Guideline No.:W-01(202601)

W-01

ROLLED STEEL

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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 service@ccs.org.cn.

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Main changes:

Revise the standard for CTOD tests of base materials.

CONTENS

ROLLED STEEL

1 Application

1.1 This Chapter applies to the works approval and products inspection of the rolled steel, i.e. normal strength hull structural steel, high strength hull structural steel and high strength steel for welded structures (including plates, strips and sections) and its materials (including billet and ingot), which are manufactured according to the requirements of CCS Rules for Classification of Sea-going Steel Ships and CCS Rules for Materials and Welding.

Note: The approval requirements of H47 steel and brittle crack arrest steel should be in accordance with the “Guidelines for Application of Thick Higher Strength Steel Plates for Ships”.

The approval requirements of corrosion resistant steel of cargo oil tanks in crude oil tankers should be in accordance with the “Guidelines for Survey of Corrosion Resistant Steel of Cargo Oil Tanks in Crude Oil Tankers”.

1.2 This chapter can be used as reference for steels for boilers and pressure vessels, steels for machinery structures，and steels for low temperature service. Additional property tests may be necessary for works approval and products inspection subject to agreement by CCS.

1.3 For a rolled coil steel plating works, where the unreeling and crosscutting need subcontracted, the quality management and quality control of the subcontractor on dimension, appearance, straightness and marks transfer are to be included in the works approval by CCS.

1.4 The rolled coil steel unreeling works is to be subject to works approval by CCS and to type test as appropriate. The unreeled steel plates are to be subject to inspection and a quality certificate endorsed by CCS Surveyor after satisfactory inspection.

1.5 For a rolled steel plating works, where the billet/ingot need to be purchased, the billet/ingot material is to be ordered from the billet works as approved by CCS.

2 Normative references

The basis for approval and inspection of rolled steel works to which this Chapter apply are as follows:

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

(2) CCS Rules for Materials and Welding;

(3) IACS UR W11 Normal and Higher Strength Hull Structural Steels;

(4) IACS UR W16 High Strength Steels for Welded Structures;

(5) 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.

4.2.1 Particulars of the manufacturer:

The name, address, location of the workshops, number of staff employed and history of the manufacture; the type and specification of the manufactured products; estimated total annual production of finished products; the type, specification and delivery condition of the products for approval; the chemical composition and mechanical properties of the steel grades or similar steel type, specification, delivery condition of the products for approval (to prove the high quality and stability); certification of compliance of the quality system with IS0 9001; approval certificates already granted by other Classification Societies, if any.

4.2.2 Management documents, including QMS documents:

(1) Organizational structure, quality control points, staff and composition of quality department , quality management system documents, identification and documentary trail or related descriptions;

(2) Origin and storage of raw materials storage of finished products, storage of finished products, For a rolled steel plating works, where the billet/ingot steel need to be purchased, the provisions for control of such purchase and acceptance are to be established.

4.2.3 Main production, inspection/test equipment's:

(1) Information on main production equipment: parameters of steel-making furnace(including ladle refining and vacuum degassing installations, if any), casting equipment, types/relevant parameters of heating furnace, parameters and calibration of the rolling mill (maximum rolling force, size of roll, main control means of the rolling mill), parameters of on-line accelerating cooling system, types/parameters/temperature control capability/ calibration of heat treatment furnace(if any), flatten steel coil equipment(if any).

(2) Main inspection/test equipment: equipment for chemical composition analysis, mechanical property test and NDT (if any), metallography and relevant calibration procedures(if any). The manufacturer itself is to be equipped with the above inspection/test equipment.

