



CHINA CLASSIFICATION SOCIETY

GUIDELINES FOR INSPECTION OF HULL WELDS

CCS RULE CHANGE NOTICE

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CHAPTER 1 GENERAL

Section 1 GENERAL

1.1.2 Application

1.1.2.1 The Guidelines apply to use of welding consumables, qualification tests of welders, design and approval of welding procedures, hull assembly and welding, non-destructive testing of welds and materials as well as other inspections in respect to construction and repair for ships and offshore installations.

1.1.3 Welders

1.1.3.1 Welders engaged in operations covered by the Guidelines are to be specially trained in relevant knowledge and ~~qualified by CCS through tests in accordance with CCS Rules for Materials and Welding~~ obtain qualification certificates accordingly upon qualification tests.

CHAPTER 3 QUALIFICATION TESTS OF WELDERS AND WELDING OPERATORS

Section 1 GENERAL PROVISIONS

3.1.1 Application

3.1.1.1 This Chapter applies to the qualification tests of welders for shielded metal arc welding, semi-automatic gas metal arc welding, gas tungsten arc welding and flame brazing of steels, aluminium alloys, stainless steel, copper alloys and titanium alloys for structures, machinery installations, boilers, pressure vessels and piping system, etc. of ships and offshore installations.

3.1.1.2 The qualification tests for fully mechanized welding and automatic welding operators may be carried out according to Section 3 of this Chapter.

3.1.2 General requirements

3.1.2.1 Welders engaged in both construction of new ships and ship repairs are to pass qualification tests and obtain a certificate issued or accepted by CCS.

3.1.2.2 Welders, who have been engaged in the welding of test plates for an approved welding procedure, may be qualified to the corresponding welding conditions (welding processes, positions and consumables), subject to prior agreement by CCS Surveyor.

3.1.3 Qualification tests and evaluation of welders

3.1.3.1 Qualification categories, test items, evaluation methods and, retests and re-qualified are to comply with the requirements in Chapter 4, PART THREE of CCS Rules for Materials and Welding.

3.1.3.2 There are no mandatory requirements for the types of welded joints (welding by both sides, one-side welding, with or without backing, if gouged or not), edge preparation and size (groove angle, root face, root gap) of test plates in the tests, they may be determined according to the actual condition of production.

3.1.3.3 The qualification test of a combination of two welding processes (e.g. a one-side joint with the root to be welded by gas tungsten arc welding and to be filled by shielded metal arc welding) may be either of the following:

- (1) the test is carried out directly by combining the two processes; or
- (2) the test is carried out by using the two processes (one-side gas tungsten arc welding and shielded metal arc welding from both sides) separately.

3.1.3.4 Attention is to be given to the following for qualification tests of welders:

- (1) before being welded, a stamp is to be affixed to the test assembly and kept at all test stages;
- (2) the assembly of the test plates, adjustment of welding parameters and groove cleaning etc. are to be performed by the welder himself;
- (3) the test assembly is to have at least one stop/restart in the top capping run from which the bend test specimen is to be taken. For the one-side welding tests without backing and with back formation, there is also to be a stop/restart in the root run;

(4) for any material or procedure requiring preheating, post-weld heating or heat input, the conditions for tests are to be the same as those for production;

(5) minor imperfections are to be allowed to be removed, except on the surface layer, by grinding or any other repair method, subject to agreement by the Surveyor.

3.1.3.5 The Surveyor is to witness tests, measurements of test specimens and evaluation.

3.1.4 Scope of application of welder's qualification

3.1.4.1 The scope of application of welder's qualification for steel and aluminum alloy is to satisfy the requirements of Section 3, Chapter 4, PART THREE of CCS Rules for Materials and Welding. The scope of application of welder's qualification for titanium and copper alloy are respectively given in Sections 2 and 4 of this Chapter.

