RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part K Materials

2011 AMENDMENT NO.1

Rule No.27 30th June 2011

Resolved by Technical Committee on 3rd February 2011

Approved by Board of Directors on 25th February 2011

Rule No.27 30th June 2011
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 K MATERIALS

Amendment 1-1

Chapter 3 ROLLED STEELS

3.5 Rolled Stainless Steels

Table K3.18 has been amended as follows.

Table K3.18 Grades and Chemical Composition of Stainless Steels

Grade	Chemical composition (%)									
	C	*Si*	*Mn*	*P*	*S*	*Ni*	*Cr*	*Mo*	*N*	Others
*KSUS*304	0.08max.	1.00max.	2.00 max.	0.045 max.	0.030 max.	8.00~10.50	18.00~20.00	—	—	—
*KSUS*304*L*	0.030max.					9.00~13.00				
*KSUS*304*N*1	0.08max.		2.50 max.			7.00~10.50			0.10~0.25	
*KSUS*304*N*2						7.50~10.50			0.15~0.30	$Nb \leq 0.15$
*KSUS*304*LN*	0.030max.		2.00 max.			8.50~11.50	17.00~19.00		0.12~0.22	—
*KSUS*309*S*	0.08max.	1.50max.				12.00~15.00	22.00~24.00		—	
*KSUS*310*S*						19.00~22.00	24.00~26.00			
*KSUS*316		1.00max.				10.00~14.00	16.00~18.00	2.00~3.00		
*KSUS*316*L*	0.030max.					10.00~14.00				
*KSUS*316*N*	0.08max.					10.00~14.00			0.10~0.22	
*KSUS*316*LN*	0.030max.					10.50~14.50	16.50~18.50		0.12~0.22	
*KSUS*317	0.08max.					11.00~15.00	18.00~20.00	3.00~4.00	—	
*KSUS*317*L*	0.030max.									
*KSUS*317*LN*									0.10~0.22	
*KSUS*321	0.08max.					9.00~13.00	17.00~19.00	—	—	$Ti \geq 5 \times C$
*KSUS*329*J*1	0.08max.	1.00max.	1.50 max.	0.040 max.	0.030 max.	3.00~6.00	23.00~28.00	1.00~3.00	—	—
*KSUS*329*J*3*L*	0.030max.	1.00max.	2.00 max.	0.040 max.	0.030 max.	4.50~6.50	21.00~24.00	2.50~3.50	0.08~0.20	—
*KSUS*329*J*4*L*	0.030max.	1.00max.	1.50 max.	0.040 max.	0.030 max.	5.50~7.50	24.00~26.00	2.50~3.50	0.08~0.30	—
*KSUS*347	0.08max.	1.00max.	2.00 max.	0.045 max.	0.030 max.	9.00~13.00	17.00~19.00	—	—	$Nb \geq 10 \times C$

Table K3.19 has been amended as follows.

Table K3.19 Mechanical Properties of Stainless Steels

Grade	Tensile test			Hardness test		
	Proof stress (N/mm^2)	Tensile strength (N/mm^2)	Elongation ($L = 5.65\sqrt{A}$)(%)	H_B	H_{RB}	H_V
*KSUS*304	205min.	520min.	40min.	187max.	90max.	200max.
*KSUS*304*L*	175min.	480min.				
*KSUS*304*N*1	275min.	550min.	35min.	217max.	95max.	220max.
*KSUS*304*N*2	345min.	690min.		248max.	100max.	260max.
*KSUS*304*LN*	245min.	550min.	40min.	217max.	95max.	220max.
*KSUS*309*S*	205min.	520min.		187max.	90max.	200max.
*KSUS*310*S*						
*KSUS*316						
*KSUS*316*L*	175min.	480min.				
*KSUS*316*N*	275min.	550min.	35min.	217max.	95max.	220max.
*KSUS*316*LN*	245min.		40min.			
*KSUS*317	205min.	520min.		187max.	90max.	200max.
*KSUS*317*L*	175min.	480min.				
*KSUS*317*LN*	245min.	550min.		217max.	95max.	220max.
*KSUS*321	205min.	520min.		187max.	90max.	200max.
*KSUS*329*J*1	390min.	590min.	18min.	277max.	29max. (1)	292max.
*KSUS*329*J*3*L*	450min.	620min.	18min.	302max.	32max. (1)	320max.
*KSUS*329*J*4*L*	450min.	620min.	18min.	302max.	32max. (1)	320max.
*KSUS*347	205min.	520min.	40min.	187max.	90max.	200max.

