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# B-05 SEAMLESS STEEL GAS CYLINDERS

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## Foreword

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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](mailto:mp@ccs.org.cn).

~~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](mailto:ps@ccs.org.cn).~~

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### Main changes and effective date:

1. All technical requirements were modified according to ISO 9809-1: 2019 and GB/T 5099-2017.

2. Part of the text has been modified and the content structure has been adjusted

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## SEAMLESS STEEL GAS CYLINDERS

### 1 Application

1.1 This guideline is applicable to the works approval and ~~post approval~~ unit/path inspection of ~~refillable and portable~~ seamless steel gas cylinders for ships which are used for containing ~~permanent gases such as oxygen, nitrogen, hydrogen, etc. or high pressure liquefied gases such as carbon dioxide, etc., and have a nominal working pressure of 8 MPa-30MPa compressed, liquefied and dissolved gases and for quenched and tempered steel cylinders with a maximum actual tensile strength of less than 1100 MPa, and with water capacities up to and including 450L, a nominal capacity of 0.5L-150L~~ and a service environment temperature shall meet the requirements of 40 °C-60 °C.

1.2 This guideline is not applicable to the seamless steel gas cylinders used for containing dissolved gases and adsorbed gases and cylinder pressure vessels mounted as accessory on transport vehicles and machinery installations. Seamless steel gas cylinders are not to be used for containing the media having stress corrosion tendency.

~~1.3 Reference may be made to This guideline for seamless steel gas cylinders having a nominal capacity of 150L-500L.~~

~~1.4 Seamless steel gas cylinders having a working pressure greater than 30MPa are to be surveyed in accordance with the recognized standards (e.g. ISO 9809-2) and/or relevant technical protocols.~~

~~1.5~~1.3 This guideline is in principle only applicable to the approval and unit/path inspection of the body of seamless steel gas cylinders, ~~exclusive of not for~~ head valves.

~~1.6~~1.4 This guideline is applicable to the seamless steel gas cylinders used on ships ~~classed with CCS and reference may be made to This guideline for the seamless steel gas cylinders used on offshore installations, Seamless steel gas cylinders for offshore installations and etc. can refer to this Guideline.~~

~~1.7 This guideline is applicable to the initial approval and post approval manufacturing inspection of seamless steel gas cylinders. The seamless steel gas cylinders in service are to be surveyed in compliance with the requirements of applicable international conventions and the competent state administration.~~

~~1.8~~1.5 Upon the approval of CCS, seamless steel gas cylinders may be approved and unit/path inspected/surveyed in accordance with the technical requirements of recognized standards ~~standards acceptable to the state administration.~~

1.6 Seamless steel gas cylinders for specific purposes shall comply with the requirements of relevant conventions, regulations, rules and relevant standards for specific purposes. For example, seamless steel gas cylinders for inflation systems of inflatable liferafts shall comply with the relevant requirements of the International Life-saving Appliance Code.

## 2 Normative references

~~Chapter 2, PART SIX of Chapter 2, Part Six of China Classification Society~~ CCS Rules for Classification of Sea-going Steel Ships

~~ISO 9809-1:2010-2019 Gas cylinders—Design, construction and testing of refillable seamless steel gas cylinders and tubes—Part 1: Quenched and tempered steel cylinders and tubes with tensile strength less than 1100 MPa~~ Gas Cylinders—Refillable Seamless Steel Gas Cylinders—Design, Construction and Testing—Part 1: Quenched and Tempered Steel Cylinders with Tensile Strength Less Than 1100MPa.