3.1.4.2 Attention is to be given to the following points for austenitic or duplex stainless steels within the scope of application of welder's qualification:

(1) The welders with qualification for austenitic or duplex stainless steels can cover each other;

(2) The welders with qualification for austenitic or duplex stainless steels cannot be qualified for welding the base metals of carbon steels and low alloy structural steels and vice versa;

(3) The welders with qualification for austenitic or duplex stainless steels can be qualified for the following items, provided that austenitic or duplex stainless steel filler materials are used:

The welding of dissimilar steels between austenitic stainless steels/duplex stainless steels and carbon steels/low alloy structural steels; The welding of dissimilar steels between austenitic stainless steels and duplex stainless steels;

(4) For lean duplex stainless steel, the application of welder qualification is to be in accordance with that of duplex stainless steel.

3.1.5 Qualification Certificate of Welder

3.1.5.1 Upon a satisfactory qualification test carried out by CCS, a Qualification Certificate of Welder is to be issued by CCS. The period of validity and renewal of the certificate and the extension of its period of validity are to comply with the requirements in Chapter 4, PART THREE of CCS Rules for Materials and Welding.

3.1.5.3 For the format of Welder's Qualification Certificate, see Appendix 3A of this Chapter. The actual certificate issued by CCS is to prevail.

3.1.5.4 Attention is to be given to the following cases for the completion of the Qualification Certificate of Welder and its applicability:

(1) The qualification for the one-side welding with ceramic backing and back formation falls into the category of "welding with backing" and is the same as the qualification for one-side welding with steel backing, not covering the qualification for the welding without backing and with back formation.

(2) Upon successful completion of the combined tests referred to in 3.1.3.3, both welding processes and associated plate thicknesses are to be stated in the certificate. Such certificate applies respectively to the one-side welding with root run and the welding by both sides with top capping run, with applicable throat thicknesses being appropriate to those of respective test assemblies.

Section 2 SPECIAL REQUIREMENTS FOR QUALIFICATION TESTS OF WELDERS FOR WELDING COPPER ALLOYS

3.2.1 Application

3.2.1.1 This Section applies to the qualification tests for shielded metal arc welding, gas metal arc welding, gas tungsten arc welding, plasma arc welding and electro gas welding of copper alloys.

3.2.2 ~~Test items~~ and requirements [for qualification tests](#)

3.2.2.1 The items for qualification tests of welding copper alloys are to be referred to those required for welding steels and aluminium alloys in Chapter 4, PART THREE of CCS Rules for Materials and Welding, of which the diameter of former for bend tests is to satisfy the requirements of 4.3.2.3(2) in Section 3, Chapter 4 of the Guidelines.

3.2.3 Coverage of materials

3.2.3.1 In order to minimize unnecessary multiplication of technically identical tests, copper alloys are divided into groups according to similar metallurgical and welding characteristics, as shown in Table 3.2.3.1.

Groups of copper alloys

Table 3.2.3.1

Material group	Type of copper alloy	Typical examples in CCS rules
W31	Pure copper	-
W32	Copper zinc alloy	Aluminum brass
W33	Copper tin alloy	90/10 Cu-Sn phosphor bronze, 88/10/2 gunmetal etc.
W34	Copper nickel alloy	90/10 Cu-Ni-Fe, 70/30 Cu-Ni-Fe
W35	Copper aluminum alloy	Cu3, Cu4
W36	Copper nickel zinc alloy	Cu1, Cu2

3.2.3.2 Welding consumables used in the [qualification](#) test are to be appropriate to the chemical composition of base metals.

3.2.3.3 The qualification for any material in one group covers all other materials in the same group.

3.2.3.4 The coverage of welder qualification for different groups of copper alloys is given in Table 3.2.3.4.

Application of welder qualification for copper alloys

Table 3.2.3.4

Material group of test assembly	Range of approval					
	W31	W32	W33	W34	W35	W36
W31	*	—	×	×	×	—
W32	—	*	—	—	—	×
W33	—	—	*	—	—	—
W34	—	—	—	*	×	—
W35	—	—	—	×	*	—
W36	—	×	—	—	—	*

Notes: * represents the material group for which the welder is approved [from the approval in the qualification](#) test

× represents the material group for which the welder is also [approved qualified](#)

— represents the material group for which the welder is not [approved qualified](#)

3.2.3.5 A special test is to be carried out for welding together copper alloys of different groups.

3.2.4 Application of test assembly specifications

3.2.4.1 The application of [test assembly qualified](#) thicknesses for butt welding of plates, fillet welding of plates or butt welding of pipes is given in Table 3.2.4.1.