Note:

(1) Rockwell hardness of *KSUS*329*J*1, *KSUS*329*J*3*L* and *KSUS*329*J*4*L* is to *C* scale value (H_{RC}).

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 30 June 2011.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to materials other than those for which the application for survey is submitted to the Society on or after the effective date.

Amendment 1-2

Chapter 4 STEEL PIPES

4.3 Stainless Steel Pipes

Table K4.19 has been amended as follows.

Table K4.19 Grades and Chemical Composition

Grade	Chemical composition (%)								
	C	*Si*	*Mn*	*P*	*S*	*Ni*	*Cr*	*Mo*	Others
*K*304*TP*	0.08 max.	1.00 max.	2.00 max.	0.040 max.	0.030 max.	8.00~ 11.00	18.00~ 20.00	-	-
*K*304*LTP*	0.030 max.					9.00~ 13.00			
*K*309*STP*	0.08 max.	1.50 max.				12.00~ 15.00	22.00~ 24.00		
*K*310*STP*						19.00~ 22.00	24.00~ 26.00		
*K*316*TP*		1.00 max.				10.00~ 14.00	16.00~ 18.00	2.00~ 3.00	
*K*316*LTP*	0.030 max.					12.00~ 16.00			
*K*317*TP*	0.08 max.					11.00~ 15.00	18.00~ 20.00	3.00~ 4.00	
*K*317*LTP*	0.030 max.								
*K*321*TP*	0.08 max.					9.00~ 13.00	17.00~ 19.00	-	$Ti \geq 5 \times C$
*K*329*J*1*TP*	0.08 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	3.00~ 6.00	23.00~ 28.00	1.00~ 3.00	-
*K*329*J*3*LTP*	0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	4.50~ 6.50	21.00~ 24.00	2.50~ 3.50	*N*: 0.08~0.20
*K*329*J*4*LTP*	0.030 max.	1.00 max.	1.50 max.	0.040 max.	0.030 max.	5.50~ 7.50	24.00~ 26.00	2.50~ 3.50	*N*: 0.08~0.30
*K*347*TP*	0.08 max.	1.00 max.	2.00 max.	0.040 max.	0.030 max.	9.00~ 13.00	17.00~ 19.00	-	$Nb \geq 10 \times C$

Table K4.20 has been amended as follows.

Table K4.20 Tensile Test[(2)(3)]

Grade	Yield point or proof stress (N/mm^2)	Tensile strength (N/mm^2)	Elongation (%) ($L = 5.65\sqrt{A}$)	
			$L^{(1)}$	$T^{(1)}$
*K*304*TP*	205min.	520min.	26min.	22min.
*K*304*LTP*	175min.	480min.		
*K*309*STP*	205min.	520min.		
*K*310*STP*				
*K*316*TP*				
*K*316*LTP*	175min.	480min.		
*K*317*TP*	205min.	520min.		
*K*317*LTP*	175min.	480min.		
*K*321*TP*	205min.	520min.		
*K*329*J*1*TP*	390min.	590min.	14min.	10min.
*K*329*J*3*LTP*	450min.	620min.	14min.	10min.
*K*329*J*4*LTP*	450min.	620min.	14min.	10min.
*K*347*TP*	205min.	520min.	26min.	22min.

Notes:

(1) *L* (or *T*) denotes that the longitudinal axis of the test specimen is arranged parallel (or normal) to the final direction of rolling.

