Guideline No.: W-14(202407)

W-14

STEEL WIRE ROPE SLING

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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 mp@ccs.org.cn.

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Main changes:

1. The certification requirements were modified according to CCS rules.
2. Change the wording, for example: "submitted to CCS for information" were changed to "submit to CCS for review".

CONTENTS

STEEL WIRE ROPE SLING

1 Application

1.1 This Chapter is applicable to the type approval and unit/batch inspection of sling for steel wire ropes, and the end securing ways usually include swaged ferrules, alloy or resin cast joints and inserted joints. Other securing ways may also be referred to in this Chapter.

1.2 Steel wire rope sling mentioned in this Chapter is used for lifting, mooring and towing of ships and offshore installations, other services such as hoisting in ports may be referred to in this Chapter.

2 Normative references

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

(2) CCS Rules for Lifting Appliances of Ships and Offshore Installations;

(3) CCS Rules for Materials and Welding;

(4) Technical Regulations for Statutory Surveys of Lifting Appliances;

(5) Technical Regulations for Statutory Surveys of Towage at Sea;

(6) Relevant international or national standards.

3 Terms and definitions

3.1 Swaged sling for steel wire rope means one end or both ends of the wire ropes are swaged into eye or ring shape (ring swaged sling) with tube by mechanical means, including wire ropes, swaged ferrules and the attachments such as rings, suspension lug, crane hook.

3.2 Inserted sling for steel wire rope means end of strand is inserted reversely to main body of steel wire rope to form a hole or ring at the end of steel wire rope.

3.3 Cast sling for steel wire rope means steel wire rope and sling joint (socket) are connected by alloy or resin casting. Cast sling for steel wire ropes is grouped into open type and closed type according to different cast sling joints (sockets).

3.~~2~~ 4 Safe working load of the sling means the maximum load for which the sling has been designed and tested. This load is not to be less than the maximum load to which the sling will be

subject when the lifting appliance is operating at its SWL.

4 Drawings and documents

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

(1) Particulars of the applicant, qualification documents and details of the products for approval, including the specification and the construction;

(2) Particulars of main production equipment, inspection and test equipment and personnel qualification;

(3) Main production technology and quality control documents.

5 Technical requirements

The design, manufacture, inspection and use of steel wire rope sling are to comply with the requirements of standards accepted by CCS.

Slings manufactured based on the requirements of ship design drawings or purchase technical agreements or beyond the range of standard specifications are to be subject to necessary strength assessment according to standards accepted by CCS. The drawings and technical documents are to be submitted to CCS for approval or information.

The manufacturer is to design the construction of slings based on the purpose of the products and users' requirements and calculate the safe working load. The calculated safe working load is not to be less than that required by users and that for lifting appliances, otherwise, the design is to be modified.

6 Materials and components

6.1 Steel wire ropes

Steel wire ropes are to comply with the requirements of Chapter 10, PART ONE of CCS Rules for Materials and Welding and standards accepted by CCS, and to be furnished with certificate of marine products by CCS or equivalent certificates. The construction and relevant technical parameters of steel wire ropes are to be the same as those in purchase technical agreements.

6.2 Attachments such as crane hook, shackle and suspension lug

Attachments such as crane hook, shackle and suspension lug are to comply with the requirements of CCS Rules for Lifting Appliances of Ships and Offshore Installations and CCS relevant guidelines. Purchased attachments are to be furnished with certificate of products by CCS or Equivalent Document (stamped by CCS) .

6.3 Casing material of swaged sling for steel wire ropes

Chemical composition and mechanical property of aluminum alloy casing are to comply with the requirements of recognized securing sling standards accepted by CCS. The specification and tolerance are to comply with relevant requirements of swaged sling for steel wire ropes accepted by CCS. Series 5 aluminum and aluminum-magnesium alloy heat-pressed seamless tube or forged seamless pipe.

The surface of aluminum alloy casing is to be smooth and free from burrs, cracks, mechanical damages and other significant defects. Seamless manufacturing process is applied for aluminum alloy casing. No shrinkage holes, cracks, laminations, slags, etc. are allowed for aluminum casing. Any doubts on the internal quality of aluminum casing by the surveyor, necessary non-destructive test may be required to carry out by the work.

