TÜRK LOYDU RULE CHANGE SUMMARY

TL NUMBER: 03/2017 JULY 2017

Latest editions of TL Rules incorporate all rule changes. The latest rule revisions of a published rule are shown with a vertical line. Changes after the publication of the rule are written in red colour.

Please note that within this document added items are written in red and for deleted items strikethrough is applied. After the publication of relevant rule, those revisions are to be indicated with a vertical line. Following Rule Changes presented in English are also implemented into Turkish Version of Rules.

RULE CHANGE SUMMARY

CLASSIFICATION AND SURVEYS

No	Item
01	Section 2
01	Section 3

CHAPTER 1 - HULL

No	Item
01	Section 07
02	Section 16
03	Section 17
04	Section 22

05	Section 23
06	Section 26
07	Section 28
08	Section 36

CHAPTER 2 - MATERIAL

No	**Item**
01	**Section 3**
02	Section 4
02	**Section 10**

CHAPTER 3 - WELDING

01	**Section 5**
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CHAPTER 4 - MACHINERY

No	**Item**
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01	**Section 9**
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CHAPTER 4-1 - AUTOMATION

No	**Item**
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CHAPTER 5 – ELECTRICAL INSTALLATION

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CHAPTER 9 – CONSTRUCTION AND CLASSIFICATION OF YACHTS

No	**Item**
01	**Section 5**
02	Section 6

CHAPTER 35 - TENTATIVE RULES FOR SHIPS LESS THAN 500 GT

No	**Item**
01	**A Section 1**
02	A Section 2
03	A Section 3
04	A Section 4

CLASSIFICATION & SURVEYS

01. Section 2 - Classification

Revision Date: April 2017

Entry into Force Date: 1 July 2017

A new notation is added for Power Plant Ships to Table 2.12 as below:

POWER PLANT SHIP	Ships specially equipped for power generation	Power plant ship	Case by case	Case by case

02. Section 3 - Surveys

Revision Date: April 2017

Entry into Force Date: 1 July 2017

A new paragraph in item B.4.1.1 is added according to UR E24 as below:

……

- As a minimum, harmonic distortion levels of main busbar on board such existing ships are to be measured annually under seagoing conditions as close to the periodical machinery survey as possible so as to give a clear representation of the condition of the entire plant to the surveyor. Harmonic distortion readings are to be carried out when the greatest amount of distortion is indicated by the measuring equipment. An entry showing which equipment was running and/or filters in service is to be recorded in the log so this can be replicated for the next periodical survey. Harmonic distortion levels are also to be measured following any modification to the ship's electrical distribution system or associated consumers by suitably trained ship's personnel or from a qualified outside source.

  Records of all the above measurements are to be made available to the surveyor at each periodical survey.

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item D.2.3.6.2 is deleted and following items' numbers are revised according to UR Z7.1 Rev.12 as below:

~~**2.3.6.2** Representative thickness measurement to determine both general and local levels of corrosion in the shell frames and their end attachments in all cargo holds and water ballast tanks is to be carried out. Thickness measurement is also to be carried out to determine the corrosion levels on the transverse bulkhead plating. The thickness measurements may be dispensed with provided the surveyor is satisfied by the close-up examination, that there is no structural diminution, and the hard protective coating where applied remains efficient.~~

2.3.6.2 The surveyor may extend the thickness measurements as deemed necessary. When thickness measurements indicate substantial corrosion, the extent of thickness measurements is to be increased to determine the extent of areas of substantial corrosion.

Table 3.1 may be used as guidance for these additional thickness measurements.

2.3.6.3 For areas in spaces where hard protective coatings are found to be in a good condition, the extent of thickness measurement according to Table 3.6 may be specially considered.

2.3.6.4 Transverse sections are to be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item D.3.1.1 is revised as below:

……

- The electrical equipment, including the generators, the motors of the essential auxiliary machinery, the switch gear, including its protective and interlocking device, cable network is to be examined externally. The insulation resistance is to be measured (see, IACS Rec. 57 Rev.1).

- Electrical installations, including machinery and equipment, located in spaces in which there is a risk of inflammable gas or steam air mixture accumulating, are to be checked as to the explosion protection provided (see, IACS Rec. 35 Rev.1).

……

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Table 3.4 is revised as below:

Table 3.4 Minimum requirements for internal examination at hull class renewal surveys of fuel oil, lub oil and fresh water tanks (aligned with URZ7 Rev.25)

Tank	Class renewal survey No.1 Age ≤ 5	Class renewal survey No.2 5 < Age ≤ 10	Class renewal survey No.3 10 < Age ≤ 15	Class renewal survey No.4 and subsequent Age > 15

Fuel oil bunker tanks - Engine room - Cargo length area - If no tanks in Cargo Length Area, additional fuel tank(s) outside of Engine Room (if fitted)	None None None	None One One	One Two One	One Half, minimum 2 Two
Lub oil	None	None	None	One
Fresh water	None	One	All	All

Notes :

1. *These requirements apply to tanks of integral (structural) type.*

2. *If a selection of tanks is accepted to be examined, then different tanks are to be examined at each class renewal survey, on a rotational basis.*

3. *Peak tanks (all uses) are subject to internal examination at each class renewal survey.*

4. ***At class renewal survey No.3 and subsequent surveys, one deep tank for fuel oil in the cargo length area is to be included, if fitted.***

Revision Date: April 2017

Entry into Force Date: 1 July 2017

A new paragraph in item G.2 is added according to UR Z18 Rev.6 as below:

2. Internal Inspection

Water tube boilers used for main propulsion, including reheat boilers, all other boilers of essential service, and boilers of non-essential service having working pressure exceeding 0.35 N/mm^2 (3.5 bar) and a heating surface exceeding 4.5 m^2, are to be surveyed internally.

Where deemed necessary by the Surveyor, the boiler is to be cleaned on the water, flue gas and exhaust gas sides, and, if required, its outside surfaces are to be exposed as well, so that all walls subject to pressure may be examined.

At each survey the boilers, super heaters and economizers are to be examined internally on water-steam side and fire sides. Boiler mountings and safety valves are to be examined at each survey and opened out as considered necessary by **TL**.

When direct visual internal inspection is not feasible due to the limited size of the internal spaces, such as for small boilers and/or narrow internal spaces, this may be replaced by a hydrostatic pressure test or by alternative verifications as determined by **TL**.

The adjustment of the safety valves is to be verified during each boiler internal survey. For exhaust gas boilers, if steam cannot be raised at port, the safety valves are to be adjusted at the test bench. The correct set pressure is to be verified by the Chief Engineer at sea and the results recorded in the log book for review by **TL.**

Revision Date: April 2017

Entry into Force Date: 1 July 2017

A new item M is added with title "Survey of Electrical Equipment Installed in Hazardous Areas on Tankers" according to IACS Rec.120.

PART A – CHAPTER 1 – HULL

01. Section 07 – Plating

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item B.2.2.1 is revised as below:

2.2.1 The thickness $t_{B,SW}$ of bottom plating is not to be less than determined by the following formula:

$$t_{B,SW} = 1.3 \cdot \frac{a}{a_0} \cdot \sqrt{\frac{L \cdot T}{H}} \ [mm]$$

$t_{B,SW}$ is not to be less than minimum thickness $t_{min,SW}$ determined in the item B.3.3 and need not to be greater than greater of t_B and t_{min} determined according to 2.1 and 3.1 or 3.2 respectively.

02. Section 16 – Hull Outfitting

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Note 7 of is revised as below:

(7) *Refer to UI SC190 and UI SC191 for interpretations acceptable to* ***TL****.*

03. Section 17 – Equipment

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item A.3.2, 3.3 and table 7.2 are revised as below:

3.2 For ships having the navigation notation K20 or K50, K6, L1, L2 the equipment in anchors and chain cables may be reduced. The reduction consists of taking one numeral lower in Table 17.1.

3.3 Upon requested by the owner, for ships having the notation K20, K6, L1 and L2, one anchor may be used with TL consent. See table 17.2.

Table 17.2 Equipment reduction for restricted service

Restriction of voyage	Stockless bower anchors		Stud-Link chain cables	
	Number	Mass change per anchor	Length reduction	Diameter reduction
3 nm from the coast line (Class D)	2	-%30	-%20	-%10
6 nm from the coast line (Class C), K6	2	-%30	-%20	-%10
20 nm from the coast line (Class B), K20	2	-%20	-	--
Alternatively				
3 nm from the coast line (Class D)	1	-	-%50	-
6 nm from the coast line (Class C), K6	1	-	-%50	-
20 nm from the coast line (Class B), K20	1	+%40	-%40	-

04. Section 22 – Corrosion Protection

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item A.7.1.1 is revised according to UI SC227 Rev.2 as below:

7.1.1 All seawater ballast tanks must be provided with a corrosion protection system.

The following tanks shall not be considered to be dedicated seawater ballast tanks and shall therefore be exempted from the application and requirement of the Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers (resolution MSC.215(82)), provided the coatings applied in the tanks described in paragraphs 2. and 3. below are confirmed by the coating manufacturer to be resistant to the media stored in these tanks and provided such coatings are applied and maintained according to the coating manufacturer's procedures.

05. Section 23 – Bow Stern and Doors

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item A.1.3 is revised according to UI SC220 Rev.1 Corr.2 as below:

1.3 For ~~vehicle ferries~~, ro-ro passenger ships~~, and other ships of similar type~~ subject to the provisions of subparagraphs SOLAS Reg. II-1/17-1 items 1.2 and 1.3, all accesses that lead to spaces below the bulkhead deck shall have a lowest point which is not less than 2.5 m above the bulkhead deck. **(1)**

06. Section 26 – Stability

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item A.2.10 is revised as below:

The Means a mechanically self-propelled ship which, by reason of its function, carries on board more than 12 special personnel as defined in paragraph 1.3.11 of the Code of Safety for Special Purpose Ships (2008 SPS Code) MSC. 266(84), as may be amended, including passengers (ships engaged in research, expeditions and survey; ships for training of marine personnel; whale and fish factory ships not engaged in catching; ships processing other living resources of the sea, not engaged in catching or other ships with design features and modes of operation similar to ships mentioned above which, in the opinion of TL may be referred to this group).