(2) Where the nominal diameter of stainless steel pipes is 200*mm* and over, tension test specimens may be taken transversely.

(3) Where test specimens of non-tubular section are taken from automatic arc welded steel pipes, laser beam welded steel pipes and electric-resistance welded steel pipes, the test specimens are to be taken from the part that does not include the welded line.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 June 2011.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to steel pipes other than those for which the application for survey is submitted to the Society on or after the effective date.

Amendment 1-3

Chapter 3 ROLLED STEELS

3.6 Round Bars for Chains

Paragraph 3.6.3 has been amended as follows.

3.6.3 Deoxidation Practice and Chemical Composition

1 The deoxidation practice and chemical composition of each grade are to comply with the requirements given in **Table K3.21**. Elements other than specified in **Table K3.21** may be added subject to special approval by the Society.

2 Grades *KSBCR*4*S* and *KSBCR*5 are to be vacuum degassed.

Paragraph 3.6.4 has been added as follows.

3.6.4 Rolled Reduction Ratio

The rolled reduction ratio of grades *KSBCR*3, *KSBCR*3*S*, *KSBCR*4, *KSBCR*4*S* and *KSBCR*5 is to be at least the approved value.

Paragraph 3.6.5 has been added as follows.

3.6.5 Grain Size

The austenitic grain size of grades *KSBCR*3, *KSBCR*3*S*, *KSBCR*4, *KSBCR*4*S* and *KSBCR*5 is to be 6 or finer in accordance with *ASTM E*112 or to be deemed as equivalent by the Society.

Paragraphs 3.6.4 and 3.6.5 have been renumbered as follows.

3.6.~~4~~6 Mechanical Properties

3.6.~~5~~7 Selection of Test Samples

Paragraph 3.6.6 has been amended as follows.

3.6.~~6~~8 Selection of Test Specimens

1 Test specimens are to be taken in accordance with **Table K3.24** from test samples specified in **3.6.~~5~~7**.

(-2 to -5 are omitted)

Paragraph 3.6.7 has been renumbered as follows.

3.6.~~7~~9 Hydrogen Embrittlement Test

Paragraph 3.6.8 has been amended as follows.

3.6.~~8~~10 Surface Inspection, Non-destructive Test and Verification of Dimentions
(-1 to -4 are omitted)
5 With respect to **-2** and **-3** above, non destructive examination procedures, together with rejection/acceptance criteria are to be submitted to the Society.
6 With respect to **-2** and **-3** above, non destructive examination operators are to be appropriately qualified in performing non destructive examinations.
~~5~~**7** Dimensional tolerance of round bars refers to **Table K3.25**.

Paragraph 3.6.9 has been amended as follows.

3.6.~~9~~11 Additional Tests before Rejection
(-1 and -2 are omitted)
3 Where the hydrogen embrittlement test selected for the first test specimen has failed to meet the requirements specified in **3.6.~~7~~9-2**, the bar materials may be subjected to a hydrogen degassing treatment after approved by the Society, and additional test can be performed after degassing.

Paragraph 3.6.10 has been renumbered as follows.

3.6.~~10~~12 Marking

Paragraph 3.6.13 has been added as follows.

3.6.13 Submission of Data
For grades *KSBCR*4*S* and *KSBCR*5, the following information for each heat is to be submitted by the bar manufacturer to the mooring chain manufacturer.
(1) The results of the microscopic examinations for non-metallic inclusions
(2) The results of macro etched examinations in order to confirm that there is no injurious segregation or porosity.
(3) The results of Jominy hardenability tests.

Chapter 5 CASTINGS

5.2 Steel Castings for Chains

Paragraph 5.2.4 has been added as follows.

5.2.4 Grain Size

The austenitic grain size of grades *KSCCR*3, *KSCCR*3*S*, *KSCCR*4, *KSCCR*4*S* and *KSCCR*5 is to be 6 or finer in accordance with *ASTM E*112 or to be deemed as equivalent by the Society.

