Guideline No.: G-01(202511)

G-01

CRANES

Issued date: November 1,2025

Foreword:

China Classification Society (hereinafter refferred 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~~**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.~~

~~This Guide is published and updated by CCS and can be found through http://www.ccs.org.cn . Comments or suggestions can be sent by email to ps@ccs.org.cn~~ .

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Main changes:

The requirement of “Non-destructive testing” is added in item 6 to identify Non-destructive testing acceptance Criteria.

Test 7 in table 9.1 has been supplemented with no-load release test.

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CRANES

1 Application

1.1 This Guideline applies to the following types of cranes:

(1) Deck cranes mounted on ships for handling cargo or containers in harbour conditions;

(2) Floating cranes or grab cranes mounted on barges or pontoons for operating in harbour conditions;

(3) Engine room cranes and provision cranes etc. mounted on ships (including floating docks) for handling equipment and stores in harbour conditions;

(4) Cranes mounted on ~~fixed or~~ mobile offshore installations for transferring equipment and stores.

1.2 This Guideline applies to the cranes of the following structural configurations:

(1) Jib type cranes;

(2) Gantry cranes;

(3) Traveling cranes in engine room.

2 Normative references

~~The approval and inspection in this Guideline are to be based on the following documents:~~

~~(1)~~2.1 Technical Regulations for the Statutory Surveys of Lifting Appliances of the Register of Shipping of the People's Republic of China (only for ships flying the flag of China only);

~~(2)~~ 2.2CCS Rules for Lifting Appliances of Ships and Offshore Installations;

~~(3)~~2.3 CCS Rules for Classification of Sea-Going Steel Ships;

~~(4)~~2.4 CCS Rules for Materials and Welding and subsequent amendments thereto.

3 Terms and definitions

The following terms and definitions given in the above rules and standards apply to this Guideline:

3.1 Standard service conditions are the conditions under which the SWL of a lifting appliance is ascertained. It is to include all of the following conditions:

(1) the angle of heel not exceeding 5° and a trim of 2° during the operation of the appliance;

(2) the appliance being operated in harbour;

(3) the appliance being operated at a wind speed not exceeding 20 m/s and a corresponding wind pressure not exceeding 250 Pa;

(4) the motion of lifting load being free from any external conditions;

(5) the nature of the lifting operations in terms of their frequency and dynamic characteristics being compatible with the load of factor permitted in this PART for the appliances concerned.

3.2 Safe working load (SWL)

(1) Safe working load of a lifting appliance means the maximum static load the appliance is certified to be capable of sustaining whilst correctly rigged under the design operation.

(2) Safe working load of loose gear means the maximum load for which the gear has been designed and tested. This load is not to be less than the maximum load to which the gear will be subjected when the lifting appliance is operating at its SWL.

3.3 Nominal hoisting speed means the average speed of the hook when only the lifting mechanism is used to lift the safe working load.

3.4 Nominal luffing time means the time required for using luffing mechanism only to change the maximum operation radius to the minimum one at the safe working load.

3.5 Nominal slewing speed means the speed of the crane slewing with lifted safe wording load in maximum operation radius, with the ship having a 5° heel and a 2° trim.

3.6 Loose gear means the gear which is not permanently attached to the lifting appliances, such as chains, triangle eyeplates, hooks, blocks, shackles, swivels, sockets, preventer guys with patent clips and rigging screws, etc. Lifting beams, spreaders, frames and similar items of equipment are

also considered as loose gear.

3.7 Fittings mean fittings which are permanently attached to the derrick booms, masts or derrick posts, decks, superstructures or other structures such as eyeplates, derrick heel assemblies, gooseneck bearings including gooseneck pipes, derrick bands and built-in sheaves, etc.

3.8 Factor load means the loads (excluding wind load) to be considered in designing a lifting appliance, expressed as follows:

Factor load = live load × duty factor × dynamic factor

3.9 Live load is the sum of the safe working load (SWL) of an appliance and the static weight of any component of the appliance which is directly connected to, and undergoes the same motion as, the safe working load during the lifting operation.

3.10 Duty factor is a factor which makes allowances for the frequency and state of loading for which a lifting appliance is to be considered in design.