Item E.1.1 is revised as below:

The requirements of this Section apply to cargo ships of ~~500 GT~~ 80 m. and more and to all passenger ships regardless of length, as well as those ships covered by other damage stability regulations in conventions or codes.

Item E.1.1.4 is revised as below:

Special purpose ships are to comply with the Code of Safety for Special Purpose Ships, Chapter 2, introduced by IMO Resolution MSC.266(84), as may be amended.

07. Section 28 – Oil Tankers

Revision Date: April 2017

Entry into Force Date: 1 July 2017

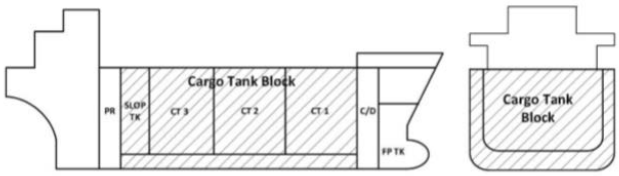
Item C.1.1.2 revised according to UR M76 as below:

~~**1.1.2** Fuel oil bunker tanks are not to be situated within cargo area. Such tanks may, however, be situated at forward and aft end of cargo area provided that total boundary area against cargo tanks is to be kept minimum.~~

1.1.2 On oil and chemical tankers, fuel tanks located with a common boundary to cargo tanks shall not be situated within the cargo tank block. Such tanks may, however, be situated at the forward and aft ends of the cargo tank block instead of cofferdams. Fuel tanks shall extend neither fully nor partly into cargo or slop tanks.They may however be accepted when located as independent tanks on open deck in the cargo area subject to spill and fire

safety considerations. Fuel tanks are not permitted to extend into the protective area of cargo tanks required by MARPOL Annex I and the IBC code. For chemical tankers due attention has to be paid to restrictions on cargoes that can be located adjacent to fuel tanks.

The arrangement of independent fuel tanks and associated fuel piping systems, including the pumps, can be as for fuel tanks and associated fuel piping systems located in the machinery spaces. For electrical equipment, requirements to hazardous area classification must however be taken into account.



Cargo tank block is the part of the ship extending from the aft bulkhead of the aftmost cargo or slop tank to the forward bulkhead of the forward most cargo or slop tank, extending to the full depth and beam of the ship, but not including the area above the deck of the cargo or slop tank.

Revision Date: April 2017

Entry into Force Date: 1 July 2017

Item C.2.3 is moved to C.2.2.2.2 and sub-items and related references are renumbered accordingly.

08. Section 36 – Goal-Based Ship Construction Standards For Bulk Carriers And Oil Tankers

Revision Date: April 2017

Entry into Force Date: 1 July 2017

This is a new section added according to UR Z23 Rev.6.

PART A – CHAPTER 2 – MATERIAL

01. Section 3 – Rolled Steel Plates, Sections, Bars

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item C is revised according to UR W16 Rev.3 and E is revised according to UR W1 Rev.3.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Appendix D is added with a title “Manufacturing Approval Scheme of High Strength Steels for Welded Structures” according to UR W16.

02. Section 4 – Steel Pipes and Fittings

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Table 4.13 is revised as below:

Table 4.13 Chemical composition of steel pipes for low temperature services

Strength category or pipe grade	Chemical composition [%]									
	$C_{max.}$	Si	Mn	$P_{max.}$	$S_{max.}$	Cr	Ni	Mo	N	Others
TL-R 360 T	0.16	≤ 0.40	0.40-1.20	0.025	0.020	≤ 0.3	≤ 0.3	≤ 0.08	-	Al_{met} ≥ 0.015 **(1) (2)**
TL-R 390 T	0.16	≤ 0.40	0.50-1.50							
TL-R 490 T	0.18	0.10-0.50	≥ 0.90							
TL-R 0.5 Ni	0.16	≤ 0.50	0.85-1.70	0.025	0.015	≤ 0.15	0.30-0.85	≤ 0.10	-	Al_{met} ≥ 0.015 **(1) (3)**
TL-R 3.5 Ni	0.15	0.15-0.35	0.30-0.85	0.025	0.010	-	3.25-3.75	-	-	V ≤ 0.05
TL-R 9 Ni	0.13			0.020			8.5-9.5	≤ 0.10		
1.4306	0.030	≤ 1.00	≤ 2.00	0.045	0.015	18.0-20.0	10.0-12.0	-	≤ 0.10	-
1.4404	0.030					16.5-18.5	10.0-13.0	2.0-2.5	≤ 0.10	
1.4541	0.08					17.0-19.0	9.0-12.0	-	-	Ti ≥ 5x%C ≤ 0.70
1.4550	0.08					17.0-19.0	9.0-12.0	-	-	Nb ≥ 10x%C ≤ 1.00
1.4571	0.08					16.5-18.5	10.5-13.5	2.0-2.5	-	Ti ≥ 5x%C ≤ 0.70

(1) *Al may be wholly or partly replaced by other fine grain elements.*
(2) *Residual elements: Cu ≤ 0.20; total Cr + Cu + Mo ≤ 0.45 %*
(3) *Residual elements: Nb ≤ 0.05; Cu ≤ 0.15; V ≤ 0.05; total ≤ 0.30*

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Table 4.14 is revised as below:

Table 4.14 Mechanical and technological properties of steel pipes for low temperature services

Strength category or pipe grade	Tensile strength R_m [N/mm²]	Yield strength or proof stress R_{eH} or $R_{P0.2}$, $R_{P0.1}$ (1) [N/mm²] min.	Elongation A [%] min.		Impact energy KV (2) [J] min.		
			Long.	Transv.	Test temperature[C°]	Long.	Transv.

TL-R 360 T	360-490	255	25	23	5°C below design temperature, min. -20°C	41 (29)	27 (19)
TL-R 390 T	390-510	275	24	22			
TL-R 490 T	490-630	355	22	20			
TL-R 0.5 Ni	490-610	355	22	20	-60		
TL-R 3.5 Ni	440-620	345	22	20	-95		
TL-R 9 Ni	690-840	510	20	18	-196		
1.4306	460-680	215	40	35	-196	-	60
1.4404	490-690	225	40	30			
1.4541	500-730	235	35	30			
1.4550	510-740	240	35	30			
1.4571	500-730	245	35	30			

(1) *$R_{P0.2}$ or R_{eH} applies to ferritic steels, $R_{P0.1}$ austenitic steels.*

(2) *Average value of 3 specimens; the values in brackets are the indivudual minima.*

03. Section 10 – Materials for Equipment

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item C is revised according to UR W22 Rev.6 as below:

1.1.2 Mooring equipment covered are common stud and studless links, connecting common links (splice links), enlarged links, end links, detachable connecting links (shackles), end shackles, subsea connectors, swivels and swivel shackles.

1.2.3 Each grade is to be individually approved. Approval for a higher grade does not constitute approval of a lower grade. If it is demonstrated to the satisfaction of **TL**, that the higher and lower grades are produced to the same manufacturing procedure using the same chemistry and heat treatment, consideration will be given to qualification of a lower grade by a higher. The parameters applied during qualification are not to be modified during production.

1.3.2.2 Flash welding including current, force, time and dimensional variables as well as control and recording of parameters, maintenance procedure and programme for welding machine**.**

1.3.2.9 The manufacturer's procedure for removing and replacing defective links without heat treatment of the entire chain.

1.3.3 For initial approval CTOD (Crack Tip Opening Displacement) tests are to be carried out on the particular IACS mooring grade of material. CTOD tests are to be tested in accordance with a recognized Standard such as BS 7448 Part 1 and BS EN ISO 15653:2010. The CTOD test piece is to be a standard 2 x 1 single edge notched bend piece, test location as shown in Figure 10.6. The notch of the CTOD specimen is to be located as close to the surface as practicable. The minimum cross section of the test piece shall be 50 x 25mm for chain diameters less than 120 mm, and 80 x 40 mm for diameters 120 mm and above. CTOD specimens are to be taken from both the

side of the link containing the weld and from the opposite side. Three links are to be selected for testing, a total of six CTOD specimens. The tests are to be taken at minus 20ºC and the lowest CTOD of each set of 3 specimens shall meet the minimum values indicated below, Table 10.15

1.3.4 Calibration of furnaces shall be verified by measurement and recording of a calibration test piece with dimensions equivalent to the maximum size of link manufactured. The manufacturer shall submit a procedure for furnace temperature surveys which shall include the following requirements: The temperature uniformity of furnaces is to be surveyed whenever approval of manufacturer is requested and at least annually during normal operating conditions. Furnaces are to be checked by conveying a monitoring link instrumented with two thermocouples through the furnaces at representative travel speed. One thermocouple shall be attached to the surface of the straight part and one thermocouple shall be imbedded in a drilled hole located at the mid thickness position of the straight part of the calibration block. The time-temperature curves shall show that the temperatures throughout the cross section and the soaking times are within specified limits as given in the heat treatment procedure.

1.5.2 Approval will be given only after successful testing of the completed chain. Each Grade is to be individually approved. Approval for a higher grade does not constitute approval of a lower grade. If it is demonstrated to the satisfaction of **TL**, that the higher and lower grades are produced to the same manufacturing procedure using the same chemistry and heat treatment, consideration will be given to qualification of a lower grade by a higher. The parameters applied during qualification are not to be modified during production.The approval will normally be limited up to the maximum diameter equal to that of the chain diameter tested. The rolling reduction ratio is to be recorded and is to be at least 5:1 for TL-R3, TL-R3S, TL-R4, TL-R4S and TL-R5. The rolling reduction ratio used in production can be higher, but should not be lower than that qualified.

