Guideline No.: P-02(202502)

P-02

VALVES OF PIPING SYSTEMS

Issued date: February 1~~21~~, 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 mp@ccs.org.cn.

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Main changes:

Modified the requirement of the alternative methods in item 9.2.4 to be consistent with the description in UR G3 Rev. 7

CONTENTS

VALVES OF PIPING SYSTEMS

1 Application

1.1 This Guideline applies to type approval and inspection of valves and fittings in marine piping systems.

1.2 This Guideline specifies general requirements for valves and fittings in marine piping systems. The type approval and inspection of valves and fittings in chemical cargo piping, chemical processing piping, liquefied gas cargo piping and liquefied gas processing piping are also to comply with the relevant special requirements and recognized standards acceptable to CCS.

1.3 The applicable design pressure and design temperature ranges are those used for valves of Class I, Class II and Class III marine piping systems. The piping system classes are specified in 2.1.5, Section 1, Guideline 2, PART THREE of CCS Rules for Classification of Sea-Going Steel Ships.

1.4 This Guideline applies to type approval and products inspections of gate valves, stop valves, check valves, plug valves, ball valves, butterfly valves, diaphragm valves, reducing valves and adjusting valves in marine piping systems. Filters and other piping fittings are to be referred to in this Guideline.

1.5 Generally valves and fittings in marine piping systems are to be subject to CCS Type Approval B; if the manufacturer has special requirements and the conditions permit, CCS Type Approval A or works approval may be requested.

Note: The requirements of G3~~.6~~ Rev.~~6~~7 are to be uniformly implemented by IACS Societies for piping components and pumps:

1) when an application for testing is dated on or after 1 January 2021; and

2) which are installed in new ships for which the date of contract for construction is on or after 1 January 2021.

2 Normative references

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

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

(2) CCS Rules for Materials and Welding;

(3) IACS UR_G3 (Rev.~~6~~7 201~~6~~9).

3 Terms and definitions

3.1 For the purpose of this Guideline:

(1) Design pressure and design temperature are the design pressure and design temperature as defined respectively in 2.1.3 and 2.1.4, Section 1, Guideline 2, PART THREE of CCS Rules for Classification of Sea-Going Steel Ships.

(2) Test pressure means the gauge pressure (manometer pressure) to which the internal chamber of the valve is subjected during testing.

(3) Valve body test means the pressure test of the whole valve housing which consists of valve body and valve cover. The test is to examine the compactness of valve body and valve cover and the pressure tightness of connection between valve body and valve cover.

(4) Seal test means the test to examine sealing of seal pair of discs and valve body.

(5) Upper seal test means the test to examine sealing seal pair of valve rod and valve cover.

(6) Duration of test means the duration the test at the test pressure.

4 Plans and documents

4.1 The valves are to designed and manufactured in accordance with the accepted standards and their structure, scantling, material, intended purposes, service conditions and inspection and test items are to meet the accepted criterion and also to be in compliance with the relevant requirements of CCS Rules for Classification of Sea-going Steel Ships and this Guidelines. For the valves with novel structures or non-standard valves, the following drawings and technical documents are to be submitted to CCS when applying for approval:

(1) Main performance specifications (including the design pressure, design temperature, applicable medium, performance and purposes of the entire series of products to be approved; for valves to be delivered with associated hydraulically, electrically or pneumatically controlled devices, models and parameters of associated devices also to be

included);

(2) General assembly;

(3) Drawings of main components and parts: Valve body and coupling flange, valve disc and rod, valve seat, spring (if any), servo mechanism (if any);

(4) Physicochemical performance schedule of main components and parts;

(5) Type test programme.

4.2 The following plans and documents are to be submitted to CCS for information:

(1) Main procedure documents, including welding procedures and heat treatment, build-up welding and spray welding procedures, if applicable;

(2) Specimens of product instructions, product nameplates and manufacturer's certificate.

5 Materials and components

5.1 Materials and components include the valve bodies and coupling flanges, valve discs, valve plates, valve rods, valve seats, springs (if any), servo mechanism (if any), etc.

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

5.3 The valve covers and other pressure parts are to be tested to 100% hydraulic pressure. The pressure parts are to be subjected to 100% seal test after assembling with valve discs, valve plates, valve rods and valve seats.