## 3 Terms and definitions

3.1 For the purpose of this guideline, the following definitions are used:

- (1) ~~Permanent gas: gas of a critical temperature less than 10°C.~~
- (2) ~~High pressure liquefied gas: gas of a critical temperature greater than or equal to 10°C and less than or equal to 70°C.~~
- (3) ~~Nominal working pressure: the restricted filling pressure of the contained gas at reference temperature (normally 15°C) for steel cylinders containing permanent gases; and the upper limit value of the pressure of the gas contained in the cylinder at 60°C for steel cylinders containing high pressure liquefied gases.~~
- (4) Hydraulic test pressure  $P_h$ : the pressure to be reached during hydraulic test.
- (5) Yield strength: the upper yield strength is to be taken where the material test specimen exhibits apparent yielding during the tensile test; where the test specimen does not exhibit apparent yielding, the specified non-proportional elongation strength under the test force,  $R_{p0.2}$ , is to be taken as the yield strength of the material.
- (6) Batch quantity: the specified quantity of steel cylinders which adopt the same design conditions, have the same nominal diameter and design wall thickness, are made of steel of the same heat/furnace number by the same manufacturing process, and are continuously heat treated in accordance with the same heat treatment specifications. For quenched and tempered steel cylinders, a batch corresponds to a quantity of not less than 200 plus the number of steel cylinders used for destructive test.
- (7) Filling ratio: the maximum allowable weight of gas to be filled per unit water capacity of the steel cylinder specified in the applicable standards for various filled media.
- (8) Burst pressure  $P_b$ : the maximum pressure of gas cylinders reached during burst test.

## 4 Drawings and documentation to be submitted

4.1 The following drawings and documentation to be submitted are to be submitted to CCS for

approval:

(1) Seamless steel gas cylinder drawings. Drawings are to reflect the products' structural form, main dimensions, materials, mechanical and chemical parameters, manufacturing and heat treatment methods, nominal working pressure, hydraulic test pressure and other special technical requirements;

(2) Seamless steel gas cylinder design calculations. Relevant calculations, including strength calculations of cylinder body, base and head, are to be made in accordance with the design standard;

(3) Type test plan.

4.2 The following drawings and documentation to be submitted are to be submitted for review when the initial works approval is being applied for:

(1) Basic information of the manufacturer: name, address and production history of the manufacturer, types and specifications of current products, the types, specifications and delivery conditions of the products for which approval is being applied, information on other certification or qualification certificates obtained, etc.;

(2) Quality system documents and other management documents. The organizations of the quality system and product quality control points are to be clearly defined in these documents;

(3) Main production, measuring/testing equipment.

List of main production equipment:

Forming equipment;

Heat treatment furnace's type, dimensions, heating method, temperature controlling and recording method, and arrangement of temperature measuring points.

List of main measuring/testing equipment

List of equipment for chemical components analysis, mechanical properties, mechanical test, metallographic test, NDT, hydraulic test, etc. (including the product name, type, manufacturer, statutory inspection organization and valid period of verification/calibration)

(4) Process documents:

Production process flow chart (quality control points are to be indicated);

Operation guidance books with various work procedures indicated in production process flow chart, including the main work procedures such as forming, heat treatment, NDT, etc.;

(5) Qualification certificates of testing and inspection personnel;

(6) Test location and laboratory qualifications (where the test is subcontracted, the qualification of the subcontractor and subcontract agreement are to be described).

(7) List of suppliers of materials and main parts;

(8) Product description and quality certificates (sample).

## 5 Technical requirements ~~for the materials of seamless steel gas cylinders~~

### 6.5.1 General design requirements

6.5.1.1 The design formula used to determine the wall thickness of cylinder body is to comply with the requirements of recognized standards (e.g. ISO 9809-1).

6.5.1.2 The guarantee value of the yield strength of heat treated material,  $R_{eg}$ , is to be taken for design of wall thickness of parts under pressure, and the limit of the ratio of yield strength guarantee value  $R_{eg}$  to tensile strength guarantee value  $R_{mg}$  is to comply with the requirements of the standards;

6.5.1.3 The design and calculation of the wall thickness of the bottle body shall be subject to the hydrostatic test pressure  $P_h$ ; the hydraulic test pressure of the cylinder is 1.5 times of the nominal working pressure

5.1.4 In general, more than two openings on a gas cylinder are not allowed, and the openings can only be designed to be arranged along the neutral axis of the gas cylinder.

~~6.1.4.5.1.5~~ For CrMo steel, the actual maximum tensile strength of cylinder body material  $R_{ma}$  is generally not to exceed 1100MPa; for CMn steel, the actual maximum tensile strength  $R_{ma}$  is not to exceed 1030MPa. For cylinders filled with the medium posing a risk of hydrogen embrittlement, the actual maximum tensile strength of cylinder body material  $R_{ma}$  is generally not to exceed 880MPa, or may not exceed 950Mpa when the actual yield-strength ratio is not more than 0.9.