Paragraph 5.2.4 has been amended as follows.

5.2.~~4~~5 Chemical Composition and Vacuum Degasification Process

1 The chemical composition of steel castings is to be subjected to special approval by the Society. Grades *KSCCR*4, *KSCCR*4*S* and *KSCCR*5 are to contain a minimum of 0.2% molybdenum.

2 Grades *KSCCR*4*S* and *KSCCR*5 are to be vacuum degassed.

Paragraphs 5.2.5 to 5.2.8 have been renumbered as follows.

5.2.~~5~~6 Mechanical Properties

5.2.~~6~~7 Selection of Test Specimen

5.2.~~7~~8 Surface Inspection

5.2.~~8~~9 Quality

Paragraph 5.2.9 has been amended as follows.

5.2.~~9~~10 Non-destructive Test

(-1 and -2 are omitted)

3 With respect to **-1** above, non destructive examination procedures, together with rejection/acceptance criteria are to be submitted to the Society.

4 With respect to **-1** above, non destructive examination operators are to be appropriately qualified in performing non destructive examinations.

Paragraph 5.2.10 has been renumbered as follows.

5.2.~~10~~11 Repair of Defects

Paragraph 5.2.11 has been amended as follows.

5.2.~~11~~12 Additional Tests before Rejection

Where the tensile test or impact test on the selected first test specimens fails to meet the requirements, additional tests may be conducted according to the requirements given in **3.6.~~9~~10**.

Paragraph 5.2.12 has been renumbered as follows.

5.2.~~12~~13 Marking

Paragraph 5.2.14 has been added as follows.

5.2.14 Submission of Data

For grades *KSCCR*4*S* and *KSCCR*5, the following information for each heat is to be submitted by the bar manufacturer to the mooring chain manufacturer.

(1) The results of the microscopic examinations for non-metallic inclusions

(2) The results of macro etched examinations in order to confirm that there is no injurious segregation or porosity.

(3) The results of Jominy hardenability tests.

Chapter 6 STEEL FORGING

6.3 Steel Forgings for Chains

Paragraph 6.3.3 has been amended as follows.

6.3.3 Heat Treatment and Forging Ratio

1 The steel forgings are to be normalized, normalized and tempered, quenched and tempered or heat treated by the process approved by the Society.

2 The forging ratio of grades *KSFCR*3, *KSFCR*3*S*, *KSFCR*4, *KSFCR*4*S* and *KSFCR*5 is to be at least the approved value.

Paragraph 6.3.4 has been added as follows.

6.3.4 Grain size

The austenitic grain size of grades *KSFCR*3, *KSFCR*3*S*, *KSFCR*4, *KSFCR*4*S* and *KSFCR*5 is to be 6 or finer in accordance with *ASTM E*112 or to be deemed as equivalent by the Society.

Paragraph 6.3.4 has been amended as follows.

6.3.45 Deoxidation Practice and Chemical Composition

1 The deoxidation practice and chemical composition of each grade are to comply with the requirements given in **Table K6.7**. Elements other than specified in **Table K6.7** may be added subject to a special approval by the Society.

2 Grades *KSFCR*4*S* and *KSFCR*5 are to be vacuum degassed.

Paragraphs 6.3.5 to 6.3.7 have been renumbered as follows.

6.3.56 Mechanical Properties

6.3.67 Selection of Test Specimens

6.3.78 Surface Inspection

Paragraph 6.3.8 has been amended as follows.

6.3.89 Non-Destructive Test

1 (Omitted)

2 With respect to **-1** above, non destructive examination procedures, together with rejection/acceptance criteria are to be submitted to the Society.

3 With respect to **-1** above, non destructive examination operators are to be appropriately qualified in performing non destructive examinations.

Paragraph 6.3.9 has been amended as follows.