4.2.4 Process documents

Flow chart of manufacturing process, component design of approved steel type, control criteria of the manufacturer, technological specifications (operation guidance) in which the following are to be included:

(1) Steelmaking, if any:

① Desulphurization, dehydrogenation, supplied treatment, if any;

② Deoxidation, grain refining, nitrogen binding and alloying practice;

③ Information on materials;

④ Refining means (LF, vacuum degassing installations, if any, RH, VD);

(2) Casting:

① Casting method;

② Size and mass of ingots, size of continuous cast billets, casting/solidification cooling rate control, scarfing and discarding procedures of billets /ingots;

③ Quality control measures(methods to prevent re-oxidation, inclusions and segregation control such as electromagnetic stirring, soft reduction, etc.);

(3) Reheating and rolling:

① Heating system;

② Descaling, water pressure;

③ Measurement of temperature and thickness;

④ Reduction ratio, rolling and finishing temperatures for each grade/thickness combination;

⑤ On-line cooling method, cooling parameters;

⑥ For products delivered in the Normalized rolling(NR) or thermo-mechanical rolling (TM) condition, the following additional information on the programmed rolling schedules is to be given: description of the rolling process; the methods used to determine austenitizing temperature, re-crystallization temperature and Ar3 temperature(Can use theoretical calculation method); control standards for typical rolling parameters used for the different thickness and grades of steel (temperature and thickness at the beginning and at the end of the passes, interval between passes, reduction ratio, temperature range and cooling speed of accelerated cooling, if any) and relevant method of control.

(4) Heat treatment:

① Heat treatment system;

② The methods used to determine austenitizing temperature, re-crystallization temperature and Ar3 temperature(Can use theoretical calculation method);

(5) For hot rolled steel plate, the following are to additionally be submitted:

① Specification and mass of the maximum and minimum coils;

② Reeling temperature;

③ Information on unreeling, straightening, crosscutting, sampling and marking.

(6) Recommendations for fabrication and welding in particular for products delivered in the NR or TM condition may be provided by steel mill: cold and hot working recommendations if needed in addition to the normal practice used in the shipyards and workshops; minimum and maximum heat input and recommended pre-heat/interpass temperature.

(7) The factory shall submit the process control documents (including the rolling process) of the approved product, and verify that the qualified products can be produced in accordance with the above process control documents. After the approval, the factory shall continue to produce according to the above process.

4.2.5 Qualification certificate of the test and inspection personnel.

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

4.4 Other documents when deemed necessary by CCS.

4.5 The manufacturer has to submit to CCS the documents required in 4.2 together with the request of changing the approval conditions, in the case of the following (1) through (5) as applicable. However, where the documents are duplicated by the ones at the previous approval for the same type of product, part or all of the documents may be omitted except the approval test program.

(1) Change of the manufacturing process (steel making, casting, rolling and heat treatment)

(2) Change of the maximum thickness (dimension)

(3) Change of the chemical composition, added element, etc.

(4) Subcontracting the heat treatment, etc.

(5) Use of the ingots, slabs, blooms and billets manufactured by companies other than the ones verified in the approval tests.

5 Technical requirements

Nil.

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 grade, specification and delivery condition of the products for approval(the clear relationship between deoxidation method, grain refining elements and delivery condition for different grades, if different thickness range with different composition control, separate

explanation needed.)

In addition, where zirconium, calcium and rare earth metals have been used during steelmaking for grain refinement and, or inclusion modification, the contents of these elements shall be specified in the manufacturing specification. Nitrogen binding, micro alloying and residual elements should be described in the type test program and reflected in the process documents.

(2) The steel grade, specification, number and delivery condition of the typical samples for test approval;

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

(4) Sampling position,(schemes) and sampling instructions;

(5) Name, place of test and qualification of the laboratory (if applicable, the explanation of the subcontractor);

(6) If the factory can provide recently test reports signed by the IACS members societies, type test may be dispensed with subject to approval by CCS.

7.2 Selection of typical samples for type test

The requirements are as follows:

(1) The typical samples are to be taken for type test from the largest products with the same type of billet / ingot for each type and each delivery condition. CCS may require additional approval test for the smallest or medium products as the case may be. The selection of the casts for the test product is to be based on the typical chemical composition, with particular regard to the aimed C*eq*, *CET* or *P*cm values and grain refining micro-alloying additions.