6.4 Sockets of cast sling of steel wire ropes

6.4.1 Type and dimension: sockets of cast sling of steel wire ropes generally include open type and closed type. Other constructions are to be subject to special consent of CCS. The construction and dimension are to comply with the requirements of standards accepted by CCS.

6.4.2 Manufacturing: sockets may be manufactured by means of forging, casting or welding after hot formation of steel plates, and be subject to necessary heat treatment and mechanical processing. The manufacturing method of sockets is to be submitted to CCS during works approval.

6.4.3 Properties: chemical composition and mechanical properties of sockets are to comply with relevant requirements of CCS Rules for Lifting Appliances of Ships and Offshore Installations, CCS Rules for Materials and Welding and standards accepted by CCS on steel castings, steel forgings or welding construction.

6.4.4 Non-destructive test: sockets are to be subject to necessary non-destructive test after final heat treatment to verify whether there are internal defects such as shrinkage holes or cracks. Non-destructive test methods are to comply with the requirements of standards accepted by CCS.

6.4.5 Purchased sockets are to be furnished with certificate of products by CCS.

6.4.6 If sockets are subject to independent approval, material test and welding test (if any) are to be carried out according to CCS Rules for Materials and Welding and relevant socket standards accepted by CCS. Sockets are to be subject to proof test and breaking test during approval. When necessary, tools are to be made in accordance with the requirements of standards accepted by CCS to ensure smooth performance of proof test and breaking test.

6.4.7 During welding of sockets of cast sling for steel wire ropes, the manufacturer is to assess welding procedures of main stressed parts and prepare welding procedure specifications according to relevant requirements of CCS Rules for Materials and Welding. Welding procedure specifications may be applied only after CCS approval.

7 Type test

7.1 Determination of the type test program

The type test program is to be submitted to CCS for approval, which is to clearly state the products name, specification of specimens, test items, methods and technical requirements, development basis, test place, evaluation standards for non-conforming products.

7.2 Selection of typical samples

(1)In an initial approval, different products are to comply with following sampling principles:

①– Swaged sling for steel wire ropes: Products of each joint type are to be tested. During sampling, steel wire ropes with both maximum and minimum for at least one construction is to be sampled for the type test respectively.

② Cast sling for steel wire ropes: manufacturing process (forging, casting and welding) of different sockets and casting material (alloy or resin) of cast sling for steel wire ropes applying for approval are to be tested respectively. During sampling, at least one samples with maximum diameter of steel wire ropes (products of one type) applying for approval are to be selected for all type tests. For other types of products, typical specification may be selected for partial type test.

③ Inserted sling for steel wire ropes. Products of each joint construction are to be tested. During sampling, steel wire rope with maximum diameter for at least one construction is to be sampled for all type tests. For other types of products, typical specification may be selected for partial type test.

(2) For change (expand the scope of approval~~addition~~) of works approval, sampling of the

additional part is to be carried out according to initial approval. When product specification (diameter range) is increased, only the maximum specification is selected for type test.

7.3 Type test items and requirements

The manufacturer is to carry out type test according to the CCS relevant rules, standards accepted by CCS and relevant technical requirements. Main test items and requirements are as follows:

(1) Tests of raw material and main components and parts

① Tests of raw material and main components and parts such as steel wire ropes, sockets and aluminum casing are to comply with relevant requirements on raw material and parts in 5 of this Chapter.;

② Welding examination of sockets for cast sling for steel wire ropes (if welding is carried out).): Prior to welding, edge and type examinations are to be carried out based on drawings. After welding, welds are to be subject to visual examination and welding records are to be checked. Major welding parts are to be subject to non-destructive test. Type and range of non-destructive tests depend on importance and load condition of components. Non-destructive test procedures are to comply with the requirements of standards accepted by CCS. Welding examination is to comply with relevant requirements of Section 6.5, Chapter 6 of CCS Rules for Lifting Appliances of Ships and Offshore Installations.;

③ Non-destructive test (if any): Sockets of cast sling for steel wire ropes are to be subject to non-destructive test, and the results are to comply with the requirements of standards accepted by CCS. During approval, non-destructive test methods (ultrasonic and magnetic particle) and procedure specifications are to be determined based on actual condition of products.

