with the notch centered in the middle, one set are to be taken across the unwelded side and one set are to be taken from the bent region.
- (2) Test procedures and form of test specimen are to comply with the requirements in **Chapter 2, Part K**.
- (3) Mechanical properties are to comply with the requirements specified in **Table L3.412**.
- (4) If the tensile test result does not conform to the requirements, a retest of two further specimens selected from the same sample may be carried out. Where both additional tensile tests show

satisfactory results, the sampling length of offshore chain is considered acceptable.

- (5) If the impact test results does not conform to the requirements, a retest of three further 1 set (3 pieces) specimens selected from the same sample may be carried out. The results of a retest are to be added to those previously obtained to form a new average. If the results of a retest comply with the requirements specified in **Table L3.412** and the new average comply with the requirements specified in **Table L3.412**, the sampling length of offshore chain is considered acceptable.

2 Mechanical tests for accessories of offshore chains and connecting common links are to be carried out in accordance with following manner after final heat treatment.

- (1) One tensile test specimen and one set (3 pieces) impact test specimen are to be taken at the frequency specified in **3.2.11-2(1)** of accessories of offshore chains and connecting common links and mechanical tests are to be carried out. Mechanical properties are to comply with the requirements specified in **Table L3.412**.
- (2) Where the test results specified in (1) above do not conform to the requirements, additional tests may be carried out by the two tensile test specimens and 2 sets impact test specimens taken from the same lot specified in (1) above. The results of the retest of impact test specimens are to be added to those previously obtained to form a new average. Where one tensile test does not conform to the requirement specified in **Table L3.412**, the sampling rot represented is to be subjected to rejection and where the new average value does not comply with the requirements specified in **Table L3.412**, the sampling rot represented is to be subjected to rejection.

Fig L3.23 Location for Sampling Test Specimens for Links of Offshore Chains

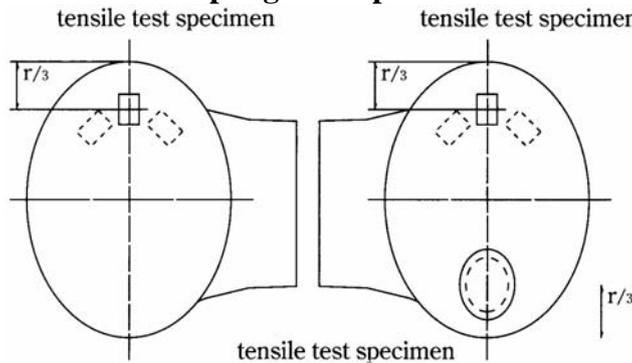


Table L3.12 has been amended as follows.

Table L3.412 Mechanical Properties

Kinds of off-shore chains	Tensile test				Impact test ⁽¹⁾		
	Yield point or proof stress ⁽²⁾	Tensile strength ⁽²⁾	Elongation (L=5d)	Reduction of area	Testing Temperature	Minimum mean absorbed energy (J)	
	(N/mm ²)	(N/mm ²)	(%)	(%)	(°C)	except welded part	welded part
Grade R3	410 min.	690 min.	17 min.	50 min.	-20 ⁽³⁾	40 ⁽³⁾	30 ⁽³⁾
Grade R3S	490 min.	770 min.	15 min.	50 min.	-20 ⁽³⁾	45 ⁽³⁾	33 ⁽³⁾
Grade R4	580 min.	860 min.	12 min.	50 min.	-20	50	36
<u>Grade R4S</u>	<u>700 min.</u>	<u>960 min.</u>	<u>12 min.</u>	<u>50 min.</u>	<u>-20</u>	<u>56</u>	<u>40</u>
Grade R5	760 min.	1000 min.	12 min.	50 min.	-20	58	42

Notes:

- (1) When the absorbed energy of two or more test specimens among a set of test specimens is less in value than the

specified minimum mean absorbed energy or when the absorbed energy of a single test specimen is less in value 70% of the specified minimum mean absorbed energy, the test is considered to have failed.

(2) Aim value of yield to tensile ratio is maximum 0.92.

(3) Impact test of Grade *R3* and *R3S* offshore chains may be carried out at the temperature of 0°C where approved by the Society. In this case, minimum mean absorbed energy is not to be less than following values.

	except welded part	welded part
(a) Grade <i>R3</i> offshore chain	60 <i>J</i>	50 <i>J</i>
(b) Grade <i>R3S</i> offshore chain	65 <i>J</i>	53 <i>J</i>

3.2.16 Markings

Sub-paragraph 3.2.16(2) has been amended as follows.

Where offshore chains and accessories of offshore chains have satisfactorily passed the tests and inspections required by **3.2**, they are to be marked as follows.

(1) Places of markings

At stud of each end of offshore chains

At stud of each end at intervals not exceeding 100 *m*

On connecting common link

On stud of common links next to connecting common links or joining shackles All kind of accessories of offshore chains

(2) Kinds of markings

Society's stamp

The grade of offshore chains and accessories of offshore chains (e.g. *NK-R3*, *NK-R3S* ~~and~~, *NK-R4*, *NK-R4S* and *NK-R5*)

The nominal diameter of offshore chains and accessories of offshore chains Manufacturer's number

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 April 2009.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part L **Equipment**

GUIDANCE

2009 AMENDMENT NO.1

Notice No.18 15th April 2009

Resolved by Technical Committee on 4th February 2009

Notice No.18 15th April 2009

AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

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

Part L EQUIPMENT

L3 CHAINS

L3.2 Offshore Mooring Chains

Paragraph L3.2.13 has been amended as follows.

L3.2.13 Mechanical Tests

Where applying the **Notes(3)** of **Table L3.~~4~~12 of the Rules**, manufacturer is to submit the documents indicating that manufacturer and purchaser agreed to conduct impact test in accordance with **Notes(3)** of **Table L3.~~4~~12 of the Rules**, to the Society for approval.

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 15 April 2009.