(2) For steels with similar composition design and the same manufacturing method and delivery condition, subject to consent of CCS, higher roughness grade may cover lower roughness grade for the same strength (Such as B cover for A. However, for steels intended for welding with high heat input, the approval test for the lowest toughness grade steel and the highest toughness grade steel may cover the intermediate toughness grade steel. If the measures to ensure high heat input welding performance (such as chemical composition and process) are similar, with the consent of CCS, the approval of high toughness grade can cover the low toughness grade),For high strength hull structural steel, the higher strength

grade can cover lower strength grade within grade immediately below. For high strength steel for welded structures, each strength grade should be selected for testing separately, if the approved steel with the same composition design, manufacturing method and delivery condition, with the consent of CCS, the higher strength grade can cover lower strength grade within grade immediately below.

(3) For normal or high strength hull structural steel, the test samples are to be taken, unless otherwise agreed, from the product (plate, flat, section, bar) corresponding to the top of the ingot, or, in the case of continuous casting, a random sample. For high strength steel for welded structures, the test samples are to be taken from the product (plate, flat, section, bar and tubular) corresponding to the top and bottom of the ingot, or, in the case of continuous casting, a random sample. For continuous casting, the test specimens are to be taken at the top and bottom of the product corresponding to the billet.

The position and direction of the samples are to be in compliance with7.3 and Chapter 3,Part One of CCS Rules for Materials and Welding.

(4) For coils, test specimens are to be taken from the top, middle and bottom respectively, see for the test items in 7.3. In approval of an unreeling works, the test specimens are to be taken from the top, middle and bottom for tensile, impact and ageing impact testing. The steel coil manufactures should specify the distance cut from the top and tail of the steel coil, and inform the CCS and the coil flatting and machining works.

(5) In application for billet / ingot approval, the billet / ingot cast at the same time for the maximum and minimum thickness (for steel ingot specifications) for different grades of steel should be carried out he type test, in accordance with requirements of 7.3.14, and any thickness (for steel ingot may be the specification) Billet / ingot rolling into the final product should be carried out the full type of test, the alternative principle can refer to the requirements of 7.2 (2). For billet / ingot production plants with multiple production lines, one production line should be carried out the type test as required above, and the type test of other lines can be exempted after approval by CCS.

(6) In case of multi-source slabs or changing of slab manufacturer, the rolled steel manufacturer is required to obtain the approval of the manufacturing process of rolled steels using the slabs from each slab manufacturer. A reduction or complete suppression of the approval tests may considered by the Society taking into account previous approval as follows:

The rolled steel manufacturer has already been approved for the rolling process and heat treatment using approved other semi-finished products characterized by the same thickness

range, steel grade, grain refining and micro-alloying elements, steel making(deoxidation) and casting process;

The semi-finished products has been approved for the complete manufacturing process with the same conditions (steelmaking, casting, rolling and heat treatment) for the same steel types.

7.3 Type test items and requirements

Type test items and requirements are given in Table 7.3with details as follows.

7.3.1 Chemical composition analysis

The inspection requirements are given in Table 7.3. Elements Sb and B are to additionally be determined where electric arc furnace is applied. For the high strength steels for welded structures, the Ceq, CET / Pcm values should be submitted, the barrel and finished product composition should be compared to ensure that the differences meet the manufacturer's quality control program.

7.3.2 Tensile test

(1) Tensile specimens are to be of full thickness. For plates over 40 mm thick, round test specimens may be used with sampling location at 1/4 and 1/2 of the thickness of the product.

(2) Tensile specimens are to be taken longitudinally and transversely respectively. For strips and sections of less than 600mm in width, the specimens may be taken only longitudinally.