3.11 Dynamic factor is a factor which takes account of all the dynamic effects of the appliance arising from its lifting operation, and by which the live load is multiplied to represent the load for all dynamic effects on the system.

3.12 Dead load is the self-weight of any component of the lifting appliance which is not included in the live load.

3.13 Design stress is the maximum stress permitted in this PART to which any component part of a lifting appliance may be subjected when the appliance is lifting its safe working load (SWL), that is, when the appliance is subjected to the factor load plus the specified lateral and wind loads.

3.14 General examination is to take the form of a visual inspection of the lifting appliances, which is to be supported by other means as necessary and carried out so far as practical to achieve a sound view on components in question. For this purpose, components or parts are to be dismantled for more thorough examination where considered necessary.

3.15 Visual examination is to take the form of a visual inspection of the lifting appliances by checking for deformation or other defects of components, such as chafe or excessive wear and corrosion.

4 Plans and documents

4.1 The applicant is to submit the following plans and documents for crane systems to CCS for approval:

(1) General arrangement of crane, including specification of principal operational parameters;

(2) Force analysis for the crane system;

(3) Layout of lifting, luffing, slewing and travelling mechanisms, including the arrangement and functions of overload protection, overmoment protection and various limit switches;

(4) Strength calculations of main items, clearly indicating the design basis, operating criteria, rated capacity, weights and centers of gravity of the crane parts and relevant national standards;

(5) Stability calculation of crane, as applicable;

(6) Structural plans of all main components comprising the crane including jib, tower, platform, gantry, logies, slewing ring, pedestals, rails, stowage arrangement, indicating their structures, scantlings and grades of steel, welding consumables, type and size of welds;

(7) Standards/technical specifications for welding, castings and forgings.

4.2 The applicant is to submit the following plans and documents for crane systems for information:

(1) Details of sheaves, axles, pivot pins, wheels, spreader beams, slewing ring, slewing ring bolts and similar items and the specification of the grade of steel to be used;

(2) Details of blocks, hooks, swivels, lifting beams, spreaders, frames and other items of loose gear, indicating material, safe working load (SWL), proof load and the standard to which they have been manufactured;

(3) Size, construction, finish and certified breaking loads of and normal tensile strength for wire ropes to be used;

(4) Instructions for operation and maintenance.

5 Materials and components

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

6 Welding and non-destructive test

6.1 The welding procedures for main structures such as pedestal, frame and jib are to be evaluated prior to manufacturing by CCS according to CCS Rules for Materials and Welding, and the welding and inspection shall comply with 6.5 of CCS Rules for Lifting Appliances of Ships and Offshore Installations.

6.2 Non-destructive testing acceptance criteria are to meet the following requirements:

Radiographic testing: CB/T 3558-II, ISO 10675-1- 2 or GB3323- II;

Ultrasonic testing: CB/T 3559- II, ISO 11666- 2 or EN1712- 2;

Magnetic particle testing: CB/T 3958- II or ISO 23278- 2X;

Penetrant testing: CB/T 3958- II or ISO 23277- 2X.

If other national or regional standards will be used, they are to be evaluated by CCS and confirmed the determination level before use. For those upgraded the new standard is to be applied.

7 Design and technical requirements

7.1 The calculation of structural strength is to be in accordance with CCS Rules for Lifting Appliances of Ships and Offshore Installations or the standards or publications recognized by CCS.

7.2 Design angles for normal operation of cranes onboard conventional ships, 5° is for heel and 2° for trim. For other ships see the requirements of 3.2.10.1 in CCS Rules for Lifting Appliances of Ships and Offshore Installations for details.

7.3 The materials used for construction of cranes are to comply with the requirements of Guideline 6 of CCS Rules for Lifting Appliances of Ships and Offshore Installations.

7.4 The slewing ring bearings are to be tight to prevent entry of rainwater or dust. The connection bolts are to be arranged evenly along the circumference. Where the lateral load analysis and the

specific bolt connection are submitted, suitable scallop arrangement may be considered for the connection between the upper part of slewing bearings and the bolt.

7.5 Loose gear such as hooks, lifting eyes, swivels and shackles are not to be made of cast iron or cast steel.

7.6 Sheaves for steel wire rope are to be made of steel, and the use of cast iron sheaves is to be specially agreed by CCS.