6.3.910 Additional Tests before Rejection

Where the tensile test or impact test on the selected first test specimens fails to meet the requirements, additional tests may be carried out according to the requirements given in **3.6.910**.

Paragraph 6.3.10 has been renumbered as follows.

6.3.~~10~~11 Marking

Paragraph 6.3.12 has been added as follows.

6.3.12 Submission of Data

For grades *KSFCR*4*S* and *KSFCR*5, the following information for each heat is to be submitted by the bar manufacturer to the mooring chain manufacturer.

(1) The results of the microscopic examinations for non-metallic inclusions

(2) The results of macro etched examinations in order to confirm that there is no injurious segregation or porosity.

(3) The results of Jominy hardenability tests.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 July 2011.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to offshore chain and accessories of offshore chain for which the application for survey is submitted to the Society before the effective date, or offshore chain and accessories of offshore chain used for offshore units and single point mooring systems for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part K Materials

2011 AMENDMENT NO.1

Notice No.41 30th June 2011

Resolved by Technical Committee on 3rd February 2011

Notice No.41 30th June 2011
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 K MATERIALS

Amendment 1-1

K3 ROLLED STEELS

K3.6 Round Bars for Chains

Paragraphs K3.6.4 and K3.6.6 have been renumbered as follows.

K3.6.~~4~~6 Mechanical Properties

K3.6.~~6~~8 Selection of Test Specimens

Paragraph K3.6.7 has been amended as follows.

K3.6.~~7~~9 Hydrogen Embrittlement Test

Where hydrogen embrittlement test specimens are *U*14*A* tensile test specimens instead of 20*mm* tensile specimens in accordance with **K3.6.~~6~~8-2**, hydrogen embrittlement test is to be carried out in accordance with the following procedure and the test result is to be complied with the requirement of **3.6.~~7~~9-2, Part K of the Rules**.
((1) to (3) are omitted)

Paragraph K3.6.8 has been amended as follows.

K3.6.~~8~~10 Surface inspection, Non-destructive Test and Verification of Dimensions

1 The harmful defects specified in **3.6.~~8~~10, Part K of the Rules** means the depth of defects in surface exceeds 1% of the nominal diameter of bar materials.

2 Where the depth of the defects in surface does not exceed 1% of the nominal diameter of bar materials, the defects may be removed by the grinding or suitable methods. In this case, bar materials are to be repaired smoothly on longitudinal direction, and the dimension tolerance for bar materials is also to be complied with the requirements in **3.6.~~8~~10-5, Part K of the Rules** after completion of repair work.

3 "to be appropriately qualified in performing non destructive examinations" specified in **3.6.10-5, Part K of the Rules**, means those qualified Level II or higher in accordance with *ISO* 9712 or an equivalent qualification deemed appropriate by the Society.

Paragraph K3.6.13 has been added as follows.

K3.6.13 Submission of Data

1 The macro etched examination specified in **3.6.13(2), Part K of the Rules** is to conform to *ASTM E*381 or other standard as deemed appropriate by the Society.

2 The Jominy hardenability test specified in **3.6.13(3), Part K of the Rules** is to conform to *ASTM A255* or other standard as deemed appropriate by the Society.

K5 CASTINGS

Section K5.2 has been added as follows.

K5.2 Steel Castings for Chains

K5.2.10 Non-destructive Test

"to be appropriately qualified in performing non destructive examinations" specified in **5.2.10, Part K of the Rules**, means those qualified Level II or higher in accordance with *ISO* 9712 or an equivalent qualification deemed appropriate by the Society.

K5.2.14 Submission of Data

1 The macro etched examination specified in **5.2.14(2), Part K of the Rules** is to conform to *ASTM E*381 or other standard as deemed appropriate by the Society.

2 The Jominy hardenability test specified in **5.2.14(3), Part K of the Rules** is to conform to *ASTM A*255 or other standard as deemed appropriate by the Society.

K6 STEEL FORGINGS

Section K6.3 has been added as follows.