Application of [qualified thickness for copper alloy test assembly thickness](#) Table 3.2.4.1

Test assembly thickness (mm)	Range of approval ^{①②}
t	$(0.5 \sim 1.5) t$

Note: ① In the case of oxy-acetylene welding, separate tests are to be carried out for maximum and minimum production thicknesses [in the qualification tests](#).

② In the case of repair welding, t is depth of repair welding.

3.2.4.2 The application of [test qualified](#) pipe diameters for butt welding of pipes is given in Table 3.2.4.2.

Application of [qualified diameter for copper alloy test Pipe diameter](#) Table 3.2.4.2

Test pipe diameter (mm)	Range of approval
$D \leq 25$	$D \sim 2D$
$D > 25$	$\geq 0.5D$ (minimum 25 mm)

3.2.5 Others

3.2.5.1 The coverage of other essential variables (e.g. welding processes, joint types and welding positions) of qualification tests of welding copper alloys are to be referred to that of welding steels and aluminum alloys, except for 3.2.3 and 3.2.4.

Section 3 QUALIFICATION TEST REQUIREMENTS OF WELDING OPERATORS

3.3.1 Application

3.3.1.3 For the welding operator who solely operates the equipment without responsibility for setting up and/or adjustment (for example, only operating the start button on the automatic welding line), if his/her relevant welding work experience and the product welds meet the quality requirements, he/she is unnecessary to take the [examination qualification tests](#).

3.3.3 General requirements

3.3.3.2 The [skill-test qualification tests](#) of welding operators is generally to be carried out by the means specified in this Section, but if the welding operator successfully completes the welding procedure qualification test, he/she can also be regarded as passing the relevant welding condition test.

3.3.3.4 In case of failure in the first [examination test](#), the requirements for [re-examination and re-test and re-qualified](#) are the same as those in 4.1.5, Chapter 4, Chapter 3 of CCS Rules for Materials and Welding.

3.3.4 Type and size of test assemblies

3.3.4.1 The type of test assemblies for [skill-examination qualification tests](#) includes plate butt welding, pipe butt welding and plate fillet welding, see Figure 4.2.2.1, Chapter 4, PART THREE of

CCS Rules for Materials and Welding, but the length of test assemblies for plate butt welding and fillet welding is not to be less than 500mm.

3.3.7 Certificate and term of validity

3.3.7.1 When the welding operator passes the qualification [examination tests](#), CCS is to issue the qualification certificate. Each shipyard/manufacture is to be responsible for the term of validity and scope of application for the certificate.

3.3.7.3 If the welding operator takes the [examination qualification tests](#) at the first time, his/her qualification validity period usually starts from the date of issuing certificate after all tests have passed.

3.3.7.5 Under the requirements of 3.3.7.4, in order to continue the validity of the certificate, the welding operator's skills are to be periodically verified by one of the following methods:

(1) ~~The skill examination is to be carried out~~ [The welder is to be re-tested](#) every 6 years, with the specific method as the same as 3.3.4-3.3.6, but if bending test is used, the number of samples will be reduced by half;

(2) Verification conducted every 3 years: radiographic inspection, ultrasonic inspection or destructive test is to be carried out on 2 welds welded by the welding operator within the last 6 months of the 3-year validity period and recorded. The welds are to reproduce the initial test conditions (except plate thickness). After passing these tests, the qualification of welding operator may be extended for 3 years;

(3) Re-verification is to be carried out not exceeding 3 years and the method is to be in accordance with 4.1.7.4 (3), Section 1, Chapter 4, PART THREE of the CCS Rules for Materials and Welding.

3.3.7.6 Upon verifying that the above conditions are met, CCS is to sign the qualification certificate of welder operator to confirm the continuation of his/her qualification.

3.3.8 Coverage of welder operator qualification

3.3.8.1 The category and code of welding processes commonly used in ship construction for fully mechanized and automatic welding are shown in Table 3.3.8.1. [Reexamination](#) [Re-qualified](#) is to be carried out if the code of welding process is changed.