(2) Visual and dimensional examination

The surfaces of ferrules of steel wire rope sling are to be smooth and free from cracks, flashes or burrs. Steel wire ropes are to be free from damage during manufacturing and proof test.

Items, methods and results of dimensional examination are to comply with the requirements of standards accepted by CCS and relevant technical documents.

(3) Proof test (proof load test)

Loads of proof test are to comply with the requirements of standards accepted by CCS and relevant technical documents. In general, ferrules are subject to 2 times safe working load or 40% minimum theoretical breaking load of steel wire ropes (whichever is lesser) along the axial direction of rope for at least 5 minutes. Visual examination and dimensional measurement are to be carried out after unloading, and ferrules are to be free from visual defects such as slipping and cracks.

(4) Fatigue test (or vibration impact test and static tensile test)

Swaged sling for steel wire ropes and inserted sling for steel wire ropes are to be subject to fatigue test (or vibration impact test and static tensile test), the test method and results are to comply with the requirements of recognized standards.

(5) Breaking test

During type test, sling for steel wire ropes is to be subject to breaking test to verify theoretical breaking load. Breaking test is to use samples after proof test. Breaking test force is to reach the requirements of theoretical breaking load stipulated in standards accepted by CCS. Breaking test may be unloaded at a certain period of time (30s) after the products are damaged or loaded to breaking force. The results are to comply with the requirements of recognized standards.

(6) Test items and evaluation

Type test and delivery test items are given in Table 7.3. During approval, test is to be carried out based on the requirements of test program. If external dimension does not comply with requirements, the product cannot be accepted. If other test results do not comply with requirements, it is to find reason. If tests fail due to test equipment or test methods other than product performance, specimens may be remade for test, otherwise re-test is to be carried out for double sampling. The test is to be deemed satisfactory only after compliance with requirements, otherwise this batch of products or this type test is to be deemed unsatisfactory.

Test items and requirements **Table 7.3**

No.	Test item	Type test	Unit/batch inspection
1	Raw material and parts examination	☒	☒
2	Visual and dimensional examination	☒	☒
3	Proof test	☒	☒
4	Vibration impact test (if any)	☒	⊟

5	Breaking test (if any)	☒	☒~~☒~~

Notes: ☒—Applicable; ☐—Not applicable.

8 Unit/batch inspection

8.1 The unit/batch inspection for products after approval is to be carried out according to the approved test program, and the test items are given in Table 7.3~~. The test for unapproved products includes confirmation of technical process, on-site supervision or review of process record, and the test items are the same as those of type test. The inspection is to include the check of construction and sketches of the sling and strength assessment~~.

8.2 For proof test, 3% of the products (at least 1 piece) or requirements of recognized standards of the same batch, ropes construction and strands specification are to be selected. When breaking test is carried out according to the requirements of relevant technical regulations on inspection (e.g. Technical Regulations for Statutory Surveys of Towage at Sea) or purchase technical agreements, at least one specimen for each specification is to be made for test.

Note: for the steel wire rope sling with collar, the appropriate verification test load can be selected according to the actual situation of the product during the single piece / batch inspection.

8.3 After satisfactory unit/batch inspection, CCS is to issue a certificate of marine products or equivalent certificates. The manufacturer is to submit product quality certificate for confirmation by CCS. The quality certificate is to contain at least following:

(1) Manufacturer’s name or identification;

(2) Name or the purchaser;

(3) Acceptance criteria (rules, standards~~, technical agreement~~, etc.)

(4) Product name, number and quantity;

(5) Diameter, construction and anti-rotating performance of steel wire ropes;

(6) Specification, length, safe working load, proof load and theoretical breaking load of wire rope sling;

(7) Test date, test condition and endorsement of relevant personnel;

(8) Product name, number and specification of attachments of wire rope sling (if any);

(9) Identification with related description.

8.~~5~~ 4 The satisfactory sling for steel wire ropes or product nameplate is to be identified with:

(1) Product number;

(2) Construction, specification and safe working load of sling for steel wire ropes;

(3) Permanent’s marks such as CCS stamp.