K6.3 Steel Forgings for Chains

K6.3.9 Non-destructive Test

"to be appropriately qualified in performing non destructive examinations" specified in **6.3.9, Part K of the Rules**, means those qualified Level II or higher in accordance with *ISO* 9712 or an equivalent qualification deemed appropriate by the Society.

K6.3.12 Submission of Data

1 The macro etched examination specified in **6.3.12(2), Part K of the Rules** is to conform to *ASTM E*381 or other standard as deemed appropriate by the Society.

2 The Jominy hardenability test specified in **6.3.12(3), Part K of the Rules** is to conform to *ASTM A*255 or other standard as deemed appropriate by the Society.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 1 July 2011.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to offshore chain and accessories of offshore chain for which the application for survey is submitted to the Society before the effective date, or offshore chain and accessories of offshore chain used for offshore units and single point mooring systems for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 1-2

K5 CASTINGS

K5.1 Steel Castings

Sub-paragraph K5.1.10(3) has been deleted.

K5.1.10 Non-destructive Testing

The non-destructive tests for steel castings specified in **5.1.10-1** and **-2, Part K of the Rules** are to be dealt with as follows.

(1) Stern frame and rudder frame

The non-destructive tests of stern frame and rudder frame are to comply with the **Annex K5.1.9(1)** "GUIDANCE FOR ULTRASONIC TESTS AND SURFACE INSPECTION OF HULL STEEL CASTINGS" of this Part.

(2) Crankshafts

The non-destructive tests of crankshafts made of steel castings are to comply with the **Annex K5.1.9(2)** "GUIDANCE FOR SURFACE INSPECTION OF DIESEL ENGINE CRANKSHAFTS" and **Annex K5.1.10(2)** "GUIDANCE FOR ULTRASONIC TESTS OF CAST STEEL CRANKTHROWS" of this part.

~~(3) Boiler drum~~

~~The criteria for non-destructive test in case where cast steels are used for boiler drum exposed to internal pressure are to be as specified in **Annex K5.1.10(3)** "GUIDANCE FOR NON-DESTRUCTIVE TEST AND SURFACE INSPECTION OF CAST STEEL FOR BOILERS AND PRESSURE VESSELS."~~

Annex K5.1.10(3) has been deleted.

~~Annex K5.1.10(3) GUIDANCE FOR NON-DESTRUCTIVE TEST AND SURFACE INSPECTION OF CAST STEEL FOR BOILERS AND PRESSURE VESSELS~~

~~1.1 Scope~~

~~This Guidance applies to radiographic test and magnetic particle test of cast steel for boiler drum exposed to internal pressure or shell of the pressure vessel of Group I or II, and liquid penetrant test of cast steel for shell of the pressure vessel of Group I or II.~~

~~1.2 Radiographic Test~~

~~The results of the radiographic tests are to be judged in accordance with the following **(1)** through **(3)**.~~

~~(1) Any cracks or insufficient fusion are to be judged unacceptable.~~

~~(2) Gas and blowholes, sand spots and inclusions are to be judged unacceptable in case where the maximum defect size or the total sum of the defect point in the interpretation area where the most mass defects are present and selected on the test area exceeds the value given in **Table 1.** However, the value given in **Table 2** may be used instead of that in **Table 1** for pressure vessels of Grade II with thickness.~~

~~The defect point per one defect is specified in **Table 3** according to the defect size and the defects of which size do not exceed the value of no-counting specified in **Table 2** may be neglected in the sum of the defect point.~~

~~(3) Internal shrinkage is to be judged unacceptable in case where the total sum of the defect length or that of the defect area in the interpretation area of 100 *mm*×100*mm* where the most mass defects are present and selected on the test area exceeds the value given in **Table 4.**~~

~~The defect length is adopted to linear internal shrinkage and that of 5*mm* or less may be negligible.~~

~~The defect area is adopted to dendritic defect and calculated by multiplying the maximum length and the length to be at right.~~