1.5.3 The steelmaker is to submit a specification of the chemical composition of the bar material, which must be approved by **TL** and by the chain manufacturer. The steel maker is to confirm by analysis and testing that the specification is met.For grades TL-R4, TL-R4S and TL-R5 chain the steel shall contain a minimum of 0.20 percent molybdenum.

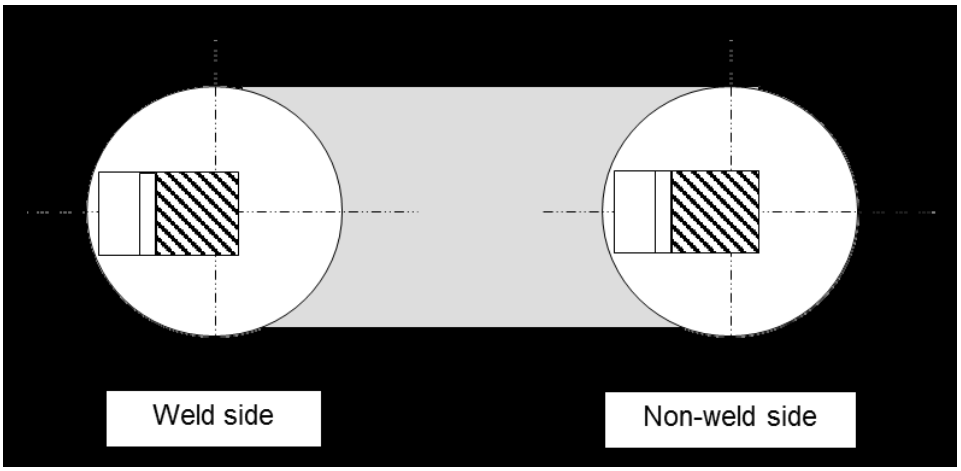


Figure 10.6 Location of CTOD test specimens for chain

Table 10.15.a Minimum CTOD test values for chain type

Chain Type	R3 in mm		R3S in mm		R4 in mm		R4S & R5 in mm	
	BM	WM	BM	WM	BM	WM	BM	WM
Stud link	0.20	0.10	0.22	0.11	0.24	0.12	0.26	0.13
Studless	0.20	0.14	0.22	0.15	0.24	0.16	0.26	0.17

1.6.2 Approval will be given only after successful testing of the completed accessory. Approval for a higher grade does not constitute approval of a lower grade. If it is demonstrated to the satisfaction of **TL,** that the higher and lower grades are produced to the same manufacturing procedure using the same steel specification, supplier and heat treatment, consideration will be given to qualification of a lower grade by a higher. The approval will normally be limited to the type of accessory and the IACS designated mooring grade of material up to the maximum diameter or thickness equal to that of the completed accessory used for qualification unless otherwise agreed by **TL**. However for the different accessories that have the same geometry, the tests for initial approval are to be carried out on the one having the lowest reduction ratio**.** Qualification of accessory pins to maximum diameters is also required. Individual accessories of complex geometries will be subject to **TL** requirements.

1.6.3 For forgings, forgings are to have wrought microstructure and the minimum reduction ratio is to be 3 to 1. The forging reduction ratio, used in the qualification tests, from cast ingot/slab to forged component is to be recorded. The forging reduction ratio used in production can be higher, but should not be lower than that qualified. The degree of upsetting during qualification is to be recorded and maintained during production. Heat cycling during forging and reheating is to be monitored by the manufacturer and recorded in the forging documentation. The manufacturer is to have a maintenance procedure and schedule for dies and tooling which shall be submitted to **TL**.

1.6.6 For initial approval CTOD tests are to be carried out on the particular IACS mooring grade of material. Three CTOD tests are to be tested in accordance with a recognized standard such as BS 7448 Part 1 and BS EN ISO 15653:2010. For rectangular accessories, the CTOD test piece is to be a standard 2 x 1 single edge notched bend specimen of thickness equal to full thickness of material to be tested. Subsized specimens can be used subject to approval of **TL**. For circular geometries, the minimum cross section of the test piece shall be 50 x 25mm for accessory diameters less than 120 mm, and 80 x 40 mm for diameters 120mm and above. The notch of the CTOD specimen is to be located as close to the surface as practicable. The tests are to be taken at minus 20º C and the results submitted for review. The minimum values of each set of three specimens are to at least meet the requirements as indicated in table 10.15.b (same as that of the studless chain material shown in table 10.15.a).

Table 10.15.b Minimum CTOD test values for accessories

Grade of Accessory	TL-R3 in mm	TL-R3S in mm	TL-R4 in mm	TL-R4S & TL-R5 in mm
CTOD	0.20	0.22	0.24	0.26

The geometry of accessories can vary. Figure 10.7 shows the CTOD location for circular and rectangular cross sections such as those of the D-shackle and accessories fabricated from rectangular sections. The orientation of the specimen shall consider the direction of the grain flow. Figure 10.7(b) shows two possible sampling positions for CTOD test specimens with notch orientation for rectangular type accessories.

1.6.7 Calibration of furnaces is to be verified by measurement and recording of a calibration test piece with dimensions equivalent to the maximum size of link manufactured. Thermocouples are to be placed both on the surface and in a drilled hole located to the mid thickness position of the calibration block. The furnace dimensions shall be such as to allow the whole furnace charge to be uniformly heated to the necessary temperature. Temperature uniformity surveys of heat treatment furnaces for forged and cast components shall be carried out according to API Spec 6A/ISO 10423 Annex M or ASTM A991. The initial survey shall be carried out with maximum charge (load) in the furnace. Subsequent surveys shall be carried out annually and may be carried out with no furnace charge.

The quench bath maximum temperature and the maximum heat treatment transfer times from furnace to quench are to be established and documented. During production the established quenching parameters are to be followed and records are to be maintained of bath temperatures and transfer times.

2.2.1.1 The steels are to be manufactured by basic oxygen, electric furnace or such other process as may be specially approved. All steels are to be killed and fine grain treated. The austenitic grain size for TL-R3, TL-R3S and TL-R4 is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO 643. Measurements for circular sections are to be taken at 1/3 radius

2.2.1.2 Steels for bars intended for TL-R4S and TL-R5 chain is to be vacuum degassed. The austenitic grain size is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO 643. Measurements for circular sections are to be taken at 1/3 radius.

2.2.1.3 For TL-R4S and TL-R5 the following information is to be supplied by the bar manufacturer to the mooring chain manufacturer and the results included in the chain documentation:

- Each heat is to be examined for non-metallic inclusions. The level of micro inclusions is to be quantified and assessed in accordance to the national/international standards; to be sure inclusion levels are acceptable for the final product.

- A sample from each heat is to be macro etched according to ASTM E381 or equivalent, to be sure there is no injurious segregation or porosity.

- Hardenability data, according to ASTM A255, or equivalent, is to be supplied with each heat.

New Figure 10.7 is added as below and following figures are renumbered:

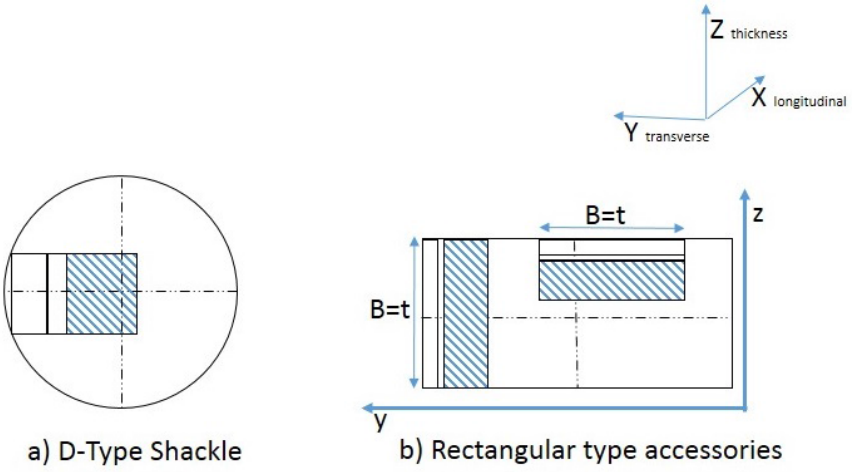


Figure 10.7 Location of CTOD test specimens: a) Circular type accessory and b) rectangular type accessory, B corresponds to the thickness of material, the grain flow is considered in the longitudinal direction X

2.2.5.1 Non-destructive examination is to be performed in accordance with recognized standards such as those indicated below or equivalent. Non- destructive examination procedures, together with rejection/acceptance criteria are to be submitted to **TL.**

Magnetic particle testing (MT) of bars:

- ASTM E1444 and ISO 9934

Magnetic Leakage Flux Testing (MLFT)-JIS Z2319

Eddy current testing (ET) of bars:

- ISO 15549

2.2.5.2 Manufacturers shall prepare written procedures for NDE. NDE personnel shall be qualified and certified according to ISO 9712, ACCP or equivalent. Personnel qualification to an employer or responsible agency based qualification scheme as SNT-TC-1A may be accepted if the employer's written practice is reviewed and found acceptable and the Level III is ASNT Level III, ISO 9712 Level III or ACCP Professional Level III and certified in the applicable method. NDE operators shall be qualified to at least level II.

2.2.5.3 The manufacturer shall ensure that 100 percent of bar material intended for either chain or fittings is subjected to ultrasonic examination at an appropriate stage of the manufacture to procedures approved by **TL** and to the acceptance criteria required. The bars are to be free of pipe, cracks and flakes. If the end length of the delivered bars is not subjected to UT then it must be agreed between the bar supplier and the chain manufacturer of what length of bar is to be removed from the ends. The details are to be documented in the approval of each bar supplier. Phased array UT procedures may be applied, subject to approval by **TL**.

2.2.5.4 100 percent of bar material is to be examined by magnetic particle (MT) or eddy current (ET) or Magnetic Leakage Flux Testing (MLFT) methods. The bars are to be free of injurious surface imperfections such as seams,

laps and rolled-in mill scales. Provided that their depth is not greater than 1 % of the bar diameter, longitudinal discontinuities may be removed by grinding and blending to a smoothy contour. All bars supplied in a machined (peeled) condition shall be 100% visually inspected. **TL** may also require: 10% inspected with magnetic particle testing (MT) or eddy current testing (ET) or Magnetic Leakage Flux Testing (MLFT), for longitudinal imperfections. The maximum depth of peeling is to be agreed and documented in the approval of each supplier.