(3) For materials showing no yield phenomenon, the proof strength $R_{p0.2}$is to be determined.

(4) Where the steel is supplied in TMCP condition, the tensile test of stress relief is to be conducted with heating temperature of600℃and heating time of 2 min/mm, but not less than one hour.

(5) For high strength steels for welded structures, the Y/T ratio should be calculated.

7.3.3 Bend test

The bend test specimens are to be 30mm in width (while the thickness is less than 6mm,b=5a,a for steel thickness)and bent to an angle of 180° with the diameter of bend mandrel referred to relative

national standard.

Note: For normal or high strength hull structural steel the bend test should be carried out, with the diameter of the bend mandrel referred to the GB/T700、GB/T1591.

7.3.4 Charpy V-notch impact test

(1) Charpy V-notch impact test is to determine the energy, the percentage of crystalline fracture and side expansion value, and a curve is to be drawn to determine the brittle transition temperature (normally corresponding to 50% crystalline fracture). The photo of the fracture is to be provided.

(2) The temperature requirements for impact test are given in Table 7.3.

(3) For materials of thickness less than or equal to 40mm,the impact specimens are to be taken close to the surface; for materials of thickness more than 40mm, the specimens are to be taken at 1/4 and 1/2 of the thickness respectively.

(4) In general, plates of less than 6mm in thickness may be free from impact test.

(5) Sections of less than 600mm in width may be tested only in longitudinal direction.

(6) For steel bars of less than 60mm in diameter, the specimens are to be taken at 1/3 of the radius from the outer surface. Where the diameter is more than or equal to 60mm, the specimens are also to be taken at the core.

7.3.5 Ageing impact test

The temperature requirements for ageing impact test are given in Table 7.3. For high strength steels for welded structures, only the maximum thickness typical is selected for this test.

7.3.6 Sculpture print test

(1) For normal or high strength hull structural steel, Sulfur print test should be carried out on billet / ingot and plate. For high strength steels, Sulfur print test only should be carried out on billet / ingot.

(2) The test is to be carried out on the billet / ingot having the maximum thickness. For billet, the sulfur prints are to be taken for half cross section from the center to the side of the plate. For ingot, the sulfur prints are to be taken for full cross section.

(3) The sulfur prints for plates are to be taken from the middle of the plate with length greater than 600mm. Thickness is full thickness.

7.3.7 Macrostructure examination

The macrostructure examination is to be carried out on billet / ingot and finished product. The requirements for sampling position and length are the same as those for sulfur prints.

7.3.8 Metallographic examination

The metallographic examination (×100 and 500 magnification) is to be carried out close to the surface and at the mid-wall thickness respectively to measure Ferrite and/or prior austenite grain size. Where the thickness of the product is over 40 mm, additional samples are to be taken at 1/4 thickness. For high strength steels for welded structures, non-metallic inclusions and impurities should be measured in accordance with ISO 4967 or equivalent.

7.3.9 Drop weight test

(1) For the first approval or additional items approval of the plates with steel types other than A, B, D, AH32/36/40, DH32/36/40 the plates with maximum thickness and highest grade of steels are to be selected for drop weight testto determine NDTT (Nil-Ductility Transition Temperature). Transverse specimens are to be taken.

(2) The standard for the test is Chapter 2,Part One of CCS Rules for Materials and Welding. The photo of the sample after the final test should be shown in the test report.

7.3.10 Mechanical test in through-thickness

For plates with mechanical properties of Z-Direction, a tensile test in through-thickness is to be conducted to determine the reduction of area. For high strength steels for welded structures, the through-thickness tensile strength should also be determined.

7.3.11 Non-destructive test

Z-direction steels are to be subject to ultrasonic examination, the method and the result should meet the requirement of the Rules for material and welding.

7.3.12Welding property test

(1) For the first approval and additional items approval of plates from grade E of normal

strength hull structural steel, high strength hull structural steel or high strength steel for welded structures with grade H420 to H500, the products with maximum thickness and highest strength and toughness grade are to be selected for welding property test.

