



CCS Rule Change Notice For

**GUIDELINES FOR INSPECTION OF
HULL WELDS**

Version: November 2020 RCN No.1

Effective date: 1 January 2021

Beijing

Brief Introduction

The latest revision of UR W24, W27 and W32 has been included and coordinated with CCS Rules for Materials and Welding and CCS Guidelines of Copper Alloy Propellers. UR W24 and W27 will take effect on 1 July 2021. UR W32 will take effect on 1 January 2022.

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CHAPTER 3 QUALIFICATION TESTS OF WELDERS

Appendix 3B¹ Example of Welder's Qualification Certificate^{①②}

WELDER'S QUALIFICATION CERTIFICATE

Welder's name:	Date of birth:	Photograph
Cert. No:	Sex:	
Identification No.		
WPS/pWPS No.		
Employer's name and address		
Date of initial approval		Product type
This is to certify that the welder 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.		
Items	Test piece	Range of qualification
Welding process		
Base metal		
Filler metal type		
Plate /pipe wall thickness		
pipe outside diameter		
Type of welded joint		
Welding position		
Revalidation method	In accordance with Section 4.1.7.4, Chapter 4, Part THREE of Rules for Materials and Welding 1) ☐ 2) ☐ 3) ☐	
Other details		

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

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

¹ This content will take effect on 1 January 2022.

RECORDS OF SUPERVISION BY EMPLOYER EVERY SIX MONTHS

	Report No. to be reviewed	Date of report	Signature of Employee	Date of signature
1				
2				
3				
4				
5				
6				

TEST RECORD

Type of test	Performed and accepted	Not required
Visual examination		
Radiographic examination		
Surface examination		
Macro examination		
Fracture test		
Bend test		
Additional tests		

Notes: ① Certificate is to be re-issued after periodical verification is carried out, with this form of welder's qualification certificate, in accordance with Rules for Materials and Welding (retest every 3 years or verification every 2 years). This form of certificate applies to initial test and periodical verification.

② "Test Record" can be the back page of a certificate or a separate file.

CHAPTER 4 APPROVAL OF WELDING PROCEDURES

Section 5 APPROVAL OF SPECIAL WELDING PROCEDURES

4.5.3 Repair welding of ~~copper-alloy~~ propellers²

4.5.3.1 ~~The test assembly is to be butt welded by both sides at the down hand position, and the plate thickness is to be not less than 30 mm. The test assembly is to be not less than 250 mm in length and not less than 280 mm in width. Cast copper alloy and cast steel propeller repair welding approval procedure is to be in accordance with the relevant provisions of Section 4, Chapter 8, PART THREE of CCS Rules for Materials and Welding.~~

4.5.3.2 ~~The welding processes, welding consumables, preheating, interpass temperatures and post-weld heat treatment used for the welding of test plates are to be determined according to the specific conditions for weld repairs of products.~~

4.5.3.3 ~~After completion of welding, test assemblies are to be 100% inspected visually, tested by dye penetration and by radiographic testing. If post-weld heat treatment is required, the non-destructive testing is to be carried out thereafter.~~

4.5.3.4 ~~Test items are specified as follows:—~~

(1) ~~two transverse tensile test specimens;—~~

(2) ~~three macrographic sections.—~~

4.5.3.5 ~~Required test results are as follows:—~~

(1) ~~the results of the visual examination are to comply with recognized standards;—~~

(2) ~~no crack is allowed, as shown by the dye penetrant testing;—~~

(3) ~~the radiographic examination is to comply with recognized standards;—~~

(4) ~~no cracks and no pores greater than 3 mm are allowed, as shown by the macrographic examination;—~~

(5) ~~the tensile strength requirement is given in Table 4.5.3.5(5).—~~

Tensile strength of repair weld joints of copper alloy propellers Table 4.5.3.5(5)

Alloy type	Minimum tensile strength(N/mm ²)
Cu1	370
Cu2	410
Cu3	500
Cu4	550

4.5.3.6 ~~The coverage of approval of welding procedures are as follows:—~~

(1) ~~Repair welding of copper alloy propellers is subjected to the procedure approval test with plate thickness specified in this Section. This requirement is applicable to the repair welding of copper alloy propellers of all thicknesses.—~~

(2) ~~Copper alloy propellers of different materials are subjected to procedure approval tests separately.—~~

(3) ~~For the coverage of welding conditions, relevant provisions of Section 1, Chapter 3, PART THREE of CCS Rules for Materials and Welding may be referred to.~~

CHAPTER 6 WELDING OF HULL STRUCTURES

Section 5 REPAIR WELDING OF ~~COPPER-ALLOY~~ PROPELLERS³

² This content will take effect on 1 July 2021.

³ This content will take effect on 1 July 2021.

6.5.1 General requirements

6.5.1.1 This Section applies to the repair welding of blades and hubs of copper alloy and steel castings propellers complying with the requirements of Section 4, Chapter 8, PART THREE of CCS Rules for Materials and Welding.

6.5.1.2 This Section also applies to the repair welding for casting defects and insufficient sizes found during the manufacturing process of integral and built-up cast copper alloy propellers of civilian ships and during their service.

6.5.1.3 The chemical composition and mechanical properties of copper alloys used in manufacturing propellers are to comply with the requirements of Section 1, Chapter 9, PART ONE of CCS Rules for Materials and Welding, and the chemical composition and mechanical properties of steel castings are to comply with the requirements of Section 5, Chapter 6, PART ONE of CCS Rules for Materials and Welding.

