Guideline No.: W-07(201510)

W-07

ANCHORS

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Foreword

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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CONTENS

ANCHORS

1 Application

1.1 This Chapter applies works approval and inspection of steel casting anchors and accessories, welding fabricated anchors and accessories, which are manufactured in accordance with the requirements of CCS Rules for Classification of Sea-going Steel Ships and CCS Rules for Materials and Welding.

2 Normative references

(1) CCS Rules for Classification of Sea-going Steel Ships;

(2) CCS Rules for Materials and Welding.

3 Plans and documents

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

3.2 The applicant is to submit the following documents to CCS for information.

(1) Particulars of the manufacturer: name, address and organizational structure, history, production capacity, main products, legal person, business license, registered trademark, etc.

(2) Details of the products for approval: types, steel grades, specifications, heat treatment, delivery condition.

(3) Main production equipment and inspection/test equipment: name/purpose, specifications or calibration of metallurgical, casting, welding equipment, heat treatment equipment (including dimension of the furnace hearth, heating methods, temperature control recording, arrangement of temperature measuring points), equipment for lifting and weighing, proof load test, non-destructive test, chemical composition analysis and mechanical property test (tensile and impact test).

(4) Technical process and inspection: flow chart of manufacturing process (indicating quality control points), major process specification, inspection provisions for each stage, inspection record, production record, format of quality certificate.

(5) Qualified products: analysis of the recent quality statistics for the products or similar

products, users' comments.

(6) Quality management documents and others: procedures and systems for quality control (a list of the documents may be provided), copies of quality certificate and other qualification certificate issued by a competent unit.

(7) Personnel: a list of welders, NDT personnel, technical inspectors, mechanical test and chemical analysis personnel, with qualification certificates of welder, qualification certificates of NDT personnel, and job certificates for mechanical test and chemical analysis personnel.

3.3 The following documents are to be submitted to CCS for approval:

(1) design descriptions (including calculation);

(2) product drawings (including drawings of components and parts and list of materials);

(3) type test program.

4 Materials and components

4.1 Materials and components are to comply with relevant requirements of CCS Rules.

4.2 All anchors and components are to be manufactured by works as approved by CCS, and are to comply with the requirements of CCS Rules for Materials and Welding.

5 Design and technical requirements

5.1 Anchors designed as high holding power ones or super high holding power ones, when in the process of approval, are subject to holding power tests at sea in accordance with the requirements of CCS Rules for Materials and Welding.

6 Selection of typical samples

6.1 According to the complexity of casting technique, at least two types of structures are to be selected as typical samples for cast steel anchors. A product with specification reflecting the manufacturer's casting capacity (more than 80% of maximum mass or maximum dimension) is to be selected from each type for the test.

6.2 According to the complexity of welding technique, at least two types of structures are to be

selected as typical samples for welded anchors and welding fabricated anchors. A product with specification reflecting the manufacturer's production capacity (more than 80% of maximum mass or maximum dimension) is to be selected from each type for the test.

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) acceptance criteria (the current rules or standards adopted);

(3) selection of typical samples and reasons;

(4) the test items, methods and requirements;

(5) the type and position of the test specimens;

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

7.2 Type test items and requirements

(1) Chemical composition analysis: C, Si, Mn, P, S, Cr, Ni, Mo, Cu, V, Als, to comply with the requirements of CCS Rules for Materials and Welding.

(2) Metallographic examination: the components and parts of cast steel anchors are to be fully annealed or normalized and tempered (the tempering temperature is not to be less than 550℃) at AC_3＋50～150℃. The specimens are to be prepared in the position with maximum thickness after heat treatment. The process of preparation is to be free from super heating or deformation. The specimens are to be etched in nitric acid alcohol solution for metallographic examination (×100 magnification) and micrographs are to be provided. Matrix structure is ferrite + detached networks distributed perlite or ferrite + perlite. No structure in the as cast condition or Widmanstatten structure (coarsening) is allowed.

(3) Mechanical property test of the materials: to comply with the relevant requirements of CCS

Rules for Materials and Welding.

(4) Drop test: the cast steel anchor arm, shank and shackle to be freely dropped respectively from 4 m height on a solid steel plate of not less than 50 mm in thickness, and peening with a hammer of not less than 3 kg. If drop test is not carried out for the welding anchor, welds may be subject to ultrasonic examination which may be carried out according to CCS requirements or recognized standards.

(5) Product anchors are to be subject to proof-load test. The test methods and results are to comply with the requirements of CCS Rules for Materials and Welding.

(6) Mass and dimension of anchors (including the turning angle of the arms) are to be subject to examination. The deviation of actual mass of anchors from their nominal mass is to be within the range of +7% to -3%. Where the deviation of mass complies with the requirements, the dimension is to comply with the requirements in the drawings approved by CCS and deviation of the dimension is to be within the range of ±4%, but not greater than 20 mm. Fabrication and fitted dimension of the anchors are to comply with the requirements of CCS Rules for Materials and Welding.

(7) Visual examination and non-destructive test are to comply with the following requirements:

① the visual examination and non-destructive test after proof-load test are to comply with the requirements of CCS Rules for Materials and Welding;

② magnetic particle test: the test is to be in accordance with Appendix 7B, Chapter 7 of CCS Guidelines for Inspection of Hull Welds;

Acceptance criteria for surface testing of castings Table 7.2(1)

Inspection zone	Maximum number of indications	Type of indication	Maximum number for each type	Maximum dimension of single indication
Fabrication weld preparation and weld repairs	4	Linear	4	3mm
		Nonlinear	4	5mm
		Aligned	4	3mm
Locations other than welds	20	Linear	6	5mm
		Nonlinear	10	7mm
		Aligned	6	5mm

③ ultrasonic test of steel castings: the test is to be in accordance with Appendix 7B, Chapter

7 of CCS Guidelines for Inspection of Hull Welds;

Acceptance criteria for ultrasonic testing of steel castings Table 7B.4.6

Inspection zone	Allowable disc shape according to DGS (mm)	Maximum number of indications to be registered①	Allowable length of linear indications (mm)②
UT1	>6	0	0
UT2	12~15	5	50
	>15	0	0

Notes: ① Grouped in an area measuring 300 x 300mm.

② Measured on the scanning surface.

④ the major defects are to be classified and disposed in accordance with the welding procedure approved by CCS.

(8) Welding/weld repairs assessment

① for fabricated anchors, the welding procedure is to be submitted for assessment and approval;

② for cast steel anchors, the weld repairs procedure is to be submitted for assessment and approval.

8 Unit/batch inspection

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

8.2 The unit/batch inspection test is to be conducted according to the approved program. The test program is to contain the test items for witness, review and on-site examination. The items are to include:

(1) visual examination;

(2) main dimension and fitted dimension examination;

(3) chemical composition analysis;

(4) mechanical property test;

(5) drop test (applicable to cast steel anchor);

(6) proof-load test of anchors (if required);

(7) non-destructive test;

(8) mass examination;

(9) free turning of anchor;

(10) repairs of major defects, including confirmation of welding/weld repair procedure and test after repair;

(11) other test/inspection items as deemed necessary by CCS.

8.3 Each casting after satisfactory inspection is to be marked with CCS stamp. The mark is to comply with the requirements of CCS Rules for Materials and Welding.

8.4 After satisfactory inspection and review of the submitted documents, CCS Surveyor is to issue a certificate of marine products.