7.7 The safety factor n of wire ropes for both running and standing application are not to be less than the value given by the following expression, but need not be greater than 5 or less than 3:

$$n = \frac{10^4}{0.9SWL + 1910}$$

where: SWL —— safe working load of crane, in kN.

7.8 The minimum breaking load Q*b* is given by the following expression:

$$Qb = nW \quad kN$$

where: n —— safety factor of wire rope required, obtained from 7.7;

W—— the static load in the wire rope taking due account of the friction in the sheaves over which the wire rope passes, in kN.

7.9 For running rope of crane, the ratio of sheave diameter measured at the bottom of rope groove to wire rope diameter is not to be less than 19:1.

7.10 The pedestal flange in way of the slewing ring bearing is to be of rigid and levelled construction. Where the flange is stiffened with brackets, the spacing of the brackets is not to be greater than that of two connecting bolts.

7.11 On or near each control, the function of which is to be identified, there is to be affixed a written notice or symbols which clearly show the directions of movement of the lifting appliances and the neutral position of the controller. The direction of movement of the control lever or wheel for the operation of the lifting appliances is to relate logically to the direction of motion controlled with the convention that, if there is a lever type controller, the movement towards the driver corresponds to the upward movement of the load or the jib and the movement towards the right of

the driver corresponds to the crane slewing to the right; if there is a wheel type controller, the clockwise movement corresponds to the upward movement of the load or the jib or the crane slewing to the right, and so on.

7.12 Means are to be provided for the control of hoisting, luffing, slewing and the positioning of traveling cranes, as applicable.

7.13 Cranes are to be provided with limit switches for the following:

(1) Upper limit of hoisting travel;

(2) Luffing angles for upper and lower limits;

(3) Slewing angles, applicable to cranes with restricted slewing angle;

(4) Travel of crane, applicable to travelling cranes and to the crab of bridge crane.

The above limit switches are to operate alarms, automatically cut off operating power and hold crane and load in position in the event of the activation of any of these limit switches. Auxiliary cranes, such as food lifts, are excepted.

7.14 If the mechanism of a crane is required to have a function to run over a present limit， e.g. a jib is to be lowered down, an override switch may be provided to prevent the action of the limit switch. The switch is to be suitably protected to prevent inadvertent operation.

7.15 Buffers and buffered stops are to be provided for the travelling cranes and crabs and they are to be located behind limit switches.

7.16 Cranes are to be provided with overload protective devices or load indicator. The overload protective device is to be set to operate at a load not exceeding 110 per cent of the SWL.

7.17 For variable load/radius cranes a load indicator which automatically displays a maximum safe load at a given radius is to be fitted. An alarm is to operate when the load reaches 95 per cent of the SWL and at 110 per cent of the SWL the operating power is to be automatically cut off.

7.18 All running mechanisms of the cranes are to be fitted with brakes, for hoisting and luffing mechanisms they are to be of “locked on” type and be fitted with releasing gear to enable the load to be lowered down in position. The safety factor of the brake, i.e. the ratio of brake torque to rated torque, is not to be less than 1.5.

7.19 Travelling cranes are to be fitted with rail clamping devices so as to prevent the crane from slipping due to wind load or due to the inclination of ship.

7.20 Travelling cranes are to be provided with anchoring device for fixing the crane when it is out of service.

7.21 Cranes are to be provided with audible and visual signal alarms. In the case of travelling cranes a continuous audible and visual warning is to be given when the crane is to move/is moving along its track.

7.22 For variable load/radius cranes a jib radius indicator is to be fitted.

7.23 In the case of floating cranes the following is to be provided:

(1) a wind speed indicator and alarm when wind speed exceeds a predetermined limit for a given time;

(2) crane level indication with operating limits as specified in design;

(3) means of communication between the crane operator and the signalman;

(4) a hook load indicator.

7.24 Rope is to be capable of reeling onto the drum evenly and if necessary, coiler or other device may be fitted. The length of the rope drum is to be such that the rope will, in general, reel up onto the drum in not more than three layers, but it is recommended that where practicable the rope should reel onto the drum in a single layer. The rope may reel up onto the drum in more than three layers if either one of the following requirements is met:

(1) the coiler is fitted; or

(2) the drum has rope groove; or

(3) the reeling angle is restricted up to 2°.