Category of welding processes for welding operator examination **Table 3.3.8.1**

Code	Mechanized and automatic welding processes in actual working	Digital code in ISO 4063
SAW	Submerged arc welding	12
GMAW	Gas metal arc welding (including MIG、MAG、FCAW)	13
GTAW	Gas tungsten arc welding	141
GFW	Gravity welding	112
EGW	Electro-gas welding	73
LBW	Laser beam welding	52

3.3.8.2 After the welding operator passes the [examination tests](#), the coverage of base metal quality is the same as that stipulated for welder [examination qualification tests](#) (see 4.3.4, Chapter 4, PART THREE of CCS Rules for Materials and Welding for details), but the thickness and pipe diameter are not limited.

3.3.8.3 The coverage of welding positions is the same as that stipulated for welder [examination qualification tests](#) (see 4.3.7.1, Chapter 4, PART THREE of CCS Rules for Materials and Welding for details).

3.3.8.4 The coverage of joint type and process are as follows:

- (1) Fillet welding can be covered after the butt welding [examination test](#) is qualified, but not vice versa;
- (2) Single side welding without backing can cover single side welding with backing (double side welding can be regarded as backing), but not vice versa;
- (3) Multi-bead welding can cover single-bead welding, but not vice versa;
- (4) Double-wire welding can cover single-wire welding, but not vice versa.

3.3.8.5 For mechanized welding, [reexamination re-qualified](#) is to be carried out if the following factors are changed:

- (1) Change from visual observation to remote control, and vice versa;
- (2) Delete the automatic arc length control system;
- (3) Delete the automatic connector tracking;
- (4) Remove the fusibility moulding.

3.3.8.6 For automatic welding, [reexamination re-qualified](#) is also to be carried out if the following factors are changed:

- (1) With or without arc and/or connector sensors;
- (2) Change of type of welding system (including change of robot control system).

3.3.8.7 For the same welding process, when the automatic welding is changed to mechanized welding, the welding operator is to take the [reexamination re-qualified](#).

3.3.8.8 When the above-mentioned welding variables are the same, the qualification of weld operators engaged in boiler and pressure vessel welding can cover that of weld operators engaged in welding work for ships and offshore installations.

Section 4 SPECIAL REQUIREMENTS FOR QUALIFICATION TESTS OF WELDERS FOR WELDING TITANIUM ALLOYS

3.4.1 Application

3.4.1.1 This section applies to the qualification tests of welders for tungsten inert gas (TIG) welding, metal-arc inert gas welding (MIG) and plasma welding of titanium alloys. The qualification tests of welders for other welding processes are subject to individual consideration.

3.4.5 Coverage of welder qualification

3.4.5.1 Where the same welding specification is used, successful completion of the qualification test for any titanium and titanium alloys may cover titanium and titanium alloys in the same group. The specific material groups are shown in Table 3.4.5.1:

Application for qualification test of welders for welding titanium alloys **Table 3.4.5.1**

Group	Type of titanium and titanium alloys	Typical examples in CCS Rules for
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		Materials and Welding
51	Pure titanium	TA2, TA3
52	α type titanium alloys (or similar to α type)	TA7, TA9, TA9-1, TA10, TA18, TA31
53	α - β type titanium alloys	TA4 TC4ELI

3.4.5.2 Except for 3.4.5.1, the coverage of other variables (e.g. thicknesses of base metals, pipe diameters, welding processes, joint types, welding positions, etc.) of qualification tests of welding titanium alloys satisfy the relevant requirements for qualification tests of welding steels in Section 3, Chapter 4, PART THREE of CCS Rules for Materials and Welding.

Section 5 SPECIAL REQUIREMENTS FOR QUALIFICATION TESTS OF WELDERS FOR BRAZING

3.5.1 Application

3.5.1.1 This section applies to the qualification tests of welders for flame brazing of copper alloy pipe.

3.5.2 Type and dimensions of test assemblies

3.5.2.1 The welder qualification test assembly is to be edge prepared, joined, cleaned prior to welding and welded according to a welding procedure specification (WPS or PWPS) simulating the conditions in production, as far as practicable. The length of the butt and lap test assembly is not to be less than 250 mm. When the outside diameter of the pipe is greater than 76 mm, samples are to be taken from the two symmetrical positions respectively. When the outside diameter of the pipe is less than or equal to 76 mm, two test assemblies are to be welded and one sample is to be taken from each test assembly.

