Guideline No.: W-06(202307)

W-06

STEEL CASTINGS

Issued date: July 01, 2023

Foreword

China Classification Society (hereinafter referred to as CCS) Product Inspection and Testing Guideline (hereinafter referred to as this Guideline) contains the technical requirements, inspection and testing criteria related to classification and statutory survey of marine products to be applied for CCS approval/inspection.

This Guideline frees the users to adopt other test methods and requirements which are equivalent to or are stricter than this Guideline.

This Guideline is published and updated by CCS, and is released at http://www.ccs.org.cn. Your comments or suggestions are welcomed and may be sent to our email addressed mp@ccs.org.cn.

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W-06 (201705) May 09,2017

Main changes:

Transform UR W8 into the guideline

CONTENS

STEEL CASTINGS

1 Application

1.1 This Chapter applies to works approval and inspection of steel castings intended for use in the hull structure and machinery structure as required in CCS Rules for Materials and Welding.

1.2 For manufacturers using intermediate frequency furnace for smelting, CCS will not approve such manufactured steel castings for hull structure (stems, stern frames, rudder horns, anchors and screw shaft brackets) generally, unless specially agreed by CCS if the manufacturers have the secondary refining equipment.

1.3 The requirements for castings for crankshafts, propellers, boilers, pressure vessels and piping systems, and ferritic castings for low temperature service and austenitic stainless steel castings may be referred to in this Chapter, and additional properties tests may be carried out for works approval and product inspection under the approval by CCS.

2 Normative references

2.1 CCS Rules for Classification of Sea-going Steel Ships;

2.2 CCS Rules for Materials and Welding.

2.3 Relevant national and international standards.

3 Terms and definitions

Nil.

4 Drawings and documents

4.1 A manufacturer intending for approval by CCS is to submit an application to CCS for works approval.

4.2 The applicant is to submit the following documents to CCS for information:

(1) Particulars of the manufacturer: the name, address and history of the manufacturer; the type and specification of the manufactured products; the type, specification and delivery condition of the products for approval; the quality statistics of the products in recent years; other recognized qualification certificates.

(2) Management documents, including quality system documents. The documents are to clearly indicate the organizational structure and quality control points.

(3) Main production equipment and inspection/test equipment:

① list of main production equipment:

- smelting equipment;

- type and dimensions of heating treatment furnace, heating method, temperature control record, arrangement of temperature measuring points;

- welding equipment;

② list of main inspection/test equipment: equipment for chemical composition analysis, mechanical property and metallographic examination and NDT (including name, modal, manufacturer, a unit carrying out statutory calibration for the above equipment and the validity of appraisal).

The manufacturer is to be equipped with necessary equipment for chemical analysis, mechanical property test and NDT.

(4) Process documents:

① flow chart of manufacturing process (quality control points required to be indicated);

② list of basic procedure specifications (at least including important procedures such as types, smelting, casting, heat treatment and non-destructive testing);

③ welding repair documents relevant to casting material stipulated in CCS rules and corresponding welding procedure qualification report.

(5) Qualification certificate of the test and inspection personnel.

(6) Place of test and qualification of the laboratory (if applicable, the qualification of the subcontractor and the agreement).

4.3 The type test program is to be submitted to CCS for approval.

4.4 Other documents that deemed necessary by CCS.

5 Technical requirements

5.1 Castings are to comply with structural strength design requirements of relevant rules and standards according to application position and actual working condition.

6 Materials and components

Nil.

7 Type test

7.1 Determination of the type test program

Prior to works approval, CCS and the applicant are to determine the type test program through negotiation. The program may be proposed by the applicant and examined and approved by CCS, or proposed by CCS and confirmed by the applicant. The program is to include:

(1) The type, specification and delivery condition of the products for approval;

(2) Details of selection of typical samples for type test;

(3) The test items and the standards or rules adopted;

(4) Sampling position, type and number;

7.2 Selection of typical samples

7.2.1 According to each type of castings, the selected sample is to be capable of representing the types of product for approval. Where materials, shapes or steel grades are similar for different types, reduction of the number of typical samples may be considered.

7.2.2 In an initial approval, at least one piece of typical product is to be selected, capable of representativeness and with weight more than 80% of the maximum mass applying for approval. An additional piece of product with other mass may be taken for sampling.