7.25 The length of rope reeling up onto the drum is to be appropriate to any operating positions within the design working range of the lifting appliances and in any case not less than three turns of rope remaining on the drum.

7.26 Under all operation conditions the distance between the top layer of the wire rope when

evenly reeling up onto the drum and the outer edge of the drum flange is to be greater than 2.5 times the diameter of the wire rope.

8 Testing of cranes

8.1 Each crane is to be tested with a test load in accordance with the following Table and the test procedure is to be subject to agreement. The jib is to be placed at the maximum jib radius as specified in the approved plan and the test is to be carried out using certified weight suspended from the cargo hook or lifting attachment for a duration not less than 5 min after lifting up the test weights.

Load Test of Cranes **Table 8.1**

Safe working load (SWL), in kN	Test load, in kN
SWL ≤ 196	1.25 × SWL
196 < SWL ≤ 490	SWL + 49
SWL > 490	1.1 × SWL

8.2 During the test, the crane is to hoist, slew and luff the test load at slow speed and braking tests are also to be carried out to the hoisting, slewing and luffing mechanisms for their effectiveness. Gantry and traveling cranes together with their travelling trolleys, where appropriate, are to be travelled slowly over the full length of their track with the test load suspended from hook.

8.3 In case of a variable load-radius crane the tests are, in general, to be carried out for the appropriate safe working loads at their respective jib radius. Alternative proposals will be specially considered.

8.4 Overload protection devices and overmoment protection devices, if any, are to be verified for their operation.

8.5 Where it is not practicable for the crane to raise the full test load, as may be the case for hydraulic cranes, a reduced test load may be accepted but in no case is this to be less than 1.1 times SWL.

8.6 For cranes on floating docks, the vertical projection of boom is to form a specific included angle when testing considering the need of anti-capsizing, and the angle is to be proved and approved.

8.7 After the overload test, the crane is to be loaded with its safe working load and operated over its full range of speeds in order to demonstrate satisfactory operation of crane, efficiency of

overload and weightload indicators, effectiveness of limit switches, etc.

8.8 After testing, the crane is to be thoroughly examined for deformation or other defects.

9 Test Items

The test items of cranes are given in the following Table.

Test Items of Cranes **Table 9.1**

No.	Test items	Test load	General content	Basis	Remarks
1	Limit switch	No	Checking the ranges of hoisting, luffing, slewing and traveling	4.3.2.2 of CCS Rules for Lifting Appliances of Ships and Offshore Installations	Limit switches are to operate alarms, cut off operating power and hold crane and load in position. Auxiliary cranes are excepted.
2	Weight suspending	See 8.1 of this Guideline	Suspended for 5 min at the maximum jib radius	6.4.2.1 of CCS Rules for Lifting Appliances of Ships and Offshore Installations	For cranes with SWL section, each section is to be tested. The item 3, if tested at this point, may be deemed as an alternative
3	Dynamic load	See 1.8.1 and 1.8.5 of this Guideline	Various movements at slow speed	6.4.2.2 of CCS Rules for Lifting Appliances	Slow travel over the full length of their track
4	SWL	SWL	Various movements, all ranges, check of performance parameters	6.4.2.7 of CCS Rules for Lifting Appliances	Travel over the full length for 3 times, check of linkage/interlock according to technical requirements
5	Overload protection	1.1 times SWL	See 1.7.16 and 1.7.17 of this Guideline	4.3.2.4 and 4.3.2.5 of CCS Rules for Lifting Appliances	Rapid lift of SWL from unloaded condition may be an alternative
6	Emergency stop	SWL	Cutting off operating power	4.3.1.3 of CCS Rules for Lifting Appliances	The emergency stop is to be independent of the controls. The manufacturer is to start from small load.
7	~~Manual~~ Emergency releasing	SWL and no-load release	Using gravity and manual assistance to lower down the load	4.3.2.6 of CCS Rules for Lifting Appliances	This means hoisting and luffing mechanisms in principle
8	Measurement of insulation resistance	At the end of test	The resistance of main circuit and control circuit	4.1.3.2 of CCS Rules for Lifting Appliances	See relevant requirements in PART FOUR of CCS Rules for Classification of Sea-going Steel Ships