For the first approval and additional items approval of high strength steel for welded structures with grade H550 to H960, the thickest products with the highest toughness grade for each strength grade is to be tested. If two or more grades have the similar chemical composition design, testing requirements on the lower grades may be reduced at the discretion of CCS.

(2) ①For normal or high strength hull structural steel, abut specimens to be welded with heat input 15±2kJ/cm and 50±5kJ/cm respectively. The weld is to be perpendicular to the direction of rolling.

② For high strength steel for welded structures with grade H420 to H500, butt specimens with as-welded and post-weld heat treated condition are to be welded separately with heat input 15±2 kJ/cm (only for as-welded) and 50±5 kJ/cm (35±3.5kJ/cm for QT) respectively.

③ For high strength steel for welded structures with grade H550 to H960, butt specimens are to be welded separately with heat input 10±2kJ/cm and a maximum heat input as proposed by the manufacturer respectively. The approved maximum heat input shall be stated on the manufacturer approval certificate. If the manufacturer requests to include the approval for Post Weld Heat Treated (PWHT) condition, additional butt weld test assembly welded with a maximum heat input proposed by the manufacturers to be post-weld heat treated (PWHT) prior to testing.

④ The bevel preparation should be preferably 1/2V or K related to thickness. The usual welding procedures are to be adopted as much as possible. The weld is to be perpendicular to the direction of rolling. All the welding parameters, such as consumables designation code and diameter, edge preparation, preheating temperature, interposes temperature, current, amperage, voltage, travel speed, heat input value and passes, are to be submitted.

⑤ For steels intended for welding with high heat input, the maximum heat input in accordance with the products standard is to be adopted to butt-joint specimens with as-welded and post-weld heat treated condition.

⑥ For high strength steel for welded structures, the butt weld test assemblies of N/NR plates

or sections and seamless tubular in any delivery condition are to be prepared with the weld seam transverse to the final plate rolling direction, and the butt weld test assemblies of TM/TM+AcC/TM+DQ and QT plates are to be prepared with the weld seam parallel to the final plate rolling direction.

⑦ Post-weld heat treatment procedure:

For the steel sheet to be subjected to the post-weld heat treatment test in 7.3.12 (2), reference should be made to the following heat treatment process. Steels delivered in N/NR or TM/TM+AcC/TM+DQ condition shall be heat treated for a minimum time of 1 hours per 25mm thickness (but not less than 30 minutes and needs not be more than 150minutes) at a maximum holding temperature of 580°C, unless otherwise approved at the time of approval. Steels delivered in QT condition shall be suitable for heat treated for a minimum time of 1 hours per 25mm thickness (but not less than 30 minutes and needs not be more than 150minutes) at a maximum holding temperature of 550°C with the maximum holding temperature of at least 30°C below the previous tempering temperature, unless otherwise approved at the time of approval. Heating and cooling above 300°C shall be carried out in a controlled manner in order to heat/cool the material uniformly. The cooling rate from the max. holding temperature to 300°C shall not be slower than 55°C/hr.

(3) The specimens are to be subject to the following tests:

① Two full-thickness specimens (transverse) for tensile test. When the breaking strength of a test specimen exceeds the capacity of the test machine, the test specimen may be divided into several portions and the thickness of each specimen is not to be less than 25 mm. The average value of the tensile results obtained from the several specimens may be taken as the result of the full thickness butt weld joint. The specimens are to be machined flush with the surface of the plate. The tensile strength value and position of fractures of the specimens are to be submitted;