The pressure test reports are to be reviewed and confirmed by CCS Surveyor or the tests are to be carried out in the presence of CCS Surveyor.

5.4 If the above-mentioned main components and parts are purchased, the applicant must establish perfect means to control subcontractors for ensuring the quality of such parts and materials used are to comply with the requirements of Guideline 2, PART THREE in CCS Rules for Classification of Sea-Going Steel Ships.

5.5 If the purchased valve bodiesare made of castings or forgings,,it should be satisfied with the certificate requirments of current Chapter 3, Part 1 of China Classification Society Rules for Classification of Sea-going Steel Ships.

6 Evaluation of welding procedures

6.1 If the main components and parts are of welded construction, the welding procedure is to be evaluated and approved according to the relevant requirements of CCS Rules for Materials and Welding.

7 Design and technical requirements

7.1 Marine ambient conditions

7.1.1The design and type selection of valves in marine piping systems are to comply with the requirements in Section 2, Guideline 1, PART THREE of CCS Rules for Classification of Sea-Going Steel Ships so as to ensure their normal operation.

7.2 Applicability of valves in marine piping systems

7.2.1 The design and technical characteristics of valves in marine piping systems are to comply with the requirements of marine ambient conditions and applicable medium.

7.2.2 The valves intended to use for low-temperature liquefied gas piping system, chemical cargo and dangerous cargo are also to meet the relevant requirements of IGC Code, IBC Code, IMDG Code, etc.

7.3 Technical requirements

7.3.1General requirements for valves and fittings in marine piping systems

(1) For through type valves and fittings, the inlet and outlet sealing surfaces are to be parallel to each other. For rectangular valves and fittings, the inlet and outlet sealing surfaces are to be vertical to each other. The parallelism or verticality is to comply with requirements of approved plans.

(2) The structural length tolerances of valves and fittings are to comply with requirements of approved plans.

(3) Where the valve body and valve cover are connected by bolts and the periphery of such connection is not machined, the misalignment as shown in Table 7.3.1 is allowed.

Dimension **Table7.3.1 (in mm)**

Non-nominal diameter (DN)	Allowable misalignment
≤ 100	< 3.0
125 ~ 250	< 4.0
300 ~ 600	< 6.0
650 ~ 800	< 8.0

(4)The valves and fittings assembled are to comply with the following requirements:

① flexible on-off operation, without any blocking;

② lifting check valves and stop check valves are to have the following functions: When the valve rod is hoisted, the valve is to be capable of being opened or closed freely at an inclination angel of 16° to the vertical. Special requirements for valves and fittings are to be additionally specified in product standards;

③ when the gate valve is closed, the sealing surface center of the valve core is to be above that of the valve seat.

(5) Technical specifications for castings and forgings are to comply with requirements of CCS Rules for Materials and Welding or recognized material standards, the designated classes and surface quality are to be indicated in construction drawings.

(6) The grinding-in sealing surface of valves must be free from harmful pores or other scars.

(7) The fluid passage is to be carefully cleaned and processed, without mould sand or impurities.

(8) The exterior surfaces of steel and iron valves and fittings are to be coated with anticorrosive paint, without any holiday, draining or silting.

(9) The dimensions of parts are to comply with requirements of plans approved by CCS.

(10) The positive mass deviation of valves and fittings is not to exceed 4% of required mass.

7.3.2 Technical requirements for flanges and wafer butterfly valves (PN 0.25 ~ 2.5 MPa; DN 40 ~ 2000 mm)

(1) When a fluid medium is used, the peak flow rate at the butterfly valve inlet is to be 3 m/s or 5 m/s.

(2) The butterfly valves are randomly applicable to the following conditions, excluding the condition of free evacuation:

① stopping and sealing;

② stopping and low leakage (allowable maximum percolation rate of fluid: 0.1 DN mm^3/s);

③ adjusting flow within required range.

(3) Pressure-temperature class

The maximum working pressure and temperature are to be determined by the manufacturer according to construction and material of butterfly valves, other factors and related recognized standards and to be marked on nameplates of products. However, butterfly valves of all types are to operate continuously at the indicated working pressure and at -10 ~ 65℃.

(4) Valve bodies

① The connection dimensions and sealing surface types of flanges are to comply with the requirements of plans approved by CCS.

② The sealing surface of flanges is to be perpendicular to the axis of the butterfly valve opening, the flange is to be coaxial with the butterfly valve.

