Guideline No.: W-04 (201510)

W-04 ALUMINUM ALLOY SECTIONS

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Foreword:

This Guide is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

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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.

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, identification and the documentary trail or relevant descriptions.

For manufactures whose raw materials need to be purchased, the source of the materials is to be stated and listed, and the provisions for control of such purchase and acceptance are to be stated.

(3) Main production equipment and relevant parameters: smelting equipment, ingots casting method, heating furnace, extruder (capacity, maximum speed, stroke, shearing force, etc.), heat treatment furnace, straightening and cutting equipment.

(4) List of main inspection/test equipment.

(5) 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).

(6) 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

(1) 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, temper condition and delivery condition 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 subcontractor and the agreement).

5.2 Selection of typical samples

Products manufactured under worst heat treatment condition are to be selected as approved sampling products. For extruded products with pressure welding closed profiles, such closed profiles are to be preferred as typical products.

5.3 Type test items and requirements

5.3.1 Chemical composition analysis: Si, Fe, Cu, Mn, Mg, Cr, Zn, Ti, Ni, Ca, V 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 fractured surface microscopic section analysis 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.

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

6 Unit/batch inspection

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

6.2 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. The items are to include:

(1) Surface quality and main dimensions;

(2) Occasional check and review of the report of chemical composition analysis;

(3) Witnessing of mechanical property test;

(4) Microstructure examination (solution treated);

(5) Macrostructure examination;

(6) Drift expanding test or fractured surface analysis of sections with closed profiles (if required);

(7) Other items where deemed necessary by CCS.

6.3 When the aluminum alloy sections are submitted to CCS Surveyor for inspection, the manufacturer is to submit its quality certificate to CCS Surveyor for review. The quality certificate is to contain at least following items and to be submitted to CCS for information during works approval:

(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.