Amendment on 27 June 2024
Resolved by Technical Committee on 8 May 2024

Test Blocks for Steel Castings

Object of Amendment

Rules for the Survey and Construction of Steel Ships Part K
Guidance for the Survey and Construction of Steel Ships Part K

Reason for Amendment

IACS Unified Requirements (UR) W7 and W8 specify requirements for the mechanical properties and test methods of steel forgings (W7) and steel castings (W8). UR W7(Rev.4), adopted in February 2022, stipulates that Charpy impact tests must be performed on steel forgings, whereas UR W8(Rev.3), adopted in March 2022, specifies requirements for the selection and sizes of test specimens of cast steel. The requirements of UR W7 and UR W8 have already been incorporated into the NK Rules and Guidance.

In recent years, however, relevant industry members have commented that the test block size specified in UR W8(Rev.3) is not practical for manufacturing, and that steel castings can be correctly evaluated using test blocks smaller than the required size. Based on these comments, IACS prepared IACS UR W8(Rev.4) to revise the requirements on test material selection and size for steel castings, and this draft was adopted in March 2024.

In addition to above, it was found that the relevant NK requirements inadvertently refer to the material grades of alloy steel forgings used for rudder stocks, pintles, etc. up to an including UR W7(Rev.3) instead of switching to the new ones introduced by UR W7(Rev.4).

Based on the UR W8(Rev.4), relevant requirements are revised accordingly. In addition, relevant requirements are revised to conform to UR W7(Rev.4) with respect to the material grades of alloy steel forgings used for rudder stocks, pintles, etc..

Outline of Amendment

The main contents of this amendment are as follows:

(1) Specify that selection arrangements of test blocks provided by manufacturers are to at least 30 *mm* in thickness for those test blocks either attached to castings or cast integrally onto castings.
(2) Specify that Society approval is required for alternative test block arrangements used in lieu of (1) above.
(3) Amend relevant requirements to that rudder stocks, pintles, etc. using alloy steel forgings comply with Table K6.3(b), Part K of the Rules for the Survey and Construction of Steel Ships.

Effective Date and Application

(1) This amendment applies to ships for which the date of contract for construction is on or after 1 July 2024.

(2) Notwithstanding (1) above, the amendment may be applied in advance upon request of the shipowner.

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

ID: DD24-01

Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

Amended	Original	Remarks
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS **Part K MATERIALS** **Chapter 5 CASTINGS**	**RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS** **Part K MATERIALS** **Chapter 5 CASTINGS**	
5.1 Steel Castings	**5.1 Steel Castings**	
5.1.6 Mechanical Properties	**5.1.6 Mechanical Properties**	
1 The mechanical properties of the steel castings are to conform to the requirements given in **Table K5.2** using the test blocks specified in **5.1.8-2**.	**1** The mechanical properties of the steel castings are to conform to the requirements given in **Table K5.2**.	UR W8(Rev.4) 7.3
5.1.8 Selection of Test Specimens	**5.1.8 Selection of Test Specimens**	
1 Test specimens for steel castings are, after final heat treatment, to be taken from the test block either attached to the castings, cast integrally onto the castings or cast separately. However, test blocks may be separated from the body of the casting before final heat treatment in cases where deemed appropriate by the Society. At least one test block is to be provided for each casting or batch of castings, and one set of test specimens is to be taken from each test block. The "one set of test specimens" referred to above includes one tensile test specimen and three shock test specimens.	**1** Test specimens for steel castings are, after final heat treatment, to be taken from the test block cast integral with the body of casting. However, test blocks may be separated from the body of the casting before final heat treatment in cases where deemed appropriate by the Society. At least one test block is to be provided for each casting, and one set of test specimens is to be taken from each test block. The "one set of test specimens" referred to above includes one tensile test specimen and three shock test specimens.	UR W8(Rev.4) 6.2

Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

Amended	Original	Remarks
2 Test block is to be in accordance with the following **(1)** or **(2)**:	(Newly added)	
(1) The preferred test block arrangement, where practical, is for the manufacturer to provide at least one 30 *mm* test block by either attached to the castings or cast integrally on the castings.[1]	(Newly added)	UR W8(Rev.4) 6.3(i)
Note 1: The test results represent the material from which the castings have been poured and the subsequent heat treatment process and may not necessarily represent the properties of the castings. These properties can be affected by solidification conditions and the rate of cooling during heat treatment, which are in turn influenced by casting thickness, size, complexity and shape. The purpose of the test bock is to provide a qualitative check to demonstrate the effective control of existing heat treatment processes and procedures.	(Newly added)	UR W8(Rev.4) 6.3(i) Note 1
(2) For castings where it is required that the mechanical properties need to be demonstrated for specific section thicknesses and when agreed upon between the manufacturer and the purchaser, then proposals[2] for alternative test block arrangements instead of **(1)** above (in terms of size and type) are to be submitted to the Society for approval.	(Newly added)	UR W8(Rev.4) 6.3(ii)
Note 2: The size of the "alternative test block instead of **(1)** above" for mechanical testing may be determined by the ruling section of the casting that they are representative of the casting's heat treatment and microstructure. Also see *ISO 4885:2018*; *ISO683-1:2016* and *ISO 683-2: 2016*. Alternatively, determination of "alternative test block arrangements instead of **(1)** above (in terms of size and type)" may be supported by historical and statistical test data, production of a representative test block or a component, simulation software, or a	(Newly added)	UR W8(Rev.4) 6.3(ii) Note 2

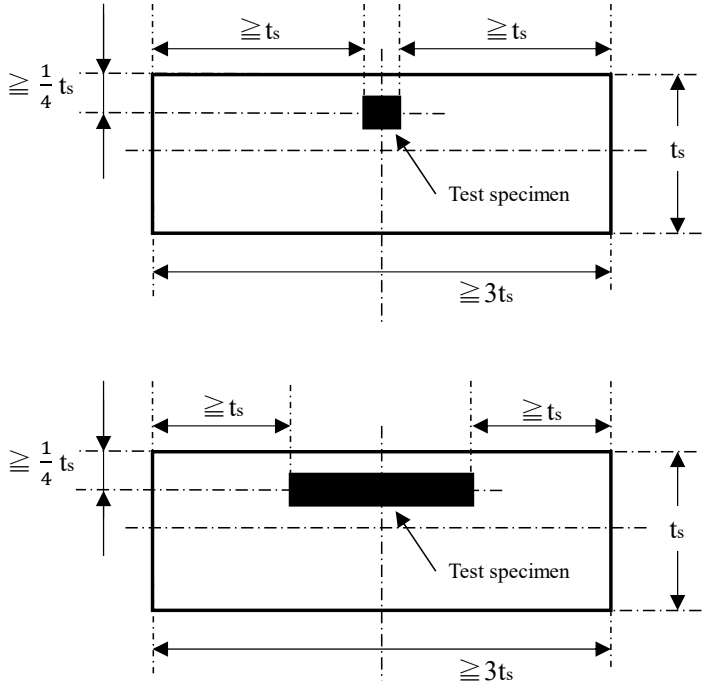
Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

Amended	Original	Remarks
combination of all these items.		
3 The number of test blocks is to be as given in the following **(1)** through **(4)**:	**2** The number of test blocks is to be as given in the following **(1)** through **(4)**:	
(1) Except where specified otherwise by the Society, one test block is to be taken from each steel casting. In cases where the mass of one steel casting (as heat treated, hereinafter referred to as the "mass") is more than ten tons, two test blocks are to be taken from each steel casting, located as far as practicable from each other.	(1) Except where specified otherwise by the Society, one test block is to be taken from each steel casting. In cases where the mass of one steel casting (as heat treated, hereinafter referred to as the "mass") is more than ten tons, two test blocks are to be taken from each steel casting from the heaviest section, located as far as practicable from each other.	UR W8(Rev.4) 6.4
(2) In cases where the mass of one casting is one ton and under one test block is to be taken from every one group of steel castings cast from the same charge and heat treated simultaneously in the same furnace. In cases where the total mass of one group of steel casting exceeds two tons, two test blocks are to be taken.	(2) In cases where the mass of one casting is one ton and under one test block is to be taken from every one group of steel castings cast from the same charge and heat treated simultaneously in the same furnace. In cases where the total mass of one group of steel casting exceeds two tons, two test blocks are to be taken.	
(3) In cases where a number of steel castings of similar form and size are cast from the same charge and the mass for each casting is less than 500 *kg*, test blocks may be separately cast under Surveyor approval regardless of the requirements in **-1** and **(2)** above. In this case, the test blocks are to be heat treated simultaneously with the body of the steel casting in the same furnace.	(3) In cases where a number of steel castings of similar form and size are cast from the same charge and the mass for each casting is less than 500 *kg*, test blocks may be separately cast under Surveyor approval regardless of the requirements in **-1** and **(2)** above. In this case, the test blocks are to be heat treated simultaneously with the body of the steel casting in the same furnace.	
(4) In cases where one steel casting is made from two or more casts, which are not mixed in a ladle prior to pouring, one test block is to be taken from each charge regardless of the requirements in **(1)** or **(2)** above. These are to be attached to the casting or cast integrally on the castings at locations as widely separated as possible.	(4) In cases where one steel casting is made from two or more casts, which are not mixed in a ladle prior to pouring, one test block is to be taken from each charge regardless of the requirements in **(1)** or **(2)** above.	UR W8(Rev.4) 6.5
(Deleted)	**3** Test block size is to be in accordance with the following **(1)** through **(3)**:	UR W8(Rev.3) 6.3

Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

Amended	Original	Remarks
(Deleted)	(1) Test block thickness (t_S) is not to be less than the ruling section of the casting or 30 *mm*, whichever is larger.	
(Deleted)	(2) The t_S of very thick castings for uses other than stern tubes, stern frames, anchors or rudder horns may be 150 *mm* or less. In such cases, test block length and width are normally to be at least three times t_S, unless otherwise deemed appropriate by the Society (*See* **Fig. K5.1**).	
(Deleted)	(3) For castings for stern tubes, stern frames, anchors and rudder horns, t_S is to represent the ruling section.	
(Deleted)	**4** Except where specified otherwise by the Society, test specimens are to be taken from test blocks in accordance with the following (*See* **Fig. K5.1**): (1) For test blocks with thicknesses of 56 *mm* or less, the longitudinal axis of test specimens is to be located at least 14 *mm* from the surface in the thickness direction. (2) For test blocks with thicknesses more than 56 *mm*, the longitudinal axis of test specimens is to be located at least t_S /4 from the surface in the thickness direction. (3) Test specimens are to be taken in such a way that no part of the gauge length is machined from material closer than t_S to any of the other surfaces. (4) All impact test specimens are to comply with **(1)** and **(2)** above.	UR W8(Rev.3) 6.4
(Deleted)	**5** For alloy steel castings, manufacturers are to propose dimensions for test blocks and are to demonstrate the representative nature of said test block mechanical properties with respect to castings.	UR W8(Rev.3) 6.3

Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

Amended	Original	Remarks
(Deleted) (Deleted)	Fig. K5.1 Test Specimen Positions Relative to Test Block  Note: The upper figure shows the view from the length direction, and the lower figure shows the view from the width direction.	UR W8(Rev.3) Fig.1

Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

Amended	Original	Remarks
Chapter 6 STEEL FORGINGS	**Chapter 6 STEEL FORGINGS**	
6.1 Steel Forgings	**6.1 Steel Forgings**	
6.1.6 Mechanical Properties*	**6.1.6 Mechanical Properties***	
1 The mechanical properties of steel forgings are to be in accordance with **Tables K6.3(a)** and **K6.3(b)**. However, mechanical properties of alloy steel forgings with yield point or proof stress values different from the values in **Tables K6.3(a)** and **K6.3(b)** are to be as deemed appropriate by the Society.	**1** The mechanical properties of steel forgings are to be in accordance with **Tables K6.3(a)** and **K6.3(b)**. However, the mechanical properties of low alloy steel forgings for which the following apply may be as deemed appropriate by the Society.	
(Deleted)	(1) Where the value of yield point or proof stress of the forgings is different from the values in **Tables K6.3(a) and K6.3(b)**.	
(Deleted)	(2) Where the forgings are used for rudder stoke or pintles etc.	

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2024.

2. Notwithstanding the amendments to the Rules, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

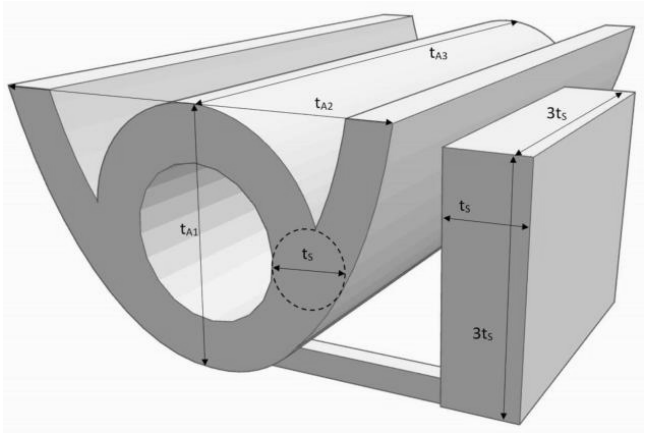
3. Notwithstanding the provision of preceding **2.**, the amendments to the Rules may apply to the surveys for which the application is submitted to the Society before the effective date upon request by the owner.

* "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.