③ Both end faces of double flanges and wafer flanges are to be parallel to each other.

④ Threaded bolt holes are allowable for double flanges and wafer flanges, if required for constructional reasons.

⑤The position tolerance of the axis of diameter d_o of flange bolt holes at both ends relative to that of flange holes is to comply with the accepted criterion or requirements of drawings approved by CCS.

⑥The structural length of wafer butterfly valves is to comply with requirements of plans approved by CCS.

⑦The minimum diameter of valve seats is not to be less than that required in Table7.3.2(1).

Nominal diameter Table 7.3.2(1) (in mm)

Nominal diameter DN	Minimum diameter of valve seats	Nominal diameter DN	Minimum diameter of valve seats
40	34	450	425
50	44	500	475
65	59	600	575
80	74	700	670
100	94	800	770
125	119	900	870
150	144	1000	970
200	190	1200	1160
250	230	1400	1360
300	280	1600	1560
350	325	1800	1760
400	375	2000	1960

⑧ The valve body gasket ring (valve seat) and valve body are to be so connected that no loosening or leakage will occur in valve operation.

⑨Where material of valve body is HT 200, the minimum thickness of valve body is to be according to Table 7.3. 2(2).

Thickness of valve body **Table 7.3. 2(2) (in mm)**

Nominal diameter DN	Nominal pressure PN Mpa			Nominal diameter DN	Nominal pressure PN Mpa		
	0.25	0.6	1.0		0.25	0.6	1.0
	Minimum wall thickness t				Minimum wall thickness t		
40	7	7.5	8	450	12	15	16
50				500	13	16	17
65	8	8.5	9	600	14	17	18
80				700	15	18	19
100				800	16	19	20
125	9	9.5	10	900	18	20	22
150				1000	20	21	23
200	10	11	12	1200	21	23	26
250				1400	22	25	30
300	11	12	14	1600	24	28	34
250		13	15	1800	26	31	38
400	12	14		2000	28	34	42

⑩ The valve body may be of welded construction, the welding procedure and requirements for welders are to comply with CCS Rules for Materials and Welding.

⑪ The edge forms of butt-welded joints are to comply with CCS Rules for Materials and Welding or recognized standards.

⑫ For butterfly valves with nominal diameter DN not less than 800 mm, the valve body is to be suitably stiffened to enhance shell rigidness and footing support and fixing bolt

holes are to be provided.

(5) Valve plates and rods

① Valve plates and rods are to be so designed as to withstand the load 1.5 times the maximum differential pressure imposed on the butterfly plate by the medium when the medium flows in any direction.

② The valve rod may be designed as an integral shaft or two separate short ones, whose embedded length in the shaft hole is to be not less than 1.5 times the shaft diameter.

③ The strength of connection of valve rod with butterfly plate is to be designed for delivering the maximum torque the valve rod can withstand. Shaft and butterfly plate may be connected by any means, provided that no loosening will occur in normal operation and that the valve rod will not be released automatically due to medium pressure.

(6)Bearings and shaft seals

① The bearings are to be capable of withstanding the maximum load delivered by the valve rod during testing and operation of the butterfly valve.

② For butterfly valves with nominal diameter of not less than 350 mm, suitable bearings are to be selected to withstand axial thrust and spring collars are not to be used for stopping the thrust.

③ A reliable shaft seal is to be arranged to avoid leakage at the valve rod.

(7)Operation

① The butterfly valves may be operated manually, electrically, hydraulically or pneumatically.

② The driving devices for butterfly valves are to be so arranged as to ensure normal operation of butterfly valves in non-free-evacuating pipelines where the maximum differential pressure does not exceed the maximum working pressure of the valves.

③ The dimensions of driving devices and coupling flanges of butterfly valves are to comply with requirements of design plans approved by CCS.

④ For butterfly valves operated by handwheel (including handwheel of driving device) or wrench, the valve is to be closed by turning handwheel or wrench clockwise towards the operator, unless otherwise specified in the contract for delivery.

⑤ An arrow indicating the closing direction is to be clearly marked at the handwheel rim together with the word “OFF” before the arrow or alternatively, two arrows respectively indicating the opening and closing directions together with the word “ON” or “OFF” may be marked.