~~Table 1 Allowable Values for Gas, Blowholes, Sand spots and Inclusions~~

~~Thickness of test area *t* (*mm*)~~		~~$t \leq 10$~~	~~$10 < t \leq 25$~~	~~$25 < t \leq 50$~~	~~$50 < t \leq 80$~~	~~$80 < t \leq 120$~~	~~$t > 120$~~
~~Interpretation area (*mm*)~~		~~30×30~~	~~50×50~~	~~70×70~~		~~100×100~~	
~~Maximum size of defect uncounted (*mm*)~~		~~0.4~~	~~0.7~~	~~1.0~~		~~1.5~~	
~~Detect point~~	~~Gas and blowholes~~	~~3~~	~~4~~	~~6~~	~~8~~	~~10~~	~~12~~
	~~Sand spots and inclusions~~	~~5~~	~~8~~	~~12~~	~~16~~	~~20~~	~~24~~
~~Maximum defect size (*mm*)~~	~~Gas and blowholes~~	~~3~~		~~4~~	~~5~~	~~7~~	~~9~~
	~~Sand spots and inclusions~~	~~6~~		~~8~~	~~10~~	~~14~~	~~18~~

Table 2 Allowable Values for Pressure Vessels of Group II with Over 25 *mm* Thickness

Thickness of test area t (*mm*)		$25 < t \leq 50$	$50 < t \leq 80$	$80 < t \leq 120$	$t > 120$
Detect point	Gas and blowholes	14	20	23	25
	Sand spots and inclusions	20	30	37	42
Maximum defect size	Gas and blowholes	1/2 of thickness or 15*mm* whichever is smaller			
	Sand spots and inclusions	thickness or 15*mm* whichever is smaller			

Table 3 Defect Point per One Defect

Size of defect(*mm*)	2 or less	Exceeding 2 but 4 or less	Exceeding 4 but 6 or less	Exceeding 6 but 8 or less	Exceeding 8 but 10 or less	Exceeding 10 but 15 or less	Exceeding 15 but 20 or less	Exceeding 20 but 25 or less	Exceeding 25 but 30 or less
Defect point	1	2	3	5	8	12	16	20	40

Table 4 Allowable Values for Internal Shrinkage

Thickness of test area t (*mm*)	$t \leq 25$	$25 < t \leq 50$	$50 < t \leq 120$	$t > 120$
Defect length (*mm*)	12	18	30	50
Defect area (mm^2)	250	600	800	1,000

1.3 Magnetic Particle Test

(1) On making magnetic particle test, the requirements specified in **4.1 of the Annex M2.2.7** "GUIDANCE FOR NON-DESTRUCTIVE TEST ON WELDED JOINTS OF BOILERS AND PRESSURE VESSEL" in **Part M** of this Guidance are to be applied.

(2) The results of the magnetic particles test is judged acceptable, in case where the following **(a)** through **(c)** are complied with.

(a) There are no magnetic particle indications due to surface crack.

(b) The maximum length of linear magnetic particle indications (those of which the length is not less than 3 times the width) is 4*mm* or less.

(c) The length of major axis of circular magnetic particle indications (those other than specified in **(b)** above) is 4*mm* or less.

(d) On scattering magnetic particle (a number of indications appearing in a certain domain), the total sum of the length of indications in a square of 2,500mm^2 is 8*mm* or less, as well as each indication is complied with **(b)** or **(c)** above. In this case, the indications of 1*mm* or less may be negligible.

(e) In applying **(b)** through **(d)** above, two or more indications existing nearly on a single line and between which distance is shorter than 2*mm* or the length of the shortest indication whichever is shorter are to be regarded as the continuous defect including the distance between them.

1.4 Repair of Defects

The defects judged unacceptable may be repaired. Welding for the repair are to be in accordance with the requirements specified in **5.1.11, Part K of the Rules**.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 30 December 2011.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to installations other than those for which the application for survey is submitted to the Society on or after the effective date.