

Guideline No.: W-04 (201705)



W-04

ALUMINUM ALLOY SECTIONS

Issued date: May 9, 2017

© China Classification Society

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.

Historical versions and release date : W-04(201510)

October 20,2015

Main changes:

1. Added the requirements about the billet works approval according to the CCS Rules for materials and welding in “1. Application”
2. Revised the requirements for quality document that need to submit to CCS in Article 4.2, added the requirements of qualified vendor list and quality certificate.
3. Revised the requirements for selection of typical samples in “5.2 Selection of typical samples”, added the regulations for aluminum alloy grade, delivery state and boundary conditions of typical samples.
4. Revised the requirements for chemical composition analysis and macrosection tests in “5.3 Type test items and requirements”.
5. Revised the requirements for unapproved unit/batch inspection in Article 6.1 according to CCS Rules.
6. Adjusted the expression of some terms.

CONTENTS

1 Application4

2 Normative references4

3 Design and technical requirements4

4 Plans and documents4

5 Type test6

6 Unit/batch inspection7

ALUMINUM ALLOY SECTIONS

1 Application

1.1 This Guideline applies to the works approval and inspection of the extruded aluminum alloy sections manufactured according to CCS Rules for Classification of Sea-going Steel Ships and CCS Rules for Materials and Welding.

1.2 This Guideline applies to aluminum alloy sections manufactured by mould casting or continuous or semi-continuous casting process, and formed by extrusion. The delivery condition is to be of O,HXX/HXXX, TX wrought aluminum alloy.

1.3 The billet used to aluminum alloy extrusion sections is to be made at works approved by CCS

2 Normative references

2.1 The basis for approval and inspection of aluminum alloy sections are as follows:

- (1) CCS Rules for Classification of Sea-going Steel Ships;
- (2) CCS Rules for Materials and Welding.

3 Design and technical requirements

3.1 The design is to comply with the requirements of PART ONE of CCS Rules for Materials and Welding.

4 Plans 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 in triplicate 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, production equipment, inspection/test equipment 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: organizational structure,

quality control points, responsibilities of the management departments / managers, quality management system documents or a list, identification and the documentary trail, regulations on management of purchasing and acceptability Criteria of raw materials, qualified vendor list and quality certificate ,etc.

(3) A list of main production equipment and inspection/test equipment and their technological parameters: smelting equipment, ingots casting method, heating furnace, extruder (capacity, maximum speed, stroke, shearing force, etc.), heat treatment furnace, straightening and cutting equipment.

(4) Process documents: flow chart of manufacturing process, control criteria of the manufacturer, technological specifications (operation guidance), in which the following are to be included:

① Smelting, refining, casting (including technological specifications and ingots quality control);

② Extruding:

- main technological parameters (such as temperature, speed);
- preparation system before manufacturing (including quality acceptance of ingots, surface grinding or cleaning of the ingots, surface quality and dimension control);
- heating system;
- equipment preparation system;
- operation specifications;
- heat treatment system;
- process quality control (including surface quality and dimension tolerance of the sections);

③ Provisions for disposal of non-conformity or non-conforming products;

④ Provisions for inspection before delivery (including final apparent quality, dimension tolerance, sampling test, identification mark).

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

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

4.4 Other documents where deemed necessary by CCS.

5 Type test

5.1 Determination of the type test program

The type test 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 aluminum alloy grade, specification, and delivery state of the products for approval;
- (2) The acceptance criteria (the valid rules and standards adopted);
- (3) Selection of typical samples for type test;
- (4) The test items and requirements;
- (5) Sampling position, type and number;
- (6) Place of test and qualification of the laboratory (if applicable, the qualification of the Selection of typical samples for type test; subcontractor and the agreement).

5.2 Selection of typical samples

- (1) The aluminum sections that applied for approval should select the representative products according to the different grades and delivery states. When selecting the products as typical samples, try to choose the closed profiles. If the applicant only produces open-type profiles, then the approval cannot cover the closed profiles.
- (2) In works approval, the typical products is to be selected, capable of representing the maximum extrusion capacity of the manufacturer, such as the max circumscribed circle diameter, range of thickness and max outer diameter of bar. CCS may require additional approval test for the smallest or medium specification products as the case may be.

5.3 Type test items and requirements

5.3.1 Chemical composition analysis: Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ni, Ca, V, Zr, Al and other

added elements.

5.3.2 Mechanical property test: the number, position and size of the prepared specimens and the test results are to comply with the requirements of CCS Rules for Materials and Welding.

5.3.3 Macrostructure examination: the test piece from the bottom of the section is to be free from crack, piping, gas hole and bright grain, and non-metallic intrusions, segregations or intermetallic compounds, lamination or coarse grain ring that may affect the property of the products.

5.3.4 Microstructure: for quenched sections, no super burning is allowed in the result.

5.3.5 Occasional check of profile dimension and tolerance: the percentage of occasional check or review of inspection record is to depend on the quality control of the manufacturer.

5.3.6 Surface quality inspection

- (1) The surface of the sections is to be well ground, smooth and even, and free from harmful defects that will impair further manufacture processes and proposed application, such as cracks, laps, nitrate spots, laminations, corrosion, oxide inclusions, oxide skins, blisters, significant metallic and non-metallic intrusions, mechanical damage.
- (2) Slight oxidated color, flakes or dark spots are permitted in the surface.
- (3) The edges of the sections are to be straight and plane, and free from burrs.

5.3.7 The sections with closed profiles shall carry out macrosection tests or drift expanding test, the result is to show satisfactory penetration and free from lack of fusion. Drift expanding test shall be carried out in accordance with the requirements of CCS Rules, the test piece of macrosection tests should take from the top of the sections in addition to taking from the bottom.

5.3.8 Other inspection and test items where deemed necessary by CCS, such as corrosion test.

6 Unit/batch inspection

6.1 The unit/batch inspection of the aluminum sections should be carried out after the works approval, otherwise the unit/batch inspection should be carried out according to requirements of type test.

6.2 The unit/batch inspection after the works approval should 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. The items are to include:

- (1) Surface quality and main dimensions;
- (2) Chemical composition analysis;
- (3) Mechanical property test;
- (4) Microstructure examination (solution treated);
- (5) Macrostructure examination;
- (6) Drift expanding test or macrosection tests of sections with closed profiles (if required);
- (7) Other items where deemed necessary by CCS.

6.3 After the inspection of aluminum alloy sections is completed, the manufacturer is to submit its quality certificate to CCS Surveyor for review. The quality certificate is to contain at least following items:

- (1) Name of the purchaser and order number;
- (2) Quantity, size and weight of the product;
- (3) Delivery condition and grade of material;
- (4) Chemical composition of aluminum alloy;
- (5) Batch number or identification mark which will enable the full history of the item to be traced;
- (6) Test results;
- (7) Clarifying manufacturer's statement "According to CCS Rules or approval by CCS, accepted acceptance criteria or relevant standards, tests are satisfactory".

6.4 After satisfactory inspection of the products and review of the documents submitted by the manufacturer, CCS Surveyor is to issue a Certificate of Marine Products.