7.2.3 In an approval, if selected typical samples are not marine castings, technical conditions need not fully comply with CCS rules, but internal and external quality as well as impact roughness performance of materials are not to lower than the requirements of CCS rules.

7.2.4 The final selection of typical samples is to be confirmed by CCS Surveyor.

7.3 Type test items and requirements

(1) Chemical composition analysis: C, Si, Mn, P, S, Nb, V, Ti, Cr, Ni, Mo, Cu, Als and other added elements.

(2) Tensile test: to determine the upper yield strength R_{eH}, tensile strength R_m, elongation A_5, and area reduction Z, and graphs or computer records to be provided as far as possible.

(3) Charpy V-notch impact test: according to the CCS Rules for Materials and Welding and the approved welding drawings.

(4) Visual examination: slight defects on the surface of casting for approval may be repaired by grinding. Defects required for welding repair are not to be disposed by the manufacturer, which must be notified to CCS Surveyor for confirmation, and repaired according to approved welding procedure.

(5) Non-destructive test: The results of nondestructive testing of steel castings shall meet the requirements of relevant standards.

(6) Other test items as specified in technical drawings, or as deemed necessary by CCS.

8 Unit/batch inspection

8.1 After works approval by CCS, the marine castings which are required to be subject to CCS inspection by LIST OF CERTIFICATION REQUIREMENTS FOR CLASSED MARINE PRODUCTS in Appendixes Chapter 3, PART ONE of CCS Rules for Classification of Sea-going Steel Ships are to be applied by the manufacturer for unit/batch inspection by CCS, which can be used onboard ships only after satisfactory inspection and a certificate of product obtained.

8.2 The detailed requirements for unit/batch inspection of steel castings are to be notified in written form to the works when CCS issues a certificate of works approval.

8.3 The unit/batch inspection is to be carried out according to the approved test program. The test program is to contain the test items for witness, review and on-site examination with details as follows.

(1) Chemical composition analysis: samples from each cast.

(2) Mechanical property test: samples from each unit or each batch.

The test materials used for sampling should meet the relevant requirements for specimen in Chapter 6 ,Part One of CCS Rules for Materials and Welding . If the test method is to be used to determine the thickness of the specimen, a comparative test of large and small specimens is required. The thickness of the large specimen should not be less than the ruling section of the casting (refer to standards such as ISO4990), and the thickness of the small specimen should be selected by the factory itself (but not less than 30mm). If the test results are all qualified, the small-sized specimens can be selected for subsequent product inspections. After completing the comparison of large and small specimens, if the casting product requires a larger thickness of large specimens, the comparison test of large and small specimens needs to be conducted again according to the above requirements.

(3) Non-destructive test (if required):

① Nondestructive testing should be carried out in steel casting rough machining or finishing, such as in the rough state, the surveyor shall be marked in the remark column "the certificate of the product should be carried out the NDT after rough machining (finishing) and inspected by the surveyor

② The results of nondestructive test at least comply with the requirements of Appendix 7B, Chapter 7 of CCS Guidelines for Inspection of Hull Welds and its amendments, Or meet the requirements of the following Table:

Surveillance project	**Ultrasonic test（UT）**		**Magnetic particle testing（MT）**		**Penetrant testing（PT）**	
Detection Standard	GB7233	IACS Rec.69	GB9444	IACS Rec.69		IACS Rec.69
Level	Ⅱ	Acceptable	Ⅱ	Acceptable		Acceptable

Note :The priority of the order is: the requirements of Appendix 7B, Chapter 7 of CCS Guidelines for Inspection of Hull Welds and its amendments, IACS Rec.69, GB/T7233 and GB9444

After approved by CCS, other national or regional standards can be used.

(4) Visual and dimensional examination.

Visual inspection of each cast steel shall carry out by the surveyor. The factory is responsible for checking the dimension accuracy of the cast steel.

(5) Repair of defects should be according to requirements of Chapter 6, Part One of CCS Rules for Materials and Welding

8.4 Each casting after satisfactory inspection is to be marked with CCS stamp.

8.5 The manufacturer should be Submit a certificate that meets the relevant requirements of Section 1, Chapter 6, Part One of CCS Rules for Materials and Welding for each or batch qualified steel casting (s).

8.6 After completion of satisfactory inspection, CCS Surveyor is to issue a certificate of products.