Amended	Original	Remarks
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 **Part K MATERIALS** **K5 CASTINGS** **K5.1 Steel Castings** **K5.1.8 Selection of Test Specimens** The wording "when deemed appropriate by the Society" specified in **5.1.8-1, Part K of the Rules** means the cases for which the Society approves test blocks separated from the body of casting be heat treated simultaneously with the body of the steel casting in the same furnace, and the test specimens taken from such test blocks represent the microstructure and mechanical properties of	**GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS** **Part K MATERIALS** **K5 CASTINGS** **K5.1 Steel Castings** **K5.1.8 Selection of Test Specimens** **1** The wording "when deemed appropriate by the Society" specified in **5.1.8-1, Part K of the Rules** means the cases for which the Society approves test blocks separated from the body of casting be heat treated simultaneously with the body of the steel casting in the same furnace, and the test specimens taken from such test blocks represent the microstructure and mechanical properties of	

Amended	Original	Remarks
the steel casting.	the steel casting.	
(Deleted)	**2** For the wording "ruling section" specified in **5.1.8-3(1), Part K of the Rules,** reference is to be made to *ISO 683-1:2018* and *ISO 683-2:2018*.	UR W8(Rev.3) 6.3
(Deleted)	**3** Shorter width or length may be accepted for test blocks where actual casting width or length (t_A) is in the range between t_s and $3t_s$.	UR W8(Rev.3) 6.3 Guidance
	Example 1) For a general casting with dimensions 140 *mm* × 160 *mm* × 1250 *mm*, the required test block size would typically be 140 *mm* × 160 *mm* × 420 *mm* (that is $t_s \times t_A \times 3t_s$).	Example 1
	Example 2) For a stern tube casting with dimensions 1000 *mm* × 600 *mm* × 1800 *mm* (width t_{A1} × height t_{A2}× length t_{As}) and ruling section t_s = 170 *mm*, the required test block size would typically be 170 *mm* × 510 *mm* × 510 *mm* (that is $t_s \times 3t_s \times 3t_s$) (*See* **Fig. K5.1.8-1**).	Example 2
(Deleted)	Fig. K5.1.8-1Test Block Gated to Stern Tube Casting	UR W8(Rev.3) Fig.2
(Deleted)		

Amended-Original Requirements Comparison Table (Test blocks for steel castings and others)

<table>
<tr><th>Amended</th><th>Original</th><th>Remarks</th></tr>
<tr>
<td>

K6 STEEL FORGINGS

K6.1 Steel Forgings

K6.1.6 Mechanical Properties

"Deemed appropriate by the Society" specified in **6.1.6-1, Part K of the Rules** is applied as follows:

Where the value of yield point or proof stress of alloy steel forgings in mechanical properties is altered, the value of yield point or proof stress and "*M*" is to be suffixed to the markings. (for example, *KSFA*600-*M*-410*M* or *KSFA*600-*H*-410*M*)

(Deleted)

(Deleted)

(Deleted)
</td>
<td>

K6 STEEL FORGINGS

K6.1 Steel Forgings

K6.1.6 Mechanical Properties

"Deemed appropriate by the Society" specified in **6.1.6-1, Part K of the Rules** is applied as follows:

(1) Where the value of yield point or proof stress of low alloy steel forgings in mechanical properties is altered, the value of yield point or proof stress and "*M*" is to be suffixed to the markings. (example: *KSFA*60-410*M*)

(2) Where the forgings are used for rudder stoke or pintles etc., the mechanical properties are to be of **Table K6.1.6-1.**

Table K6.1.6-1 Mechanical Properties of Low Alloy Steel Forgings

Kind	Grade	Tensile strength (N/mm^2)	Yield point or proof stress (N/mm^2)	Elongation ($L = 5.65\sqrt{A}$) (%)		Reduction of area (%)	
				L	*T*	*L*	*T*
Low Alloy Steel Forgings	*KSFA*55*W-S*	540～660	345 min.	20 min.	14 min.	50 min.	35 min.
	*KSFA*60*W-S*	590～710	395 min.	18 min.	13 min.	50 min.	35 min.
	*KSFA*65*W-S*	640～790	445 min.	17 min.	12 min.	50 min.	35 min.

Notes:
</td>
<td></td>
</tr>
</table>

Amended	Original	Remarks
	(1) Letters "*L*" and "*T*" in the Table signify the direction of the specimen taken from longitudinal and tangential to the product respectively. (2) The requirements are applicable to those quenched and tempered. (3) Intermediate values of those tabulated in the table may be applicable where approval of the Society is obtained. In this case, the values are to be obtained by interpolation and counting fractions over 0.5 as one and disregarding the rest.	

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2024.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction* is before the effective date.

3. Notwithstanding the provision of preceding **2.**, the amendments to the Guidance may apply to the surveys for which the application is submitted to the Society before the effective date upon request by the owner.

* "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.