⑥ When the butterfly valve operated by wrench is fully open, the wrench is to be parallel with piping axis. The wrench or tag is to be marked with the words “ON” and “OFF”.

⑦ All butterfly valves are to be fitted with a means of indicating butterfly plate position and a limiter for securing full opening and full closing positions of the valve.

⑧ Butterfly valves operated by wrench are to be fitted with a means for locking more than three opening conditions.

7.4 Materials

7.4.1Materials of main components and parts of valves in marine piping systems are to be selected for types, temperatures and pressures of medium to be conveyed. In the case of conveying dangerous chemicals, the manufacturer is to provide sufficient evidence for compliance of the material selected with operational requirements.

7.4.2 If the valve is fitted on piping connecting with cargo tank onboard ship carrying liquefied gases in bulk, the melting point of valve material is not to be lower than 925℃.

7.5 All valve structures are to be capable of preventing the possible release or loosening of valve cover and compressing cover during the operation, Rotary valve cover is not to be used for valve with the nominal diameter greater than 40mm in Grade I and II piping system, sea valve and side valve with the nominal diameter greater than 40mm and valve fitted in flammable liquid system.

7.6 The marine valves are to be closed by turning the hand wheel in clockwise direction and opened conversely.

7.7 The welded neck on valve body is to be longer sufficient to ensure that the valve will not deform due to welding at joints or postweld heat treatment.

8 Type test

8.1 Selection of typical samples

(1) When applying for approval at the first time, the selected typical samples are to cover the manufacturer's production level, processing and testing capabilities. Usually the valves with maximum design pressure and maximum design diameter in each product series are selected, depending on structure, purpose, design pressure and temperature of valves of different materials. Type test is to be carried out for each type and specification of valves intended to use for the low-temperature liquefied gas medium below -55℃. The manufacturer's marketing and stocks as well as testing equipment in the selected test location may be taken into account when selecting typical samples.

(2) When renewing the approval, only one type which is the most representative or the most demanded in market may be selected for inspection and test from approved product series.

8.2 Type test items are to include:

(1) test of physical and chemical properties of raw materials of main components and parts;

(2) dimensional and visual examination;

(3) back seal test (if applicable);

(4) hydraulic strength test of main pressure parts;

(5) seal test;

(6) test of physical properties of rubber valve seat (if applicable);

(7) functional test (for valves fitted with electrically, pneumatically or hydraulically controlled actuators);

(8) other test items with special requirements.

8.3 The following test methods and technical requirements are to be complied with.

(1) Test of physical and chemical properties of raw materials of main components and parts: Technical specifications for castings and forgings are to comply with the relevant recognized material standards, and designated classes and surface quality are to be

indicated in construction drawings. The casting methods and dimensions of test bars, processed shapes and dimensions of test samples, and their chemical composition, mechanical properties and heat treatment procedures are to comply with the relevant requirements of CCS Rules for Materials and Welding. For materials not listed in CCS Rules for Materials and Welding, other relevant recognized standards may apply.

Material test is to be carried out for the valves intended to use for low-temperature medium below -55℃ in accordance with the minimum design temperature.

(2) Dimensional and visual examination is to comply with the relevant technical requirements in 2.7.3 of this Guideline.

(3) Assembly check is to comply with the relevant technical requirements in 2.7.3 of this Guideline.

(4) Hydraulic strength test of valve bodies

① The hydraulic test pressure P_s is 1.5 times the nominal pressure or 1.5 times the maximum allowable working pressure. Special requirements are to be additionally specified in product standards.

② Test time is specified in Table 8.3(1).

Test time **Table 8.3(1)**

Nominal diameter DN, in mm	Minimum duration of maintaining pressure in testing, in s
< 250	120
≥ 250	180

③ The valve body or other stressed parts are to be knocked with a copper hammer (of 0.1 kg in mass and 300 mm in handle length) during testing, no leakage or percolation are to be visible by naked eyes on surface of valve body and stuffing box while maintaining pressure.

(5) Test of sealing surfaces

① The seal or back seal test pressure P_m is to be 1.1 times the nominal pressure or 1.1 times the maximum allowable working pressure. Special requirements are to be

additionally specified in product standards.

② Test time is specified in Table 8.3(2).

Test time **Table 8.3(2)**

Nominal diameter DN, in mm	Minimum duration of maintaining pressure in testing, in s
≤ 200	60
≥ 250	120

③ The seal pair of valve disc and valve seat is to be checked during testing, the maximum allowable leakage is specified in Table 8.3(3).