2.2.5.6 Weld repair of bar is not permitted.

2.3.1.1 Forged steels used for the manufacture of accessories must be in compliance with approved specifications and the submitted test reports approved by **TL.** Steel is to be manufactured by basic oxygen, electric furnace or such other process as may be specially approved. All steel is to be killed and fine grain treated. The austenitic grain size for TL-R3, TL-R3S and TL-R4 is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO 643. Measurements for circular sections are to be taken at 1/3 radius. Measurements for non-circular sections are to be taken at 1/4t**.**

2.3.1.2 Steel for forgings intended for TL-R4S and TL-R5 chain is to be vacuum degassed. The austenitic grain size is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO 643. Measurements for circular sections are to be taken at 1/3 radius. Measurements for non-circular sections are to be taken at 1/4t.

2.3.1.3 For steel intended for TL-R4S and TL-R5 accessoies the following information is to be supplied by the steel manufacturer to the mooring accessory manufacturer and the results included in the accessory documentation:

- Each heat is to be examined for non-metallic inclusions. The level of micro inclusions is to be quantified and assessed in accordance with the national/international standards; to be sure inclusion levels are acceptable for the final product.

- A sample from each heat is to be macroetched according to ASTM E381 or equivalent, to be sure there is no injurious segregation or porosity.

- Hardenability data, according to ASTM A255, or equivalent, is to be supplied with each heat.

2.3.5.1 For test sampling, forgings of similar dimensions (diameters do not differ by more than 25 mm) originating from the same heat treatment charge and the same heat of steel are to be combined into one test unit. From each test unit one tensile and three impact test specimens are to be taken and tested in accordance with Section 2. For the location of the test specimens see Figure 10.8.

2.3.5.2 Each heat of Grade TL-R3S, TL-R4, TL-R4S and TL-R5 is to be tested for hydrogen embrittlement. In case of continuous casting, test samples representing both the beginning and the end of the charge shall be taken. In case of ingot casting, test samples representing two different ingots shall be taken.

2.3.5.2.1 Two (2) tensile test specimens shall be taken from the central region of forged material which has been subjected to the heat treatment cycle intended to be used in production. A specimen with a diameter of 20 mm is preferred (consideration will be given to a diameter of 14 mm).

2.3.5.2.2 One of the specimens is to be tested within a maximum of 3 hours after machining (for a 14 mm diameter specimen, the time limit is 1½ hours). Where this is not possible, the specimen is to be immediately cooled to -60°C after machining and kept at that temperature for a maximum period of 5 days.

2.3.5.2.3 The second specimen is to be tested after baking at 250°C for 4 hours, alternatively 2 hours for 14 mm diameter specimen.

2.3.5.2.4 A slow strain rate < 0,0003 s^{-1} must be used during the entire test, until fracture occurs (This is approximately 10 minutes for the 20 mm diameter specimen). Tensile strength, elongation and reduction of area are to be reported.

2.3.5.2.5 The acceptance requirement for the test is:

$$Z_1/Z_2 \geq 0.85$$

where:

Z_1 = Reduction of area without baking

Z_2 = Reduction of area after baking

If the requirement $Z_1/Z_2 \geq 0.85$ is not achieved, the bar material may be subjected to a hydrogen degassing treatment after agreement with **TL**. New tests shall be performed after degassing.

2.3.6.1 Non-destructive examination is to be performed in accordance with recognized standards, such as those indicated below, or equivalent. The non-destructive examination procedures, together with rejection/acceptance criteria are to be submitted to **TL.**

Magnetic particle testing (MT) of forgings:

- EN 10228-1, ASTM A275, using wet continuous magnetization technique

Ultrasonic testing (UT) of forgings:

- EN 10228-3, ASTM A388, ISO 13588

2.3.6.2 Manufacturers shall prepare written procedures for NDE. NDE personnel shall be qualified and certified according to ISO 9712, ACCP or equivalent. Personnel qualification to an employer or responsible agency based qualification scheme as SNT-TC-1A may be accepted if the employer's written practice is reviewed and found acceptable and the Level III is ASNT Level III, ISO 9712 Level III or ACCP Professional Level III and certified in the applicable method. NDE operators shall be qualified to at least level II.

2.3.6.4 Defects on non-machined surfaces may be removed by grinding to a depth of 5% of the nominal diameter. Grinding is not permitted on machined surfaces, except for slight inspection grinding on plane surfaces to a maximum depth of 0.8 mm in order to investigate spurious indications. Welding repairs are not permitted.

2.4.1.1 Cast steels used for the manufacture of accessories must be in compliance with approved specifications and the submitted test reports approved by **TL**. Steel is to be manufactured by basic oxygen, electric furnace or such other process as may be specially approved. All steel is to be killed and fine grain treated. The austenitic grain size for TL-R3, TL-R3S and TL-R4 is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO 643. Measurements for circular sections are to be taken at 1/3 radius. Measurements for non-circular sections are to be taken at 1/4t.

2.4.1.2 Steel for casting intended for TL-R4S and TL-R5 accessories are to be vacuum degassed. The austenitic grain size is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO

643. Measurements for circular sections are to be taken at 1/3 radius. Measurements for non-circular sections are to be taken at 1/4t.

2.4.1.3 For steel intended for TL-R4S and TL-R5 accessories the following information is to be obtained and the results included in the accessory documentation:

- Each heat is to be examined for non-metallic inclusions. The level of micro inclusions is to be quantified and assessed in accordance to the national/international standards; to be sure inclusion levels are acceptable for the final product

- A sample from each heat is to be macro etched according to ASTM E381 or equivalent, to be sure there is no injurious segregation or porosity.

- Hardenability data, according to ASTM A255, or equivalent, is to be supplied with each heat.

2.4.6 Non-destructive examination and repair

2.4.6.1 Non-destructive examination is to be performed in accordance with recognized standards, such as those indicated below, or equivalent. The non-destructive examination procedures, together with rejection/acceptance criteria are to be submitted to **TL.**

Magnetic particle testing (MT) of castings:

- ASTM E709, using wet continuous magnetisation technique

Ultrasonic testing (UT) of castings:

- ASTM A609, ISO 13588

2.4.6.2 Manufacturers shall prepare written procedures for NDE. NDE personnel shall be qualified and certified according to ISO 9712, ACCP or equivalent. Personnel qualification to an employer or responsible agency based qualification scheme as SNT-TC-1A may be accepted if the employer's written practice is reviewed and found acceptable and the Level III is ASNT Level III, ISO 9712 Level III or ACCP Professional Level III and certified in the applicable method. NDE operators shall be qualified to at least level II.

2.4.6.4 Defects on non-machined surfaces may be removed by grinding to a depth of 5% of the nominal diameter. Grinding is not permitted on machined surfaces, except for slight inspection grinding on plane surfaces to a maximum depth of 0.8 mm in order to investigate spurious indications.

2.4.6.5 Where the repair entails removal of more than 5% of the diameter or thickness, the defective area shall be repaired by welding. The excavations shall be suitably shaped to allow good access for welding. The resulting grooves shall be subsequently ground smooth and complete elimination of the defective material shall be verified by NDE.

2.4.6.6 Weld repairs are classified as major or minor. A weld repair is considered major when the depth of the groove prepared for welding exceeds 25% of the diameter/thickness or 25 mm, whichever is smaller. All other weld repairs are considered minor.

2.4.6.7 Major weld repairs require approval before the repair is commenced. Proposals for major repairs shall be accompanied by sketches or photographs showing the extent and positions of the repairs. A grain refining heat

treatment shall be given to the whole casting prior to major repairs. A post weld heat treatment or repeat of original heat treatment of castings shall be carried out.

2.4.6.8 Minor and major weld repairs must be recorded on sketches or photographs showing the extent and positions of the repairs.

2.4.6.9 All weld repairs shall be done by qualified welders using qualified procedures. Welders shall be qualified according to ISO 9606, ASME IX, ASTM A488 or equivalent. Procedures shall be qualified according to ISO 15614, ASME IX, ASTM A488 or equivalent with the following additional requirements: Charpy V notch impact tests with notch locations in weld metal, fusion line and heat affected zone + 2 mm and + 5 mm from fusion line, respectively. Test results shall meet the requirements specified for the parent metal**.**

3.2.1.1 Offshore mooring chains are to be manufactured in continuous lengths by flash butt welding and are to be heat treated in a continuous furnace, batch heat treatment is not permitted, except in special circumstances where short lengths of chain are delivered, such as chafing chain. See item 6.

3.2.3.1 Bars for links shall be heated by electric resistance, induction or in a furnace.

3.2.3.2 For electric resistance heating or induction heating, the heating phase is to be controlled by an optical heat sensor. The controller is to be checked at least once every 8 hours and records made.

3.2.3.3 For furnace heating, the heat is to be controlled and the temperature continuously recorded using thermocouples in close proximity to the bars. The controls are to be checked at least once every 8 hours and records made.

3.2.5.4 Grain determination shall be made for the final product. The austenitic grain size for TL-R3, TL-R3S, TL-R4, TL-R4S and TL-R5 is to be 6 or finer in accordance with ASTM E112 or equivalent grain size index in accordance to ISO 643. Measurements for circular sections are to be taken at surface, 1/3 radius and centre for the base material, HAZ and weld.