~~6.1.5.1.6~~ The bottom structure of seamless steel cylinders is to comply with the following requirements:

~~6.1.5.1(1)~~ The structural form and dimensions are to comply with the requirements of relevant standards;

~~6.1.5.2(2)~~ The part in connection to convex base is to be smooth and its thickness is to be no less than the design thickness of the cylinder body;

~~6.1.5.3(3)~~ There is to be a transitional section between the annulated shell of concave base and the cylinder body. The connection of transitional section to cylinder body is to be smooth.

~~6.1.5.4(4)~~ The design of convex base and concave base is to be subject to fatigue test by means of cyclic pressurization. The design of cylinder bases is considered qualified provided that the cylinder bases can withstand 80000 cycles of pressurization with the upper limit of cyclic pressure being at the nominal working pressure, or 12000 cycles of pressurization with the upper limit of

cyclic pressure being at the test pressure, without being damaged; the design is not to be adopted if the cylinder bases have not passed the said test successfully.

~~6.1.65.1.7~~ The thickness of steel cylinder opening is to be measured ~~from the thread groove and to be no less than the design thickness of the cylinder body~~ in order to ensure that the opening will not be deformed when subject to the moment of valve-tightening force couple and the additional external force of neck ring riveting.

~~6.1.75.1.8~~ The internal threads of cylinder openings are to comply with the following requirements:

~~6.1.7.1(1)~~ The thread ~~form, dimensions and tolerances~~ are to comply with the requirements of recognized standards. ~~Existence of reverse pitch, flat pitch, pitch double line, pitch base flatness, pitch sharpness, pitch broadness and apparent jumping ripples on the thread surface are not allowed.~~

~~6.1.7.2(2)~~ The number of useful threads is to be such that the shear safety factor calculated at the hydraulic test pressure of steel cylinder,  $P_h$ , is at least 10, ~~and is to be no less than 6.~~

## ~~65.2~~ General requirements for manufacturing

~~65.2.1~~ The manufacture of marine seamless steel gas cylinders, ~~the main inspections during manufacture and~~ inspections/tests upon completion are to comply with the requirements of CCS Rules for Classification of Sea-going Steel Ships, approved drawings and relevant standards.

~~65.2.2~~ The manufacturers of seamless steel gas cylinders are to introduce the manufacturing process, describe the manufacturing tools having significant impact on product quality such as the press head for air cylinder pressing and drawing, mold plate or mold tool for shell nosing during rotary pressing or mold pressing, and specify other requirements for process verification before the product is put into service, regular inspection, repair and replacement when the product is in service, etc.

~~65.2.3~~ The cylinder body is not allowed to be welded or repaired. The crack, inclusion, non fusion and other defects on the inner surface of the cylinder from the tube shall be removed by mechanical milling and other methods. The treatment of surface defects of the cylinder body shall comply with the requirements of relevant recognized standards for gas cylinders.~~For steel cylinders manufactured through closing the bottom of seamless steel pipes, means are to be provided by the manufacturer to ensure the sealing tightness of the cylinder bottom; the internal surface of cylinder bottom is to be free from any visible pit, fold, overlap and oxide scale; removal of bottom and the defects thereof is allowable, however, the design thickness of cylinder bottom must be guaranteed; weld repair on the bottom is not allowed.~~

~~6.2.4~~ Gas cylinders are to be type tested in accordance with 7.2 of this guideline prior to going into service.

~~6.2.5~~ Welding on seamless steel gas cylinders is not allowed.

~~65.3~~ The filling ratio is to be consistent with the strength of cylinder body and also comply with the requirements of the conventions, regulations, rules and recognized standards involved in the

use of gas cylinders administration.

## **6 Materials and components Design and technical requirements**

56.1 The material used for the manufacture of gas cylinders shall be steel, other than rimming quality, with non-ageing properties and shall be fully killed with aluminium and/or silicon. In cases where examination of this non-ageing property is required by the customer, the criteria by which it is to be specified should be agreed with the customer and inserted in the order. The material of cylinder body must be non aging killed steel smelted by basic open hearth furnace, electric furnace or basic oxygen converter.