Maximum allowable leakage **Table 8.3(3)**

Type of valves	Maximum allowable leakage, in mm^3/s
Soft seal valves and fittings, valves and fittings closed by handwheel and lifting check valves	0
Swing check valves and plug valves	0.01 DN

(6) General requirements of hydraulic test

① Air in the valve chamber is to be fully evacuated in hydraulic tests.

② The sealing surface of valves and fittings is not to be greased in seal tests.

③ The pressure is to be increased gradually to required value and abrupt increase is not allowed in tests.

④ In general, test medium is fluid or gas.

(7) Tests requirements for valves and fittings

① Strength test and seal test of stop valves and diaphragm valves

Seal the outlet port and fill the chamber with water and apply the hydraulic test

pressure P_s to inlet port (lower side of valve disc) to carry out hydraulic strength test on valve body. Upon satisfactory examination, reduce the pressure to seal test pressure P_m, close the valve and open the blank flange on the outlet port. Check the tightness of sealing surface after removing all water.

② Strength test and seal test of stop check valves

First carry out the strength test and seal test of valve body according to 2.8.3(7)① above. Upon satisfactory examination, release the pressure and hoist the valve rod. Apply the seal test pressure P_m (pressure of 0.3 MPa for valves and fittings with maximum working pressure more than 0.3 MPa) to outlet port (upper side of valve disc) and check the tightness of sealing surface on the lower side of valve disc.

③ Strength test and seal test of lifting check valves and swing check valves

First carry out the hydraulic strength test of valve body according to 2.8.3(7)① above. Upon satisfactory examination, carry out the seal test of sealing surface according to 2.8.3(7)②.

④ Strength test and seal test of butterfly valves

(a) First carry out the hydraulic strength test and seal test of valve body according to 2.8.3(7)① above. For two-way seal butterfly valves, carry out the seal test in the other direction.

(b) Physical property test of rubber valve seats, the test results are to meet the requirements of accepted criteria.

⑤ Tests of gate valves, ball valves and cocks

Seal one port and fill the chamber with water. Apply the hydraulic test pressure P_s on one port and carry out the hydraulic strength test of valve body. Upon satisfactory examination, reduce the pressure to seal test pressure P_m and close the valve, open the blank flanges on both ports. Check the tightness of two sealing surfaces after removing all water.

For seal tests of gate valves, ball valves and cocks with one-way seals, apply the pressure on inlet port only and check the outlet port; for valves and fittings without designed medium flow directions, apply on one port and check the other port; carry out the seal test in the other direction upon satisfactory examination.

For three-way valves and fittings, check the tightness of outlet ports.

⑥ Reducing valves and pneumatic control valves

Carry out the pressure strength (P_s) test according to design requirements. Upon satisfactory examination, carry out the seal performance (P_m) test (the internal leakage of pneumatic control valve is not to be more than 1.5% of maximum output pressure, without external leakage at connections). Upon satisfactory examination, carry out pressure control function test. When the inlet pressure reaches nominal pressure, the outlet pressure is to change evenly within the nominal range without phase steps.

⑦ Besides the above-mentioned test items, for the valves intended to use at the working temperature below -55℃ , tightness test is to be carried out for each structural type and specification of valves with the pressure not less than its design value at its minimum design temperature or below, and the valves make low temperature operation performance test to be verified to have good operational performances during the test.

8.4 Exemption from test items

(1) Normally all test items applicable in 2.8.2 above are to be carried out when the applicant applies for approval at the first time. The manufacturer may apply for exemption from some of the test items in writing, and CCS Surveyor will consider the application according to the manufacturer's production, history of production and usage record of his products and will fax the manufacturer's written application together with comments to the Classed Newbuildings Department/Product Management Department of the Headquarters, and can grant an exemption from some test items only upon approval by the Classed Newbuildings Department/Product Management Department, provided that the following conditions are met:

① the applicant is to be able to provide a test report of corresponding test items issued by an authoritative technical organization (e.g. General Administration of Quality Supervision, or a national defense laboratory) recently;

② the applicant is to be able to provide a test report of corresponding test items signed by an IACS member society recently;

③ if the products are manufactured upon technology transfer or authorization from another manufacturer whose products are type approved by CCS, some test items as specified in 2.8.2 above may be dispensed with after the manufacturing capability and

processing/assembling level are assessed.