② For normal or high strength hull structural steel and high strength steel for welded structures with grade equal or less than H690, a weld face bend specimen and a weld root bend specimen should be prepared. The breadth of specimens is 30mm and the diameter of the bend mandrel:d=4a(ReH ≤400 N/mm^2)；d=5a（400N/mm^2＜ReH ≤500 N/mm^2）；d=6a（500N/mm^2＜ReH ≤690 N/mm^2） where *a* is the thickness of the specimen, the bending angle α equals180°. Where the thickness of the plate is more than20mm, two side bend specimens may be prepared;

③ A set of three impact test specimens perpendicular to the weld. The notches of specimens are to be located at the center of weld, on the fusion line and at 2 mm, 5mm and 20mm from fusion line. The fusion line is to be determined by corrosion test. The temperature for impact test is taken as the delivery inspection temperature. The sampling position is 1 to 2mm from the surface of the plates. Where the thickness is more than50mm, additional specimens are to be taken from the root of the weld edge, and the notches of specimens are located as same to the above;

④ HV10hardness distribution test: hardness distribution test is to be carried out on the cross section of the weld 1~2mm from the upper and lower surfaces, the root of the weld of the K edge of the plates respectively. The measuring points are on the weld, the fusion line, at the heat affected zones and on the parent metal. The space between the measuring points is about 0.7mm, and the heat affected zone of each side is to have at least 6to 7 measuring points.

The maximum HV10 hardness value usually is not to be greater than HV350,for the strength grade equal or less than H460,and the maximum HV10 hardness value usually is not to be greater than HV420 for the strength grade H500-H690, and the maximum HV10 hardness value usually is not to be greater than HV450 for the strength grade H890 and H960,.

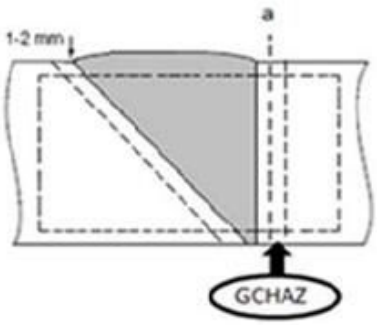
⑤ The photos of edge preparation, dimension, passes, hardness value and joints are to be submitted to CCS;

⑥ Steels intended for welding with high heat input are to be subject to visual, macrostructure and microstructure inspection. The sectional surface of the welds is to be free from such defects as cracks and lack of fusion. A micro-specimen is to be taken from the weld, fusion line, and 2mm, 5mm, 10mm, 20mm from the fusion line respectively along the centerline of the through-thickness, and 100 times metallographic photos shall be provided;

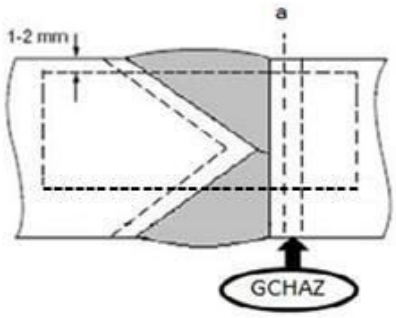
⑦ Non-destructive test for the specimens.

⑧ For high strength steel for welded structures, CTOD test specimens are to be taken from test plate(excluding steels intended for welding with high heat input) with as-welded and post-weld heat treated condition(if applicable). Grain-coarsened HAZ (GCHAZ) shall be targeted for the sampling position of the crack tip. Three tests shall be performed at –10 °C on each butt weld test assembly. The eigenvalue reference value is 0.15 mm. For grades H690 and above, dehydrogenation of as-welded test pieces may be carried out by a

low temperature heat treatment, prior to CTOD testing. Heat treatment conditions of 200 °C for 4 h are recommended. See Figure for the form and direction of the samples. The test method and sampling/preparation of the samples are to be in compliance with Chapter 2,Part One of CCS Rules for Materials and Welding or other equivalent standards (ISO15653 for example).



For plate thickness t ≤ 50mm, CTOD test specimen is to be samples in full thickness.