56.2 The material of cylinder body is to be compatible with the gas intended to be filled. Refer to ISO 11114-1 for compatibility of cylinder material with the gas;

56.3 The S element content (mass fraction) of the cylinder body material obtained through heat analysis is not to exceed 0.010% and the P element content (mass fraction) thereof obtained through heat analysis is not to exceed 0.020%. And the sum of S+P content percentages is not to exceed 0.025%;

56.4 The limit values (the difference between the maximum content and the minimum content) of the chemical composition of cylinder body material are not to exceed the values listed in the table 56.4 below:

**Chemical Composition Table**

**Table 56.4**

<b>Element</b>	<b>Maximum content (mass fraction), %</b>	<b>Limit value (mass fraction), %</b>
C	<0.30	0.06
	≥0.30	0.07
Mn	--	0.30
Si	--	0.30
Cr*	<1.50	0.30
	≥1.50	0.50
Ni*	--	0.40
Mo*	--	0.15

- Notes: ① The requirements in the table above must be complied with where the element marked by "\*" are alloy elements of the steel;
- ② The maximum content of any intentionally added element is to be reported;
- ③ Total content of V+Ni+Ti+B+Zr is not to exceed 0.15%.

56.5 The cylinder body is generally to be manufactured with nationally or internationally

recognized steel used for pressure vessels. Typical recognized steels include CrMo steel and CMn steel.

56.6 Rough rolled billets or steel billets are to be subject to macrostructure examination and defects such as flakers, residual shrinkage cavity, delamination, air bubble, foreign matters and impurity inclusion are not allowed. The center porosity is to be no greater than grade 1.5 and segregation no greater than grade 2.5. For seamless steel pipes, the wall thickness deviation is not to exceed -10%~+15% of the nominal wall thickness and the steel pipes are to be 100% satisfied by NDT.

## 7 Type test

### 7.1 Sampling principle of type test

7.1.1 Seamless steel cylinders are to be type tested according to different types. Cylinders are considered to be of different types in any one of the following cases:

- (1) Production process flow is different;
- (2) Material designation is different;
- (3) Heat treatment process is different;
- (4) Structural form of cylinder bottom and ratio of bottom thickness to cylinder diameter are different;
- (5) The overall length of the cylinder has increased by more than 50 % (cylinders with a length/diameter ratio less than 3 shall not be used as reference cylinders for any new design with this ratio greater than 3);
- (6) The outside diameter or minimum guarantee thickness of the cylinder is different;
- (7) The hydraulic test pressure is different (the design on the same basis with only hydraulic test pressure being reduced is not to be considered as new design);
- (8) The minimum guaranteed yield strength and/or minimum guaranteed tensile strength are different.

(9) In case of tapered threads the torque test shall be performed; in case of parallel threads the calculation of the shear strength shall be performed, if the diameter of the internal thread has increased by 50% or more, the pressure cycling test on two cylinders shall also be performed.

7.1.2 For each type of gas cylinders for which approval is to be applied, at least 50 gas cylinders are to be manufactured by the applicant and tested in accordance with the corresponding requirements of the table in 7.2.

7.1.3 For marine seamless steel gas cylinders for type test, the acceptance of raw materials, main manufacturing process, inspection and test, and transfer of relevant marks must be carried out

under the supervision of the surveyor and the results thereof are to comply with the requirements of CCS Rules for Classification of Sea-going Steel Ships and approved drawings.