(2) For re-approval at renewal of approval certificate, if there is no change to the design, the type test may be omitted. However, CCS still reserves the right to require type test again.

9 Unit/batch inspection

9.1 The inspections for issuing marine products certificates may be carried out only for those valves which have been satisfactorily inspected/tested by the manufacturer as required and are ready for delivery.

9.2 The unit/batch inspection items for manufacturers with CCS type approval B

9.2.1 Tests are to be carried out according to the approved inspection plan (related provisions in quality control plans), including at least the related items such as strength test, back seal test and seal test for valve body.

9.2.2 The above tests may be carried out by the manufacturer independently and a complete test report is to be submitted to the Surveyor for review.

9.2.3 3% or at least one unit is to be selected randomly from each batch/for each structural type and re-tested by the Surveyor according to the above test items or the test of which is to be witnessed at the manufacturer.

9.2.4 For the valves intended to use at the working temperature below -55℃, the strength test and seal test for all valves are to be witnessed by the surveyor at site. At least 10% of tightness test for each type/specification of valves with the pressure not less than its design value at its minimum design temperature or below is to be sampled to witness by surveyor, and the valves make low temperature operation performance test to be verified to have good operational performances during the test. As an alternative to the above, ~~the test for the valves may be not witnessed by the Society if it can be comply with the requirement of the follows~~if so requested by the relevant manufacturer, the certification of a valve may be issued subject to the following:

1）The valve has been approved by the Society, and

2) The manufacturer has a recognized quality system that has been assessed and certified by the Society subject to periodic audits, and

3) The quality control plan contains a provision to subject each valve to a hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure for all valves and

seat and stem leakage test at a pressure equal to 1.1 times the design pressure for valves other than safety valves. The set pressure of safety valves is to be tested at ambient temperature. The manufacturer is to maintain records of such tests, and

4) Cryogenic testing consisting of valve operation and leakage verification for a minimum of 10% of each type and size of valve (at least one set) ~~for valves other than safety valves~~ intended to be used at a working temperature below -55°C ~~by the manufacturer~~in the presence of the Society's representative.

For valves used for isolation of instrumentation in liquefied gas cargo and process piping not greater than 25mm, unit production testing need not be witnessed by the surveyor. Records of testing are to be available for review. (IACS UR_G3 Rev.~~6~~7 201~~6~~9)

9.2.5 The raw material quality certificates of main components and parts and the records of hydraulic strength test, seal test and function test of valve bodies for each unit/batch are to be submitted to CCS Surveyor for review when applying for unit/batch inspection.

9.2.6 If the purchased pressure parts such as valves, valve covers, etc. are made of castings or forgings, they should be satisfied with the certificate requirments of current Chapter 3, Part 1 of China Classification Society Rules for Classification of Sea-going Steel Ships.

9.3 Unit/batch inspection for manufacturers with CCS type approval A

9.3.1 The inspection is basically to review reports and all test items are to be completed by the manufacturer independently. The inspection application is to be submitted before product delivery, together with reports/records/documents covering all test/inspection items specified in 2.9.2 of this Guideline for review by CCS Surveyor.

9.3.2 Periodical audits are to be requested in time by manufacturers with CCS type approval A according to the requirements in Section 4, Guideline 3, PART ONE of CCS Rules for Classification of Sea-Going Steel Ships.

9.3.3 For the valves intended to use at the working temperature below -55℃, the strength test and seal test for all valves are to be witnessed by the surveyor at site. At least 10% of tightness test for each type/specification of valves with the pressure not less than its design value at its minimum design temperature or below is to be sampled to witness by surveyor, and the valves make low temperature operation performance test to be verified to have good operational performances during the test.

9.4 Unit/batch inspection for manufacturers without CCS approval

9.4.1 Drawings/technical documents are to be prepared by the manufacturer according to 4.1 and 4.2 of this Guideline and submitted to CCS for approval/information.

9.4.2 For valves to be inspected, at least one unit is to be selected randomly for each type and tested for all type test items required in 8.2 of this Guideline.

9.4.3 Valves, which have not been selected as samples, are to be inspected and tested at least according to the related items as specified in 9.2 of this Guideline.