3.2.9.1.1 The negative tolerance on the nominal diameter measured at the crown:

up to 40 mm nominal diameter	:	- 1 mm
over 40 up to 84 mm nominal dia.	:	- 2 mm
over 84 up to 122 mm nominal dia.	:	- 3 mm
over 122 up to 152 mm nominal dia.	:	- 4 mm
over 152 up to 184 mm nominal dia.	:	- 6 mm
over 184 up to 222 mm nominal dia.	:	- 7.5 mm

Note 1:

*The cross sectional area at the crown must have no negative tolerance. For diameters of 20 mm or greater, the plus tolerance may be up to 5 percent of the nominal diameter. For diameters less than 20 mm the plus tolerance is to be agreed with **TL** at the time of approval.*

Note 2 of item C.3.2.9.1.1 is added as below:

Note 2:

The cross sectional area at the crown is to be calculated using the average of the diameters with negative tolerance and plus tolerance, measurements are to be taken from at least 2 locations approximately 90 degrees apart.

Item C.3.2.9.1.2 is revised as below:

3.2.9.1.2 Diameter measured at locations other than the crown:

The diameter is to have no negative tolerance. The plus tolerance may be up to 5 percent of the nominal diameter except at the butt weld where it is to be in accordance to manufacturer's specification, which is to be agreed with **TL**. For diameters less than 20 mm, the plus tolerance is to be agreed **TL** at the time of approval.

Item C.3.2.9.1.5 is revised as below:

3.2.9.1.5 The tolerances for stud link and studless common links are to be measured in accordance with Figure 10.10.

Item C.3.2.9.1.6 is revised as below:

3.2.9.1.6 For stud link chains studs must be located in the links centrally and at right angles to the sides of the link. The following tolerances in Figure 10.10 are acceptable provided that the stud fits snugly and its ends lie flush against the inside of the link.

Item C.4.1.2 is revised as below:

4.1.2 All chain is to be subjected to proof load tests, sample break load tests and sample mechanical tests after final heat treatment in the presence of a syrveyor. Where the manufacturer has a procedure to record proof loads and the surveyor is satisfied with the adequacy of the recording system, the Surveyor needs not to witness all proof load tests. The surveyor is to satisfy himself that the testing machines are calibrated and maintained in a satisfactory condition. Prior to inspection the chain is to be free from scale, paint or other coating and is to have a suitably prepared surface as per the applied NDE testing standard. The chain is to be sand-or shot blast to meet this requirement.

Item C.4.1.2 is revised as below:

4.2.4 If the loading capacity of the testing machine is insufficient, an alternative load testing machine is to be used that does have sufficient capacity (e.g. two loading machines in parallel) provided the testing and calibration procedure are agreed with **TL.**

Table 10.19 is revised as below:

Table 10.19 Frequency of break and mechanical tests

Nominal chain diameter (mm)	Maximum sampling interval (m)
Min-48	91
49-60	110
61-73	131

74-85	152
86-98	175
99-111	198
112-124	222
125-137	250
138-149	274
150-162	297
163-175	322
176-186	346
187-198	370
199-210	395
211-222	420

Item C.4.3.2 is revised as below:

4.3.2 The entire chain is to be checked for the length, five links ar a time. By the five link check the first five links are to be measured. From the next set of five links, at least two links from the previous five links set are to be included. This procedure is to be followed for the entire chain length. The measurement are to be taken preferably while the chain is loaded to 5-10% of the minimum proof load. The tolerances for the 5 link measurements are indicated in Table 10.18, any deviations from the 5 link tolerances are to be agreed by the client and **TL**. The links held in the end blocks may be excluded from this measurement.

Item C.4.3.3 is added as below:

4.3.3 Chain dimensions are to be recorded and the information retained on file.

Item C.4.3.4 is added as below:

4.4.4 Hardness tests are to be carried out on finished chain. The frequency and locations are to be agreed with **TL**. The recorded values are for information only and used as an additional check to verify that the heat treatment process has been stable during the chain production.

Item C.4.5 is revised as below:

4.5 Non-destructive examination after proof load testing

Item C.4.5.1 is revised as below:

4.5.1 All surfaces of every link are to be visually examined. Burrs, irregularities and rough edgesw are to be contour ground. Links are to be free from mill defects, surface cracks, dents and cuts, especially in the vicinity where gripped by clamping dies during flash welding. Studs are to be securely fastened. Chain is to be positioned in order to have good Access to all surfaces. In order to allow optimal access to the surface area it is recommended that chain be hung in the vertical position, however access to inspect the interlink area may only be possible with the chain in the horizontal position.

Item C.4.5.2 is revised as below:

4.5.2 Testing is to be performed in accordance with a recognized Standard and the procedures, together with acceptance/rejection criteria are to be submitted to **TL** for review. Manufacturers shall prepare written procedures for NDE. NDE personnel shall be qualified and certified according to ISO 9712, ACCP or equivalent. Personnel qualification to an employer or responsible agency based qualification scheme as SNT- TC-1A may be accepted if the employer's written practice is reviewed and found acceptable and the Level III is ASNT Level III, ISO 9712 Level III or ACCP Professional Level III and certified in the applicable method. NDE operators shall be qualified to at least level II.

Item C.4.5.3 is revised as below:

4.5.3 Magnetic particles are to be employed to examine the flash welded area including the area gripped by the clamping dies. Procedures are to be submitted to **TL** for approval. Procedures and equipment in accordance with those approved are to be used. Frequency of examination is to be every link. Additionally, 10% of links are to be tested on all accessible surfaces. Link surfaces and the surface at the flash weld are to be free from cracks, lack of fusion and gross porosity. Testing shall be performed in accordance with ASTM E709 or another recognized standard (e.g. ISO 9934) using wet continuous fluorescent magnetization technique. Non fluorescent techniques can be accepted in special cases where the standard inspection procedures are impractical.

Links shall be free from:

- Relevant linear indications exceeding 1.6 mm in transverse direction
- Relevant linear indications exceeding 3.2 mm in longitudinal direction
- Relevant non-linear indications exceeding 4.8 mm.

Item C.4.5.4 is revised as below:

4.5.4 Ultrasonics are to be employed to examine the flash weld fusion. Procedures are to be submitted to **TL** for approval. Procedures and equipment in accordance with those approved are to be used. On-site calibration standards for chain configurations are to be approved. Frequency of examination is to be every link. The flash weld is to be free from defects causing ultrasonic back reflections equal to or greater than the calibration standard. The flash butt welds shall be ultrasonic tested (UT) in accordance with ASTM E587 or another recognized standard using single probe, angle-beam shear waves in the range from 45 to 70°. Single probe technique has limitations as far as testing of the central region is concerned and the flash weld imperfections such as flat spots may have poor reflectivity. Where it is deemed necessary, detectability of imperfections may need to be carried out by using a tandem technique, TOFD or phased array.

Item C.4.5.5 is added as below:

4.5.5 Stud welds, if used, shall be visually inspected. The toes of the fillets shall have a smooth transition to the link with no undercuts exceeding 1.0 mm. Additionally, at least 10% of the stud welds distributed through the length shall be dye penetrant tested according to ASTM E1417 or magnetic particle tested according to ASTM E1444 or equivalent. Cracks, lack of fusion or gross porosity are not acceptable. If defects are found, testing shall be extended to all stud welds in that length.

Item C.4.6.2 is revised as below:

4.6.2 If single links are found to be defective or not to meet other applicable requirements, defective links may be cut out and a connecting common link inserted in their place. The individual heat treatment and inspection procedure of connecting common links is subject to **TL**'s approval. Other methods for repair are subject to the written approval of **TL** and the end purchaser. Weld repair of chain is not permitted.

Item C.4.6.7 is revised as below:

4.6.7 If a link fails during proof load testing, a thorough examination with the surveyor informed in a timely manner is to be carried out to identify the probable cause of failure of the proof test. In the event that two or more links in the proof loaded length fail, that section of proof loaded length is to be rejected. The above failure investigation is to be carried out especially with regard to the presence in other lengths of factors or conditions thought to be causal to failure.

Item C.4.6.8 is revised as below:

4.6.8 In addition to the above failure investigation, a break test specimen is to be taken from each side of the one failed link, and subjected to the breaking test. Where multiple chains are produced simultaneously it is recognised that the preceding flash butt welded link and subsequent flash butt welded link will be on an alternative chain length or the other end of the chain length. In such cases the **TL** may require that two additional break tests are to be taken from the lengths of chain that include the preceding and subsequent welded links. Based upon satisfactory results of both break tests and the results of the failure investigation, it will be decided what length of chain can be considered for acceptance.

Failure of either or both breaking tests will result in rejection of the same proof loaded length. Replacement of defective links is to be in accordance with item 4.6.2. If the investigation identifies defects in the flash butt weld or a lower strength flash weld "a glue-weld" is found, additional NDT such as phased array UT is to be carried out to identify if other links are affected. A full assessment of the flash butt welding machine is to be carried out, together with assessment of the condition of the bar ends prior to welding.

Item C.5.1.1 is revised as below:

5.1.1 This item applies to but is not limited to mooring equipment accessories such as detachable connecting links (shackles), detachable connecting plates (triplates), end shackles, swivels and swivel shackles and subsea connectors.

Item C.5.1.3 is added as below:

5.1.3 For accessory production a Manufacturing Procedure Specification (MPS) is to be submitted to **TL** that details all critical aspects of accessory production, casting, forging, heat treating (including arrangement and spacing of components in the heat treatment furnaces), quenching, mechanical testing, proof and break loading and NDE.

Item C.5.2.2.1 is added as below:

5.2.2.1 For individual produced, individual heat treated, accessories or accessories produced in small batches (less than 5), alternative testing will be subject to special consideration. Alternative testing is to be approved by **TL** and the following additional conditions may apply.

(a) Alternative testing is described in a written procedure and manufacturing procedure specification (MPS).

(b) A finite element analysis is provided at the break load and demonstrates that the accessory has a safety margin over and above the break load of the chain.

(c) Strain age testing (as per approved procedure by **TL**) is carried out on the material grade produced to the same parameters at the time of qualification.

(d) If an accessory is of a large size that will make heat treating in batches unfeasible or has a unique design, strain gauges are to be applied during the proof and break load tests during initial qualification and during production. The strain gauge results from production are to be comparable with the results from qualification.