## 7.2 Type test items and requirements

Type test items and requirements

Table 7.2

Test item	Test quantity	Test requirements
Raw material inspection	Each heat or each batch	<ol style="list-style-type: none"> <li><u>Each batch of raw</u>Raw materials are to be furnished with product quality certificates;</li> <li>Elements to be analyzed are to include C, Si, Mn, P, S, Nb, V, Ti, Cr, Ni, Mo, Cu, Al, B, <del>As, Sn, Zr, [N], [O]</del> and purposefully added elements;</li> <li><del>Rough rolled billets or steel billets are also to be subject to macrostructure examination;</del></li> <li><del>For seamless steel pipes, visual inspection, wall thickness inspection and mechanical properties tests are also to be carried out;</del></li> </ol>
Internal and external visual inspection of gas cylinders	Each cylinder	<p><u>The internal and external surfaces of finished gas cylinders are free of defects that may affect the safe use of gas cylinders, for details, see 8.3 of ISO9809-1:2019.</u></p> <p><del>1. The internal and external surfaces of cylinder body are to be smooth, even and free from defects affecting the strength of cylinder body, such as visible crack, fold, ripple, double skin, inclusion, etc.; existence of smooth local pits formed after fall off of oxide scale and minor traces generated due to grinding repair are allowable, however, the design thickness of cylinder body must be guaranteed.</del></p> <p><del>2. For a cylinder body manufactured by pressing and drawing process, the depth of its concave base is to be consistent with the specified design value, and the thickness of base spherical shell and annulated shell is to comply with the design requirements.</del></p> <p><del>3. Connection between cylinder shoulder and cylinder body must be smooth and the cylinder shoulder is to be free from groove marks.</del></p>

Test item	Test quantity	Test requirements
Inspection of dimension, shape and position tolerances, <u>neck threads inspection</u>	Each cylinder	<p>1. Dimensional inspection:</p> <p><u>For each cylinder for type test</u>, wall thickness, outer diameter and height of cylinder body, thickness and central depth (applicable to concave base) of cylinder base are to be measured. The results are to be consistent with the requirements of 7.3~<del>7.5</del><u>7.6</u>, 8.1, 8.2 of ISO 9809-1:<del>2010</del><u>2019</u> and <u>CCS</u> approved drawings.</p> <p><u>The thickness and outer diameter of the two cylinders for mechanical property test shall also be measured according to 7.3 to 7.6, 8.1 and 8.2 of ISO9809-1:2019 and the approved drawings.</u> <del>For</del>for each steel cylinder, three cross sections, namely the upper, middle and lower cross sections, are to be taken along the length of cylinder body. The wall thickness and outer diameter are to be measured respectively. Wall thickness of each cross section is to be measured at four measuring points evenly distributed along the circumference. The outer diameter is to be measured for two times vertically and crosswise. The thickness of cylinder base is to be measured at one measuring point located in the center of the base. For concave base, the thickness of the earthing point is also to be measured at the four measuring points evenly distributed along the circumference. The wall thickness measured at various points is to be no less than the minimum thickness guarantee value.</p> <p>2. Form and position tolerances are to comply with the requirements of 8.5~8.9 of ISO 9809-1:<del>2010</del><u>2019</u>.</p> <p><u>3. Neck threads inspection shall conform to the requirements of 8.9 of ISO9809-1:2019.</u></p>
Hardness test	Each cylinder	Hardness is to be tested at three points respectively located in the upper, middle and lower portions of the cylinder body and the results are to be consistent with the requirements of 11.3 of ISO 9809-1: <del>2010</del> <u>2019</u> and approved drawings.
Ultrasonic test	Each cylinder	To be in accordance with 8.4 of ISO9809-1: <del>2010</del> <u>2019</u> .
Magnetic particle inspection (when applicable)	Each cylinder	<u>If required by the standards that adopted, the results shall conform to the requirements of the standards.</u> <del>To be carried out in accordance with NB/T 47013.4 2015.</del>
Tensile test	2 cylinders	<del>2</del> <u>1</u> test pieces/cylinder
		To be in accordance with 10.2 of ISO 9809-1: <del>2010</del> <u>2019</u> and approved drawings.

Test item	Test quantity	Test requirements
Bending or flattening <del>or ring flattening</del> test	to be taken randomly	Bending: 2 test pieces/ cylinder, flattening/ring flattening: 1 test piece / cylinder
Impact test		1 group 3 test pieces/ cylinder
Strain ageing-impact test (when applicable)		1 group 3 test pieces/cylinder
Base check		1 test piece/cylinder
Metallographic inspection		1 test piece/cylinder
Hydraulic burst test	2 cylinders to be taken randomly	
Pressure cycling test	3 cylinders to be taken randomly	
Hydraulic test <u>and Capacity check</u>	Each cylinder	
Thread inspection	Each cylinder	
Neck ring torque test (when applicable)	1 cylinder to be taken randomly	
Torque test for <u>taper thread only</u>	1 cylinder to be taken randomly	
Air tightness test (when applicable)	Each cylinder	

## 8 Unit/batch inspection

8.1 Generally, Unit/batch inspection for issuing product certificates of marine seamless steel gas cylinders is to be carried out after works approval ~~has been obtained by the manufacturer, unless otherwise specially considered. Marine seamless steel gas cylinders are to be subject to unit/batch inspection.~~ the unit/batch inspection of unapproved seamless steel gas cylinders is to be carried out according to the requirements for type test of this guideline.