3.5.4 Application of welder qualification

3.5.4.1 Brazing process is only applicable to method of qualification test.

3.5.4.2 Any type of copper alloy base metal and filler metal can cover other copper alloy base metals and filler metals. The applicable scope of base metals is shown in Table 3.5.4.2. When the thicknesses of base metals are different, the applicable thickness ranges are to be determined separately. The applicable scope of the outer diameter of pipe is less than or equal to that of the qualification test.

Applicable scope of base metal thickness		Table 3.5.4.2
Thickness of test assembly t (mm)		Applicable thickness (mm)
$t < 3$		$(0.5 \sim 2)t$
$3 \leq t \leq 10$		$1.5 \sim 2t$
$t > 10$		$5 \sim 2t$

3.5.4.3 Welding joint type is only applicable to joint type of qualification test. For lap joints, the applicable scope of lap length is less than or equal to the lap length of the qualification test.

Appendix 3A Example of Welder's Qualification Certificate

CCS WELDER'S QUALIFICATION CERTIFICATE

中国船级社焊工能力认证证书

Type 证书类别	Welding operator 焊接操作者 ☐	Welder 焊工 ☐
Name 姓名	Date of birth 出生日期	Photograph 照片
Cert. No. 证书号	Sex 性别	
Identification No. 身份证号		
WPS/PWPS No. WPS/PWPS编号		
Employer's name and address 工厂名称和地址		
Date of initial approval 初次发证日期		Product type 产品类型
This is to certify that the welder/welding operator has passed the qualification test (/and re-validation record audit) according to the rules of CCS, and is qualified to undertake welding operation specified in range of qualification of this certificate. 此证书证明焊工/焊接操作者根据本社规范通过了资格考试能力认证（/和重新生效记录审核），具有从事此证书规定范围内焊接工作的资格能力。		
Items 项目	Test piece 试件	Range of qualification 适用范围
Welding process 焊接方法		
Base metal 母材		
Filler metal type 填充金属类型		
Plate /pipe wall thickness 板/管壁厚度		
Pipe outside diameter 管子外径		
Type of welded joint 焊接接头形式		
Welding position 焊接位置		
Revalidation method 周期性验证方式	In accordance with 4.1.7.4, Chapter 4, Part THREE of CCS Rules for Materials and Welding(welder) 选用CCS《材料与焊接规范》第3篇第4章第4.1.7.4条（焊工） 1) ☐ 2) ☐ 3) ☐ In accordance with 3.3.7.5, Chapter 3 of CCS Guidelines for Inspection of Hull Welds(welding operator) 选用CCS《船舶焊接检验指南》第3章第3.3.7.5条（焊接操作者） 1) ☐ 2) ☐ 3) ☐	
Other details 其他细节		

This certificate is issued at [place] , and valid until [DD/MM/YYYY] .

发证地点: , 有效期至:

Signature/seal of surveyor: Issued on [DD/MM/YYYY] .

验船师签名/盖章: , 签发日期:

RECORDS OF SUPERVISION BY EMPLOYER EVERY SIX MONTHS

工厂每6个月考察记录

	Report No. to be reviewed 审核的报告号	Date of report 报告日期	Signature of Employer 工厂审核人签字	Date of signature 签字日期
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

TEST RECORD

试验记录

Type of test 试验形式	Performed and accepted 完成并通过	Not required 不要求
Visual examination 目视检验		
Radiographic examination 射线检验		
Surface examination 表面检验		
Macro examination 宏观检验		
Fracture test 破断试验		
Bend test 弯曲试验		
Additional tests 附加试验		

注：表格“试验记录”可作为证书的背页或作为分开文件。

Note: The form of “Test Record” may be used as the back page of the certificate or as a separate document.

CHAPTER 6 WELDING OF HULL STRUCTURES

Section 6 WELDING OF AUSTENITIC STAINLESS STEEL-CLAD PLATES

6.6.1 General requirements

6.6.1.2 The welders engaged in the welding of austenitic stainless steel-clad plates are to be trained in and certified for relevant operations acquire qualification certificates accordingly upon qualification tests. ~~In addition, the welding consumables approved by CCS are to be used.~~