For plate thickness t > 50mm, subsidiary test specimen with a thickness of maximum 50mm in subsurface area is to be sampled

⑨ For high strength steel for welded structures, Testing in accordance with standards accepted by CCS such as GB/T4675.1 for Y- groove weld crack test(Hydrogen crack test). Minimum preheat temperature is to be determined and the relationship of minimum preheat temperature with thickness is to be derived.

7.3.13Dimensional and visual examination

(1) For the type test all the plates rolled by the test billet/ ingot the dimensional and visual examination should be carried out. The length, width, thickness and irregularities of each plate are to be measured. Thickness measurement methods and requirements are to comply

with relevant requirements of CCS Rules for Materials and Welding. Other measurement values are to be in compliance with the specific requirements of GB/T709.

(2) For rolled coil, a coil is to be selected to measure the thickness, width and tower. The values are to be in compliance with the specific requirements of GB/T709.

(3) For steel plate processed from steel coil ,select at least 5 pieces in one coil by random are carried out the dimension test, each piece should inspected the length, width, thickness and flatness, the result should meet the requirement of GB/T709.

(4) For sections in the type test all the section should be inspected in dimension and the values are to be in compliance with the relevant standards.

(5) The external quality is to be in compliance with the relevant standards.

7.3.14 Sulphur print test, macrostructure examination and chemical composition analysis are to be increased for the approval of steel billet/ ingot.

7.3.15 CTOD test.: for the initial approval or change of approval E,EH32/36/40, FH32/26/40the CTOD should be carried out. The test temperature is -10℃.The sampling, making the test sample, test method should meet with Part 1,Chapter 2 of CCS Rules for material and welding and other equivalent standard (such as ~~ISO15653~~ISO12135).

7.3.16 For steels requiring elevated temperatures such as boiler steel, a tensile test at elevated temperatures is to be carried out. The test temperatures are 50℃, 100℃, 150℃, 200℃,250℃, 300℃, 350℃, 400℃ and 450℃.

For high strength steel for welded structures , additional tests such as large scale brittle fracture tests (Double Tension test, ESSO test, Deep Notch test, etc.) may be required.

Other test items when deemed necessary by CCS.

7.3.17 In general, the preparation of samples and mark transfer are to be in the presence of the Surveyor.

7.3.18 Test items other than those for chemical analysis, tensile, impact, ageing impact and metallographic examination may be dispensed with subject to approval by CCS. The relief items should be stated in the test program.

7.3.19 The manufacture have the steelmaking, continuous-casting and rolling capacity, and billet/ ingot for the rolled products is manufactured by self and meeting the requirements of 7.2 (5),the relative billet/ ingot work approval certificate can be issued meanwhile the rolled product work approval certificate is issued.

8 Unit/batch inspection

8.1 The unit/batch inspection of rolled steels is to be carried out after works approval according to CCS Rules for Classification of Sea-going Steel Ships.

8.2 The detailed requirements for unit/batch inspection of rolled steels 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 or review. The items include the mechanical test (tensile test, impact test, etc.), and non-destructive test (if required) ; chemical analysis. The appearance and dimension shall be guaranteed by the manufacturer. If necessary, the Surveyor may check the technical or test record, or propose additional test times.

8.4 The unit/batch inspection for steel plate processed from steel coil

The surveyor should check the steel coil certificate and random check the process of uncoiling , dimension ,appearance and transfer the stamp., The check rate should no less than 10%.

If the surveyor have any suspect on the manufacture quality certificate ,the chemical reinspection or the mechanical property test with sample taken from the top or tail should be carried out.

When the manufacture flatting the coil from the new steel coil supplier for the first time, the mechanical property test(tensile test and impact test).should be carried out and the samples taken from the top, middle and tail in one coil which selected by random. The results of the mechanical property test should not less than former’s obviously.

8.5 The steel coil thickness should be integer multiple of 0.5mm.

8.6 After satisfactory inspection of products, CCS Surveyor is to issue a certificate of marine products or endorse the manufacturer’s quality certificate.