8.2 The unit/batch inspection (see 3.1 (6) for the definition of batch quantity) of seamless steel gas cylinders after CCS approval is to be carried out in accordance with the product inspection plan already approved during the approval. The test items listed in the table 8.2 are to be included:

Type test items and requirements

Table 8.2

Test item	Test quantity	Inspection method
Raw material inspection	Each heat or each batch	Report review
<del>Internal and external visual</del> Visual inspection of cylinder body	<del>Each cylinder</del> Random inspection	<del>Random inspection +</del> report review
Inspection of dimension, shape and position tolerances, neck threads inspection	<del>Each cylinder</del> Random inspection	<del>Random</del> inspection+report review
Hardness test (at 1 measuring point on the cylinder body)	Each cylinder	Report review
Ultrasonic test	Each cylinder	Report review
Tensile test	1 time	Test witness
<del>Bending or flattening or</del> ring flattening test (when applicable)	1 cylinder/batch	Bending:2 times Flattening/ring flattening:1 time
Impact test (when applicable)		1 group 3 times
Burst test	1 cylinder/batch	Test witness
Hydraulic test and Capacity check	Random inspection	<del>Random</del> inspection+report review
<del>Metallographic inspection</del> (when applicable)	<del>1</del> cylinder/batch	Report review
Dissection test of cylinder base (when applicable)	1 cylinder/batch	Test witness
<del>Bottom sealing test (only</del> applicable to the bottom of cylinders made of steel pipes)	<del>Each cylinder</del>	
<del>Air tightness test (when</del> applicable)	<del>Each cylinder</del>	
<del>Other inspections (when</del> applicable)	<del>The test items required by drawings approved by CCS, approved standards or technical documents of the factory.</del>	
<del>Other inspections</del>		

Notes: ① The tests are to be carried out in accordance with the type test requirements specified in 7.2;

(a) Tensile test: 2 samples shall be taken when the drawings approved by CCS, approved standards or technical documents of the factory require taking 2 samples;

- (b) Impact test: for thin-walled transverse impact specimen with wall thickness less than 3.5 mm, flattening test is allowed to replace impact test;
- (c) Ultrasonic testing: magnetic particle testing can be used to replace ultrasonic testing if the approved standards allow;
- (d) Bottom tightness test: it can be replaced by air tightness test or helium leak test.
- (e) "When applicable": bending test or flattening test, cylinder bottom dissection test, air tightness test: tests shall be conducted when required by CCS approved drawings, approved standards or factory technical documents.

- ② Where the test results are not satisfactory, disposal is to be made according to the following provisions:
- a. Where the non-conformity results from abnormal testing operation, noncompliance of test specimen preparation or measurement error, specimens of the same quantity may be re-tested; where the results of such re-test are satisfactory, the initial test will be invalidated;
  - b. Where a non-conformity due to heat treatment is confirmed, re-conducting the heat treatment to this batch of cylinders is allowable; however, the heat treatment is not to be repeated for more than twice; for cylinder bodies which have been heat treated again, the design wall thickness is to be guaranteed; the batch of cylinder bodies which have been heat treated again are to be treated as a new batch for single batch inspection;
  - c. Where the non-conformity results from other causes, the non-conforming steel cylinders are to be discarded or repaired by approved means; the repaired steel cylinders are to be re-tested for the original non-conforming items.

8.3 Cylinders qualified through inspection are to be clearly identified with permanent marks according to relevant standards, and ~~including but not limited to the following information~~ CCS certificate No. and CCS steel stamp.

~~Vessel weight;~~

~~Nominal water capacity;~~

~~Hydraulic test pressure;~~

~~Date of test;~~

~~Manufacturer serial number;~~

~~CCS steel stamp;~~

~~CCS certificate code.~~

8.4 The product certificates will be issued for qualified products by CCS surveyor upon completion of product inspection.