6.5.2 Division of repair welding zones and scope of defects for which repair welding is allowed

6.5.2.1 For the repair welding of propellers, defects are divided into three different zones according to their positions, sizes and their levels of hazard to the service of propellers. Such zones are in accordance with the requirements of Section 4, Chapter 8, PART THREE of CCS Rules for Materials and Welding.

6.5.2.2 In principle, the detection of defects and the repair of defects in each zone are to follow the requirements of Section 4, Chapter 8, PART THREE of CCS Rules for Materials and Welding. For propellers having the defects listed in the following Table and requiring repair welding, a document stating the scope of repair welding details and a welding procedure specification are to be submitted in advance by the manufacturer to CCS for approval. The repair welding zones of propellers and their areas are to be as specified in Table 6.5.2.2.

Repair welding zones and areas of propellers Table 6.5.2.2

Position of defect	Repair allowed or not	Maximum size of a single defect for which repair welding is allowed Area $s \times \text{depth } h$ (mm ² ×mm)					Total area for which repair is allowed
		$D \leq 1.0 \text{ m}$	$1.0 \text{ m} < D \leq 1.5 \text{ m}$	$1.5 \text{ m} < D \leq 2.5 \text{ m}$	$2.5 \text{ m} < D \leq 4.0 \text{ m}$	$D > 4.0 \text{ m}$	
Zone A	Repair generally not allowed	Repair welding may be carried out only upon implementation of certain procedures, subject to discreet acceptance by CCS. If accepted, effective heat treatment for stress relief and inspection are to be carried out after completion of welding. The repairs which CCS may discreetly accept refer to single defects the area and depth of which are not greater than 70% of maximum size of a single defect allowed in zone B on pressure face, and the total area of which is not greater than 3% of surface area of zone A, subject to agreement reached by parties concerned					
Zone B on pressure face (B1 + B2)	Repair allowed	500×6	1400×7	2500×10	5000×15	7500×15	Total repair welding area on each face in each subzone is to be not greater than 5% of surface area of the subzone.
Zone B on suction side from fillet to 0.4R (subzone B3)		700×8	1500×8	2500×10	5000×15	7500×20	Where total repair welding area on a blade face is to be not greater than 5% of the face, however, total repair welding area in zone C on pressure face or in zone B4 and zone C on suction side may be 7% of respective areas of these zones
Zone C, zone B on suction side from 0.4R to 0.7R (subzone B4)		700×8	1500×8	4000×10	7500×15	20000×25	
Internal and external hub surfaces							Total repair welding area on internal and external hub surfaces is to be not greater than 5% of respective areas of these surfaces.
Large and small hub end-faces		700×8	1000×8	2000×10	4000×15	10000×25	Total repair welding area on large and small hub end-faces is to be not

							greater
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Notes: (1) The portion of zone B within 0.4 R on pressure face is called subzone B1, the portion of zone B on pressure face beyond subzone B1 is called subzone B2;
(2) ————— Propeller sizes given in the Table are net sizes in propeller drawings, and D is propeller diameter;
(3) ————— The size of a defect is the size after removal of the defect;
(4) ————— The maximum length of a single defect for which repair welding is allowed is to be not greater than twice the square root of the area of the defect.

6.5.3 Repair welding procedure

6.5.3.1 ~~Repair welding is to be carried out in calm weather. If weather conditions are severe, it is to be carried out at a sheltered location. Repair welding is to comply with the relevant procedure of section 4, Chapter 8, PART THREE of CCS Rules for Materials and Welding.~~

6.5.3.2 ~~The repair welding consumables are to be approved by CCS as qualified ones. None destructive testing is to comply with the relevant requirements of section 4, Chapter 8, PART THREE of CCS Rules for Materials and Welding.~~

6.5.3.3 ~~The shielded metal arc welding with coated electrodes or the electro gas welding are generally to be applied for propeller repairs. The gas tungsten arc welding is to be used with care.~~

6.5.3.4 ~~The repair welding is preferably to be carried out at the down hand position and where this is not practicable, the gas metal arc welding is to be carried out. If necessary, suitable preheating is to be done prior to welding and kept till completion of welding.~~

6.5.3.5 ~~Upon completion of each run during the repair welding, all slag inclusions, undercuts and other defects are to be removed before the metal deposition of the next run.~~

6.5.3.6 ~~After completion of the repair welding, welds are to be ground smooth for visual examination and dye penetrant test. If the propeller or its blades are to be heat treated for stress relief, they are to be visually examined before the heat treatment and are still to be subjected to the visual examination and dye penetrant test after such heat treatment. The radiographic examination is to comply with recognized standards. The repair welding of any area within the zone A specified by CCS is to be evaluated.~~

6.5.4 Heat treatment

6.5.4.1 ~~In general, straightened or weld repaired propellers are to be stress relieved. Furnace annealing is recommended for the repair welding in zones A and B or the repair welding of large areas in other zones. In addition, local stress relief may be applied (e.g. local annealing and hammering).~~

6.5.4.21 ~~Suitable temperature control equipment is to be provided for stress-relief heat treatment in a furnace. Where local stress is to be relieved, various positions of the thickest blade are to be monitored by sufficient thermocouples. The Surveyor is to confirm that the technical means of heat treatment provided for local stress relief and the monitored technical data are effective.~~

6.5.4.32 ~~In addition to the above requirements, other requirements for repair welding, straightening and heat treatment as specified in Section 4, Chapter 8, PART THREE and Section 1, Chapter 9, PART ONE and Section 1, Chapter 6, PART ONE of CCS Rules for Materials and Welding are to be complied with.~~