(1) The quality certificate shall meet the relevant requirements of Chapter 3, Part 1 of CCS Rules for material and welding. The space for stamp and endorsement by CCS Surveyor is

to be reserved.

(2) The quality certificate of steel coil should be noted: This steel coils in this certificate cannot be used on board as the hull structural steel directly until they are flatten and machined to steel plates with CCS surveyor inspection and certificate issued by CCS for steel plate is required.

(3) The steel plate processed from steel coil should have the CCS certificates or the certificate issued by CCS base on the manufacture quality certificate. The chemical component ,mechanical property ,thickness and specification should be original from the steel coil certificate and it should be noted “the data original from the steel coil certificate”. The original copy of steel coil should be submit to CCS.

(4) The quality certificate of the steel plate processed from steel coil should maintain the information of the manufacture name, grade, specification, weight, serial No.(cast No./Coil No.)and steel coil certificate No. from original steel coil certificate.

(5) The format of the manufacturer’s quality certificate is to be approved by CCS.

Test items for type approval **Table 7.3**

Test items	Applicable grades	Sampling requirements	Test requirements				Remarks
Chemical composition	A, B, D,E	ladle samples and top of finished products	C, Si, Mn, P, S, Cr, Ni, Mo, V, Cu, Al and other added elements				
	AH32/36/40, DH32/36/40, EH32/36/40, FH32/36/40		C, Si, Mn, P, S, Nb, V, Ti, Cr, Ni, Mo, Cu, Al, B, As, Sn, Pb, [N], [H], [O] and other added elements				
	AH420~960, DH420~960, EH420~960, FH420~690,		C, Mn, Si, P, S, Ni, Cr, Mo, Al, N, Nb, V, Ti, B, Zr, Cu, As, Sn, Bi, Pb, Ca, Sb, O, Hand other added elements$C_{eq}$and/or P_{cm},calculationas applicable				
Tensile test	all grades	top and bottom longitudinal and transverse	ReH, Rm, A, Z				
Bend test	All grade	top and bottom	longitudinal and transverse				
Impact test			temperature ℃				
	A,B,AH32/36/40, AH420~960	top and bottom longitudinal and transverse	+20	0	-20	-40	
	D,DH32/36/40, DH420~960		0	-20	-40	-60	
	E,EH32/36/40, EH420~960		0	-20	-40	-60	
	FH32/36/40, FH420~690		-20	-40	-60	-80	
Ageing impact test	A,B,AH32/36/40, AH420~960	top and bottom longitudinal	+20	0	-20		5% plastic deformation, ageing for one hour at 250℃, not lower than the required value of assessment temperature
	D,DH32/36/40, DH420~960		0	-20	-40		
	E,EH32/36/40, EH420~960		0①	-20	-40	-60	
	FH32/36/40, FH420~690		-20①	-40	-60	-80	
Sulphur prints	the same as sampling requirements	recommend top					
Macrostructure	the same as sampling requirements	top					
Metallographic	the same as sampling requirements	top					

Continued table 7.3

Test items	Applicable grades	Sampling requirements	Test requirements	Remarks
Drop weight	refer7.3.9	top	refer7.3.9	
Z-direction tensile test	Z-direction steel	top and bottom	refer 7.3.10	
Non-destructive test	Z-direction steel	all	refer 7.3.11	
Property test at elevated temperature	if the elevated temperature mechanical is required	top and bottom	refer 7.3.16	
Welding property	E, higher strength steels and high strength steel for welded structures	refer 7.3.12	refer 7.3.12	
Dimension and appearance	all	refer 7.3.13	refer 7.3.13	
Base material CTOD test	E, EH32/36/40, FH32/36/40,	refer Rules for Materials and Welding	A set of three specimens of full thickness, see Rules for Materials and Welding	The eigenvalue reference value is 0.20 mm

Note: ①Applicable only toEH420~960 and FH420~690.