Item C.5.2.5.3 is added as below:

5.2.5.3 Strain age properties have been carried out on the material grade produced to the same parameters.

Item C.5.2.5.4 is added as below:

5.2.5.4 Strain gauges are to be applied during the break load test in the high stress locations to monitor that the strains stay within allowable limits.

Item C.5.4.1 is revised as below:

5.4.1 Accessories are to be subjected to mechanical testing as described in item 2.3 and 2.4. Mechanical tests are to be taken from proof loaded full size accessories that have been heat treated with the production accessories they represent. At least one accessory out of every batch or every 25 accessories, whichever is less, is to be tested. Hardness tests are to be carried out on finished accessories. The frequency and locations are to be agreed with **TL**. The recorded values are for information only and used as an additional check to verify that the heat treatment process has been stable during the accessory production.

Item C.5.4.2 is revised as below:

5.4.2 Forged shackle bodies and forged Kenter shackles are to have a set of three impact tests and a tensile test taken from the crown of the shackle.

Tensile test on smaller diameter shackles can be taken from the straight part of shackle, where the geometry does not permit a tensile specimen from the crown.

The tensile properties and impact values are to meet the requirements of Table 10.16 in the locations specified in Figure 10.8, with the Charpy pieces on the outside radius.

Item C.5.4.3 is revised as below:

5.4.3 The locations of mechanical tests of cast shackles and cast Kenter shackles can be taken from the straight part of the accessory. The tensile properties and impact values are to meet the requirements of Table 10.16 in the locations specified in Figure 10.8.

Item C.5.4.4 is revised as below:

5.4.4 The locations of mechanical tests of other accessories with complex geometries are to be agreed with **TL**. For non-circular sections, 1/4*t* (thickness) from the surface is considered appropriate. Rolled plates are to be tested

to the Standard to which they are produced.

Item C.5.4.5 is revised as below:

5.4.5 For individually produced (heat treated) accessories or accessories produced in small batches (less than 5), alternative testing can be proposed to **TL**. Each proposal for alternative testing is to be detailed by the manufacturer in a written procedure and submitted to **TL** and the following additional conditions may apply:

5.4.5.1 If separately forged or cast coupons are used, they are to have a cross-section and, for forged coupon, a reduction ratio similar to that of the accessories represented, and are to be heat treated in the same furnace and quenched in the same tank at the same time, as the actual forgings or castings. Thermocouples are to be attached to the coupon and to the accessories.

5.4.5.2 If separately forged or cast coupons are agreed, it is to be verified by procedure test that coupon properties are representative of accessory properties.

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5.4.7 Mechanical tests of pins are to be taken as per Figure 10.8 from the mid length of a sacrificial pin of the same diameter as the final pin. For oval pins the diameter taken is to represent the smaller dimension. Mechanical tests may be taken from an extended pin of the same diameter as the final pin that incorporates a test prolongation and a heat treatment buffer prolongation, where equivalence with mid length test values have been established.

The length of the buffer is to be at least equal to 1 pin diameter dimension which is removed after the heat treatment cycle is finished. The test coupon can then be removed from the pin.

The buffer and test are to come from the same end of the pin as per Figure 10.11.

Item C.5.5 is revised as below:

5.5 Non-destructive examination after proof load testing

5.5.1 All chain accessories are to be subjected to a close visual examination. Special attention is to be paid to machined surfaces and high stress regions. Prior to inspection, chain accessories are to have a suitably prepared surface as per the applied NDE testing standard**.** All non-machined surfaces are to be sand or shot blasted to permit a thorough examination. Where applicable, accessories shall be dismantled for inspection of internal surfaces. All accessories are to be checked by magnetic particles or dye penetrant. UT of accessories may be required by **TL**. The acceptance /rejection criteria of UT established for the design is to be met.

5.5.2 Testing is to be performed in accordance with a recognized Standard such as those indicated below, or equivalent**.** The procedures, together with acceptance/rejection criteria are to be submitted to **TL** for review. Manufacturers shall prepare written procedures for NDE. NDE personnel shall be qualified and certified according to ISO 9712, ACCP or equivalent. Personnel qualification to an employer or responsible agency based qualification scheme as SNT-TC-1A may be accepted if the employer's written practice is reviewed and found acceptable and the Level III is ASNT Level III, ISO 9712 Level III or ACCP Professional Level III and certified in the applicable method. NDE operators shall be qualified to at least level II.

agnetic particle testing (MT) of forgings:

- EN 10228-1, ASTM A275, using wet continuous magnetization technique or equivalent standards such as ISO 4986, IACS Rec 69

Ultrasonic testing (UT) of forgings:

- EN 10228-3, ASTM A388, ISO 13588

Magnetic particle testing (MT) of castings:

- ASTM E709, using wet continuous magnetization technique

Ultrasonic testing (UT) of castings:

- ASTM A609, ISO 13588

All surfaces shall be magnetic particle tested (MT). Testing shall be performed in accordance with standards referenced using the fluorescent technique. As a minimum surfaces shall be free from:

- Relevant linear indications exceeding 1.6 mm in transverse direction
- Relevant linear indications exceeding 3.2 mm in longitudinal direction
- Relevant non-linear indications exceeding 4.8 mm.

When required by **TL**, ultrasonic testing is to be carried out on 100% of cast or forged accessories. The acceptance/rejection criteria established for the design is to be met.

.....

5.5.4 Weld repairs of finished accessories are not permitted.

Item C.5.8.1 is revised as below:

5.8.1 A complete inspection and testing report in booklet form is to be provided by the manufacturer for each order. This booklet is to include all dimensional checks, test and inspection reports, NDT reports, process records and example photographs of components positioned in furnaces, as well as any nonconformity, corrective action and repair work.

Note 1 and 2 are added to item 6.4.5 as below:

Note 1:

*Documented evidence of satisfactory testing of similar diameter mooring chain in the prior 6 month period may be used in lieu of break testing subject to agreement with **TL**.*

Note 2:

The requirements herein are also applicable to other diameter chafing chains, such as 84 mm and 96 mm, subject to compliance with the proof and break load requirements specified for the chain grade and diameters in Table 10.18.

PART A – CHAPTER 3 – WELDING

01. Section 5 – Welding Consumables and Auxiliary Materials

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item B.5.2 and table 5.7 are revised according to UR W17 Rev.4 as below:

5.2 The mercury method or thermal conductivity detector method according to standard ISO 3690 is to be used. Four weld assemblies are to be prepared. The temperature of the specimens and minimum holding time are to be complied with following, according to the measuring method respectively:

Measuring method		Test temperature [°C]	Minimum holding time [h]
Thermal Conductivity Detector Method **(*)**	Gas Chromatography	45	72
		150	6
(*) *The use of hot carrier gas extraction method may be considered subject to verification of the testing procedure to confirm that collection and measurement of the hydrogen occurs continuously until all of the diffusible hydrogen is quantified.*			

Table 5.7 Permissible hydrogen content of weld metal

Mark	Diffusible Hydrogen contents	Measuring method
H 15	15 **(1)**	Mercury Method Thermal Conductivity Detector Method
H 10	10 **(2)**	Glycerine Method
H 5	5	Mercury Method Thermal Conductivity Detector Method

(1) *10 cm^3 per 100 grams where the glycerine method is used.*

(2) *5 cm^3 per 100 grams where the glycerine method is used.*

Note: *The glycerine method is not to be used for the welding consumables with H 5 mark.*

02. Section 12 – Welding of Hull Structures

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Note of item F.2.1.1 is revised as below:

Note:

The following rules relating to the welding procedure tests comply with, borrow from in part or refer to the standards of the series ISO 15607. Compared with the previous versions of these Rules for Welding, all the details relating to the welding procedure tests which, from the shipbuilding aspect, have been satis- factorily covered in the standards, are no longer contained in these Rules or only by reference to thesestandards, especially to ISO 15614-1 "Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel an nickel alloys" and ISO 15614-2 " Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 2: Arc welding of aluminium and its alloys"

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item F.3.2.1 is revised as below:

3.1.2 For butt welding, the test assembly is to be of a size sufficient to ensure a reasonable heat distribution and according to Figure 12.2 with the minimum dimensions:

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item F.3.2.5 is revised as below:

3.2.5 The test assembly is welded on one side only. For single run manual and semi-automatic welding, a stop / restart is to be included in the test length and its position is to be clearly marked for subsequent examination.

Revision Date: May 2017

Entry into Force Date: 1 July 2017

A new paragraph is added to item 4.1.3.1 as below:

4.1.3.1 Normal and higher strength hull structural steels according to UR W11 (Chapter 2 - Material, Section 3, B),

The positions of the specimens are to be in accordance with these requirements. Dimensions and testing are to be in accordance with the requirements of UR W2.7

Revision Date: May 2017

Entry into Force Date: 1 July 2017

A new item J is added with title “Welding Requirements for Cargo Tanks of Gas Tankers” according to UR W1 Rev.3.

PART B – CHAPTER 4 – MACHINERY

01. Section 2 – Internal Combustion Engines and Air Compressors

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item B.5 is added as below:

5. Mass/Serial Produced Engines

Trunk engines manufactured in mass or in series, can be produced according to agreed survey arrangement in accordance with Classification and Survey Rules, Section 2, F. Alternative Certification Scheme. The scope and extent of the application of Alternative Certification Scheme are to be agreed on a case by case basis.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item E.2 is totally revised according to UR M72 Rev.1.

02. Section 9 – Steering Gears and Thrusters

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item A.1.1 is revised according to UI SC242 Rev.1 as below:

.....

This section is applicable to ships for which steering is affected by means of a rudder and an electric, hydraulic or electro-hydraulic steering gear (1).

(1) *In accordance with UI SC 242, for a ship fitted with multiple steering systems, the requirements in SOLAS II- 1/30.2 are to be applied to each of the steering systems.*

Item A.1.3.1.3 is revised according to UI SC94 Rev.2 as below:

1.3.1.3 For failure detection and response of control systems, see **TL** Electric Rules Chapter 5 Section 7 item 6.10.

Item A.1.3.4 is revised according to UI SC242 Rev.1 as below:

.....

- In a passenger ship, each of the steering systems is ~~fitted with two or more identical power units~~ capable of satisfying the requirements in 1.4.1 while any one of the power units is out of operation;

- In a cargo ship, each of the steering systems is ~~fitted with one or more identical power units~~ capable of satisfying the requirements in 1.4.1 while operating with all power units;

- Each of the steering systems is arranged so that after a single failure in its piping or in one of the power units, ship steering capability (but not individual steering system operation) can be maintained or speedily regained (e.g. by the possibility of positioning the failed steering system in a neutral position in an emergency, if needed).

The above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.

Item A.3.1 is revised as below:

3.1 Number of steering gears

3.1.1 Each ship must be equipped with at least one main and one auxiliary steering gear. Both steering gears are to be independent of each other and, wherever possible, act separately upon the rudderstock. **TL** may agree to components being used jointly by the main and auxiliary steering gear.

3.1.2 For a ship fitted with alternative propulsion and steering systems, such as but not limited to azimuthing propulsors or water jet propulsion systems, the main steering arrangement and the auxiliary steering arrangement shall be so arranged that the failure of one of them will not render the other one inoperative.

For a ship fitted with multiple steering systems, the requirement in item 3.1.1 is considered satisfied if each of the steering systems is equipped with its own dedicated steering gear provided that:

- Each of the steering systems is fulfilling the requirements for main steering gear (as given in item 1.4.1).

- Each of the steering systems is provided with an additional possibility of positioning and locking the failed steering system in a neutral position after a failure of its own power unit (s) and actuator (s).

Name of Figure A.9.3 is revised according to UI SC94 Rev.2 as below:

Fig. 9.3 Principle scheme for double ~~non~~ follow-up control and autopilot or other additional control

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Sentences after title of item B.3 is added according to UI SC242 Rev.1 as below:

For a ship fitted with alternative propulsion and steering systems, such as but not limited to azimuthing propulsors or water jet propulsion systems, the main steering arrangement and the auxiliary steering arrangement shall be so arranged that the failure of one of them will not render the other one inoperative.

For a ship fitted with multiple steering systems, the requirement in item A.3.1.1 is considered satisfied if each of the steering systems is equipped with its own dedicated steering gear provided that:

- Each of the steering systems is fulfilling the requirements for main steering gear (as given in item A.1.4.1).
- Each of the steering systems is provided with an additional possibility of positioning and locking the failed steering system in a neutral position after a failure of its own power unit (s) and actuator (s).

Item B.3.4.4 is revised as below:

.....

- In a passenger ship, each of the steering systems is ~~fitted with two or more identical power units~~ capable of satisfying the requirements in A-1.4.1 while any one of the power units is out of operation;

- In a cargo ship, each of the steering systems is ~~fitted with one or more identical power units~~ capable of satisfying the requirements in A-1.4.1 while operating with all power units;

- Each of the steering systems is arranged so that after a single failure in its piping or in one of the power units, ship steering capability (but not individual steering system operation) can be maintained or speedily regained (e.g. by the possibility of positioning the failed steering system in a neutral position in an emergency, if needed).

The above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.

03. Section 16 – Pipe Lines, Valves, Fittings and Pumps

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Sentences end of item B.1 is added according to UI SC282 as below:

Materials other than steel may be assessed in relation to the risk of fire associated with the component and its installation (e.g. engine, turbine and gearbox installations). The use of materials other than steel is considered acceptable for the following applications:

1. 1 Internal pipes which cannot cause any release of flammable fluid onto the machinery or into the machinery space in case of failure, or

1.2 Components that are only subject to liquid spray on the inside when the machinery is running, such as machinery covers, rocker box covers, camshaft end covers, inspection plates and sump tanks. It is a condition that the pressure inside these components and all the elements contained therein is less than 0,18 N/mm^2 and that wet sumps have a volume not exceeding 100 litres, or

1.3 Components attached to machinery which satisfy fire test criteria according to Standard ISO 19921:2005/19922:2005 or other standards acceptable to the Administration, and which retain mechanical properties adequate for the intended installation.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item D.5.2 is revised as below:

5.2 Ship's side valves on the shell plating shall be easily accessible. Seawater inlet and outlet valves are to be capable of being operated from above the floor plates. The hand wheel of main cooling water inlet valves is not to be less than 460 mm above the bottom platform.

Cocks on the ship's side must be so arranged that the handle can only be removed when the cock is closed.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item E.2 is revised totally.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item I.3.1 is revised as below:

3.1 Sea valves are to be so arranged that they can be operated from above the floor plates. See also item D.5.2.

Item N.1.3.2 is revised as below:

1.3.2 Emergency bilge suctions are to be arranged in such a manner that they are accessible, with free flow and ~~at a suitable distance from the tank top or ship's bottom~~ the hand wheel is not less than 460 mm above the bottom platform

Last sentence of item N.4.1.3 is deleted as below:

~~Emergency bilge valves and cooling water inlet valves must be capable of being operated from above the floor plates.~~

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item P.1.6 is revised as below:

Ballast water treatment plants are to be approved by a flag administration acc. to ~~IMO Resolution MEPC.174(58), MEPC.169(57) respectively~~ Guidelines for approval of ballast water management systems (G8) (Res. MEPC 279(70)). The obligation to install a ballast water treatment plant depends on the ballast water capacity and keel lying date of the ship (See also International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004 – Regulation B-3 and **TL** Additional Rule for Installation of Ballast Water Management Systems.)

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item T.1.1 is revised as below:

.....

- A sewage treatment plant approved according to Resolution MEPC.227(64), as may be amended, or

.....

PART B – CHAPTER 4-1 – AUTOMATION

01. Section 1 – General Rules and Instructions

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Section is revised generally.

02. Section 2 – Range of Control and Monitoring Equipment

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items A.4, 7, 8, 14, 18 and 19 are revised as below:

4. A safety system for the propulsion plant is to be installed in accordance with Section 4, E. Engine systems are to be equipped according to Section 5, B. or C. , steam turbine plants according to Section 5,D.

7. A communication system is to be installed in accordance with Section 4, G.

8. Boilers and thermal oil systems are to be equipped as described in Section 5, D. and Section 6, D., E.

14. For essential auxiliary machinery, a stand-by circuit is to be provided in accordance with Section 4, I. and Section 8, I.

18. Interruptions in the power supply are to be avoided or overcome in accordance with Section 4, I.2.

19. A fire alarm and detection system is to be provided in accordance with Section 4, H.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items C.4, and 13 are revised as below:

4. For propulsion plants a safety system is to be installed in accordance with Section 4, E. Engine systems are to be equipped according to Section 5, B. or C, steam turbine plants according to Section 5,D.

13. A fire alarm and detection system is to be provided in accordance with Section 4, H.

03. Section 3 – Basic Requirements

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item D.1.2 is revised as below:

1.2 Protection measures shall be provided where incorrect operation would result in serious damage or the loss of essential functions.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item E.4 is revised as below:

4. The interrupt of the transfer of datas between connected autarkic subsystems shall not impair their independent functions.

04. Section4 – Automation Systems

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items A.1 and 20 are revised as below:

1. The machinery alarm system shall provide an optical and an audible signal of unacceptable deviations from operating figures, see Section 8.

20. Machinery alarm systems are subject to mandatory type approval.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items B.1.5 and 1.6 are added as below:

1.5 Failures of the duty alarm system have to be alarmed at an attended location.

1.6 Where the Duty Alarm System is combined with the Engineers' alarm (Engineers' call), an additional means for communication between the engine room or the engine control room and the accommodation area of the technical officers or the crew members responsible for the machinery has to be installed. This might be a telephone system.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items C with a title “Protective Devices for Machinery Plants” and D with a title “Safety Devices for Machinery Plants” are added and Existing item C is renumbered as E. Existing items D – Reductions and E – Safety Devices are deleted.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item F is revised as below:

Reliable voice communications, e.g. designated telephones, battery-powered telephones or sound-powered communication systems, shall be provided between the machinery control room or the machinery control station, the bridge and the accommodation and mess areas of the engineer officers or the crew members responsible for the machinery.

Cf. Chapter 5 – Electrical Installation, Section 9, C.5.1 ~~and Section 14, F~~.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items G.1, 3 and 4 is revised as below:

1. For general requirements relating to fire alarm systems, see Chapter 5 – Electrical Installation, Section 9 and Section 14, G.

3. The fire alarm shall be optical and audible recognised on the bridge, in the accommodation and mess areas of the engineer officers or the crew member responsible for the machinery plant and also in the machinery space without any time delay and it must be distinguishable from other alarms.

4. Each detection loop shall not comprise more than one fire subdivision or one watertight compartment or, wherever possible, more than two superimposed decks. Separate detection loops shall be used where facilities are provided for the separate flooding of different machinery spaces with gaseous fire extinguishing media (e.g. CO_2).

~~For non addressable detectors, the number of detectors in each loop shall not exceed 10.~~

This applies only to non-addressable detectors, which do not allow the remote and individual identification of each detector.

Item G.5 is deleted and followings are renumbered. Renumbered item G.5 is revised as below:

5. The position and number of detectors shall be specified under consideration of machinery space ventilation, so that all endangered areas are safely covered. This particularly applies to areas in which boilers, thermal oil systems, waste and sludge incinerators, generators, switchboards, refrigeration machinery and purifiers are installed and also in the engine casing and at the exhaust gas side in exhaust gas-fired thermal oil plants and in exhaust gas-fired boilers with finned pipes.

Existing item G.9 is deleted.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Items H.1.1 and 2.2 are revised as below:

1.1 Stand-by circuits as described in Section 8, I must automatically start stand-by units, if these are required according to relevant sections of TL Machinery Rules:

- In the case of failure of units in operation,

- To meet the demand of auxiliary machinery with staggered operation.

2.2 Following a black-out and restoration of the power supply, essential auxiliary machinery must start up again automatically, possibly in staggered formation. See also Section 8, I.

05. Section 5 – Main Propulsion Plant

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item A.3 is revised as below:

3. Facilities in the Machinery Control Room

If remote control of the propulsion plant is provided from a machinery control room, the equipment listed under 2.7 to 2.9 shall also be fitted in the machinery control room.

Last sentence of item B.4 and item B.6 are delted as below:

~~Override is permitted except for the over speed protection and for shutdown in case of oil mist detection.~~

~~**6.** Additional facilities for operating the engines with gas are to be established with TL in each individual case, taking into account the rules relating to seagoing ships, Chapter 10 - Liquefied Gas Tankers Section 16.~~

06. Section 6 – Auxiliary Machinery Systems

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item F.3 is revised as below following items are renumbered:

3. ~~The inrush of water in the discharge of the medium to be separated shall trip an alarm.~~ The inrush of water into clean oil shall be alarmed. The necessary monitoring device may be part of the separator system or a separate type approved sensor arranged in the clean oil pipe line.

4. Depending upon type and method of separation, the unintentional opening of the drum and the loss of the water seal shall trip an alarm.

07. Section 7 – Tests

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Last sentence of item A.7 is revised as below:

- Type approvals.

Title of item E is revised as E.Type Approvals

New item is added to item E.2 as below:

.....

- Protective devices

.....

08. Section 8 – Sensors, Stand-by Circuits and Remote-Control Facilities

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item B- Sensors for Main Propulsion Diesel Engines (aligned with IACS UR M35 Rev.7) is revised generally.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item F - Sensors for Auxiliary Diesel Engines (aligned with IACS UR M36 Rev.5) is revised generally.

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Tables at items D, E, F, G, H and I are revised.

PART B – CHAPTER 5 – ELECTRICAL INSTALLATION

01. Section 1 – General Requirements and Instructions

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Table 1.1 is revised according to UR E24 as below:

Table 1.1 Documents subject to approval relating to electrical equipment

Serial No.	Documents	Basic documen-tation	Additional documents							
		Ships in general	Passenger ships	Ro/Ro- passenger ships	Ro/Ro- cargo ships	Ship with refrigerating installation (YST, RCP)	Ships for the carriage of dangerous cargoes	Tankers	Oil-chemical fighting ships	Bulk carriers
1.	**Forms**									
1.1	Details of Electrical Plant	x								
1.2	Details of Electrical Equipment in hazardous areas, copies of certificate of conformity			x	x		x	x	x	x
2.	**Power-supply equipment**									
2.1	Electric plant, power generating and distribution (general layout drawing)	x								
2.2	Generators, UPS units batteries with maintenance schedule, transformers	x								
2.3	Spaces with an explosion hazard with details of installed equipment			x	x			x	x	
2.4	Short-circuit calculation, where total generators output > 500 kVA	x								
2.5	Electrical power balance (main and emergency supply)	x								
2.6	Protection coordination study with all values >3000 kVA	x								
2.7	Main switchgear	x								
2.8	Emergency switchgear	x								
2.9	Main distribution boards	x								
2.10	Refrigerating installation: Switchgear, monitoring, control and design					x				
2.11	Main cableways		x	x						
2.12	Main cableways for high-voltage systems	x								
2.13	Bulkhead/deck penetrations A60	x								
2.14	Cable layout/-list	x								
2.15	Harmonic distorsion calculations, if applicable	x								

02. Section 4 – Installation Protection and Power Distribution

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item I.11 is added with a title “Harmonic Distortion for Ship Electrical Distribution System Including Harmonic Filters (1)” according to UR E24.

03. Section 7 – Power Equipment

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Footnote of item A.1.2 is deleted as below:

1.2 The design of main and auxiliary steering gears shall conform to **SOLAS**, Chapt. II-1, Part C, Reg. 29 and 30 ~~(1)~~, and to the **TL** Rules set out in Chapter 4 - Machinery, Section 9, A.

~~(1) Also see IACS Unified Interpretation SC94.4 refer to SOLAS regulation II-1, Part C Reg. 29 and 30.~~

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item A.6.10 is added according to UR E25 as below:

6.10 Failure detection (1)

6.10.1 The most probable failures that may cause reduced or erroneous system performance shall be automatically detected and at least the following failure scenarios shall be considered:

(a) Power supply failure

(b) Earth fault on AC and DC circuits

(c) Loop failures in closed loop systems, both command and feedback loops (normally short circuit, broken connections and earth faults)

(d) Data communication errors

(e) Programmable system failures (Hardware and software failures)

(f) Hydraulic locking

(g) Deviation between rudder order and feedback*

* Deviation alarm shall be initiated if the rudder's actual position does not reach the set point within acceptable time limits for the closed loop control systems (e.g. follow-up control and autopilot). Deviation alarm may be caused by mechanical, hydraulic or electrical failures.

6.10.2 All failures detected shall initiate audible and individual visual alarm on the navigation bridge.

6.11 System response upon failure (1)

6.11.1 The failures (as defined but not limited to those in 6.10.1) likely to cause uncontrolled movements of rudder are detected, the rudder should stop in the current position. For systems and/or operational modes where midship position is considered to be the least critical condition, this may also be accepted.

(1) *Aligned with IACS UR E 25*

04. Section 10 – Computer Systems

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Section 10 is revised totally according to UR E22 Rev.2.

05. Section 20 – Electrical Equipment

Revision Date: March 2017

Entry into Force Date: 1 July 2017

Item F.1.4 is revised according to UR E7 Rev.4 as below:

.....

Cables manufactured and tested to standards other than those specified like above-mentioned will be accepted provided they are in accordance with an acceptable and relevant international or national standard and are of an equivalent or higher safety level than those listed in item 1.4. However, cables such as flexible cable, fibre-optic cable, etc. used for special purposes may be accepted provided they are manufactured and tested in accordance with the relevant standards accepted by **TL.**

PART C – CHAPTER 9 – YACHTS

01. Section 5 – Hull Construction – Steel Hulls

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item K_2 explanation at E.3 is revised as below:

K_2 = Curvature correction factor given by $1 - h / \ell$ where h is the maximum curvature height (see Figure 5.23). This value is to be taken not less than 0,75.

The thickness of the plating of the bilge is, in any event, to be taken as not less than the greater of the thicknesses of the bottom and side.

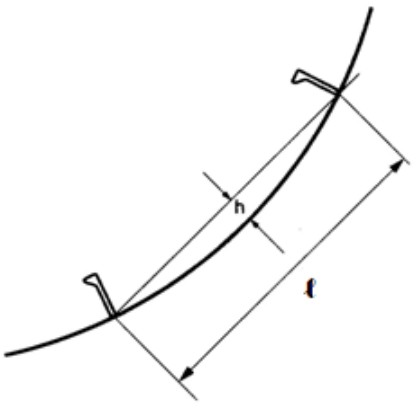

Figure 5.23

02. Section 6 – Hull Construction – Aluminium Alloy Hulls

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item K_2 explanation at F.3 is revised as below:

k_2 = Curvature correction factor given by 1-h/ ℓ to be taken not less than 0,75, where h is the distance measured perpendicularly from the chord ℓ to the highest point of the arc of plating between the two supports (see Figure 6.2).

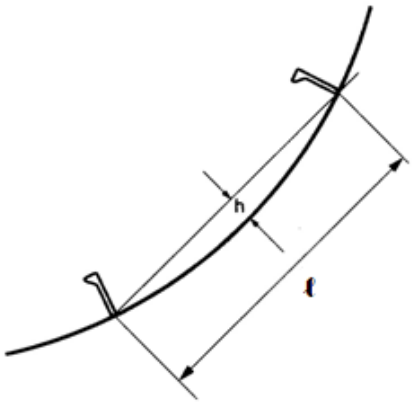

Figure 6.2

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item L.5 is revised as below:

Reinforced beams (beams, stringers) and ordinary pillars are to have scantlings as stated in J.

PART C – CHAPTER 35 –TENTATIVE RULES FOR SHIPS LESS THAN 500 GT

01. Section 1 – Design Loads

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item L is added with a title “Stern Impact Load”.

02. Section 2 – Plating

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item A.3 is added as belowand following items are renumbered:

3. For specific scantling criteria with respect to Ship Type Notations, e.g. minimum thickness requirements for bulk carrier or tankers relevant sections of Part A, Chapter 1, Hull to be referred.

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item D.2.1 is revised as below:

.....

t_B is not to be less than minimum thickness t_{min} determined in the item ~~B.3.3~~ C.2 and need not to be greater than greater of tmin determined according to C.1 and minimum thickness in conjuction with A.3.

.....

03. Section 3 – Supporting Structures

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item B.4 is revised as below:

.....

For m and m_a see TL Rules Chapter 1 Hull Section 8, item C.2.3.1.

.....

04. Section 4 – Bulkheads

Revision Date: May 2017

Entry into Force Date: 1 July 2017

Item B.2 is revised as below:

2. Bulkhead Stiffeners

The section modulus of bulkhead stiffeners is not to be less than:

$W = c_s a \ell^2 P$ $[cm^3]$

c_s = Coefficient according to Table 4.1

2.1 In horizontal part of bulkheads, the stiffeners are also to comply with the rules for deck beams according to Section 3.

2.2 The scantlings of the brackets are to be determined in dependence of the section modulus of the stiffeners according to Chapter 1 Hull Section 3, B.4.2 If the length of the stiffener is 3,5 m. and over, the brackets are to extend to the next beam or the next floor.

2.3 Unbracketed bulkhead stiffeners are to be connected to the decks by welding. The length of weld is to be at least 0,6 x depth of the section.

2.4 If the length of stiffeners between bulkhead deck and the deck below is 3 m. and less, no end attachment according to 3.4 is required. In this case the stiffeners are to be extended to about 25 mm from the deck and sniped at the ends. (See also Chapter 1 Hull Section 3, B.4.3.)

2.5 Bulkhead stiffeners cut in way of watertight doors are to be supported by carlings or stiffeners.

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